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DEPARTMENT OF THE ARMY
ARMY CONCEPT TEAM IN VIETNAM
APO San Francisco 96384

FINAL REPORT.

OPTIMUM MIX OF ARMORED VEHICLES FOR USE

IN STABILITY OPERATIONS.

ACTIV Project No. - ACG-69F

(This Report Is Published In Three Volumes)

In addition to this document being submitted to the Department of Defense, a copy of this document is being submitted to the Department of the Army.

Approved: 27 JAN 1971

Richard L. Clarkson

RICHARD L. CLARKSON
Colonel, ADA
Commanding

Best Available Copy

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AVHDO-DO (1 MAR 1971) 1st Ind
SUBJECT: Final Report - Optimum Mix of Armored Vehicles for Use in
Stability Operations. ACTIV Project No. ACG 69F

DA, Headquarters, U.S. Army Vietnam, APO San Francisco 96375 20000000

THRU: Commander-in-Chief, U.S. Army Pacific, APO San Francisco 96358

TO: Assistant Chief of Staff for Force Development, Department of the
Army, Washington, D.C. 20310

1. Subject final report is submitted for review and approval.
2. This headquarters concurs in the conclusions and recommendations as written.
3. Comments follow:

a. This report presents an accurate appraisal of conditions existing at the time of the evaluation. Since the completion of this study, redeployment of US units and other changes in operational conditions have taken place, thereby reducing the applicability of many specific conclusions and recommendations to current operations in this theater, but in no way altering the validity with regard to stability operations as a whole.

b. Since the data collection phase of this study was completed, several new items of equipment have been introduced and issued to armored/mechanized infantry units which provide increased capability where improved materiel was required. These include: the XM806 recovery vehicle, the AN/PRC-7 mine detector, and the XM202 multishot portable flame weapon. The pintle mounted grenade launcher (ENSURE 189) is scheduled for introduction in the near future.

c. Reference pages III-40 and III-41, paragraph 6e, and recommendation 91, page IV-29. The data collection phase of this study took place at a time when The Army Authorization Documents System (TAADS) had not been fully implemented in RVN. Since that time, considerable command emphasis has been placed on TAADS, previously required documentation has been reduced, and the system has been made more responsive to unit requirements. Although errors of the type identified by the study no doubt continue to exist, the status of unit authorizations and documentation has markedly improved.

d. Reference page III-35, paragraph 6d(2). It is recognized that operations in RVN resulted in increased requirements for engineer support. The apparent lack of responsive engineer support, particularly with regard to bridging and bulldozing requirements, can frequently be avoided by prior coordination with the appropriate staff engineer.

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AVHDO-DC 81 MAR 1971) 1st Ind

SUBJECT: Final Report - Optimum Mix of Armored Vehicles for Use in
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e. Reference recommendation 20, page IV-7. Although the ROI for hand-held portable mine detectors was determined based upon experience with the AN/PRS-4, it remains valid for the AN/PRS-7, which has replaced the AN/PRS-4 as the standard item of issue. The AN/PRS-7 requires considerably more operator training than the AN/PRS-4, and it is further recommended that such training for armored vehicle crewmen be included in AIT.

4. Request that one copy of all forwarding and approval indorsements be furnished this headquarters.

FOR THE COMMANDER:

1 Incl
nc

J. H. Hunsow, CPT
for **JACK P. GOOK**
CPT, AGC
Assistant Adjutant General

Copies Furnished:
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Inclosure 1)

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DEPARTMENT OF THE ARMY
ARMY CONCEPT TEAM IN VIETNAM
APO SAN FRANCISCO 96364

IN REPLY REFER TO:

AVIB-OPS

21 MAR 1971

SUBJECT: Final Report - Optimum Mix of Armored Vehicles for Use in
Stability Operations. ACTIV Project No. ACG 09F.

THRU: Commanding General
United States Army, Vietnam
ATTN: AVHDO-D
APO 96375

TO: Assistant Chief of Staff for Force Development
Department of the Army
Washington, D. C. 20310

1. Reference: Letter, AGAM-P(M) (2 May 69) FOR ACTIV, Hq DA, 8 May 69,
subject: Army Combat Developments and Materiel Evaluation (CD&ME) Program,
Vietnam.

2. In accordance with above reference, subject final report is forwarded
for review and approval.

3. Request one copy of all forwarding and approval indorsements be
furnished this headquarters.

FOR THE COMMANDER:

1 Incl
as (Quin)

J. S. Carroll
J. S. CARROLL
CPT, AGC
Adjutant

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AUTHORITY

Letter, FOR ACTIV, HQ Department of the Army, 10 March 1969, subject: Army Combat Developments and Materiel Evaluation (CD&ME) Program, Vietnam, FY 70-71.

ACKNOWLEDGMENTS

Appreciation is expressed to the officers and men of the armored units in Vietnam, whose professionalism and cooperation were fundamental to the conduct of the evaluation. The Army Concept Team in Vietnam is also indebted to the following for their invaluable personal contribution to the evaluation:

LTC Niven J. Baird, 1st Battalion, 77th Armor
LTC Robert G. Bond, 2nd Squadron, 1st Cavalry
LTC William N. Bradberry, 3d Squadron, 5th Cavalry
LTC Grail L. Brookshire, 2nd Squadron, 11th Armored Cavalry Regiment
LTC Frederick J. Brown, 1st Squadron, 4th Cavalry
LTC Lee D. Brown, 2nd Battalion, 2nd Infantry
LTC John H. Claybrook, 2nd Battalion, 47th Infantry
LTC James E. Coggins, 4th Battalion, 23d Infantry
LTC David K. Doyle, 3d Squadron, 11th Armored Cavalry Regiment
LTC Richard G. Graves, 1st Squadron, 1st Cavalry
LTC William Greenberg, 2nd Battalion, 34th Armor
LTC George Hoffmaster, 3d Squadron, 11th Armored Cavalry Regiment
LTC Robert H. Luck, 1st Battalion, 50th Infantry
LTC James L. Marini, 1st Battalion, 69th Armor
LTC David C. Martin, 1st Battalion, 16th Infantry
LTC Corwin A. Mitchell, 3d Squadron, 4th Cavalry
LTC John T. Murchison, Jr., 1st Squadron, 4th Cavalry
LTC John M. Norton, 1st Squadron, 11th Armored Cavalry Regiment
LTC J. G. Parker, 2nd Battalion, 22nd Infantry
LTC John W. Swaren, Jr., 1st Battalion, 61 Infantry
LTC Ted G. Westerman, 1st Battalion, 5th Infantry
MAJ Jack A. N. Chipman, RAAC
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CPT Mitchell A. Doyle, D Troop, 17th Cavalry
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ABSTRACT

This report has been prepared in three volumes: Volume I, is a summary of the most significant findings and contains all conclusions and recommendations. Volume II is devoted to a discussion of the various types of armored units in RVN and the problems peculiar to each type; this volume also contains recommendations from Volume I presented in a tabular form to relate them to specific types of units. Volume III presents a number of materiel problems, shows several local modifications made to overcome such problems, and describes communications nets. As originally conceived, this study was to determine, for stability operations, the optimum mix of organizational elements and equipment in armored units. During the course of the evaluation, which covered every type of armored unit in RVN, it became apparent that the different types of terrain present in RVN, and the differences in the nature of conflict between areas, precluded the preparation of any ideal mix-of-force structure. However, many means of improving armored unit equipment and organization were noted; these are enumerated in this report, and pertinent recommendations are made. Following the introduction, Section I of the report, (a detailed discussion of the characteristics of the Vietnam conflict that impact on armor employment are given in Section II.) These include the effects of both terrain and climate, and also the political and humanitarian principles that have constrained the employment of combat power. Section III is a catalogue of specific areas where improvement can be made in armor materiel or employment or both. The commentaries are categorized according to the five functions of ground combat: intelligence, mobility, firepower, command and control, and support. In Section IV, conclusions and recommendations are presented in the same sequence used in Section III. The conclusions and resultant recommendations are presented side-by-side for ease of reference. In the three major annexes contained in this summary volume, organizational and equipment modifications made by armored units in RVN are enumerated, the status of equipment (i.e., overages, shortages) in these units is presented, and the recommendations contained in this report are correlated with those of the US Army Mechanized and Armor Combat Operations in Vietnam (MACOV) study of 1967. This report is based on data collected during the period October 1969 through April 1970.

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SECTION I

INTRODUCTION

1. (U) REFERENCES

a. Evaluation of US Army Mechanized and Armor Combat Operations in Vietnam (MACOV) (U), HQ, USARV, 28 March 1967.

b. Letter, FOR ACTIV, HQ Department of the Army, 10 March 1969, subject: Army Combat Developments and Materiel Evaluation (CD&ME) Program, Vietnam, FY 70-71.

c. Letter, AVIB-GCD, HQ USARV, 28 July 1969, subject: Optimum Mix of Armored Type Vehicles for Use in Stability Operations; with 1st Ind: GPOP-DT, HQ USARPAC, 5 Aug 69; 2nd Ind: FOR ACTIV, HQ DA OACSFOR, 3 Dec 69; and 3d Ind: GPOP-DT, HQ USARPAC, 9 Dec 69.

2. (C) BACKGROUND

Early in 1967, the US Army Mechanized and Armor Combat Operations in Vietnam (MACOV) study was performed. It was a comprehensive evaluation of doctrine, tactics, techniques, materiel, organization, and force mix of the US Army mechanized infantry and armor units operating in the Republic of Vietnam (RVN) at that time. The resultant series of recommendations served as the basis for many organizational and equipment changes and improvements in armored units employed in RVN. Subsequent to completion of MACOV, however, the complexion of the war altered in several significant ways. More sophisticated anti-armor weapons appeared, typified by the RPG-7 and more efficient antitank mines, and the intensity of the conflict lessened. As a result, mechanized infantry and armored units were compelled to reassess their tactics, organizational structure, and equipment. This reassessment resulted in another series of requests for MTOE changes. As with the MACOV recommendations, some of these requests were approved, some are still pending, and some were disapproved. This series of reorganizations prompted a further evaluation to determine the optimum mix of organizational elements and equipment for armored-type units in RVN. On 10 March 1969, DA directed that the Army Concept Team in Vietnam (ACTIV) conduct a formal evaluation to determine the optimum mix of organizational elements and equipment for tank, cavalry, and mechanized infantry units employed in a stability operation.

3. (U) PURPOSE

To evaluate the current organization and effectiveness of US units equipped with armored-type vehicles in RVN and to determine an optimum mix of organizational elements and equipment for armored-type units to meet the threat encountered during stability operations.

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4. (U) OBJECTIVES

- a. Objective 1. To document organizational and equipment modifications implemented in RVN by US units equipped with armored-type vehicles.
- b. Objective 2. To determine the effectiveness of Tables of Organization and Equipment (TOE) and Modification Tables of Organization and Equipment (MTOE).
- c. Objective 3. To identify organizational and equipment problem areas, materiel requirements, and equipment inadequacies that remain after TOE modifications, and to identify equipment modifications made to armored-type vehicles.
- d. Objective 4. To determine the optimum mix of organizational elements and equipment in divisional, regimental, and separate battalion/squadron organizations.

5. (U) OPERATIONAL ENVIRONMENT

The character of the conflict in RVN varied significantly from region to region, reflecting the many factors peculiar to each Corps Tactical Zone (CTZ)*. These variables can be divided into the broad areas of mission, terrain and weather, enemy capabilities, operational constraints, and friendly forces available. These are summarized as a part of Section II, Operational Profile - Armor in RVN.

6. (C) SCOPE

- a. The original title of this study, as stated in reference 1c, was "Optimum Mix of Armored-Type Vehicles for Use in Stability Operations." A detailed analysis of the DA-approved purpose and objectives, reference 1b, defined a broader scope. Specifically, the study was not to be limited to armored vehicles, but was to consider the organizational and equipment requirements of armored-type units in stability operations. Accordingly, the title of the study was modified by ACTIV to be more descriptive of the scope of the study.
- b. The evaluation included all US armored and mechanized units (armored cavalry regiment, divisional cavalry squadrons, separate cavalry troops, tank battalions, and mechanized infantry battalions) in RVN. These units were located in all CTZs except IV CTZ, where no US armored or mechanized units were stationed. The evaluation investigate the quantitative and qualitative suitability of major and ancillary items of equipment authorized and/or employed by the evaluated units to determine requirements for changes in authorization and/or equipment modifications. Operational and environmental constraints causing variations in organizational and equipment usage were considered in analyzing problems;

* Now termed Military Regions (MR) 1, 2, 3, and 4.

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however, as in the MACOV study, standardization of organization and equipment by type of unit was a study goal. The evaluation also identified problem areas which required further investigation. Finally, the study provides background information which is considered valuable for a variety of purposes.

c. Several factors impacted on the conduct of the evaluation. Because of time and personnel resources, not all mission-essential equipment was considered. The tempo of the conflict during the evaluation period was slow. This factor undoubtedly influenced the thinking of the commanders whose subjective views were obtained. Also, the operational environment affected the evaluation. The bulk of the units were experiencing the dry season, which limited their experience with mobility problems. Most cavalry units were either in the process of, or had just completed, exchanging the M48A3 tank for the M551 AR/AAV. Because of the relatively low level of conflict, all types of units were performing essentially the same mission, reconnaissance in force, which compromised the distinctiveness and unique speed and firepower capabilities of each type of unit. Because of time and personnel resources, each unit was visited only once. The study relied heavily on subjective information. No major effort was made, mainly due to the limited scope of the evaluation, to identify precise equipment trade-offs. Finally, confusion existed regarding equipment authorizations, which affected, in some areas, the precision of the study findings related to equipment requirements.

7. (U) EVALUATION MANAGEMENT

a. General

In undertaking such a comprehensive study, it was necessary that a systematic approach be taken to respond to the assigned objectives. The designed approach insured that all interrelated phases of the evaluation progressed in a coordinated manner, and also provided for periodic reviews and consequent procedural revisions to the data collection means and the final report format.

b. Methodology

The tasking directive, reference 1b, assigned ACTIV a specific study purpose and associated sequential study objectives. In order to fulfill each objective, it was necessary as a first step to formulate a series of tasks, the fulfillment of which would satisfy the given objective. As a further step it was necessary to identify the factors and sub-factors or individual interest areas that would have to be addressed to satisfy each task. Initially, these factors were identified for the assigned missions, the operational environment, and the five functions of land combat. Subsequently, preliminary field research, document

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research, establishment of study criteria, review of pending and completed ENSURE requests, determination of the status of MACOV recommendations, and the development of the data collection and reduction techniques further refined the interest areas.

(1) Data Sources

The sources of data included commanders at all echelons of command (platoon, company, battalion, and brigade) and selected staff officers, technicians, and key non-commissioned officers. Other sources included USARV and ACTIV files, after-action reports, and operational reports - lessons learned.

(2) Data Collection Techniques

(a) Structured Interviews

The primary means of collecting data was the use of questionnaires, which were used as interview guides by the data collectors and as a means of recording data collected in the field. Questions varied from those requiring yes-or-no answers to questions requiring descriptive details.

(b) Field Observations

The prime consideration in the use of the questionnaire was that the interviewer would not influence or permit his personal views to be reflected in respondent replies. However, subsequent comments and observations of the ACTIV data collection team were an important source of data. In each unit visited, the data collectors recorded detailed information on what they observed.

(c) Document Research

Document research contributed a great deal of valuable information to the evaluation. This was particularly true in the area of supply and authorization documents.

(3) Data Collectors

There were two teams of three data collectors, each headed by a field-grade officer. One team studied the mechanized infantry and tank battalions and one studied the cavalry units. The teams visited nearly all armored units in RVN during the course of the evaluation. Dates of these visits are contained in Volume II, Annex F. Three to six days in each unit were required to conduct five to seven formal, structured interviews, to record vital information derived from evaluator observation, and to conduct informal interviews.

c. Phasing

(1) Phase I, 1 October - 15 November 1969

During this period all in-country units were visited to obtain preliminary information on unit problems. All battalion/squadron commanders completed a preliminary questionnaire which served as an input for the determination of interest areas to be examined.

(2) Phase II, 15 November - 31 December 1969

During this period data collection forms were completed, arrangements were finalized for the collection of field data, and the study methodology was finalized.

(3) Phase III, 1 January - 10 April 1970

Field data were collected during this period. Data reduction and final report production proceeded concurrently with collection. Several informal in-process reviews were conducted.

(4) Phase IV, 10 April 1970 - 31 March 1971

Report production was finalized during the period.

d. Briefings

Initially, all major-command project officers and all armored commanders were oriented on the project during Phase I visits. Subsequently, briefings were given to major unit command groups and within USARV Headquarters prior to the commencement of field data collection.

e. Source Documents and Criteria

The following major criteria were considered in this study:

- (1) Applicable G-series TOE
- (2) Applicable MTOE
- (3) Authorized equipment improvements for RVN
- (4) Current armor/mechanized infantry doctrine for stability operations
- (5) Evaluation of US Army Mechanized and Armor Combat Operations in Vietnam (MACOV) (U), 23 March 1967

- (6) Applicable ACTIV equipment evaluations
- (7) Applicable pending ENSURE requests
- (8) Applicable qualitative materiel requirements (QMRs)
- (9) Applicable weapons characteristics
- (10) Applicable reports on organization and equipment
- (11) Unit missions

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SECTION II

OPERATIONAL PROFILE - ARMOR IN RVN

1. (U) GENERAL

This section describes those characteristics peculiar to the Vietnam conflict that affect the employment of armored-type units. The first of the three following paragraphs deals with the nature of the enemy threat as encountered in RVN, including weaponry and techniques used by the VC/NVA forces. The second covers constraints placed on the use of armored units - not only natural constraints imposed by terrain and climate, but also the many political and humanitarian considerations involved in conducting stability operations in RVN. The final paragraph summarizes the evolution and modification of doctrinal roles, organization, procedures, and techniques of employment used by armored-type units to accomplish their mission within these imposed constraints.

2. (C) ENEMY THREAT

At the time of the evaluation, the level of enemy activity was relatively low. However, the VC/NVA retained sufficient strength to force US units to react to their initiatives. Therefore, the potential enemy threat in any given area determined the size of individual US maneuver elements employed and the amount of local security required. Probably the greatest advantage enjoyed by the enemy was his ability to blend into the civilian population, making positive identification difficult for US forces. Also, his access, at the time of the evaluation, to relatively secure sanctuaries aided his cause. The VC/NVA forces capitalized on the known effects of both natural and self-imposed constraints on US forces in an attempt to equalize relative combat power. This fact, along with the enemy's relative freedom of movement, created a variety of command, control, and training problems never before faced by US combat elements. Indicated below are some of the more common techniques used by the VC/NVA to nullify efforts to destroy their forces.

a. Mines

The enemy employed mines effectively and extensively against US units. The magnitude of the destruction resulting from mines can be summed up with statistics: from 1 November 1967 through 31 March 1970, 1,856 tracked combat and combat-support vehicles were destroyed by mines in RVN; this accounted for 73 percent of all losses of such vehicles during that time (see Figure II-1). In some mechanized or armored unit AOs, enemy mining operations had partially immobilized the unit. To avoid prohibitive losses, detailed mine sweeps were required to precede tracked vehicles. As a result, mobility was degraded. Units were required to expend significant efforts daily to counter this threat. In some areas, persistent heavy enemy mining had, in effect, denied the use of certain roads, because sufficient forces were not available to commit to daily mine sweeps.

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VEHICLE	COMBAT LOSSES	LOSSES TO MINES	MINE LOSSES TO TOTAL COMBAT LOSSES (PERCENT)
M106A1 4.2" Mortar Carrier	32	22	69
M113A1 APC/ACAV	1837	1342	73
M125A1 81mm Mortar Carrier	43	24	56
M132A1 Flamethrower	17	15	88
M548 Tracked Cargo Carrier	51	36	71
M577A1 Command Post Vehicle	4	3	75
M578 Light Recovery Vehicle	9	9	100
M49A3 Tank	410	308	75
M551 AR/AAV	112	88	79
M88 Medium Recovery Vehicle	16	7	44
M60 Launched AVLB	4	2	50

FIGURE II-1 (C). Mine Loss Vehicles, 1 November 1967 to 31 March 1970 (U).

b. Rocket-Propelled Grenades

The VC/NVA forces were equipped with the RPG-2 and RPG-7 rocket-propelled grenade launchers, which fired the B-40 and B-41 anti-tank grenades respectively. These weapons were extremely effective against armored vehicles, the B-40 being capable of penetrating 6 to 7 inches of armor, while the B-41 was capable of penetrating up to 11 inches.

c. Enemy Tactics

(1) Enemy forces in the relatively fixed RVN AOs quickly determined the limits of friendly artillery fans and attempted to maneuver outside them. This necessitated frequent movement and extensive construction to establish new fire-support bases.

(2) The VC/NVA soon became aware of the various fire zones designated in any given AO. They took advantage of these self-imposed friendly constraints by concentrating activities and facilities along the boundaries of relatively fixed AOs, in no-fire zones, and in civilian access areas. The enemy was thus able to provide his elements with relatively safe base

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areas. This tactic was particularly successful on boundaries between US and RVNAF/QVN/FWMAF AOs. Friendly units tended to avoid operating in these fringe areas because of the slow and detailed coordination normally required.

(3) Enemy forces in more populated areas generally preferred night movement and night attacks. Darkness tended to degrade the firepower and mobility advantages possessed by US units. The night also provided relative freedom from air observation and air strikes, while increasing US reaction time.

(4) The VC/NVA also commonly moved larger elements into and through dense jungle areas, where the heavy vegetation tended to equalize, or at least decrease, the mobility advantage possessed by US armored forces. Operations in dense jungle were characterized by very limited fields of fire and observation and reduced effectiveness of indirect fire support.

3. (C) COMBAT CONSTRAINTS

a. Natural Constraints

(1) General

Natural constraints consist of the characteristics of the terrain and weather that restrict or limit full application of combat power. With respect to armored and mechanized units, these restrictions were mainly on mobility. Discussion in this section is limited to a general description of each type of natural constraint and its effect on unit operations.

(2) Terrain

(a) Highlands

The highlands of RVN are characterized by very steep slopes and rugged rock outcroppings, with few, if any, transitional foothills. In many areas, the mountains rise abruptly from the coastal plain or piedmont. These areas generally limit vehicular movement to ridge lines, valley floors, small plateaus, and roads. Numerous small, but generally unfordable, streams and rivers are found, which further restrict cross-country movement. Establishing FM communications in this rugged terrain can become a significant problem because of line-of-sight requirements necessitating the frequent use of relay stations.

(b) Piedmont

The piedmont is characterized by gently rolling terrain. Generally, it presents no major obstacle to cross-country movement, except for some unfordable rivers and streams.

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(c) Coastal Plain and Lowlands

Adjacent to the sea, the flat coastal plains are intersected by many unfordable water obstacles that in some areas make rapid cross-country movement difficult. However, movement in these areas is generally easier than in any other type of terrain in RVN. Further inland, the coastal lowland area is densely populated, heavily cultivated, and contains extensive rice paddies and swamps. Trafficability and cross-country movement are highly affected by seasonal rainfall variations and local movement restrictions.

(3) Vegetation

(a) Dense Jungle

Dense jungle, ranging from single to triple canopy, does not totally prohibit movement of tracked vehicles. However, movement through these areas is extremely slow, occasionally hazardous, and abusive to equipment. Most units operating in jungle rely on some type of column formation. Observation distances and fields of fire are often severely limited. These factors make maneuver elements vulnerable to ambush. Furthermore, difficulties in accurate navigation and identification of precise unit location impose restrictions on the employment of supporting fires. In addition, radio operating ranges are decreased because of the attenuating effect of dense vegetation.

(b) Open Jungle

Open jungle and rubber plantations present no major problem to mounted movement, although they do decrease speed and cause some units to move in formations that do not optimize all-around security or firepower. These areas also have an attenuating effect on FM communications, reducing operating ranges by as much as 50 percent.

(c) Elephant Grass and Scrub Growth

Tall elephant grass and light scrub growth, primarily found in previously cultivated areas and Rome Plow cuts, present no major obstacle to cross-country movement. However, they do provide excellent concealment for the enemy and severely limit observation and fields of fire.

(d) Other Vegetation

1. Low grass, low scrub growth, and crops generally present no obstacles to movement. However, rice paddies, which cover vast expanses of potential maneuver area, restrict movement in the wet season.

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These areas are characterized by an extensive system of barriers such as streams, canals, and paddy dikes. In addition, many paddies have soft bottoms, which in the wet season make rapid movement impossible.

2. The nipa palm grows in bands along stream and canal banks in southern III CTZ. These bands are essentially impenetrable to tracked vehicle movement, greatly limit the range of communications, and provide cover for enemy movement.

(4) Weather

(a) Effect on Movement

Seasonal variations in rainfall have a greater influence on armored vehicle mobility than any other single natural factor. During the dry season, nearly all the coastal areas are trafficable for tracked vehicles. However, during wet seasons, most of these areas become either impassable or marginally trafficable. Although the rainy season makes movement in the piedmont difficult, it does not preclude cross-country movement, except in low areas and around rivers and streams. In the highlands, the rainy season causes loss of traction, and turns formerly fordable streams into major obstacles. In many areas, the valley floors become too soft to support the heavier armored vehicles. It was found during the study that the trafficability guidelines described in the 1967 MACOV study were generally reliable; however, some areas described as trafficable were only marginal.

(b) Other Effects

The northeast monsoon, which prevailed in I CTZ and northern II CTZ during the evaluation, caused additional constraints on equipment usage. The continuous heavy cloud cover for extended periods often makes night vision devices unusable because of low ambient-light levels.

(5) Summary

Figure II-2 depicts the various natural constraints faced by each armored and mechanized unit at the time of the evaluation. While discussed separately, the indicated individual constraints actually worked in combination. For example, while most of the highlands are covered with dense jungle, it is not the jungle itself that makes track vehicle movement impossible, but rather the terrain gradients. In the piedmont, jungle of the same density does not prohibit movement. Natural movement restrictions were more significant in RVN than in more developed areas because of the limited all-weather road network. In some areas, cross-country travel was the only practical method of movement.

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CONSTRAINT CATEGORIES		ARMED CAVALEY					ARMED INF					UNARMED INFANTRY				
GENERAL	SPECIFIC	3/5	1/1	4/17	5/17	5/1	2/5	1/5	1/7	1/2	2/1	1/5	1/5	1/5	1/5	1/5
		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
TERRAIN- PERCENTAGE OF EACH IN UNIT AO	HIGHLAND	--	--	5	5	5	--	--	--	--	100	100	100	100	100	100
	PLATEAU	--	--	5	5	5	--	--	--	--	100	100	100	100	100	100
	COASTAL PLAIN	--	--	90	90	90	--	--	--	--	100	100	100	100	100	100
	COASTAL LOWLANDS	--	--	90	90	90	--	--	--	--	100	100	100	100	100	100
	COASTAL SWAMP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VEGETATION- PERCENTAGE OF EACH IN UNIT AO	LOW GRASS (INCLUDES RICE)	15	70	60	60	60	60	60	60	60	10	10	10	10	10	10
	ELPHANT GRASS	--	--	--	--	--	--	--	--	--	10	10	10	10	10	10
	LOW SHRUB	65	40	20	20	20	20	20	20	20	10	10	10	10	10	10
	OPEN JUNGLE (INCLUDES RUBBER)	--	--	20	10	10	10	10	10	10	10	10	10	10	10	10
	THICK JUNGLE	--	--	--	--	--	--	--	--	--	10	10	10	10	10	10
WEATHER	WET/DRY (W/D)	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
	WET/DRY (W/D)	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
	WET/DRY (W/D)	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
	WET/DRY (W/D)	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
	WET/DRY (W/D)	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
ACCESS TO UNIT AO	PERCENTAGE IMPASSABLE TO ARMED VEHICLES, WET/DRY	0/11	15	20	20	20	20	20	20	20	20	20	20	20	20	20
	PERCENTAGE IMPASSABLE TO ARMED VEHICLES, WET/DRY	0/11	15	20	20	20	20	20	20	20	20	20	20	20	20	20
	PERCENTAGE IMPASSABLE TO ARMED VEHICLES, WET/DRY	0/11	15	20	20	20	20	20	20	20	20	20	20	20	20	20
	PERCENTAGE IMPASSABLE TO ARMED VEHICLES, WET/DRY	0/11	15	20	20	20	20	20	20	20	20	20	20	20	20	20
	PERCENTAGE IMPASSABLE TO ARMED VEHICLES, WET/DRY	0/11	15	20	20	20	20	20	20	20	20	20	20	20	20	20
FIELDS OF VIEW/ PERCENTAGE OF EACH IN UNIT AO	OVER 500 METERS	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	OVER 500 METERS	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	OVER 500 METERS	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	OVER 500 METERS	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	OVER 500 METERS	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95

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FIGURE II-2 (C). Natural Constraints in Unit AOs (U).

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b. Operational Restrictions

(1) General

The type of war fought in RVN involved numerous constraints on the application of total unit combat power. These constraints originated from an array of political, economic, religious, and cultural factors present in RVN, as well as the stated mission of US forces to destroy the enemy and to assist in nation-building. Most of these restrictions impacted on either freedom of maneuver or employment of firepower. Figure II-3 depicts the operational restrictions imposed on each armored and mechanized unit at the time of the evaluation.

(2) Restrictions on Maneuver

(a) Crops

1. During the growing season, movement by armored units in cultivated areas was severely restricted to prevent crop damage. In rice-growing areas, commanders often were required to confine tracked vehicle movement to roads except when in contact. This channelization compounded the mine threat. As a result, units in these areas frequently concentrated on dismounted operations during the growing season. This constraint generally did not apply in VC-controlled areas. There, crop destruction became a secondary military objective.

2. In some rubber plantations, the areas off-limits for maneuver varied frequently. Units were required to coordinate daily with plantation managers and local GVN officials to determine which blocks of rubber were being worked. In the remaining blocks of rubber, movement was restricted to minimize the damage to rubber trees, but not prohibited.

(b) Populated Areas

Tracked vehicle movement in heavily populated friendly areas was normally confined to roads in order to minimize needless damage to civilian property. These essentially off-limits areas channelized and/or blocked maneuver and, therefore, had to be considered during the planning of operations.

(c) Historical and Religious Areas

Restrictions on maneuver in and around areas of historical or religious significance were the same as for populated areas. While they did not constitute a significant constraint, they had to be considered when planning an operation to minimize any chance of damage that would provide the enemy with a propaganda tool.

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(d) Boundaries

1. General

National, corps tactical zone, provincial, district, and unit boundaries all served as constraining factors. This effect varied considerably from one part of RVN to another.

2. National Boundaries

At the time of the evaluation, maneuver within 2 km. of either the Cambodian or Laotian boundaries was prohibited. US forces were normally prevented from pursuing enemy forces into these zones to avoid international incidents. This imposed a serious constraint, and the enemy took full advantage of this publicized restriction on US forces. In northern I CTZ, US units could maneuver to the southern edge of the DMZ between North and South Vietnam. The DMZ itself constituted the buffer zone.

3. Corps Tactical Zone Boundaries

CTZ boundaries generally restricted movement by US units, because extensive and time-consuming coordination was required before they could be crossed.

4. Provincial and District Boundaries

Local political boundaries did not restrict maneuver except when unit AO boundaries coincided with them. However, when a unit AO covered portions of several districts, liaison, coordination, and clearance problems were multiplied. Therefore, while not directly restricting maneuver, the local political boundaries did increase the time required for planning and coordination of routine operations and, on occasion, slowed reaction times.

5. AO Boundaries

a. All but two battalions/squadrons were assigned specific AOs in which the restrictions on maneuver were limited to the avoidance of crops, population centers, and religious or historical areas as described above. The assignment of a unit AO was a vital control measure necessary to prevent inadvertent contact between friendly forces and to facilitate coordination with SVN/RVNAF agencies.

b. In order for a unit to expand its maneuver area, an AO extension was required. Generally, there was no problem or delay involved in obtaining a temporary extension from another US unit. However, when a US AO adjoined a province, district, or ARVN unit AO, the coordination and the time required to obtain an AO extension were often prohibitive.

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because of the multitude of agencies involved. This created a definite constraint that, in some cases, significantly decreased the unit's ability to respond rapidly to "hard" intelligence or known enemy activity.

(3) Constraints on Fires

(a) General

The constraints imposed on the use of direct and indirect fire comprised the most complex and variable set of restrictions on the application of combat power found during the evaluation. Because of the intricacy of these restrictions, numerous control measures were established by commanders at all levels, with emphasis on close cooperation with local GVN/RVNAF agencies. These control measures included the establishment of a variety of types of fire zones, establishment of fire clearance procedures and, in some areas, centralized clearance agencies. The ACTIV report ACG-68F, Reduction of Reaction Time to Engage Enemy Targets, documents the types of clearance agencies and procedures established in RVN and their effects on fire support. In any area not designated as a specific type of fire zone, US units adhered to the MACV and major subordinate command rules of engagement. The specific fire zones and their effect on unit operations are discussed below.

(b) Fire Zones

1. Specified Strike Zones

a. Specified strike zones (called free-fire zones in some areas) were areas designated for a specific period by GVN/RVNAF, in which no clearances other than that of the ground commander were required for any type of fire. In all cases, however, air warning data had to be posted for indirect fire missions. Generally, these zones were only established in nonpopulated areas. When possible, they were made to coincide with a unit AO, to prevent accidental fires on adjacent friendly forces. Specified strike zones were ideal areas for armored unit employment, since they permitted application of all available combat power with a minimum of restrictions. Most frequently, heavily vegetated areas became specified strike zones during the hours of darkness.

b. In some cases, specified strike zones were established along the fringes of civilian population areas with specific time limitations imposed. In these areas, there was generally a GVN-established curfew on civilian movement. This created some problems in positive target identification during the periods immediately following the beginning and preceding the end of curfew hours. As a result, US commanders often extended the "no-fire" period an hour or two on both ends of the curfew, a fact that the local VC occasionally exploited.

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2. No-Fire Zones

a. No-fire zones were designated areas in which all fires were prohibited without prior clearance by appropriate authorities. In these zones, the fires of maneuver elements were cleared by the battalion/squadron headquarters only after clearance had been obtained from brigade/regimental headquarters and/or local GVN/RVNAP agencies. In some areas, clearances were required from the local village chief. Twenty-four-hour no-fire zones were normally established around population centers, religious or historical shrines, and cultivated areas during the growing season. Other areas were classified as daylight (or specified time) no-fire zones to allow civilian access for such purposes as fishing, wood-cutting, and grazing livestock. In all these areas, local GVN curfews were established. While the curfew facilitated identification of friend from foe, fire control and discipline were major continuing problems for every unit, and thus acted as constraints on effective unit operations. Often civilian-access areas were heavily boobytrapped, causing a large percentage of the casualties suffered by mechanized infantry units in certain areas.

b. The time frames imposed in these no-fire zones frequently changed, magnifying the unit commander's control problems. Many unit AOs contained portions of several differently defined no-fire zones, which further complicated control. Each maneuver element commander, and each individual under his command, had to be exactly sure of what restrictions applied in his specific location at a specific time. Shifting elements from free-fire zone to an area where all fires were prohibited constituted a leadership and training problem.

c. The MACV rules of engagement specified the circumstances under which a unit receiving fire in a no-fire zone could return fire. Generally, the maneuver element commander at the site was prohibited from returning fire unless he could positively identify its source.

(c) Constraints on Direct Fire

1. General

Restrictions were imposed on the employment of direct fire weapons, particularly the main guns of the M48A3 tank and M551 AR/AAV, and caliber .50 machineguns on all vehicles. These restrictions mainly affected the use of reconnaissance by fire, but also occasionally affected the immediate engagement of enemy targets.

2. Reconnaissance by Fire

Reconnaissance by fire was totally prohibited in many AOs. In the remaining AOs, if they were not designated as free-fire zones, commanders generally had to obtain clearances from battalion/squadron or higher headquarters to employ this tactic. Because of the proximity of

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no-fire zones and/or friendly forces to the unit requesting clearance, the clearance, when granted, frequently specified both allowable directions of fire and the types of weapons cleared to fire. The unit was often limited to use of 7.62mm machinegun fire, as heavier weapons possessed too great a lethal range.

3. Safety

When operating near AO or fire-zone boundaries, maneuver element commanders had to exercise stringent control over direct fires. Some units were prohibited from firing within a specified distance of an AO boundary without clearance from adjacent units. Dense jungles, which were frequently classified as specified strike zones, made the positive location of other friendly elements difficult to determine. This situation created problems when employing heavy-caliber direct-fire weapons.

(d) Constraints on Indirect Fires

1. Clearance

Obtaining clearance for the use of indirect-fire weapons (organic or supporting) was an involved and time-consuming process in many AOs. In all units, internally generated fire requests were transmitted to the artillery liaison team at the battalion/squadron CP. The artillery liaison officer was responsible for obtaining supporting fires and clearances for use of organic indirect-fire weapons. Where central clearance agencies had been established, the time required for indirect-fire clearances was short. However, in other unit AOs, clearances had to be individually obtained from as many as six separate agencies exercising various responsibilities. This inhibited responsive employment of indirect fires. In all cases, the firing element, organic or supporting, was required to post air-warning data.

2. Safety

Safety was a primary consideration in the employment of indirect fires. Restrictions were imposed based upon proximity to friendly forces, population centers, no-fire zones, and AO boundaries. In general, indirect fires could not be employed closer than 500 to 1000 meters from friendly units or AO boundaries. All indirect fires within this prescribed limit required clearance from the adjacent unit or agency. A 1000-meter safety zone was established around all population centers. In order for fires to be placed inside this limit, clearances had to be obtained from responsible GVN/RVNAF agency and controlled by an observer on the ground. Unobserved fires in dense jungle could never begin closer than 1000 meters from friendly personnel because of the problem of determining precise locations. While these restrictions were necessary for safety, they somewhat degraded the effective employment of artillery and mortar fires, particularly considering the short ranges at which most engagements were fought. In most

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unit AOs, all organic mortar fires were cleared in the same manner as supporting artillery fires. However, in a few areas, the 81mm mortar was fired with only the ground commander's clearance.

3. Illumination

Mortar and artillery illumination fire missions required more extensive clearance than did HE fire missions. To prevent accidental injury, three separate areas had to be cleared: the area in which a malfunctioning round would impact, the impact area for the canister, and the impact area for the expended flare. In some locations, these requirements prevented maneuver elements from receiving indirect-fire illumination support because of the proximity of the civilian population to the desired target area.

(4) Other Operational Restrictions

(a) General

There were several additional factors that tended to limit the full utilization of all available combat power in RVN. These included the types of missions assigned to the maneuver units, command emphasis to minimize casualties, and the availability of ammunition and equipment.

(b) Missions

The requirement to use combat maneuver elements to secure rear bases, fire-support bases, and other fixed installations served to limit maneuver forces available for offensive operations. Route security, mine-clearing operations, and convoy escort also decreased the amount of combat power available. These passive security requirements, dictated by the nature of the war, imposed a constraint on full application of all available combat power.

(c) Casualty Minimization

Command emphasis to minimize casualties led, commonly, to substitution of firepower for maneuver. When in contact, many commanders attempted to destroy the enemy by employment of massive volumes of organic and supporting fires rather than maneuvering to destroy him. While the advantages of this substitution were readily apparent, it did limit the offensive advantages of armored units. Due to the elusive nature of the enemy, the majority of contacts were enemy-initiated, brief, violent, short-range meeting engagements or ambushes. Most US casualties occurred in the first brief moments of reaction to the contact. Once the unit was fully organized to counter the threat, and suppressive fires had been laid down, the casualty rate decreased significantly. At this point, if the unit was directed to pull back to allow for more extensive employment of indirect supporting fires, rather than maneuvering to exploit the situation, enemy

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contact was frequently lost. If contact was initiated later, the cycle started again.

(d) Available Supply Rate (ASR)

Shortages of ammunition imposed periodic constraints on operations for some units. Examples noted during the evaluation were low ASRs for the Sheridan canister round and for M4 thickener, for use in the XM45E1 mechanized-flamethrower service unit. During February 1970, the ASR for the regimental cavalry squadrons averaged 0.6 152mm canister rounds per M551 AR/AAV per day, and allowed sufficient M4 thickener for one batch of fuel per XM45E1 flame service unit every third day. Other items limited by the USARV ASR during the evaluation were trip flares and mortar illumination rounds. While infrequent and temporary in nature, these limitations were yet another type of constraint faced by the maneuver units.

(e) Equipment Availability

The availability of authorized mission-essential equipment had an effect on a commander's ability to perform his mission. In several units, certain equipment shortages slightly degraded unit combat capability. For example, two mechanized infantry battalions had not been provided a complete set of belly-armor kits for the M113A1 APC/ACAVs. One of these battalions operated in an area where a significant mine threat existed. As a result, crew protection and confidence were decreased. When the carriers were used, they were normally preceded by dismounted mine-sweep teams, and the unit thus lost some of its rapid movement capability.

4. (C) MODIFICATIONS IN THE TACTICS AND ORGANIZATION OF ARMOR

a. Armored and Mechanized Unit Tactics

(1) Armored Cavalry

Armored cavalry squadrons and troops performed in the same manner as combat maneuver battalions with the close-with-and-destroy mission, rather than having the more traditional missions of reconnaissance, security, and economy of force. Like maneuver battalions, they engaged in reconnaissance in force, until contact was made, and then attempted to destroy the enemy. The versatility, combined arms capability, and mobile, protected firepower of the armored cavalry made it extremely effective and well balanced for the wide variety of missions assigned.

(2) Armored Battalions

The traditional employment of tank formations was modified in RVN. There was little or no requirement for massed armor. Rather, tanks tended to be used in small formations, either independently or in support

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of other maneuver elements. Once in contact, instead of maneuvering to avoid the enemy's main defensive strength, armored forces routinely attacked the enemy at his strongest point in order to inflict maximum damage. Although tank elements had the significant advantages of firepower and armor protection, their limited mobility and lack of versatility made pure armor formations undesirable for employment in RVN.

(3) Mechanized Infantry

With the advent of the armored personnel carrier as a fighting vehicle, mechanized infantry units were able to achieve great versatility and potency with organic assets. Mechanized infantry continued to be used in an armor-type role of supporting regular infantry. Like the tank battalion, mechanized forces also attempted to attack and destroy the enemy's strongest point. APCs often led formations through jungle, to break trails, destroy boobytraps, and disrupt the enemy's defenses. Commonly, when contact was made, the vehicle weapons fixed the enemy, while the unit's dismounted elements maneuvered to destroy him. Mechanized infantry units developed many operational techniques that enhanced unit effectiveness in their expanded role.

b. Unit Fragmentation

To support the conflict, a large number of semipermanent base camps and fire-support bases had been established. Each of these locations required security. Personnel and equipment to accomplish this task were taken, in part, from maneuver-unit assets. Most units had elements in at least three different locations, while, in some, elements were located in as many as six. The effects of this semipermanent fragmentation impacted heavily on stated requirements.

c. Organizational Modification

In order to perform the evolved roles and to compensate for fragmentation, the structures of armored and mechanized units in RVN were somewhat modified from the basic TOEs. Some organic capabilities were upgraded, some were downgraded, and others were eliminated. Certain other added capabilities were unique to armored and mechanized units operating in RVN. These modifications in capability from the TOE were achieved in two ways; some were made officially by MTOE action, and others were effected at unit level by both authorized and unauthorized means. These modifications had a direct bearing on the tactical employment of each unit and, in many cases, were indicative of problem areas.

d. Equipment Employment

(1) General

As was the case with the type of unit organizational structure, the RVN operational environment also affected equipment employment. Vari-

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ation in equipment usage had a tendency to modify or change materiel requirements. These variations were a function of many things, such as the particular demands of the RVN environment; inherent equipment capabilities and limitations; changes in functional relationships; equipment maintainability under RVN conditions; and comparative mobility between supported/supporting type vehicles. The broader aspects of these variations are summarized herein.

(2) Usage of Primary Combat Vehicles (M48A3, M551, M113A1)

(a) General

As indicated in the MACOV study, the conventional uses of the primary fighting vehicles have been modified for applicability in RVN. Some variations in usage described in that study have continued to evolve since that time. There has continued to be an overlapping in function among the three vehicles, significant in that it affects the unit's stated equipment and organizational requirements.

(b) M113A1 APC/ACAV

1. The M113A1 was a very popular, dependable, and easily maintained vehicle. It had an inherent flexibility that allowed it to serve in a variety of roles. The M113A1 has been effectively employed in RVN as: (1) an armored cavalry assault vehicle, (2) a fighting vehicle used in a tank-like role, (3) a means of rapidly clearing areas of antipersonnel mines and boobytraps, (4) a troop carrier, (5) a cargo and equipment carrier, and (6) a highly mobile, armor-protected automatic weapons and communications platform. The MACOV study stated that: "The M113 is used as a fighting vehicle in a tank-like role -- a vehicle-mounted weapons system with armor-protected firepower and excellent cross-country mobility. The crews (squads) dismount only when forced to by untrafficable terrain, the presence of a large number of antitank mines, or requirements to conduct searches for tunnels and bunkers. Seldom are less than three men left on the M113 when a squad dismounts. M113s were also used to break trails through the jungle and knock down trees in much the same manner as tanks. In addition, combat operations in RVN reveal many situations for which mounted combat is appropriate. Here the determinants are trafficability and the density of armor-defeating weapons. The armored personnel carrier is habitually used as a fighting vehicle and not just as a means of transportation within the cavalry squadrons and mechanized infantry battalions." ¹

2. M113A1 usage, as described by MACOV, has been modified by two changes in the nature of the enemy threat. First, the enemy anti-armor capability has been greatly improved. At the time of the MACOV study, and emphatically stated therein, the VC/NVA had no significant antitank capa-

1. Paragraph II-4d(2), MACOV, VOL. One; 28 March 1967; CONFIDENTIAL.

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bility. This has changed. The second change in threat has been the decreased tempo of the war. Generally, the enemy is more elusive and harder to find. To find the enemy, a detailed dismounted ground search or a night ambush is frequently required. This has resulted in a noticeable decrease in the reliance on mounted sweep operations, particularly in mechanized infantry units. Also, the cavalry units have endeavored to maintain some dismount capability. While the M113A1 is still widely used as a fighting vehicle or in a tank-like role, more traditional uses such as providing infantry transport and supporting fires are becoming more common.

(c) M48A3 Tank

The tank has continued to prove effective within known trafficability constraints. Its use was limited only by the ingenuity of commanders. It continued to be employed successfully to cut trails in dense vegetation, to clear minefields and fields of fire, to escort supply convoys, to clear landing zones, to clear and secure lines of communication, to serve as a quick reaction system, and to contribute to area and base security. In many instances, it proved to be invaluable because of its relative sustainability under heavy enemy fire. Many of the tank's roles evolved as a result of its unique vegetation-penetrating capability. Certain others were in response to the inadequacies of other equipment in the inventory, such as the lack of a rapid and effective mine-clearance device. Its value for denial or show of force was undoubtedly significant, but impossible to gauge accurately. The absence of an enemy armor threat, and the lack of requirement for massed armor, relegated the tank to fulfilling a myriad of essentially combat-support tasks. As shown in Volume III, Annex O, the tank has been extensively modified to meet peculiar RVN requirements.

(d) M551 AR/AAV (Sheridan)

In general, the Sheridan has proven to be a highly successful combat vehicle in RVN. Its role, however, was still evolving during the time of the evaluation. Initially, the vehicle was controversial, as the Sheridan was incorrectly equated with the main battle tank. In spite of its nomenclature, the Sheridan was utilized in a classical light-tank role and was considered as such by the users. It was rarely employed in pure Sheridan formations, but rather as part of an integrated reconnaissance platoon formation. Its cross-country movement capability and firepower were prized, and enhanced its effectiveness as part of an integrated team. To meet RVN requirements, the vehicle was extensively modified, both officially and locally.

(3) Vehicular Modifications

The RVN environment induced a wide array of modifications to the combat configuration of tracked vehicles. In the opinions of the users,

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these modifications improved a particular vehicle's ability to perform unit missions. On combat vehicles these modifications included additions to, and substitutions for, authorized weapons. On command vehicles, they included the addition of radios and the relocation of communications control equipment. On mortar carriers, they included removal of turnable stops to facilitate 360-degree traverse of the mortar-tube. On the M548 tracked cargo carriers, they included modification of the cargo compartment.

(4) Mobility Compatibility

The differing cross-country mobility characteristics of military vehicles within a given type of unit affected armored and mechanized operations in RVN. This variance resulted in a wide range of modified roles for many types of vehicles. Tank/infantry teams could not be employed in many areas because of the inferior mobility of the M48A3 tank. This resulted in the M113A1 assuming a partial tank-like role as previously discussed. Combat service-support vehicles, such as AVLBs and recovery vehicles, frequently could not keep up with, or traverse the same area as the combat elements. As a result, they were left in base camps. Wheeled vehicles proved unsatisfactory for use in the forward areas, due to their limited mobility and the lack of roads in many areas. Their use was commonly limited to base camps, fire bases, and, in a few instances, forward resupply points adjacent to roads.

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SECTION III

FINDINGS AND ANALYSIS

1. (U) GENERAL

a. In response to the MACOV study mentioned in the introduction to this report, and other formal and informal analysis, a series of changes were made to the organization and equipment of armored units in RVN. The more significant of these changes are itemized in Annex B to this report. The turbulence of the combat environment and the piecemeal nature of many of the changes resulted in considerable confusion. Since armored units were frequently fragmented, and property-book control was inadequate, there was a major lack of specific information concerning assets on hand in the individual units. It was apparent, however, that many units had excesses and shortages of equipment. Annex C to this report itemizes equipment authorizations and status.

b. In this section of the report, problems encountered by armored units are discussed under the five functions of ground combat - intelligence, mobility, firepower, command and control, and support. Where further modifications in organization and equipment are needed to optimize the combat capability of armored units, these are indicated.

2. (C) INTELLIGENCE

The primary intelligence functions of armored units in RVN were area surveillance and target acquisition tasks which had both offensive and defensive aspects. Defensively, surveillance equipment was used to monitor a unit's perimeter against surprise assaults; offensively, it was used in ambush and route denial. The devices used were of two main types: visual assists, including passive and infrared night-vision devices and searchlights; and electronic radars and intrusion detectors. The problems encountered were in the areas of organization, command emphasis, and sufficiency of resources.

a. Organization

At battalion/squadron level, the employment of surveillance devices was frequently degraded by poor training, inadequate maintenance, and improper employment. In many cases, a lack of command emphasis and supervision contributed to these problems. The maximum potential of surveillance devices was realized when control over employment, training, maintenance, and support was centralized. At battalion level, surveillance planning and supervision is the staff responsibility of the S2, yet only a limited number of the battalion S2's interviewed had received any formal training on target-acquisition and surveillance equipment. It was observed that an individual directly

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responsible for training, maintenance, and employment of surveillance devices was required, who could advise the S2 on technical matters concerning surveillance. It was believed that this centralization and provision of a technically qualified operator could best be accomplished by placing all battalion/squadron surveillance/target-acquisition personnel and equipment in one platoon, under the supervision of the S2, from which surveillance teams could be attached to maneuver companies/troops as required. This approach would also optimize personnel utilization, centralize training and maintenance, and provide for more effective equipment utilization. The exact composition of the platoon would depend upon the type of unit.

b. Visual Assistance Devices

In addition to conventional searchlights, armored units employed infrared illuminators and detectors and passive night-vision devices. Although the advantages of both conventional and infrared illumination were recognized, both require running the vehicle's engine in order to generate power - a distinct disadvantage. Passive night-vision devices, on the other hand, offered the ability to observe an area while maintaining total silence. Wider distribution of these devices was therefore recommended.

(1) Searchlights

(a) All M48A3 tanks were authorized the 23-inch xenon searchlight (AN/VSS-1/2) as part of a night-vision kit (MWO 9-2350-224-30/1) for RVN application. However, the tank battalion TOE/MTOEs continued to carry the xenon searchlight as a separate line-item authorization with a BOI of five searchlights per tank company; all were carried in the company headquarters section, which has only two tanks. In comparison, regimental tank companies, under a different line-item authorization, were authorized 17 searchlights, xenon, TY, 18-inch-diameter reflector, DC, 28 volts. However, there were no searchlights of this description available, and the tanks in the regimental tank companies all mounted 23-inch xenon searchlights. The conflicts in authorization, item description, and MTOE basis of issue versus MWO authorization created a confused supply and maintenance situation. Replacement of damaged searchlights was a constant problem.

(b) The M551 AR/AAV was equipped with the smaller AN/VSS-3 searchlight; however, this searchlight was neither BII to the vehicle nor a line-item authorized by MTOE. Consequently, units were required to remove the lights and accessories from combat-loss M551's, as replacement vehicles were not equipped with the searchlight.

(c) Mechanized infantry battalions were not authorized any searchlights, although the MACOV study had recommended their inclusion in infantry units.

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(d) The M48A3 and M551 searchlights were used extensively, and were considered a valuable asset for night operations by all commanders. The M48A3-mounted AN/VSS-1/2 searchlights were used mainly in the visible white-light mode, with only infrequent use of the IR mode. The M551-mounted AN/VSS-3 saw extensive use in both modes. The near-IR (pink-light) mode was regularly used to provide supplementary illumination for passive night-vision devices.

(e) Searchlight use required the constant operation of the vehicle engine to generate power and prevent battery depletion. The resultant noise was considered a disadvantage of searchlight employment, as it compromised the unit's location. Various battery-pack experiments were conducted by some units to provide a quiet power source, but with little success.

(f) All commanders requested that each M48A3 and M551 be authorized one searchlight per vehicle, which would clarify and formalize existing authorizations.

(g) Commanders of all units were impressed with the pink-light capability of the AN/VSS-3 searchlight. Tank unit commanders unanimously stated that a pink-light capability for the AN/VSS-1/2 would be highly advantageous for night operations by M48A3-equipped units.

(h) Mechanized infantry battalion commanders emphasized the requirement for an organic searchlight capability. They recommended a small searchlight, similar to the AN/VSS-3, that could be handled and mounted by one man, could be stowed inside the vehicle during daylight, and would provide a pink-light capability. The recommended BOI was one searchlight per line platoon and separate scout section.

(2) Infrared Fire Control Equipment

(a) All M48A3 tanks equipped with the AN/VSS-1/2 23-inch xenon searchlight were authorized the M32 gunner's IR periscope, M18 binoculars, and the cupola-mounted M34/36 tank commander's IR sight, which was designed for use with the M85 machinegun in the M19 cupola. This IR night-vision kit for all M48A3 tanks in RVN was authorized under MWO 9-2350-224-30/1.

(b) The M48A3 tank IR fire control system was rarely employed. When used, it was employed primarily for surveillance rather than for night aimed fire. Most M18 binoculars were inoperative due to a lack of maintenance, shortages of batteries, or improper handling. Many M32 gunners' IR sights were not mounted, and those that were mounted were inoperative. The external mounting of a caliber .50 machinegun, a common modification, blocked the cupola optical machinegun sight. All commanders felt that the advantages of the externally mounted machinegun outweighed the loss of the sight.

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(c) Crew proficiency on IR employment and maintenance was low in all units. Many tank commanders, platoon leaders, and company commanders had little knowledge of IR.

(d) The availability and capabilities of passive night-vision devices contributed to the limited use of IR equipment. A major disadvantage in IR employment was the requirement to operate the vehicle engine. Also, it required the services of two crewmen.

(3) Passive Night-Vision Devices

(a) With the increased emphasis on night operations, passive night-vision devices assumed an increasingly important role. In NDPs and on ambushes, US forces have become very dependent on these devices for security and target acquisition.

(b) In some units, the level of training on the correct handling and employment of passive devices was low. Many soldiers were not familiar with boresighting or zeroing procedures. In addition, many were also unfamiliar with the correct use of the lens cover to avoid "white-out" of the image in bright moonlight or under offset flare illumination. Also, the passive devices were frequently not turned off during daylight conditions and were exposed to direct sunlight with the lens cover off. Maintenance problems frequently resulted from such incorrect handling.

(c) The passive, crew-served weapons sight (AN/TVS-2/2A) was used extensively by tank crews in RVN in preference to tank-mounted IR equipment. The sight was used either mounted on the caliber .50 machine-gun or handheld by a crewman in the TC cupola. Employment of the passive device had two advantages: it did not require running the tank engine, and it allowed one man to perform security surveillance for the crew, whereas two were required when the IR system was used.

(d) Figure III-1 depicts the MTOE-authorized BOI for all types of armored units at the time of the evaluation; it can be seen that the divisional cavalry troop, which had essentially the same mission and equipment as a regimental cavalry troop or the separate cavalry troop, was not authorized any crew-served night weapons sights. The discrepancies in authorizations of these devices between the tank companies of the regimental cavalry squadron and those of the tank battalion can also be noted.

(e) It should be further noted that the tank companies of the regimental cavalry squadrons were not authorized AN/TVS-4 NODs, while the tank companies of the tank battalion were authorized one each.

(f) Regimental cavalry squadrons and the separate cavalry troops were the only units that considered the MTOE authorizations adequate. All tank battalions and divisional cavalry squadrons had acquired varying quantities of passive devices to augment MTOE authorizations.

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UNIT	QUANTITY AUTHORIZED BY MTOE		
	Starlight Scope AN/PVS-1/ 2/2A/3	Night Vision Sight, Crew-Served Weapon AN/TVS-2/2A	Night Observation Device AN/TVS-4
<u>Regimental Cavalry Squadron</u>	66	136	11
HHT	4	7	2
Cavalry Troop (3)	20	36	3
Tank Company	2	21	0
<u>Divisional Cavalry Squadron*</u>	64	0	15
HHT	4	0	6
Cavalry Troop (3)	20	0	3
<u>Separate Cavalry Troop</u>	20	36	3
<u>Tank Battalion</u>	12	0	8
HHC	6	0	5
Tank Company (3)	2	0	1
<u>Mechanized Infantry Battalion</u>	62	69	11
HHC	8	15	5
Rifle Company (3)	16	18	2

* Does not include Air Cavalry Troop.

FIGURE III-1 (U). Basis of Issue for Passive Night-Vision Devices.

(g) The basis of issue of crew-served weapons sights in the ACR was one AN/TVS-2/2A per tracked vehicle with a basic-issue-item (BII) caliber .50 machinegun. This basis of issue was desired by all commanders of other type units.

(h) The basis of issue for individual starlight scopes at the time of the evaluation varied between units. Two starlight scopes per rifle squad were generally considered necessary because of extensive night operations. Since the weapons squad had essentially become a fourth rifle

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squad, it also required two starlight scopes. Platoon leaders generally accompanied their elements on night ambushes and employed a starlight scope for control and observation. The same requirement existed in tank platoons, because they often operated independently, establishing ambushes and observation posts.

(i) The large NOD was used primarily in fire-support bases and NDPs. The device was considered too large and cumbersome for mobile field use. The few units that had full authorization on hand rarely employed all of them - particularly those authorized for the battalion mortar platoons and weapons platoons of the mechanized rifle companies.

(j) All unit personnel considered the passive devices far superior in performance to the IR devices. A reliance on passive night-vision devices had generally obviated the requirement for IR individual weapons sights (128 in each division cavalry squadron, 102 in each mechanized infantry battalion, and 79 in each tank battalion) and metasopes. The IR individual sights and metasopes had generally been put into unit storage. The TOE/MTOE of the armored cavalry regiment and separate cavalry troop had deleted all IR individual weapons sights.

c. Electronic Surveillance Devices

The problems associated with these devices can largely be attributed to the lack of centralized control discussed in paragraph III-2a. Troops were ill-prepared for their employment, and consequently failed to achieve good results. Other difficulties encountered are discussed below.

(1) Ground Surveillance Radar

(a) Although it was intended by doctrine that ground surveillance radars (GSR) be employed in direct support of company/troop-size units, this was rarely done. Many unit AOs were poorly suited for radar employment because of terrain and vegetation masking. In addition, radars (AN/PPS-5's and some AN/PPS-4's issued in lieu of AN/PPS-5's) were fragile and therefore difficult to transport. Consequently, GSR employment was confined to fixed locations with good surveillance.

(b) It was acknowledged that a GSR capability was needed to support maneuver elements of battalion/squadron-size units. However, the authorized AN/PPS-4 and -5 units were considered too fragile for cross-country movement by tracked vehicle. Some units moved radars by helicopter to avoid damage.

(c) Frequent false alarms, coupled with failures to detect enemy movement identified by other means, caused a lack of user confidence in the equipment. This lack of confidence, in addition to the problems of transport and the radar's maintenance requirements, caused many battalion/squadron commanders to give GSR employment little emphasis. On the other

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hand, commanders experienced in radar employment were often able to achieve successful results with GSR, and gave its employment a considerable amount of emphasis.

(d) A critical shortage of trained operators and repairmen magnified the limitations of the equipment, contributed to the problems associated with its employment, and further lowered user confidence.

(e) Two divisions centralized control of GSR in order to improve employment, training, and maintenance. One of these divisions consolidated all GSR assets under division artillery; the other left the equipment with the separate battalions/squadrons, while centralizing training, maintenance support, and direction over employment. In both cases, centralized employment of GSR proved very effective.

(2) Electronic Intrusion Detectors

(a) Electronic intrusion detectors of various types were on hand in all armored units. These devices were designed to be man-portable, to be emplaced and retrieved by hand, and to provide squad- or platoon-sized patrols with early warning of approaching personnel or vehicles. Each troop in the regimental cavalry squadrons and the separate cavalry troops was authorized 12 AN/PSR-1 intrusion detection sets. Each rifle company in the mechanized infantry battalion was authorized 18 AN/GSS-9 breakwire alarm sets. Although divisional cavalry squadron and tank battalions were not authorized any electronic anti-intrusion devices, nearly all units had on hand some AN/GSQ-151 Patrol Seismic Intrusion Detector (PSID) alarm sets. They had been issued to units on an experimental basis without MTOE action.

(b) Unit personnel were generally unfamiliar with the basic characteristics, capabilities, or employment of such equipment, and this lack of knowledge contributed to inefficient employment of the devices. In a few units, where command emphasis had been placed on detection devices, consistent positive results had been achieved. Commanders in these units considered them an invaluable asset in the hands of trained resourceful personnel for ambush operations and for use as target-acquisition devices for organic mortars.

3. (C) MOBILITY

In addition to the normal constraints of terrain and climate, mobility was much affected by the mine and RPG threats. The need for bridging and the difficulties of land navigation also imposed restrictions, but the mine threat was the greatest single consideration.

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a. Countermine Techniques and Equipment

(1) Vehicle-Mounted Equipment

The only vehicle-mounted mine detonator available to armored units during the evaluation was the M48 Tank-Mounted Mine Clearing Roller (ENSURE 202.1). No similar device was available to M551-equipped cavalry units or mechanized infantry battalions, which comprised the majority of armored forces in RVN. The design and employment characteristics of the mine detonator, coupled with the lack of a cross-country capability, limited its usefulness. The lack of vehicle-mounted equipment required most battalions/squadrons to conduct extensive dismounted mine sweeps. These operations, which required the use of a significant number of combat elements, were slow and limited to the speed of walking personnel. One unsatisfactory, but occasionally necessary, alternative was to employ M48A3 tanks to "run" the roads and detonate any mines. This was faster than dismounted sweeps, but had obvious drawbacks.

(2) Handheld Mine Detectors

(a) Varying quantities of handheld mine detectors were on hand in all armored units. The P-153 metallic mine detector was used extensively; some units used it exclusively. The available nonmetallic density detectors saw only limited use. All available models had some qualitative limitations that made minesweeping a slow, tedious, and often hazardous operation. Most commanders relied more on visual detection by trained and alert soldiers and Kit Carson Scouts than they did on handheld detectors. The requirement for a dual-capability mine detector (metallic and nonmetallic) was unanimously stated.

(b) Commanders in mechanized infantry battalions were satisfied with MTOE authorizations for handheld mine detectors. In all other units, the BOI was considered insufficient. In mechanized infantry battalions, the BOI was one detector per line platoon/section. This BOI was desired by commanders in the tank battalions.

(c) In the regimental and divisional squadrons, a commonly used minesweeping technique was employment of multiple detectors to improve speed and accuracy. In some units, extra detectors had been obtained to allow this employment. The cavalry squadrons performed extensive minesweep operations and, based upon the technique of using multiple detectors, stated a requirement for 10 detectors per troop.

(3) Stated Requirement

All armor commanders stressed that a increase in handheld mine detectors would provide a partial and temporary solution to the mine problem. They unanimously reinforced the often repeated requirement for an

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adequate vehicle-mounted detector/detonator usable at reasonable road speeds. This requirement is clearly substantiated by the high number of vehicles lost to mines.

b. RPG Protection

(1) In RVN, the changed roles of armored fighting vehicles and the wide expanse of heavily vegetated areas decreased the conventional security afforded to armored vehicles by accompanying dismounted infantry. Doctrinally, dismounted infantry precedes armor through heavily vegetated areas to engage enemy infantry and deny them the opportunity to employ short-range anti-armor weapons such as the RPG. In RVN, however, these roles have commonly been reversed, with a consequential increase in the vulnerability of armored vehicles to RPGs.

(2) Various experiments have been conducted to find a means to protect moving armored vehicles from RPGs. These experiments generally attempted to provide standoff by means of add-on material, such as bar armor and pierced steel planking, suspended along the sides of the vehicle. None of the approaches significantly improved vehicle protection.

(3) Some measure of protection for a parked vehicle was provided by a "RPG screen," which consisted of 12 to 20 feet of 8-foot chain link fencing held up with fence pickets. Most units used this technique nightly in NDPs, laager sites, and on mounted ambushes. However, the screen did little to protect the dismounted crew from splattered molten metal from RPGs detonating on the fence.

(4) The styrofoam-filled flotation offset (mounted on the M113A1 trim vane as part of the belly armor kit, ENSURE 218.1) had been hit by RPGs in several units. Generally the vehicle suffered no major damage because of the standoff and the absorption (by the styrofoam) of the shaped-charge jet, preventing penetration of the vehicle armor plate. Many M551 crews had similar experiences with the styrofoam-filled flotation barrier in the M551 hull. Other isolated incidents had occurred in which vehicles with some commercial styrofoam packing on board had been penetrated by RPGs. It was claimed that in most cases the styrofoam provided effective protection from the jetstream and/or molten metal.

c. Land Navigation

Accurate land navigation is essential to the coordination of armored and mechanized operations and fire support. In RVN, position location was rendered extremely difficult by the terrain and vegetation. In addition, the fact that vehicle odometers were calibrated in miles, while kilometers were employed in military maps and common local usage, caused confusion. Such location techniques as the use of artillery marking rounds were only partially effective; and the lensatic compass, the primary navigational aid

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available, was affected by the metallic mass of the vehicle. Although computerized on-vehicle position locators have been tested in RVN, none have been effective.

d. Assault Bridging

(1) Squadrons in the ACR and tank battalions were the only units authorized assault bridging: i.e., armored-vehicle-launched bridges (AVLBs). With this general lack of bridging, and with the degradation of armored-vehicle swim capability, the presence of water obstacles in RVN restricted maneuver and denied armor units access to certain areas. A variety of field-expedient crossing techniques were used in an attempt to overcome this problem. One unit carried M4T6 bulk bridging with each of its platoons, which was effective for spanning short gaps. Other units used logs for bridges and corduroy crossings. Both methods were time consuming.

(2) One solution to the problem would be to provide the M60 series AVLB to divisional cavalry squadrons and mechanized infantry battalions. This alternative, satisfactory for M48A3-equipped divisional squadrons, would not be acceptable for M551-equipped squadrons and mechanized infantry units due to the mobility incompatibility and unique vehicle maintenance and supply problems.

(3) A limited number of the M113A1 marginal-terrain assault bridges (MTABs) were evaluated in RVN. This piece of equipment provided a light assault bridge to cavalry and mechanized units. Although conceptually sound, it was structurally inadequate. However, four units had MTABs on hand during the evaluation and were using them advantageously.

(4) Commanders of all units without organic assault bridging universally stated that Engineer engineering support was usually not available or was unresponsive.

(5) The TOE/MTOE basis of issue for AVLBs was two per tank battalion and three per squadron in the ACR. Units retaining the M113A1 MTAB had a section of two. Commanders stated that these BCIs were quantitatively adequate. If an assault bridge compatible with the M113/M551 were made available, the ACR would require both types of bridge to support tank and/or cavalry operations.

e. Additional M113A1 Requirements

Commanders of both divisional and regimental armored cavalry squadrons expressed a requirement for additional M113A1 assets. Squadron medical platoons needed an additional medical evacuation vehicle in order to provide one per line troop [Annex H, paragraph 2c(3)(c)2]. Howitzer battery commanders in the ACR squadrons required an M113A1 equipped with two AM/VRC-46 radios rather than the M151 1/4-ton truck which was authorized. Further discussion is contained in Annex G, paragraph 2g(2).

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4. (C) FIREPOWER

A characteristic of US tactics in the Vietnam conflict was a high reliance on superior firepower. In most cases, this firepower was amply provided by the combat vehicles employed in RVN. However, some command and support vehicles lacked sufficient armament for self-protection or had unsuitable weaponry. In addition, the .50-caliber machinegun authorized for the M48A3 tank was found to be more effective in the RVN environment when mounted outside the cupola and fired manually, although it was intended to be mounted inside the cupola and fired electrically. Furthermore, there were questions surrounding the proper individual weapons for the crew and the need for a sniper capability in armored units. Also, the insufficient number of M125A1 81mm mortar carriers caused problems in many units.

a. Support and Command Vehicle Weapons

(1) M577A1 Command Post Carrier

(a) Every tracked vehicle needed the capability to provide its own security and contribute to unit security. With the exception of the M577A1 command post carrier, all combat, combat-support, and combat service-support tracked vehicles were authorized at least one weapon.

(b) In small field CP locations, the M577A1 was commonly placed on the perimeter. Because of its distinctive silhouette, this vehicle was always a choice target for VC/NVA sappers and RPG teams.

(c) Most units had armed the M577A1s with unauthorized machineguns, mounts, and ballistic shields. A majority of M577A1s were equipped with an M60 machinegun and an ACAV shield, in preference to a caliber .50 machinegun, because the M60 was easier for one man to operate.

(2) M113A1 APC/ACAV

Tank and mechanized infantry commanders stated a requirement for additional firepower in mechanized rifle platoons and in the scout sections of the mechanized infantry and tank battalions. The modification recommended was the substitution of a 40mm high-velocity grenade launcher for one of the two caliber .50 machineguns on one vehicle in each mechanized rifle platoon and scout sections of the mechanized infantry and tank battalions. This requirement is further discussed in Annex K, paragraph 3H(2).

(3) M113A1 Medical Evacuation Vehicles

(a) Each M113A1 medical evacuation vehicle in the battalion/squadron medical platoon was authorized a caliber .50 machinegun without armor. All other unit M113A1 APC/ACAVs were authorized Armament Subsystem A.

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(b) Generally, the M113A1 medical evacuation vehicles were attached to line companies/troops and accompanied these elements on operations. Each vehicle accompanying the maneuver elements had to provide for its own security as well as contribute to unit security. The authorized BII machinegun, without an armament subsystem, did not provide the required capability. The lack of an armament subsystem made the vehicle identifiable as a medical vehicle to the enemy, who considered that the effect on the morale of his troops made them lucrative targets.

(c) All cavalry and tank units had equipped each M113A1 medical evacuation vehicle with an excess Armament Subsystem A. In mechanized infantry units, these vehicles were generally provided with only cupola armor and the caliber .50 ballistic shields, which constituted Armament Subsystem B. These local modifications were made to remove outward vehicle identification and to provide the vehicle a security capability. This is considered justified in view of the changed role of the vehicle.

(4) Supply Vehicles

(a) Each wheeled cargo vehicle was authorized one caliber .50 M2 machinegun and ringmount. In addition, the M548 tracked cargo vehicle was authorized a caliber .50 M2 machinegun and mount kit as BII. These weapons were originally intended to provide defense against air attack. In RVN, there was no air threat; however, there was a continuing threat of ambush. Most commanders considered the .50 caliber machinegun unsatisfactory for counterambush fire because the ringmount placed the gunner in a vulnerable position. In addition, the weapon was heavy and difficult to ground-mount rapidly when contact was initiated; furthermore, in many areas, caliber .50 machinegun fires were restricted by MACV rules of engagement.

(b) Many commanders placed pedestal-mounted M60 machineguns on supply vehicles. The M60 machinegun was lighter, provided adequate firepower, and had very few restrictions on its employment. Other commanders simply removed the caliber .50 machinegun and did not replace it. When an M60 machinegun was not available, personnel preferred small arms over the caliber .50 M2 machinegun.

b. M48A3 Tank Commander's Caliber .50 Machinegun

(1) The BII caliber .50 machinegun on the M48A3 tank was intended to be mounted inside the tank commander's M1 cupola and fired electrically. However, in RVN, the machinegun was frequently mounted externally and modified for manual firing. The modification entailed replacing the charging chain, electric solenoid, and backplate, with a charging handle, manual-fire backplate, and spade grips.

(2) The reasons stated for this modification were that the internally mounted machinegun was difficult to load and fire, had a limited supply of

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ammunition available at the gun, was difficult to troubleshoot in event of a malfunction, and crews were often forced and depressed to fire close-in to the tank. When more reliable weapons were available, however, these problems were reduced or eliminated.

(3) Every crew was authorized to change the authorized machinegun from electric to manual fire. Heat, humidity, and dust increased maintenance requirements on the electric firing system and made it unreliable. Nevertheless, all maintenance units refused to accept locally modified weapons for repair, and reconverted to electric fire, and issued replacement machineguns capable of electric fire. In spite of the extra time and effort for local conversion and re-conversion, all commanders were convinced that the modification was an absolute necessity for combat.

c. M48A3/M551 Crew Individual Weapons

(1) Crews in regimental cavalry squadrons were authorized four caliber .45 pistols, two M1911A1 submachineguns, and one M79 40mm grenade launcher. Crews in mechanized units were authorized four caliber .45 pistols and two M1911A1 submachineguns. A majority of crewmen and commanders considered the .45 caliber weapons unsuitable because of their weight and inaccuracy. The pistol also constituted a safety hazard and was the source of many accidents. Some commanders restricted its issue to senior NCOs and officers. The M1911A1 in one division had been directed to exchange caliber .45 weapons for M16 rifles. In other units, the crews retained their pistols, but carried extra M16 rifles, XM177E1s, and M79 grenade launchers. While the M16 was not popular, because its length made it clumsy in a turret, crews converted it to the caliber .45 submachinegun. The M79 40mm grenade launcher was a favorite weapon of crewmen and was used extensively for intelligence and illumination (ISI) fires in NCPs and reconnaissance by fire when the tank was down.

(2) Many commanders felt the need for an additional machinegun in each M48A3 tank. The loader, to provide left flank and rear security and to engage by fire. The additional machinegun (in most cases an M1911A1) was considered justifiable if authorized crew weapons included an M79 40mm grenade launcher and XM177E1 5.56mm submachineguns. These weapons would provide the needed vehicle security and reconnaissance-by-fire capability, as well as provide appropriate individual weapons for dismounted use in NCPs.

d. Sniper Capability

(1) Sniper equipment (including match-grade M14 rifles with telescopes) was authorized for use by mechanized infantry battalions in RVN. Tank battalions and cavalry squadrons were not authorized sniper equipment. With the exception of tank battalion commanders, most commanders felt that a sniper capability was required in their units.

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(2) In mechanized infantry battalions, snipers were volunteers from rifle and scout platoons, trained at either battalion or division level, and employed with ambush patrols or with maneuver elements. Snipers were found to be most effective when higher headquarters had a formal program of sniper training, incentives, and equipment maintenance.

(3) Many armored cavalry units had acquired unauthorized sniper equipment and established a sniper capability. In some cases, these units achieved excellent results.

e. M125A1 Mortar Carrier

(1) The 81mm mortar in armored and mechanized units is designed primarily to be mounted in and fired from the M125A1 mortar carrier. However, of the 162 M125A1 mortar carriers authorized for armored units in RVN, only 120 were on hand. Many units had been issued M106A1 4.2-inch mortar carriers or M113A1s in lieu of M125A1s. This shortage had developed due, in part, to the replacement of the 4.2-inch mortars in cavalry platoons with 81mm mortars.

(2) All commanders considered the M113A1 to be a totally inadequate substitute for the M125A1, since the vehicle lacked ammunition storage racks and the mortar had to be ground-mounted to fire. This decreased responsiveness and increased mortar crew vulnerability to enemy fire. The M106A1 was considered somewhat better, but also inadequate, because the parts necessary to accommodate the 81mm mortar on the firing turntable were frequently unavailable, again necessitating ground-mounting the mortar.

(3) Because of the shortage of the M125A1, a number of units operated with fewer mortars and left some in fire bases. Replacement vehicles for a combat loss or maintenance salvage were generally unavailable. This resulted in further restrictions by commanders on available assets to conserve a valuable combat capability.

f. Portable Flame Weapons

The M9-7 portable flamethrowers were used infrequently due to limited range, and weight, and logistical support requirements. The multishot portable flame weapon (launcher, rocket: 66mm, 4 tube XM202) was preferred by commanders and chemical personnel due to the increased range and accuracy. Further discussion may be found in Annex K, paragraph 3h(5).

5. (C) COMMAND AND CONTROL

a. General

(1) Most battalion/squadrons in RVN maintained at least two operational bases; as a result, unit staff and service-support elements were

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divided. In addition, the combat elements of most units were widely dispersed in the unit AO. This situation greatly expanded command and control requirements.

(2) In order to minimize the impact of these expanded requirements on unit combat elements, many battalions/squadrons had obtained large quantities of unauthorized equipment, particularly communications equipment and weapons. This was necessary to preclude taking organic equipment from line elements.

(3) Dispersion increased static security requirements, which resulted in diversion of combat elements from their primary mission. Most units had at least 10 percent of their assigned personnel committed to static defense, while some had more than 20 percent. Many commanders had requested that each semipermanent PSB or base camp be provided a security detachment. Higher authorities considered that the 110 percent manning level provided for this situation and the frequently changing tactical situation did not justify formalizing security detachments.

(4) The establishment of multiple CPs modified and/or expanded normal communications nets and increased requirements for longer range communications. Unit dispersion also modified traditional field and combat train operations. The methods used for resupply of each unit depended on the availability of secure roads, distances between maneuver elements, and the location of supporting organizations. In addition to magnifying logistical control and coordination problems, these modified circumstances increased resource requirements for unit service support elements.

(5) Organizational adjustments were required in the armored cavalry regiment and tank and mechanized infantry battalions. Realignment and augmentations were necessary to improve unit capabilities in combat support and combat service-support operations. Considerations applicable to each type unit are treated in Annexes G, J, and K.

b. Staff Operations

(1) Almost all battalions/squadrons were required to operate multiple operational and logistical bases. Staff sections were generally fragmented to meet this requirement, which resulted in two distinct staffs: a field operational staff supervised by the S3, and a logistical and administrative staff supervised by the executive officer. In most cases, the executive officer did not act as a staff coordinator.

(2) Staff problems were further compounded by the relative inexperience of most company-grade staff officers. In all units, there were principal staff officers who had no previous staff experience; often these officers had less than three years total military service.

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(3) The responsibilities and functions of some staff sections changed. The S3 Air was not used in that role and had become an assistant S3. The attached artillery liaison officer had assumed an increasingly important role in fire support coordination for unit operations. All units had augmented staff sections to meet the expanded staff requirements and to maintain 24-hour operations. The Air Control Team (ACT) personnel, motor messengers, and wiremen from the communications platoon, staff 1/4-ton vehicle drivers, and occasionally personnel from line elements were normally selected for this augmentation. With these changes, most units' staffs functioned relatively efficiently.

(4) In RVN, under the DA-approved MTOEs, battalion/squadron staffs were augmented only by an S5 officer. This officer was responsible for coordination with local authorities for the use of unit personnel and equipment to perform civic action projects. In most units, his responsibilities were broadened to include operational, intelligence-gathering, and administrative functions. The S5 sections had been provided from two to 20 men to accomplish these expanded tasks.

(5) Battalion/squadron liaison requirements varied widely from unit to unit, and depended on the characteristics of the unit AO and the assistance provided by higher headquarters. In some units, the two authorized liaison officers were rarely used in a liaison role, while in other units, staff officers had to be used to meet expanded liaison requirements.

c. Communications

(1) General

(a) Operations in RVN were characterized by dispersion at all levels: battalion/squadron headquarters, staff sections, companies/troops, platoons, and service support elements. Rear-area and local security needs increased communications requirements. Night operations were emphasized at all levels, which increased the demand for portable radios. Finally, the relatively fixed unit AOs facilitated enemy radio intercept operations, which increased requirements for secure methods of communications. The AM and UHF radio equipment authorized for all armored and mechanized units was underused in RVN. Traditional AM voice nets were rarely established, while radio-teletype equipment saw only limited use in a modified role. Increased use of FM secure-voice equipment reduced the requirement for AM communications. Wire communications were used extensively in base camps, fire-support bases, and internally among fire-support elements, but rarely elsewhere.

(b) Every unit had modified MTOE/TOE radio locations, radio nets, and communications maintenance capabilities to meet changed or increased requirements. While no two units of the same type had put into effect the same modifications, some definite trends were found during the evaluation. All units had acquired varying quantities of unauthorized

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communications equipment. Many units had removed radios from 1/4-ton utility vehicles for use in bunkers or tracked vehicles. The radios were utilized to supplement authorized radios, make up for MTOF shortcomings, and, in some units, to provide an organizational DX or maintenance float capability. Many units considered the DS signal-maintenance support to be unresponsive. In some units, two weeks or more were required for DS maintenance repairs; as a result, they established a float to preclude deadlining otherwise-operational combat vehicles. Many units had also acquired unauthorized test equipment, which enabled the communications platoon to conduct higher level radio repairs, thereby decreasing unit reliance on DS maintenance support.

(c) The communications issue was extremely complicated. With the many variations between units caused by local requirements, and local adjustments made to meet them, it was impossible to identify clearly the total communications requirements for each type of unit. However, certain specific areas, where communications usage or operational requirements created new or modified requirements, were documented and are discussed below.

(2) Radio Requirements

(a) Command Vehicle Radios

1. The AN/VRC-12 or AN/VRC-47 radios authorized command combat vehicles provided the commander with the capability to transmit and receive on his command net and to monitor his higher headquarters command net. This is the standard capability provided Army-wide; however, commanders at all levels in RVN considered this capability inadequate. When it was necessary for the commander to transmit on the higher headquarters net, he or another member of the crew had to enter the crew compartment and change the receiver/transmitter to the higher headquarters frequency. The frequency on the receiver had to be changed at the same time, if he wished to continue to monitor his own command net.

2. During routine operations, this procedure was cumbersome but tolerable. However, during enemy contact, the procedure was unacceptable. While in contact with the enemy, in addition to controlling his unit, the commander often had to communicate with helicopter gunships, medevac helicopters, and his higher headquarters. In addition, on occasion the commander personally operated a machinegun. These considerations, and the intensity and short duration of most contacts, rendered the authorized communications equipment inadequate, in the opinion of many commanders. To overcome this problem, commanders, almost without exception, provided their command combat vehicles with a minimum of two radio receiver/transmitters.

3. The operating range requirement for radios on battalion and company command nets was affected by dispersed unit operations.

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The battalion and company command vehicles also had the range capability of the AN/VRG-47, AN/VRG-48, AN/VRG-49, AN/VRG-50, AN/VRG-51, and AN/VRG-52.

Platoon leaders had a different requirement. They nearly always required a radio. The AN/VRG-47/VRG-48 for communications with the company command. Platoon leaders normally remained intact, and the platoon leader had a shorter range FM radio to control his platoon, such as the AN/VRG-129 (RT-505). Platoon leaders stated that they would need a receiver-transmitter should possess a dual, dismounted, portable operation capability, such as is available with the AN/VRG-160.

(b) Artillery Liaison Team Policy

1. Artillery liaison teams were attached to nearly all armored battalions/squadrons. Generally, the team brought with it one each AN/VRG-47 and AN/VRG-48 radio. The exceptions to this were artillery liaison teams in the 1st Brigade, 3rd Infantry Division (Mechanized), which came equipped with an AN/VRG-47 mounted on a carrier and one each AN/VRG-47, AN/VRG-48, and AN/VRG-49, as well as a secure communications capability. All units had to provide attached artillery liaison teams with additional radios.

2. The artillery liaison officer performed an expanded role of fire-support coordination. He was required to operate in a minimum of three separate radio nets: the artillery fire direction net, the artillery clearance net, and the artillery warning net. In areas where more than one clearance agency existed, he was required to enter additional nets. He also had to maintain the capability of operating in two nets when dismounted or accompanying a helicopter unit commander. Augmentation of the artillery team prior to supported unit assets was required to satisfy the tactical operational requirements.

3. With the exception of the 1st Mechanized Infantry Brigade, every unit that operated from a mobile field CP provided its S3 Air M577A1 to the artillery liaison officer. This was possible because the S3 Air functions were performed by the forward air controllers (FAC) and the S3 Air team, and as such, the S3 Air team was not required to be mounted in the M577A1.

4. Two solutions were suggested to solve the problem: either provide the artillery liaison officer with the capability to communicate on three different radio nets, or provide a two-net dismounted capability, or provide the artillery liaison officer enough organic radios to support the artillery team. The latter solution was considered more practical in BWH because the artillery team was supported by towed 105mm DB artillery battalions. The required radios were made organic to the artillery, they would probably have to be mounted in 3/4-ton trucks, which do not have the necessary capability.

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(c) Squad Radios

1. Scout squads of the tank and mechanized infantry battalion scout platoon and all cavalry platoons were each authorized one M113A1 APC/ACAV with an AN/VRC-47 radio and one M113A1 APC/ACAV with an AN/PRC-125 radio. The AN/PRC-125 was designed for mounted or dismounted use.

2. Mounted and dismounted elements of the squad often were employed in different locations. Rarely did the whole squad dismount simultaneously. When a portion of the squad dismounted to conduct a search or to establish an ambush, they required communications. Normally, the portion of the squad that remained on the ACAVs was used: (1) as a separate maneuver element, (2) to provide fire support, or (3) to act as a ready reaction force (RRF) for the dismounted elements. To support these operations, radios were required in the two authorized squad vehicles. This was particularly true at night or in dense vegetation, where alternate means of control were limited. The two radios authorized the squad were insufficient to support the simultaneous mounted and dismounted operations. In most units, scout elements had acquired additional AN/PRC-25/77 radios to provide the needed communications.

(d) Transportation Section Radios

1. The only radio authorized in the support platoon was an AN/VRC-47 for the platoon leader's M51 utility truck. For several reasons, commanders and supply personnel felt that the functions of the transportation section required it to have additional radios. These radios were needed for helipad operations; for communications with cargo helicopters; for overland resupply operations, where a small number of supply vehicles moved independently; and, particularly, for transportation section supervisory personnel to maintain required contact with the section leader.

2. All battalion/squadrons had provided radios to the transportation section. Portable radios (AN/PRC-25) were commonly used on helipads or on cargo vehicles, and were often used on M548 cargo carriers.

3. The average indicated requirement was four AN/PRC-25/77 radios. Portable radios were desired because they provided more flexibility to the section supervisors.

(e) Infantry Squad Radios

AN/PRC-86 radios issued to mechanized infantry squads lacked reliability and durability, and were considered inadequate for use in RVN. For further discussion, see Annex K, paragraph 31(2)(d)3.

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(3) Other Communications Equipment Requirements

(a) Secure Voice Equipment

1. Secure voice nets are a requirement, as VC/NVA forces possess an extensive and effective radio-intercept capability, verified by documents captured in December 1969, which described the enemy's success in obtaining early warning of B52 strikes and artillery fire missions by this means.

2. Each cavalry squadron, tank battalion, and mechanized infantry battalion was authorized two TSEC/KY-8 FM secure devices. However, by the time of the evaluation, both TSEC/KY-8 and TSEC/KY-38 secure devices had been issued through signal channels, without regard to MTOE or BOI authorizations, and the number on hand varied greatly from unit to unit.

3. Most brigade and battalion/squadron FM command nets had a secure voice capability, which was considered by the commanders to be vital to the dissemination of operations orders and to unhampered communications with subordinate commanders (the only exception was the ACR, whose organic helicopter capability enabled frequent personal contact between commanders and lessened their dependency on the secure voice net). Many commanders felt that secure voice capability was needed down to the platoon-leader/platoon-sergeant level for company/troop command nets, and suggested that this be established as soon as possible.

4. Most commanders - again with the notable exception of the regimental cavalry squadrons, who were not overly enthusiastic about secure voice devices - were of the opinion that the administrative/logistical and artillery-control nets should also have secure voice capability. A nonsecure administrative/logistical net can furnish the enemy a wealth of information as revealing as that carried on the command net itself, and the cryptographic controls under which the artillery nets functioned decreased their efficiency and added greatly to their communications time and workload. For these reasons, whenever sufficient equipment was available, various units had supplied one or the other of these nets with secure voice capability. The commanders suggested that sufficient equipment be authorized to provide all three types of communications nets with this capability.

5. A problem connected with secure voice devices was that not all necessary mounts, cables, and accessories were available for making the devices fully compatible with vehicle-mounted radios. However, this problem was alleviated, in the case of some tracked vehicles, by the use of locally fabricated mounts and cables.

(b) Communications Power Sources

1. The tank battalion was the only armored unit authorized PP1104G rectifiers by MTOE. Two rectifiers were authorized the battalion

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communications platoon to provide DC power for radios mounted in bunkers, buildings, or other nonvehicular locations, which was common in semifixed, insecure locations in RVN. However, nearly all units had acquired PF1104G rectifiers, since generators were scarce and using vehicles as a power source is inefficient.

(c) Antenna Base

1. The only long-range FM antenna authorized for armored units was the RC-292. Many units, however, had acquired varying quantities of AB-577 signal antenna bases to extend the range of standard FM radios. The AB-577, which raised the RC-292 antenna approximately 15 feet, improved communications range and quality when operating in jungle or rubber plantation areas. The AB-577 also enhanced dispersed operations by decreasing requirements for radio relay.

2. Multiple RC-292 antenna heads were used on a single AB-577 antenna base to provide extended range for as many as four separate nets. The AB-577 could be erected in 10 minutes by TOC radio operators, and was easily transportable in the M577A1 CP vehicle. A few units had acquired a second AB-577 antenna base for use at the rear CP location.

3. All commanders who had AB-577s considered them indispensable and suggested that two be authorized each battalion/squadron headquarters.

(d) Radio Accessories

1. With the exception of vehicles equipped with the AN/GRC-125 radio, which had the necessary accessories for use as a dismounted portable radio, tracked combat and combat support vehicles were not authorized any handsets, headsets, or speakers to use with vehicle-mounted FM radios. All combat tracked vehicles were authorized a combat vehicle crewman's (CVC) helmet for each crew member, which was the only authorized means of monitoring and transmitting over the radio or intercommunications system.

2. In an NDP or mounted ambush site, one crewman remained on each vehicle to provide security and to monitor the radio(s). With the helmet on, it was nearly impossible for the security guard to hear outside noises that might provide warning of enemy approach.

3. Many units lacked as many as 50 percent of their authorized CVC helmets, largely due to difficulties in obtaining repair kits. In addition, in order to transmit on secure voice FM, the CVC helmet had to be disconnected from the vehicle frequency selector (C-2742/VRC or C-2298/VRC) and plugged directly into the secure-speech device, since

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secure devices were not designed to work through radio mounts and frequency selector boxes.

4. To solve these problems, many vehicle crews had obtained speakers, headphones, and handsets, particularly on command and CP vehicles that had secure equipment installed. The handsets were connected to the face of secure devices. The handset (telephone type) was at the vehicle commander's position for his immediate use. Speakers were used to monitor radios in more secure areas, such as FSBs and daylight laagers. Headsets were used to monitor radios in night ambushes or other locations where silence was required. In order to permit the operator to listen for possible enemy approaching, one earphone of the headset was disconnected.

(4) Communications Support

(a) Maintenance

1. Organizational Maintenance

The battalion/squadron communications platoon performed organizational maintenance on all communications equipment. The authorized repairs permitted at this level were minimal: generally, organizational maintenance personnel were not permitted to replace any major component, to solder inside the receiver/transmitter casings, or to replace more than 10 to 15 percent of the modules in the new series radios. The time required for repair of equipment at organizational level normally varied from 12 to 48 hours, during the evaluation. In most units, if the communications platoon could not repair the item within that period, the item was turned in to the supporting DS unit. Armored and mechanized units were not authorized an operational float of radios for direct exchange (DX).

2. DS Maintenance

In only one division was DS-level communications maintenance support considered responsive by battalion/squadron commanders. In this unit, the time required for an item to be repaired was 48 to 72 hours. In other units, the normal time for DS communications repair was as follows: 10 to 14 days in the ACR; 14 to 15 days for divisional cavalry squadrons; and over 30 days for separate cavalry troops. Five battalions/squadrons experienced delays of up to 45 days for some radios to be returned from DS maintenance. In all cases, times exceeding three days were considered excessive and unsatisfactory.

(b) Local Expedients

1. To reduce communications equipment downtime, most units had acquired unauthorized radios above operational requirements. These radios were used as an operational float to provide unit-level

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direct exchange for inoperable radios. Additionally, nearly all units had obtained varying quantities of unauthorized test equipment and repair parts. These were used to perform DS-level repairs and reduce unit dependence on unresponsive DS maintenance organizations. Generally, the required expertise was available in the battalion/squadron platoons to perform these repairs.

2. Commanders and communications personnel in nearly all units expressed the need for an operational float of radios to permit direct exchange. The specific quantities suggested ranged from five to ten percent of the total unit radio authorization. In addition, they universally stated that the battalion/squadron communications platoon should be authorized additional test equipment to perform higher level radio repairs. Items suggested included multimeters, RF meters, wattmeters, module testers, and radio frequency generators.

3. One of the recommended solutions to improve maintenance was the collocation of an appropriately equipped DS communications maintenance contact team with the unit communications platoon, in a manner similar to the deployment of the ordnance maintenance contact teams commonly found with the battalion/squadron maintenance platoons.

4. A maintenance DX float was authorized at the DS level. However, only in one division were float radios issued by the DS unit and then only if the expected time for repair exceeded 72 hours. When a DS operational float was not maintained, the unit established a small, unauthorized float of radios.

5. The Australian cavalry squadron had no problem with communications maintenance. Squadron communications maintenance personnel were trained and equipped to perform any required maintenance short of rebuild. They averaged 12 to 24 hours time required for all levels of repair, maintaining a small float to provide direct exchange. This austere but talented organization was extremely efficient in use of all resources.

(5) Communications NCO Rank Structure

(a) In armored and mechanized units, the authorized grade level of the battalion/squadron communications chief was SSG E6, and the company/troop communications chief was a SGT E5.

(b) Reliable communications and responsive communications maintenance were directly related to the skill and experience of the communications section chiefs at the battalion/squadron and company/troop levels. All commanders and communications officers felt that the authorized grades for communication chiefs at both levels were not commensurate with the experience required or the assigned responsibilities. As a comparison, the battalion communications chief in an airborne infantry or infantry battalion is an SFC E7. A comparison of assigned communications

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equipment indicates that the armored and mechanized units are authorized a substantially larger quantity of communications equipment.

(c) The supervisory responsibilities of the battalion/squadron communications chiefs were increased in RVN. The communications requirements and support needed for dispersed operations increased the demands on the communications chiefs at both the battalion/squadron and the troop/company levels.

(6) AM and AM/RTT Communications Equipment

(a) All armored units were authorized AM and AM/RTT communications equipment. Cavalry units were authorized sufficient AM equipment to establish internal squadron nets and to enter several higher headquarters nets.

(b) Very little use was made of AM radio equipment by any armored unit. No unit had established or was required to operate in an AM voice net. A few AM/RTT systems were employed, generally in higher headquarters RTT nets. The ACR had established an internal RTT net, but it was used only sparingly. Nearly all units had access to area signal support VHF multiplex, which increased long-range point-to-point communications. With the ready availability of VHF and the extensive use of secure voice FM, unit requirements for AM and RTT were significantly reduced.

(7) Wire and Motor Communications

(a) Armored and mechanized units were authorized wire communications equipment, 1/4-ton messenger vehicles, and wiremen/motor messengers. However, unit dispersion over large areas, constant movement, insecure LOCs, and excellent area signal support made most conventional uses of wire communications and motor messengers impractical and unnecessary.

(b) Specific wire communication requirements of armored-type units could not be determined because of the wide variations in operations among similar type units. Unit switchboards and wire lines employed in base camps, FSBs, and other semipermanent locations were used for base defense and for administrative communications. Units that had sizable rear area or base camp security commitments used a large portion of their authorized wire equipment and personnel to meet defense requirements, while other units, with minimal rear area security requirements, made little or no use of wire.

(c) With the limited employment of wire communications and 1/4-ton utility messenger vehicles, and the relative permanence of wire lines that were installed, many units used motor messengers/wiremen to assist authorized radio repairmen. The communications personnel of all units felt that the replacement of two motor messengers/wiremen (MOS 36K20)

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with two field radio mechanics (MOS 31B20) would enhance the communications maintenance support for the battalion/squadron, and at the same time would meet wire and messenger requirements.

d. Other Command and Control Considerations

(1) Command and Control Helicopters

(a) Each brigade in RVN was authorized an aviation section. Infantry division brigades were authorized four LOH helicopters. The 3d Brigade, 9th Infantry Division had eight LOHs, and the 1st Brigade, 5th Infantry Division (Mechanized) had four LOH and three UH-1 helicopters. The 23d Infantry Division was authorized sufficient helicopter assets to provide full-time aviation support to the divisional cavalry squadron. Similarly, each cavalry squadron of the ACR was authorized sufficient aircraft, with a command aviation section consisting of two LOH and two UH-1 helicopters.

(b) The aviation sections were intended to provide command, control, and limited administrative support to the brigade headquarters and attached maneuver battalions. In practice, however, the amount of command-and-control "blade-time" received by the maneuver battalion commanders varied, and often was limited.

(c) All battalion/squadron commanders relied on command and control helicopters for command visits to widely dispersed elements. Also, in areas of dense jungle and heavy vegetation, helicopters were essential to assist ground navigation and to coordinate supporting fires. The use of ground command vehicles was not an acceptable alternative because of time, distance, terrain, and the tactical situation.

(d) During the evaluation, tank and mechanized infantry battalion commanders averaged 2 1/2 hours of "blade-time" daily for command, control, reconnaissance, and administrative uses. Some logistical support requirements also had to be met within "blade-time" allocations. Divisional cavalry squadron commanders received an average of 3 hours "blade-time" daily. All commanders considered these allocations inadequate.

(e) All commanders who did not have a dedicated command and control helicopter emphatically stated that one was required for optimum employment of highly mobile and responsive armored and mechanized units. Many commanders suggested that each battalion/squadron be authorized an organic aviation section, similar to that in the brigades. This suggestion is not considered acceptable because of the resource and support requirements. A desirable alternative would be to increase the size of brigade aviation sections to provide more command and control helicopter support to armored and mechanized battalions.

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(2) Air Control Team

The three-man (one E6 NCO, one E4 senior radio operator, and one E3 radio operator) battalion Air Control Team (ACT) provided for in tank and mechanized infantry battalions and regimental cavalry squadrons was not employed as such in RVN. The ACT functions were performed by USAF forward air controllers (FACs). The ACT personnel were used to augment the S3 section in the multiple operations centers, and the ACT M113A1 was either not used or was used for purposes other than those originally intended.

(3) Ground-to-Air Signaling

(a) In night operations, there was a requirement to locate unit positions precisely for aircraft providing fire support, resupply, or medical evacuation. At the time of the evaluation, there were no ground-to-air signaling devices authorized in armored units. Some units employed such devices as railroad flares, trip flares, cans filled with oil-soaked soil, or vehicle headlights. Flares were frequently difficult to extinguish and started fires; both flares and headlights often gave too much light and compromised security and cans of oil-soaked soil were difficult to light and took excessive time to set up.

(b) A number of units obtained aviator's distress light markers (SDU-5/E strobelights). Units that had these utilized them effectively. Units that did not have them, wanted them. Use of these devices was also recommended by most aviation support elements.

6. (c) SUPPORT

The impact of the RVN environment on support operations included the effects of climate and terrain, unit dispersion, and other constraints of the Vietnam conflict, such as insecure lines of communication. Personnel training requirements were especially influenced by the need to provide a wide variety of expertise in many small, isolated locations. In addition, specific equipment needs were revealed during the course of the evaluation, most notably in the area of support vehicles. The Army Authorization Documents System, which was designed to match authorized personnel and materiel to unit needs, did not function as well as expected; poor administration of the system and a lack of understanding at the unit level contributed to reduced effectiveness.

a. Supply

(1) Supply Procedures

The basic mission of the battalion/squadron support platoon - to provide supplies and related services to the battalion - did not change in the RVN environment. However, the methods used differed considerably

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from the conventional, thus changing requirements for personnel and equipment. In a conventional environment, supplies required by a battalion are moved forward, mainly overland, from the field army, to the division support activities, to the unit field trains at the brigade support area, to the unit combat trains, and then to the individual companies. A maximum number of these transfers are accomplished by throughput to preclude unnecessary handling. In Vietnam the "field army," divisional support activities, and the unit field trains were commonly collocated in a brigade base camp. The unit combat trains were located in the brigade base, at a battalion fire support base, at the battalion field command post, or with the actual maneuver elements. Supply procedures differing significantly from standard practice are discussed below.

(a) Class I

Conventionally, Class I (rations and water) supplies are drawn by the battalion mess section and prepared by each company's mess team in the field train's area. From there they are moved overland to the combat trains and then to the companies. In RVN, Class I supplies were normally drawn from field trains, but could be prepared in either the field or combat train areas. If prepared in the field trains, rations normally bypassed the combat trains and were delivered directly to the companies by air.

(b) Class III

Current doctrine provides for the DISCOM to maintain a Class III (POL) supply point at each brigade support area. This was done in Vietnam; however, in some cases, Class III was stocked further forward with battalion combat trains. Unit vehicles delivered POL overland to forward elements (conventional) or to helipads (RVN usage). In cases where a fixed fire support base existed, combat elements often returned to the base for refueling.

(c) Class V

The handling of Class V (ammunition) underwent the greatest change in the RVN environment. Conventionally, the support platoon transportation section maintains a unit Class V basic load on vehicles in the combat trains area. Basic loads are replenished from field army ASPs, for resupply of combat elements as required. In RVN, ASPs were located in nearly all brigade base camps; therefore Class V was seldom stored on unit ammunition vehicles. In many cases, small battalion ammunition holding areas and basic loads were maintained forward at fire support bases. When a combat element required ammunition resupply, it was either moved directly from the brigade base camp or the fire support base by helicopter or surface means.

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(2) Means of Transportation

(a) Another aspect of RVN operations that affected all resupply activities was the use of helicopters. At the time of the evaluation, each armored and mechanized unit conducted from 5 to 100 percent of its resupply by air. The percentage depended on distances between logistics bases and forward areas, availability of roads, availability of helicopters, and enemy threat. There had been a decrease in dependence on air resupply for armored and mechanized units during the previous two years, resulting from improved LOC security. However, the support platoons were required to be proficient in the preparation of loads for air movement and to provide personnel and equipment to conduct helipad operations.

(b) Security requirements for ground vehicular transport of supplies were greatly increased over conventional operations. MSRs were considered totally secure in only a few cases. In many battalions, combat elements were diverted to escort supply vehicles from field trains to combat trains and from combat trains to the companies. This represented a drain on combat power and a constraint on resupply operations not present in a conventional operation.

(c) Requirements on the support platoons in RVN have also been affected by numerous commitments for vehicles for use in base camp operations.

(d) Support platoons differed from those in TOE organized units in that they had organic M548 6-ton tracked cargo vehicles. This vehicle gave the supply elements cross-country mobility, which was essential in areas where roads were poor, where enemy mining of roads was prevalent, or where roads did not exist at all.

(3) Prescribed Load List (PLL)

(a) Current regulations prescribe the maintenance of PLLs at company level. However, many units had consolidated company PLLs at battalion/squadron level. The consolidation compensated for the lack of a qualified parts supply specialist at company level; this position had been deleted from the armored and mechanized units by the MTOEs. In addition, many battalions/squadrons considered that they could achieve better overall support with a consolidated PLL.

(b) Each of the two systems, consolidated or decentralized, had certain merits. Consolidation helped overcome personnel shortages, improved repair parts stockage, improved records-keeping, led to development of more accurate demand data, and provided more skilled PLL supervision by the battalion/squadron maintenance platoon. This system was particularly effective for units operating for extended periods in a fixed area. On

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the other hand, separate PLLs were essential for a company operating away from its parent battalion/squadron as was particularly prevalent in tank companies. The system employed by the ACR was a compromise between consolidation and decentralization. Each squadron had consolidated PLL parts storage, while document registers were maintained by each troop under the supervision of the squadron maintenance platoon.

b. Maintenance

(1) Direct Support Maintenance Operations

(a) In many cases, unit maintenance personnel and commanders were dissatisfied with the responsiveness and adequacy of the service provided by the direct support maintenance unit. Distance and command structure caused problems between the supported and supporting unit in the ACR. In the infantry divisions, DS maintenance battalions were primarily oriented toward the support of infantry units and usually lacked sufficient MOS-qualified personnel and equipment to support armored and mechanized units. Also, when a mechanized or armored unit was assigned to another brigade, which happened frequently, the DS battalion was occasionally slow in realigning its support elements.

(b) It was evident in many cases that DS maintenance personnel did not fully understand the greater need for maintenance support in armored and mechanized units as compared to infantry units. At the same time, supported units did not always consider the DS units' difficulties and attempt to adjust their requirements accordingly.

(c) Generally, it was found that in units where DS maintenance contact teams were collocated with the battalion/squadron maintenance platoon, problems were minimized. There was immediate consultation on problems, a greater degree of mutual understanding, and greater concern on the part of DS personnel for the supported units' operational requirements. When contact teams were available, DS repairs were commonly conducted in unit motor pools or in forward areas, eliminating downtime for evacuation. This system enabled DS personnel to supervise and perform maintenance jointly with unit mechanics. This often compensated for DS personnel shortages. When a unit changed brigades, its contact team stayed with it, thus ensuring continuous support.

(d) In units where a contact team was not available, the maintenance platoon, almost without exception, conducted unauthorized DS level repairs. This was generally more expeditious than evacuating the vehicle. Some units had unauthorized engines and transmissions on hand. These procedures were followed in units where DS support was so marginal that unauthorized procedures were considered essential.

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(2) Maintenance Publications

(a) Throughout Vietnam, less than 15 percent of all tracked vehicles had the appropriate (-10) operator's manuals on hand. Most units stated that the missing manuals had been lost or destroyed, and that replacements were on requisition but had not been received. The absence of these manuals had an adverse effect on organizational maintenance.

(b) To compensate for the lack of manuals, some commanders provided a series of checklists for daily and periodic services; however, these also were frequently lost or destroyed.

(c) It was also noted that maintenance publications printed on ordinary paper did not stand up under the rigors of combat.

(d) Considering the limited experience of many assigned personnel, commanders considered it essential that durable operator's manuals be provided for each tracked vehicle to aid in the performance of proper maintenance and for general vehicle familiarization.

c. Personnel

(1) Requirements

(a) Supervisory Personnel in the Transportation Section of the Support Platoon

1. The transportation sections in the support platoon of the tank battalion and armored cavalry squadron were authorized one lieutenant and one NCO (E6, MOS 64C40, truckmaster). Mechanized infantry battalions were authorized three NCOs (one E6, MOS 11B40, ammunition chief and two E5, MOS 64C40, truck squad leaders). Both of these authorizations were considered insufficient. The mission of the transportation section in each unit was to move supplies between trains areas and combat elements. The type of conflict in RVN and unit dispersion complicated support platoon transportation section operations. The activities of the transportation section were directed by the battalion S4, and the support platoon leader served as the primary logistical operator. Authorized section cargo vehicles are indicated in Figure III-2.

2. AR 611-201 defines the job description of the following MOSs as follows:

a. Ammunition Chief, MOS 11B40, E6: Supervises ammunition resupply in an infantry service company or comparable unit.

b. Squad Leader, MOS 64C40, E5: Supervises a truck squad or comparable unit in which vehicles of less than 5-ton rated capacity predominate.

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TYPE OF UNIT	M548	5-TON TRUCK	5-TON TRACTOR
Squadron, ACR	8	13	2
Squadron, Div	8	8	0
Tank Battalion	8	10	0
Mech Inf Bn	11	12	0

FIGURE III-2 (U). Transportation Section Cargo Vehicle Authorizations.

c. Squad Leader, MOS 64C40, E6: Supervises a truck squad or comparable unit in which vehicles of 5-ton or greater rated capacity predominate, or supervises an armored personnel carrier squad.

d. Platoon Sergeant, MOS 64C40, E6: Supervises a truck platoon or comparable unit in which vehicles of less than 5-ton rated capacity predominate.

e. Truckmaster, MOS 64C40, E7: Supervises motor transport operations in truck company or comparable unit.

f. Platoon Sergeant, MOS 64C40, E7: Supervises a truck platoon or comparable unit in which vehicles of 5-ton or greater rated capacity predominate or supervises a light/medium truck platoon or armored personnel carrier platoon.

There was no truckmaster in the grade of E6 listed in this reference.

3. The TOE for an armored personnel carrier platoon authorizes nine armored personnel carriers per squad and 18 per platoon. Likewise, the TOE for a light/medium truck platoon authorizes ten light or medium trucks per squad and 20 per platoon.

4. In addition to supervision of the operations of the cargo vehicles, the NCOs in support platoon transportation sections in armored/mechanized units in RVN were responsible for unit resupply coordination. This included coordinating aircraft sorties, preparing loads for air movement, and organizing resupply schedules. Personnel were required to be familiar with supply procedures, ammunition identification codes, and POL handling equipment. The responsibilities and duties of the transportation section senior NCO were commensurate with those of a platoon sergeant in any armored/mechanized unit. His responsibilities coincided with the description of the platoon sergeant MOS 64C40, E7, paragraph 2 f above.

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2. The equivalent of two squads were in each unit's transportation section; however, only the mechanized infantry transportation section was authorized squad leaders. The responsibilities and duties of the transportation section squad leaders were commensurate with those of squad/section leader or tank commander in any armored/mechanized unit. Their responsibilities coincided with the description of the squad leader, MOS 64C40, E6, paragraph 2 c above.

6. Throughout the evaluation, the lack of sufficient supervisory personnel in transportation sections impacted on battalion/squadron operations, which were frequently curtailed because of late, incomplete, or improper resupply.

(b) Supply Section Personnel

The functions of the battalion/squadron supply sections had been greatly expanded over those for which the section was structured by TOE/MTOE. The section was composed of a property book officer, E7 supply sergeant, E6 assistant supply sergeant, and four junior enlisted personnel (two E4, MOS 76Y20, general supply specialists and two E3, MOS 76A10, supply clerks/vehicle drivers). In most cases, the section conducted split operations, with personnel at a rear base camp as well as in a forward logistics base. Some units were required to maintain TA 50-901 (personal clothing and equipment) sections when a Central Issue Facility (CIF) was not available. Processing combat loss equipment, reports of survey, numerous hand receipt changeovers, management of supplies, and the overall records management of supply under split operations exceeded the authorized section's capabilities. Routine requirements frequently were not met. To alleviate the problem, commanders had augmented their supply sections.

(c) Maintenance Supervisory Personnel

1. There were inconsistencies in the number and grades of supervisory personnel authorized the battalion/squadron maintenance platoons. With the exception of the maintenance platoon in the ACR, which was supporting a greater density of vehicles, all platoons were performing essentially the same tasks. The authorized supervisory personnel - one automotive maintenance technician (MOS 63A10) and one motor sergeant (E6, MOS 63C40) - in the regimental and divisional cavalry squadrons were insufficient to supervise squadron maintenance activities when mission requirements dictated maintenance support in multiple locations. Tank and mechanized infantry battalions, on the other hand, were authorized an additional NCO (E7/6, MOS 63C40), which enabled them to operate effectively in two locations with proper supervision.

2. The MTOEs for mechanized infantry and tank battalions and the regimental cavalry squadrons deleted the materiel readiness NCO (E7, MOS 63C40) from the unit headquarters section; this position was not

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authorized by TOE or MTOE for divisional cavalry squadrons. Units in RVN had maintenance management and equipment records-keeping requirements equal to or greater than those of other units in the Army. Combat operational requirements emphasized more than ever the need for an advisor for the unit commander and staff on these matters. A materiel readiness NCO in each battalion/squadron headquarters would assist accurate records-keeping and PMA management.

4. The MTOEs of all armored and mechanized infantry units also deleted the maintenance data specialists (PM, MOS 71T20) from each company-sized unit. There was a requirement for this position to be reinstated, see paragraph 6a(3)(a).

(2) Training

(a) Vehicle Operators

1. Maintenance in all armored and mechanized units in RVN suffered because many newly assigned personnel had limited training on tracked vehicles.

2. In mechanized infantry units, a large majority of junior enlisted personnel (grades E3 through E6) had no formal training on the M113A1; many senior enlisted personnel had never been assigned to a mechanized unit; and most junior officers had no knowledge of the M113A1 other than that obtained in OCS or the basic course.

3. In armored cavalry units, many newly assigned M551 crewmembers had not been trained on the vehicle; and most senior NCOs had never been assigned previously to an M551 AR/AAV-equipped unit. Junior officers in armored cavalry units, however, generally had had some orientation on the M551 AR/AAV.

4. It was also observed in many units that MOS-qualified personnel were assigned duty positions in which their skills were not required. The most frequently observed cases were M551-trained personnel in M48A3-equipped units and vice versa.

5. Personnel turbulence resulted in unnecessary retraining - with a loss of valuable time and assets - inefficient combat operations, and morale problems.

(b) Mechanics

1. It was universally stated that replacement tracked vehicle mechanics (MOS 63C) and turret mechanics (MOS 45G) required extensive on-the-job training (OJT) before they were able to perform their duties in a satisfactory manner. This was particularly true in M551 AR/AAV-equipped

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units. The replacement school-trained mechanics were only generally familiar with most aspects of their job. They also believed that they did not get enough practical training on the skills needed at unit level.

2. The results of inadequate training in CONUS schools imposed a requirement for extensive supervision, which is difficult to achieve in a combat environment, or reduced operational readiness. The training problem was further aggravated by continuing shortages of maintenance personnel.

(3) Medical Personnel Skills

(a) Many battalion surgeons felt there was a requirement to increase the qualifications of the authorized senior company aidmen. Changing the MOS code from 91B (Medical Specialist) to 91C (Clinical Specialist), would, in their opinion, provide more medical competence during battlefield emergencies, decrease time lost by personnel returning to rear areas for sick call, and improve civic action programs.

(b) Most battalion/squadron surgeons felt there was no need for a surgeon at their level; generally, they were bypassed in the evacuation chain. In one division, several battalions shared surgeons. Although medical personnel generally approved of this, many commanders did not.

d. Support Vehicles and Equipment

(1) Support Vehicle Mobility

(a) The M578 light recovery vehicle, authorized for M113A1 APC/ACAV and M551 AR/AAV-equipped units, and the M60 series AVLB, authorized for the ACR squadrons, have less flotation and landspeed capability than the M113A1 and the M551. The flotation and landspeed characteristics of these vehicles are shown in Figure III-3.

Vehicle	Combat Loaded Ground Pressure (PSI)	Maximum Speed (MPH)	Acceleration, 0-15 MPH (Seconds)
M551	6.8	43.5	2.5
M113A1	7.3	40.0	2.5
M578	10.1	37.0	2.5
AVLB	12.4	30.0	2.5

FIGURE III-3 (U). Flotation and Land Speed Characteristics of Combat and Combat Service Support Vehicles.

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(b) Unit commanders frequently left the M578 in base camp areas when the unit was operating in marginal terrain to avoid having it slow the movement of combat elements. Recovery operations were normally accomplished using other combat vehicles. In addition, the M578 was an invaluable vehicle in support of unit motor pool and resupply operations. Because of its value in support operations, commanders were reluctant to expose the vehicle to the mine threat.

(c) Squadron commanders in the ACR normally kept the AVLB with their field command posts. When bridging was needed, the AVLB was dispatched to the site and combat elements were provided to secure the movement. The slowness in response, flotation problems, and the requirement to commit valuable combat assets for AVLB security frequently resulted in units employing field expedient measures for crossing obstacles. While these measures were time-consuming and inefficient, commanders often accepted them rather than employ the AVLB.

(2) Bulldozer Capability

(a) Organic Capability

1. The ACR and the tank battalion MTOEs provided one tank-mounted bulldozer blade per tank company. There was no comparable organic bulldozer capability authorized for cavalry or mechanized infantry units. These units relied on engineer bulldozer support. Generally, engineer support was neither available in the quantity needed nor responsive to unit requirements.

2. Except in one case, where a battalion-sized unit had obtained an unauthorized bulldozer, there was no satisfactory local remedy. Some units attempted to use the spade on the M578 recovery vehicle, but this usually resulted in damage to the spade. When there was a need to build a berm around a fire support base or night laager position, to improve a stream-crossing site, to prepare a sump, or to perform other medium bulldozing, the tasks were accomplished using manual labor. The lack of an organic bulldozer capability or adequate engineer support impacted adversely on every unit's operational efficiency.

3. Commanders considered that the optimum solution to this problem would be to provide each maneuver company/troop with an organic bulldozer capability by mounting a bulldozer blade on a company/troop vehicle. This solution would provide the required capability, insure responsiveness, and could be accomplished without additional personnel. Commanders of tank companies who had a bulldozer blade mounted on the M48A3 considered the one authorized bulldozer quantitatively sufficient. The qualitative aspects of the bulldozer blade are discussed in subparagraph (b) below.

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4. Other possible solutions suggested were to provide an organic M726 combat engineer vehicle (CEV) to each company/troop or to provide additional armored engineer units to support armored and mechanized units. Both solutions are considered undesirable for mechanized infantry and M451 AR/AAV-equipped cavalry units due to the mobility incompatibility between the CEV and other unit vehicles. While providing additional engineer units is feasible in the ACR, it is an unrealistic alternative for other units except on a special case basis. Also, while an organic bulldozer on the CEV would only provide marginal advantages over the M48A3 tank-mounted bulldozer, it would introduce a unique vehicle into the unit, with resultant increased maintenance and supply problems.

(b) Equipment

The authorized tank-mounted bulldozer blade was frequently not used in its intended role, as it was not rugged enough to perform the bulldozing tasks required by mechanized and armored units in RVN. When mounted, the tank bulldozer degraded the mobility and fighting ability of the vehicle. In view of the marginal value of this bulldozer, several units had removed the bulldozers from their tanks. Other units did employ the tank-mounted bulldozers with sufficiently satisfactory results to justify it.

(3) Flame Service Units

(a) The MACOV recommendation for the addition of a mechanized flamethrower capability to cavalry and mechanized units was implemented by MTOE. The regimental cavalry squadrons were authorized a flame section consisting of three M132A1 mechanized flamethrowers and three service units, as recommended by MACOV. The divisional cavalry squadrons and mechanized infantry battalions were authorized a flame platoon consisting of four M132A1 mechanized flamethrowers and two service units. There was no apparent reason for the different ratios of flamethrowers to service units. Commanders in the ACR were satisfied with their BOI for this equipment; whereas divisional cavalry squadron and mechanized infantry battalion commanders were generally dissatisfied. Tank battalion commanders, who were not authorized this equipment, stated that the capability was not required.

(b) The regimental squadrons were authorized 2 1/2-ton truck-mounted flame service units, M4A2, by MTOE. However, they had been issued the XM45E1 track-mounted service unit. Conversely, although divisional cavalry squadrons and mechanized infantry battalions were authorized XM45E1 track-mounted service units, many of these units had been issued the M4A2 truck-mounted service unit as a substitute. Some divisional squadrons had not been issued any type of service unit. The M4A2 service unit was considered unsatisfactory by all commanders. It lacked the cross-country mobility required to accompany the M132A1, and it could carry only about

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half the fuel load of the XM45E1. This was a serious limitation to flame employment. After an M132A1 expended its fuel, it had to return to a road or secure location accessible to the M4A2 for refueling. This was time-consuming, and often required diversion of other combat elements to provide security.

(c) Availability of the XM45E1 service unit was the main factor governing employment of flame sections/platoons. The ratio of one flamethrower to one service unit in the regimental cavalry squadrons allowed employment of a flamethrower and service unit in three locations simultaneously, with three loads of fuel at each location; one in the M132A1 and two in the XM45E1. In contrast, a divisional cavalry squadron or mechanized infantry battalion was limited to employment of supported flame operations in only two locations, as only two service units were authorized. This amounted to four loads of fuel at each location. The regimental cavalry squadron flame section was considered a more effective organization than the flame platoon.

(d) Every commander who had employed the flame capability considered it a valuable combat asset for RVN operations. Some commanders in divisional cavalry squadrons and mechanized infantry battalions stated a requirement for a third section in the flame platoon to allow more flame support. However, since the limiting factor was the service unit (quality, quantity, and type authorized), and not the mechanized flamethrower itself, a more practical solution would be to add additional service vehicles to these units. The mechanized infantry generally made more extensive use of this asset due to the nature of their operations. The flamethrower requirements of the divisional cavalry squadrons can be met with the same authorizations as the squadrons in the ACR.

(4) Wheeled Vehicles

(a) Utility Vehicles

Utility vehicles (M151A1 1/4-ton) were under-utilized in several units. The lack of secure LOCs reduced their role to rear area administrative functions and occasional use on convoy or road security operations. In most cases, authorizations exceeded requirements.

(b) Wheeled Supply Vehicles

Tank and mechanized infantry battalion support platoons were equipped with both M548 tracked cargo carriers and M54 five-ton cargo trucks. The M548 was widely utilized, and commanders expressed a requirement for additional vehicles of this type. By contrast, M54s were observed to be generally under-utilized in most units. In the tank battalion, the recommended adjustment was a substitution of three M548s for three M54s. In the mechanized infantry battalion, one additional M548 was required and four M54s could be deleted.

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(5) Steam-Cleaning Equipment

(a) Excessive buildup of dirt, oil, and debris in the engine compartments of armored vehicles hindered efficient maintenance, degraded vehicle performance, and constituted a potential safety hazard. When engine compartments were cleaned, time-consuming and ineffective techniques were used, frequently employing gasblines, a definite safety hazard. In most units, engine compartments were never cleaned.

(b) Unit personnel expressed a need for steam-cleaning equipment which would provide a simple and effective means for accomplishing this task. The required water supply, hardstand, and drainage were available at most unit base camps or FSBs.

(6) On-Vehicle Recovery Equipment

(a) The authorized BII recovery accessories for combat and combat support tracked vehicles consisted of one 10-foot x 3/4-inch tow cable per vehicle for M113 Series and M551 vehicles and one 15-foot x 1 1/2-inch tow cable per vehicle for the M48A3 tank. These two cables were intended to give units a limited recovery capability and the capability of towing disabled vehicles for short distances. Proper towing or recovery operations required two crossed tow cables between the two vehicles.

(b) On the average, units had on hand less than 25 percent of authorized tow cables. In the RVN climate, cables deteriorated rapidly, as they were very susceptible to humidity and oxidation. In addition, cables were lost because they were not properly stored on the vehicles or because users failed to recover them after recovery operations. While replacement cables for those that had become unserviceable or lost were on requisition, replacements were not available in sufficient quantity. As the number of available cables was reduced, units attempted recovery with only one cable, which resulted in additional cables breaking due to the increased load. These problems could have been decreased if units had exercised more care in the use of cables, if the cables were more durable, and if replacement tow cables had been more readily available.

(c) It was common in many units for recovery vehicles not to accompany combat elements in the field. The result was an increase in recovery and towing operations using combat vehicles. It was generally felt that the authorized tow cables were not sufficiently long or heavy. The units employed field expedients, such as making longer tow cables from heavier material, linking several tow cables together with clevises, and obtaining extra tow bars. Each of these actions was a logical reaction to the problem and increased the efficiency of combat elements.

(d) All commanders requested additional recovery accessories. The average of these requests are indicated in Figure III-4. These requests are considered excessive, as they were influenced by the difficulties of resupply of replacement tow cables. If the supply channels were more

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responsive, one tow cable per vehicle would be adequate. On-vehicle storage of the equipment listed in Figure III-4 would not be a problem.

ITEM	AVERAGE BOI REQUESTED
20' x 1" tow cable	2 per M113 Series and M551 Vehicle
50' x 1" tow cable	2 per M113 Series and M551-equipped Platoon/Section
20' x 1 1/2" tow cable	2 per M48A3 Vehicle
50' x 1 1/2" tow cable	2 per M48A3-equipped Platoon
Light Tow Bar	2 per M113 Series and M551-equipped Platoon/Section
Heavy Tow Bar	1 per M48A3-equipped Platoon

FIGURE III-4 (U). Requested BOI for On-Vehicle Recovery Equipment.

(e) No unit felt that the sprocket-mounted capstan kit was desirable. Of the several maintenance personnel interviewed who had experience with it, none expressed a favorable opinion.

(f) The Australian fitters' vehicle (M113A1) had a BII that provided an effective self-recovery capability. The kit consisted of two steel brackets, which fit between the M113A1's track pads, and a 75-foot x 1-inch nylon rope.

(7) Fuel Pumps

(a) Commanders expressed a requirement for a portable pump to dispense fuel from air-delivered collapsible drums in maneuver company field locations. Field expedient methods of refueling from these drums were cumbersome and time-consuming. These methods included lifting the drums by LTR/VTRs to feed by gravity, squeezing them between vehicles, and driving vehicles onto them to pressurize them. Although M113 electric bilge pumps could be used effectively, they created a fire hazard. In addition to company requirements, battalion commanders considered they should have a backup capability to support smaller detached units.

(b) The centrifugal pumping unit, fueling-defueling, which is a component of the drum and pump unit, is a standard item in the inventory. The pump is small, light, and can be operated from a 24-volt power source. This pump, with 30-foot power cable, suction tub assembly, 1 1/2-inch nozzle, 50-foot suction-discharge hose, and coupler valve (all are components of the drum and pump unit) was recognized as an effective means for dispensing air-delivered fuel.

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(c) A similar requirement existed for additional water handling equipment (MSOC 1200-gallon water truck and trailers) in the support platoons of armored/mechanized battalions. This requirement is further discussed in Annex J, paragraph 35(4).

(5) Chainsaws

(a) Divisional and regimental cavalry squadron and separate cavalry troop commanders stated a requirement for a chainsaw in each maneuver element. In tank and mechanized infantry battalions, two chainsaws were authorized for each maneuver company, HHC, and the support platoon. Commanders in these units considered this BOI adequate.

(b) Cavalry units performed comparable missions and operated in similar terrain and vegetation as tank and mechanized infantry units. Therefore, the same justification for chainsaws applies to armor, mechanized, and cavalry units.

a. The Army Authorization Documents System (TAADS)

(1) TAADS was established to provide units with a means to modify equipment and personnel authorizations officially, in order to fulfill specific operational needs. Numerous problems were involved in the administration of TAADS because of lack of response, administrative shortcomings, unavailability of necessary documents, and lack of understanding at unit level.

(2) To satisfy changed requirements, commanders took action to obtain needed assets by any means possible. The equipment, once acquired, was often found to be of permanent value to the unit. While TAADS provided the procedures for officially making changes in equipment authorizations, commanders at the battalion/squadron level often failed to comply with these procedures. In many cases, no request for MTOE modification was initiated at unit level to obtain authority for the locally procured equipment. Subsequently, when the items became inoperative and no replacement was available, TAADS was blamed. In the personnel area, most units in RVN operated overstrength during the evaluation. Normally, a request for MTOE modification had not been initiated to obtain authorization for these personnel adjustments. Again, the result was an apparent inadequacy of TAADS.

(3) Many commanders, however, utilized TAADS properly; many units submitted requests for MTOE changes. In reviewing some of these changes, it appeared that many of the requests were based on short-term requirements, and that little consideration was afforded future operational needs, which frequently resulted in a revised MTOE being obsolete on the day it was published.

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(4) Once initiated, an average of 9 months was required to obtain an approval of a revised MTOE. This was not satisfactory, and discouraged officers having 6-month command tours from rectifying organizational and equipment deficiencies by legitimate means.

(5) The voluminous documentation required by TAAOS created an unsatisfactory situation. Most units lacked a complete set of required authorization documents, because of delays in publishing detailed documents and an apparent breakdown in the in-country distribution system. Those units that did have a complete set of documents found numerous discrepancies. This was a cause of both confusion and discouragement at the battalion/squadron level.

(6) In each type of unit there were many minor items authorized that were not required for operations in RVN. These items were apparently overlooked when MTOEs were prepared.

(7) MTOE standardization by type of unit, while understandable, created problems. Similar units, operating in different locales, had significantly different requirements. Many of these requirements could be met by local letter authorizations, but this method was not considered totally satisfactory because needed assets frequently were not available. Many commanders suggested that, in addition to the standardized type unit MTOE, expanded use be made of cellular TOE augmentations. When a requirement was justified, the unit could be provided with the appropriate package augmentation. For example, this technique could be advantageously employed to provide battalion/squadron level liaison teams. The DA-approved, established cellular TOE augmentations should simplify documentation requirements for needed changes, and be more responsive by delegating implementing approval authority to theater level when resources are available.

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SECTION IV

CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations resulting from this study are placed side-by-side for easy reference and presented as a series of turn pages. The organization of the material is identical with that of Section III, FINDINGS AND ANALYSIS. Each recommendation is referenced to the appropriate paragraph and page number. Additional recommendations which pertain to specific type units are presented in Volume II, Annex M. Where appropriate, recommendations of this study are correlated with those of the 1967 MACOV study in Annex D to this report.

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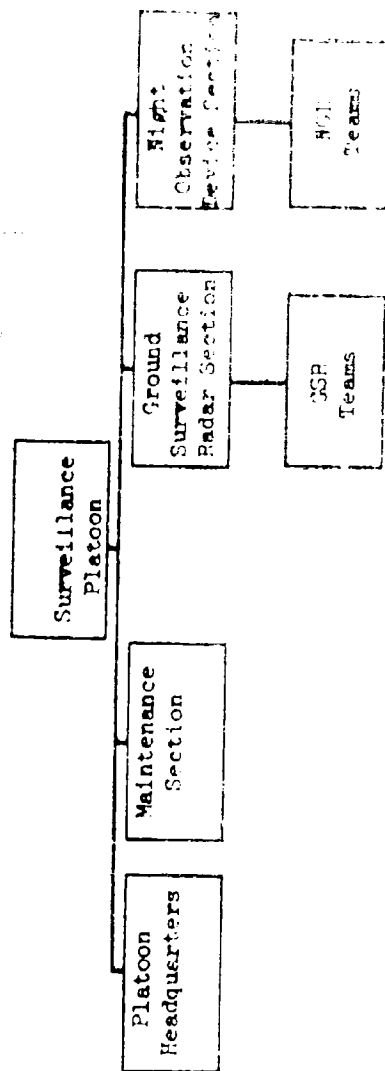
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1. (C) INTELLIGENCE

- a. There is a requirement to improve the effectiveness of the use of surveillance and target acquisition equipment [III-2a; pg. III-1].
- b. Centralized control of training, maintenance, and employment is required for effective utilization of surveillance equipment [III-2a; pg. III-1].
- c. There is a requirement for a quiet power source for vehicle-mounted searchlights to provide a covert operational capability [III-2b(1)(e); pg. III-3].
- d. There is a requirement to clarify and standardize type unit authorization documents regarding authority, item description, and basis of issue for vehicle-mounted searchlights [III-2b(1)(a); pg. III-2].
- e. There is a requirement for a pink-light capability for the AN/VSS-1/2 searchlight to allow use in conjunction with passive night vision devices [III-2b(1)(g); pg. III-3].
- f. There is a requirement for a searchlight capability in mechanized infantry units [III-2b(1)(h); pg. III-3].
1. A surveillance and target acquisition platoon be added to each armored and mechanized battalion/squadron (see Figure IV-1).
2. A simple, reliable, quiet power source be developed for use with vehicle-mounted searchlights.
3. The basis of issue of AN/VSS-1/2 and AN/VSS-3 searchlights be standardized by M. 3/703 line item or vehicle HII at one per vehicle and M. 3/11, respectively.
4. The AN/VSS-1/2 xenon searchlight be provided with a pink-light capability, or replaced with a comparable item providing this capability.
5. Mechanized infantry units be authorized one searchlight per rifle platoon/subunit section. The searchlight should be rugged, light, stowable inside the vehicle, and provide white and pink-light illumination.

* Numbers in parenthesis refer to the paragraphs of the report which support each conclusion.

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NOTE: The exact number of teams will be determined by mission and organization of the parent battalion/squadron. Other surveillance means (e.g., JCS monitoring teams) must be provided by division or brigade, would be attached to the surveillance platoon.

FIGURE IV-1 (U). Proposed Organization of a Battalion/Squadron Surveillance Platoon.

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RECOMMENDATIONS

CONCLUSIONS

- f. There is a requirement for improved training on the employment and maintenance of M-50 tank-mounted IR equipment [III-2b(2)(c); pg. III-4].
- h. The external mounting of the tank commander's caliber .50 machinegun does not facilitate use of cupola-mounted optical machinegun sights [III-2b(2)(b); pg. III-3].
- i. Tank-mounted IR equipment has been partially supplanted by passive night vision devices [III-2b(3); pg. III-4].
- j. Adjustments are required in the BOI for passive night vision devices for armored type units [III-2b(3)(d); pg. III-4].
- k. Additional training is required on the care, handling, and employment of passive night vision devices [III-2b(3)(b); pg. III-4].
- l. The individual IR weapons sights and metascopes are not required in armored units [III-2b(3)(j); pg. III-6].
- m. Some AN/PPS-4 radars were issued in lieu of the AN/PPS-5 [III-2c(1)(a); pg. III-6].
- n. The AN/PPS-4 and -5 radars required special handling because of their fragility [III-2c(1)(b); pg. III-6].
6. CONUS schools emphasize training on the employment and maintenance of tank-mounted IR fire control equipment.
7. The tank commander's cupola-mounted optical machinegun sights be deleted from M-50A3 tanks R.A.
8. The relationship between IR and passive night vision equipment for night fire control and surveillance by tank crews be examined to determine the most effective system for a night fighting capability.
9. Armored and mechanized units be authorized the quantities of passive night vision devices indicated in Figure IV-2.
10. CONUS training on organizational maintenance procedures, boreighting and zeroing techniques, and employment of passive night vision devices be improved.
11. The IR individual weapons sights and metascopes of all armored and mechanized units in AN be deleted from MTOE, turned in, and retrograded.
12. Units be issued authorized quantities of the AN/PPS-5 radar.
13. The AN/PPS-5 be made more rugged or be replaced by a more rugged radar set.

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UNIT	RECOMMENDED BOI		
	Starlight Scope AN/PVS-1/P/PA/P	Crew-Served Night Vision Sight AN/PVS-2/P/PA	Night Observation Device AN/PVS-4
<u>Regimental Cavalry Squadron</u>	66	138 (136)	6 (11)
HHC	4	9 (7)	2
Cavalry Troop (3)	20	36	1 (3)
Tank Company	2	21	1 (0)
<u>Divisional Cavalry Squadron ②</u>	64	117 (0)	9 (15)
HHC	4	15 (0)	6
Cavalry Troop (3)	20	34 (0)	1 (3)
Troop Hq	2	4 (0)	1 (0)
Cavalry Platoon (3)	6	10 (0)	2 (1)
<u>Tank Battalion</u>	56 (12)	82 (0)	4 (8)
HHC	7 (6)	7 (0)	2 (5)
Company D	16	18	1
Scout Platoon	10 (4)	10 (0)	0 (1)
Mortar Platoon	3 (0)	4 (0)	0 (4)
Tank Section	1 (0)	3 (0)	0
Company Hq	2 (0)	1 (0)	1
Tank Company (3)	11 (2)	12 (0)	1
Company Hq	2	4 (0)	1
Tank Platoon (3)	3 (0)	5 (0)	0
<u>Mechanized Infantry Battalion</u>	121 (52)	82 (69)	6 (11)
HHC	7 (8)	7 (15)	2 (5)
Company D	21	15	1
Scout Platoon	10 (4)	10	0 (1)
Mortar Platoon	3 (0)	4	0 (4)
Flame Platoon	6 (0)	0	0
Company Hq	2 (0)	1 (0)	1
Rifle Company (3)	31 (18)	20 (18)	1 (2)
Company Hq	2 (0)	4 (3)	1
Weapons Platoon	2 (0)	4 (3)	0 (1)
Rifle Platoon (3)	9 (6)	4	0

NOTE ①: Figures in parentheses indicate existing MTOE authorizations for passive night vision devices.

NOTE ②: Under current MTOE, Company D was a service company rather than a combat support company; therefore, no authorization existed for the company as reorganized.

FIGURE IV-2 (U). Recommended BOI for Passive Night Vision Devices.
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CONCLUSIONS

o. Radar employment was affected by a shortage of qualified radar operators and maintenance personnel [III-2c(1)(d); pg. III-7].

p. A requirement exists for all combat arms junior leaders and combat WOS personnel to be trained in the characteristics, capabilities, techniques of emplacement, and employment of electronic anti-intrusion devices [III-2c(2)(b); pg. III-7].

q. Electronic anti-intrusion devices are required in armored and mechanized units for employment on NDPs, OPs, LPs, and ambushes [III-2c(2)(b); pg. III-7].

2. (C) MOBILITY

a. An urgent requirement continues to exist for a track-mounted mine detector and/or detonator for each of the current families of armored vehicles [III-3a(1); pg. III-8].

RECOMMENDATIONS

14. Action be taken to make up the shortage of trained SCR personnel.

15. Action be taken to incorporate training on electronic anti-intrusion devices in -

- . All combat WOS AIT
- . Combat WOS WOC Candidate Courses
- . Combat Arms OCC, Officer Basic and Advanced Courses.

16. The AN/GSQ-151 (PROM), or its successor, be authorized for company and platoon-size armored units. The exact basis of issue should be as determined by implementation of the STANC III-USAPV/ACTIV Unattended Ground Sensor Evaluation.

17. A tracked-vehicle-mounted mine detector and/or detonator kit for use on current armored vehicles (M48, M49, M51, and M113) capable of detecting and neutralizing both pressure- and command-detonated, metallic and nonmetallic mines be developed. It should have the capability of clearing a path at least as wide as the prime mover while moving at a speed of at least 15-18 kilometers per hour on roads and at a reduced speed cross-country.

18. An interim vehicle-mounted mechanical mine detonator kit for the M113, M48, and M49 families of vehicles be developed. The kit should be attachable to maneuver-element vehicles with minimum degradation of combat capability or mobility.

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CONCLUSIONS

b. A requirement exists for development of a durable, light, and reliable man-portable mine detector capable of detecting both metallic and nonmetallic mines [III-3a(2)(a); pg. III-8].

c. The basis for issue of portable mine detectors requires adjustment for all types of units considered except the mechanized infantry battalion [III-3a(2); pg. III-8].

d. There is a continuing requirement for developments to decrease armored vehicle and crew vulnerability to shaped-charge antitank projectiles. This should include:

- (1) Improvement of on-vehicle protection [III-3b(2); pg. III-9].
- (2) Improvement of passive offset protection for stationary vehicles [III-3b(3); pg. III-9].

RECOMMENDATIONS

19. A durable, light and reliable portable mine detector capable of detecting metallic and non-metallic mines be developed.

20. Increase the BOI for handheld portable mine detectors to

- a. Three per cavalry squadron HHC
- b. Three per cavalry platoon and one per troop Hq.
- c. One per tank platoon
- d. One per tank and scout section in the tank battalion HHC
- e. Two per tank company Hq in the ACR.

21. Developmental efforts to decrease armored vehicle and crew vulnerability to shaped-charge, anti-armor projectiles be continued. Increased protection should not degrade vehicle operational capabilities.

22. Developmental efforts to improve existing RPG offset protection for stationary vehicles be continued. The device should be simple, rugged, and easily erectable.

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CONCLUSIONS

e. Styrofoam offers a degree of protection from shaped-charge projectiles (III-3a(4); pg. III-9).

f. There is a requirement for an accurate land navigation and position locator system for armored vehicles (III-3c; pg. III-9).

g. The AVLB provides adequate assault bridging for units equipped with the M48A3 tank (III-3d(2); pg. III-10).

h. There is a requirement for organic assault bridging compatible with the mobility of unit combat vehicles in M113A1 APC/ACAV and M551 AR/AAV-equipped units (III-3d(1); pg. III-10).

RECOMMENDATIONS

23. Tests be conducted to determine if the apparent absorbing effect of styrofoam could be used to enhance protection from shaped-charge projectiles.

24. A simple, reliable land navigation and position locating capability be provided each armored vehicle or, as a minimum, appropriate small unit commander's vehicles.

25. A simple and reliable compass be provided on all combat and combat support tracked vehicles, readily accessible to the commander and easily removable for maintenance or replacement.

26. The speedometer and odometer on all tracked vehicles be changed to indicate kilometers.

27. Two AVLBs be retained in each tank battalion; two AVLBs be provided each M48A3-equipped divisional cavalry squadron.

28. Development of a light assault bridge that is rugged, reliable, supportable, easy to emplace and retrieve, and compatible with the mobility of the M113A1 and M551 be continued. When the bridge is developed, two bridges and launchers be provided each mechanized infantry battalion and divisional cavalry squadron equipped with the M551. One be provided to each ACR squadron, deleting an AVLB.

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RECOMMENDATIONS

- i. Regimental and divisional cavalry squadron medical platoons require one M113A1 medical evacuation vehicle per line troop (III-3e; pg. III-10).
- j. Howitzer battery commanders in the ACR squadrons require an M113A1 equipped with two AN/VRC-46 radios to replace the authorized M151 1/4-ton truck (III-3e; pg. III-10).
3. (C) FIREPOWER
 - a. There is a requirement for M577A1s to be equipped with a machinegun (III-4(a)(1); pg. III-11).
 - b. 40mm high-velocity grenade launchers are required to replace one of two caliber .50 machineguns on one vehicle in each mechanized rifle platoon and scout section of the mechanized infantry and tank battalions (III-4a(2); pg. III-11).
 - c. M113A1 medical evacuation vehicles require armament for their own security (III-4a(3)(b); pg. III-12).
29. Regimental and divisional cavalry squadron medical platoons be issued one additional M113A1 medical evacuation vehicle.
30. ACR squadron howitzer batteries be authorized a suitably equipped M113A1 APC/ACAV. The presently authorized M151 1/4-ton truck be deleted.
31. Each M577A1 command post carrier be equipped with one M60 7.62 machinegun with rear mount and ballistic shield from the M113A1 Armament Subsystem "A".
32. One caliber .50 machinegun on one vehicle in each mechanized rifle platoon and each scout section of the mechanized infantry and tank battalions be replaced by a 40mm high-velocity grenade launcher.
33. All M113A1 medical evacuation vehicles in battalion/squadron medical platoons be equipped with Armament Subsystem "A".

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CONCLUSIONS

d. The ringmounted caliber .50 M2 machinegun is an unsuitable weapon for supply vehicles in RVN [III-4a(4)(a); pg. III-13].

e. The cupola-mounted, M2, HL, electric, caliber .50 machinegun, in the M1 tank commander's cupola on the M48A3 tank is not suitable for RVN use [III-4b; pg. III-12].

f. The authorized caliber .45 pistols and submachineguns are not fully suitable as individual weapons for M48A3/M551 crewmen in RVN [III-4c(1); pg. III-13].

g. There is a requirement for a weapon to provide left flank and rear security for the M48A3/M551 while on the move and for reconnaissance by fire [III-4c(2); pg. III-13].

h. There is a requirement for snipers and sniper equipment in cavalry and mechanized units in RVN [pg. III-13].

RECOMMENDATIONS

34. The authorized caliber .50 M2 machinegun and ringmount be replaced with an M60 machinegun and pedestal on all wheeled supply vehicles.

35. The authorized BII caliber .50 M2 machinegun and mount kit be replaced with the M60 machinegun and mount kit for the M542 tracked cargo vehicle.

36. The M2, HB, flex, caliber .50 machinegun BII be authorized on all M48A3 tanks in lieu of the M2, HB, electric, caliber .50 machinegun.

37. A standard mount be provided to mount the M2, HB, flex, caliber .50 machinegun externally on the top of the cupola.

38. Each M48A3/M551 crew be authorized one M79 grenade launcher, three 5.56mm submachineguns (or three M16 rifles until a 5.56mm submachinegun is type-classified standard A), and one caliber .45 pistol.

39. Armored and mechanized units in RVN be provided with appropriate sniper personnel and equipment authorization.

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CONCLUSIONS

i. The M113A1 and M106 4.2-inch mortar carrier were unsatisfactory substitutes for the M125A1 81mm mortar carrier [III-4e; pg. III-14].

j. M125A1 mortar carriers are required for armored units equipped with 81mm mortars [III-4e; pg. III-14].

k. The multishot portable flame weapon (launcher, Rocket: 66mm, 4-tube XM202) proved to be superior to the M9-7 portable flamethrower [III-4f; pg. III-14].

4. (C) COMMAND AND CONTROL

a. Organizational adjustments are required in armored and mechanized units [III-5a(5); pg. III-15].

(1) Armored Cavalry Regiment

a. The regimental headquarters FSCE requires augmentation.

b. An organic support squadron, similar to the support battalion of the separate armored brigade, is required.

RECOMMENDATIONS

40. Action be taken to expedite issue of the M125A1 mortar carrier to all units authorized this carrier.

41. Development of conversion kits be considered to adapt the 4.2-inch turntable of the M106A1 mortar carrier for use with the 81mm mortar when the M125A1 carrier is not available.

42. Nine M9-7 portable flamethrowers be deleted from the mechanized infantry battalion MICE.

43. Launcher, Rocket: 66mm, 4-tube, XM202 be authorized on the basis of one per scout section in the tank and mechanized infantry battalions and one per mechanized infantry platoon.

44. The following actions be taken to improve the operational capability of armored and mechanized units:

a. Armored Cavalry Regiment

(1) The regimental FSCE be enlarged to a 14-man element with supporting equipment as requested by USARV; MICE 17-520, PCA (2/70).

(2) An organic support squadron, patterned after the support battalion of the separate armored brigade (7th Div), be authorized.

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CONCLUSIONS

c. Each squadron requires an artillery liaison element at HHT and an additional FO team.

RECOMMENDATIONS

(3) Each regimental cavalry squadron be authorized an artillery liaison element consisting of one captain (MOS 1193) artillery liaison officer; one E6 NCO (MOS 13E40) artillery liaison sergeant; and two E4 (MOS 13E20) artillery liaison specialists/radio operators, [Paragraph 2c(2), Annex G].

(4) Each regimental cavalry squadron howitzer battery be authorized a fourth FO team.

(2) Tank and Mechanized Infantry Battalions

a. HHC and Company D require reorganization to relocate combat support functions in Company D and combat service support functions in HHC. The existing organization is characterized by considerable duplication of effort.

b. Tank battalions require organic dismounted infantry elements.

b. Tank and Mechanized Infantry Battalions

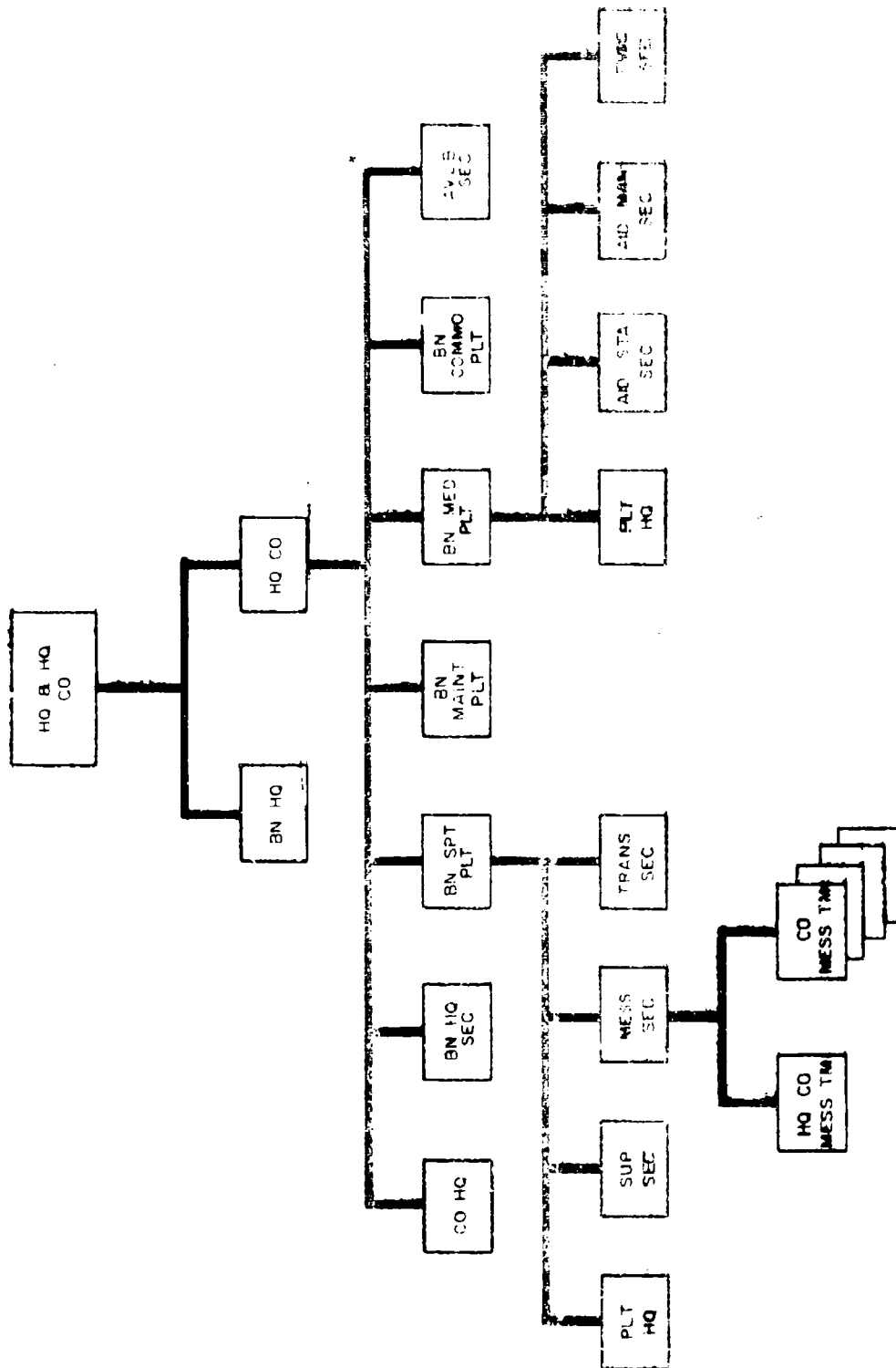
(1) HHC and Company D be reorganized to more efficiently realign combat support and combat service support functions as shown in Figures IV-3 thru IV-6, (See also Figure M-5, Annex M).

(2) A study be conducted to determine the desirability and feasibility of modifying the organization of the tank battalion for employment in low-intensity stability operations by:

a. Adding a mechanized rifle company to the battalion.

b. Replacing a tank platoon with a mechanized infantry platoon in the tank company.

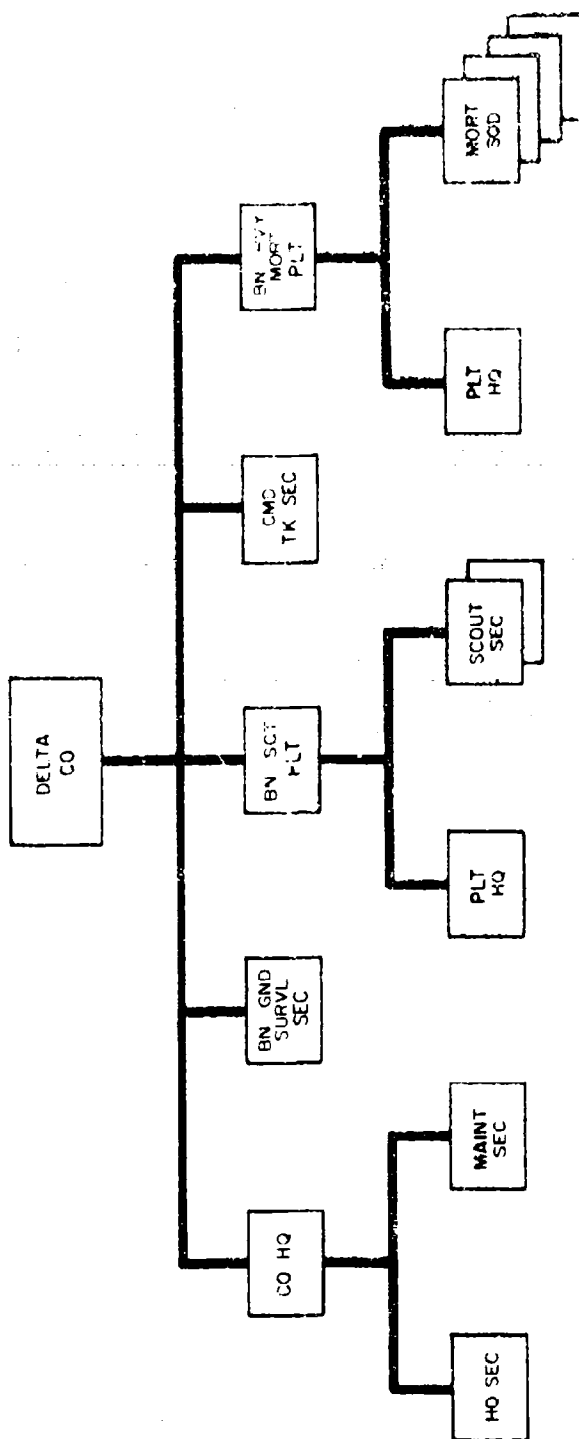
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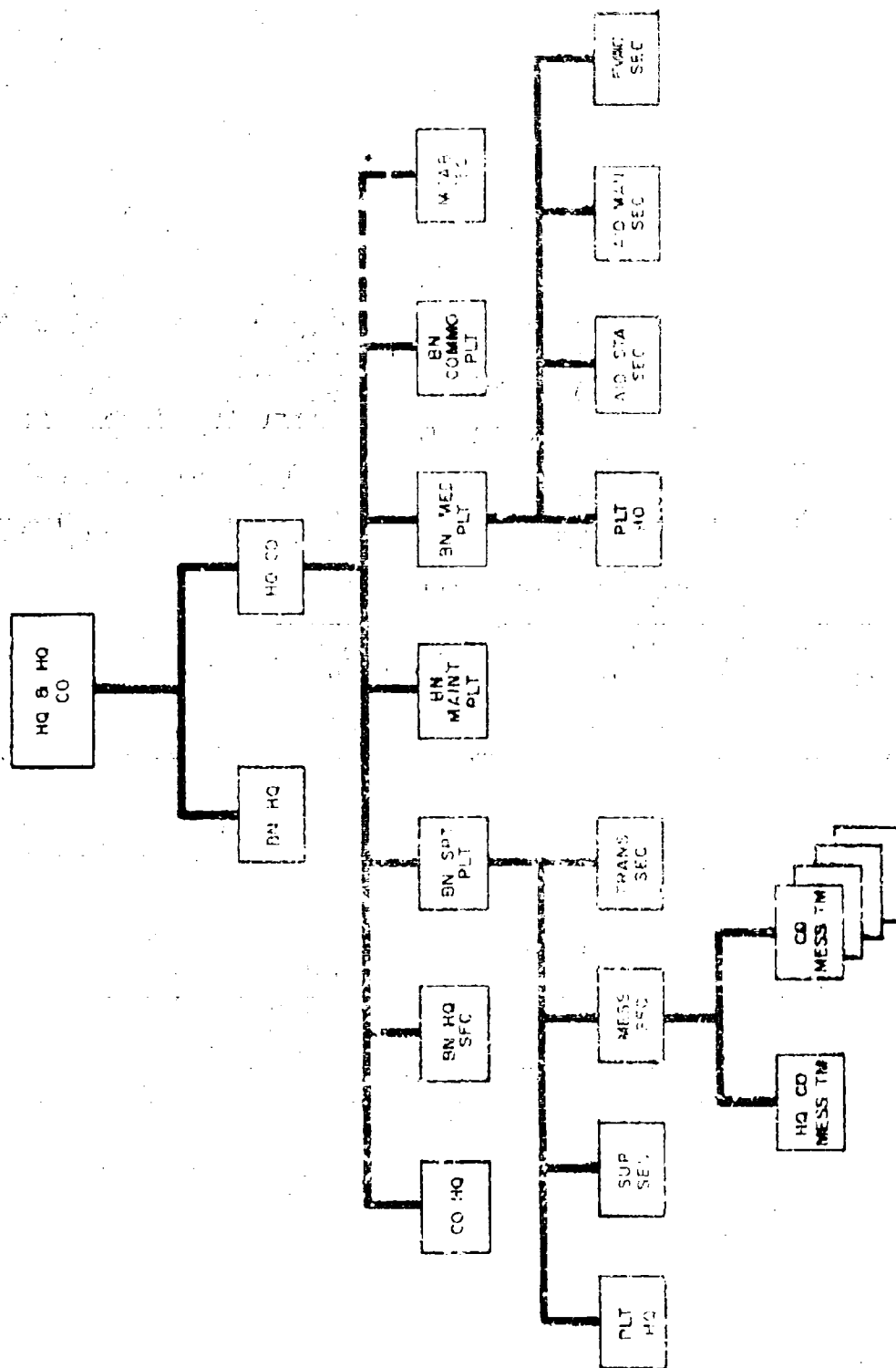
* Air control team deleted.

FIGURE IV-3 (II). Proposed Reorganization of 7th Tank Battalion.



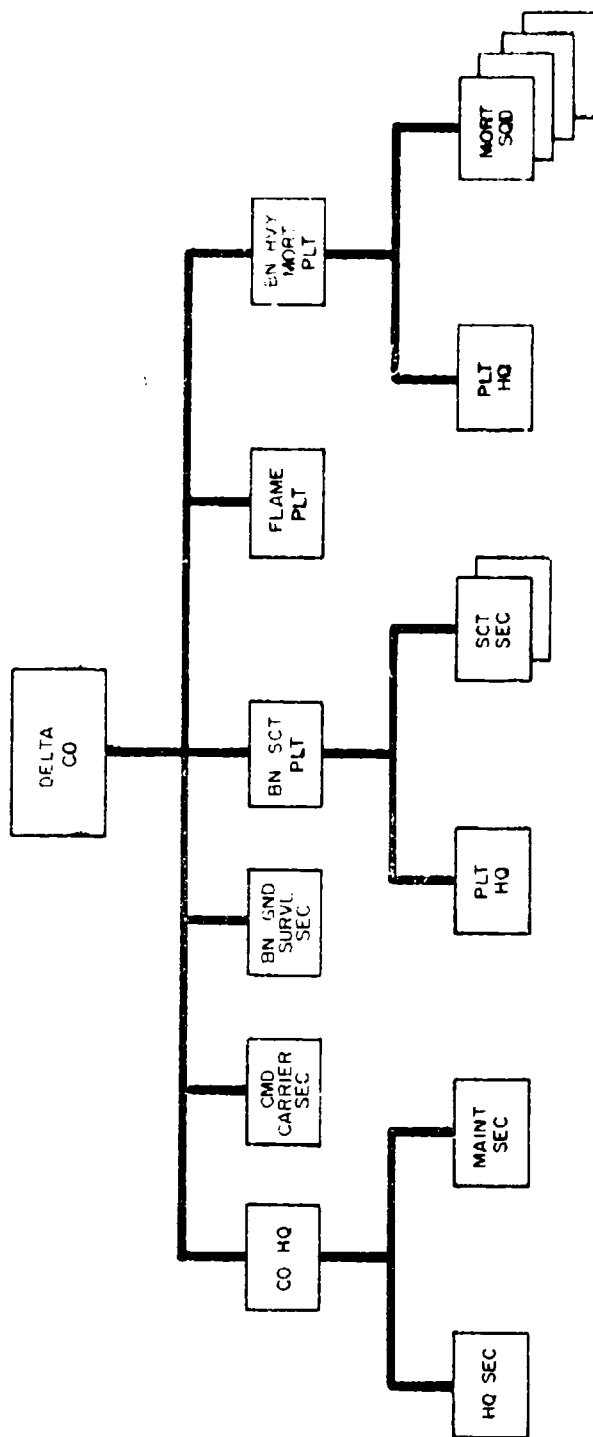
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FIGURE IV-4 (U). Proposed Reorganization of Company D, Tank Battalion.



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* Air control team deleted.
 GROUP IV-5 (1). Proposed Reorganization of SAC. Headquarters Reference: Reorganization



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FIGURE IV-6 (U). Proposed Reorganization of Company 1, Mechanized Infantry Battalion.

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CONCLUSIONS

- c. The mechanized infantry battalion is capable of controlling an additional maneuver company.

(3) Tank Companies

- a. Location and employment of artillery forward observers require re-examination.
- b. Tank companies require augmentation for local security and CP operations.

RECOMMENDATIONS

- (3) A fourth mechanized infantry company be added to the mechanized infantry battalion.

a. Tank Companies

- (1) Current doctrine regarding relationship of artillery forward observers operating with tank companies be re-examined.
- (2) Each tank company be provided with an 11-man rifle squad equipped with an M113A1 mounting one AN/VRC-14 radio and one AN/PRC-77 radio.
- (3) Each tank company be authorized a CP section consisting of one E4 senior radio operator (MOS 05C40), two E4 radio operators (MOS 05C20) and one E4 armored vehicle driver (MOS 11E20) and equipped with an M577A1 command post carrier mounting one AN/VRC-12 and one AN/VRC-14 radio.

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CONCLUSIONS

b. Battalion/squadron dispersion in multiple locations had three primary effects:

- (1) Dispersion increased security requirements, and thus decreased available unit offensive combat power by draining off combat assets for fixed security [III-5a(3); pg. III-15].
- (2) Dispersion necessitated extensive modifications to the standard communications nets and combat service support operations [III-5a(4); pg. III-15].
- (3) Battalion and squadron staffs were generally fragmented in order to operate multiple operational and logistical bases [III-5b(1); pg. III-15].

c. There is a requirement in all armored and mechanized battalions to provide the S5 with an operational section to meet increased responsibilities in the RVN environment [III-5b(4); pg. III-16].

d. Battalion/squadron ACT personnel were used to augment the S3 section [III-5b(3); pg. III-16].

e. Battalion/squadron level liaison requirements fluctuated widely [III-5b(5); pg. III-16].

RECOMMENDATIONS

45. Each battalion/squadron headquarters be authorized an S5 section consisting of an E6 civil affairs NCO, an E4 clerk typist, an E4 driver, a 3/4-ton truck, and one AN/VRC-47 radio.

46. One NCO and two radio operators be added to the S3 section.

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CONCLUSIONS

f. There is a requirement to re-evaluate armored and mechanized units' tactical communications requirements for use in stability of rations because of the usage patterns that have evolved in RVN [III-5c(1); pg. III-16].

g. The following conclusion concerning type and quantity of communication equipment authorized armored and mechanized infantry units require action to satisfy communications requirements in RVN [III-5c(1); pg. III-16].

(1) Commanders down to the platoon level require two receiver/transmitters in each command tracked vehicle for effective command and control in the RVN environment [III-5c(2)(a); pg. III-17].

(2) Artillery liaison teams attached to armored and mechanized units in RVN have insufficient organic radio communications to perform their mission [III-5(c)(2)(b)1; pg. III-18].

(3) Additional portable radios are required to support the operations of the scout squads of all armored and mechanized units [III-5c(2)(c)2; pg. III-19].

RECOMMENDATIONS

47. Further study be made to determine communications requirements for armored and mechanized units in stability operations.

48. The following changes in MPEL for armored and mechanized units be made:

a. Two AN/VRC-46 radios be authorized for all battalion, squadron, company, and troop commanders for use on their command tracked vehicle.

b. One each AN/VRC-46 and AN/GRC-160 radio be authorized for all platoon leaders' and scout platoon sergeants' command tracked vehicles.

c. Each armored and mechanized battalion/squadron be authorized one AN/VRC-49, one AN/VRC-47, and two AN/PRC-77 radios for use by attached artillery liaison sections.

d. One additional AN/PRC-25/77 radio be authorized for each scout squad of the tank and mechanized infantry battalion scout platoon and for the scout squads of all cavalry platoons.

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CONCLUSIONS

(4) The transportation section of the support platoon requires radios to perform and coordinate battalion/squadron resupply activities [III-5c(2)(d); pg. III-19].

(5) AN/PRC-88 radios have been ineffective in RVN [III-5c(2)(e); pg. III-19].

h. Battalion/squadron command, artillery control, and administrative/logistical nets require a secure voice capability to counter the VC/NVA radio intercept capability and to facilitate dissemination of operations orders and other classified information [III-5c(3)(a); pg. III-20].

i. There is a requirement to extend secure capability down to include platoon leaders [III-5c(3)(a)3; pg. III-20].

j. Interface problems exist between current FM equipment and TSEC secure speech devices [III-5c(3)(a)5; pg. III-20].

RECOMMENDATIONS

e. Four AN/PRC-25/77 radios be added to the transportation section of each battalion/squadron support platoon.

f. The AN/PRC-88 radio be deleted from the mechanized infantry MTOE.

49. Efforts be continued to develop a simple, rugged, durable, and reliable squad radio.

50. Secure speech devices be authorized to all armored and mechanized units in two increments:

a. Provide battalion/squadron command, artillery control, and administrative/logistical nets with a secure capability.

b. When secure equipment has been qualitatively improved, extend secure capability to include company/troop command nets.

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CONCLUSIONS

k. Use of vehicles to provide power for ground-mounted radios is inefficient [III-5c(3)(b); pg. III-21].

l. There is a requirement for PPL104G rectifiers in all types of armored and mechanized units in RVN [III-5c(3)(b); pg. III-21].

m. A requirement for extended range FM communications, beyond that normally provided by the PC-202 antenna, exists in armored and mechanized units in RVN. Additional PC-202 antennas are required in the mechanized infantry battalion [III-5c(3)(c); pg. III-21].

n. Armored units effectively employed AR-577 antenna bases to increase the range and efficiency of FM communications from CP locations [III-5c(3)(c); pg. III-21].

o. A requirement exists for combat and combat support vehicle crewmen to be able to monitor vehicle radios without using the CVC helmet [III-5c(3)(d); pg. III-21].

p. A requirement exists for all tracked vehicles mounting secure communications devices to have a handset capability with the secure voice device [III-5c(3)(e); pg. III-21].

RECOMMENDATIONS

51. The authorization for PPL104G rectifiers be increased to the following totals:

a. Tank battalions, cavalry squadrons and mechanized infantry battalions - three each (one forward TPC, one communications platoon, one rear CP).

b. Separate cavalry troop - one each.

52. The authorization for PC-202 antennas in the mechanized infantry battalion be increased by six (to a total of 10); one additional to each rifle company and three additional to the battalion headquarters section.

53. Each armored battalion/squadron headquarters be authorized two AR-577 antenna bases.

54. Each combat and combat support vehicle be authorized one H-180/CP handset, one H-180/CP loudspeaker, and two headsets.

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CONCLUSIONS

a. The time required for DS-level repair of communications equipment was excessive in most armored and mechanized units [III-5c(4)(a); pg. III-22].

r. Expedited repair of communications equipment is needed to increase operational efficiency and decrease quantities of unauthorized equipment maintained in a armored and mechanized units [III-5c(4)(a); pgs. III-22 & 23].

s. DS communications repair units were not stocking and using IV radio equipment as intended [III-5c(4)(a); pg. III-23].

t. The authorized grades for battalion/squadron and company/troop communications chiefs are not commensurate with their responsibilities and the skill level required in armored and mechanized units [III-5c(5); pg. III-23].

u. Armored and mechanized unit requirements for AM radios and AM/RPT equipment were reduced because of the ready availability of area signal support VHF and secure voice FM equipment [III-5c(6); pg. III-24].

RECOMMENDATIONS

55. The communications equipment repair system be modified as follows:

a. Units be authorized a 5-percent DX float of radios.

b. Forward communications maintenance capabilities be improved by permitting performance of higher skill-level repairs at battalion/squadron level and providing more responsive contact support at brigade level.

c. Steps be taken to insure that the authorized DS-maintenance DX radios are maintained and utilized as intended.

56. In all armored and mechanized units, the authorized grade of battalion/squadron communications chiefs be increased to SFC 17, and company/troop communications chiefs to SSC 21.

57. The AM and RPT equipment be deleted from each type of armored and mechanized unit in RVN. (See Annex F for detailed list)

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CONCLUSIONS

v. Armored and mechanized unit requirements for wire and motor communications were significantly modified in RVN [III-5c(7); pg. III-24].

w. The relative mix of motor messenger/wiremen (MOS 36K20) and field radio repairman (MOS 36B20) in battalion/squadron needed adjustment to meet changed RVN communications requirements [III-5c(7); pg. III-24 & 25].

x. In the RVN environment, there was a requirement for all armored and mechanized battalions/squadrons to have a dedicated command and control helicopter [III-5d(1); pg. III-25].

y. The Air Control Team was not required in RVN operations because USAF airborne forward air controllers effectively performed its mission [III-5a(2); pg. III-26].

z. An effective ground-to-air signaling device is required to accurately mark unit locations at night [III-5a(3); pg. III-26].

5. (C) SUPPORT

a. The RVN environment forced changes in accepted supply procedures, which generated personnel and equipment requirements and different skills which are not reflected in the work of battalion/squadron support platoons [III-5a(1); pg. III-26 & 27].

RECOMMENDATIONS

58. A study be conducted to reevaluate armor and mechanized unit requirements for wire and motor communications in stability operations.

59. Two motor messengers/wiremen (MOS 36K20) be deleted from the battalion/squadron communications platoon in the tank and mechanized infantry battalions and regimental/divisional cavalry squadrons, and two field radio repairmen (MOS 36B20) added.

60. The number of helicopters authorized the brigade aviation section be increased sufficiently to provide a dedicated command and control helicopter to each armored or mechanized battalion/squadron.

61. The Air Control Team and all related equipment be deleted from the tank and mechanized infantry battalion and regimental cavalry squadron MTOEs.

62. An aviator's distress-light marker (SDU-5/E) be added to the BII of all combat and combat support vehicles.

63. That the doctrine and organization for supply of armored and mechanized units during stability operations be reexamined in the light of experience in RVN.

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RECOMMENDATIONS

64. Regulations be modified to allow battalion/squadron commanders the option of PLL consolidation in a combat environment.
65. Increased command emphasis be placed upon improving command relationships and more closely defining responsibilities between supported and supporting units with regard to automotive maintenance for armored and mechanized units.
66. Divisional maintenance and area support DS maintenance battalions be structured to have the capability of providing each armored and mechanized battalion/squadron with a full-time maintenance contact team when locations, equipment density, or peculiar maintenance circumstances so dictate.
67. Information required for operator and organizational maintenance be provided in a convenient manner using a material that will meet the requirements of the RVN environment, such as a plastic-covered pocket-size table.

CONCLUSIONS

- b. Flexibility was required in the handling of PLLs to meet variations in unit positioning. The authority to consolidate PLLs when desired would provide the flexibility (II-6a(3); pg. III-28).
- c. DS maintenance contact teams should be provided, and collocated with supported units when distance, density, or peculiar maintenance circumstances prevent normal DS support (III-6b(1); pg. III-29).
- d. Adequate publications are required for effective organizational maintenance (III-6b(2); pg. III-30).
- e. The durability of present operator manuals is unsatisfactory under combat conditions (III-6b(2); pg. II-30).

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CONCLUSIONS

f. The quantity and grade structure of supervisory personnel in battalion/squadron transportation sections were not commensurate with the mission of the section or the duties and responsibilities of the supervisors [III-6c(1)(a); pg. III-30].

g. There was a requirement for additional personnel in each battalion/squadron supply section and in the headquarters of the separate cavalry troop [III-6c(1)(b); pg. III-32].

h. Divisional and regimental armored cavalry squadron maintenance platoons required additional supervisory personnel [III-6c(1)(c); pg. III-32].

i. All battalion/squadron-size units required a materiel readiness NCO to assist in maintenance records-keeping and PLL management [III-6c(1)(c); pg. III-32 & 33].

j. All company/troop/battery-size units required a maintenance data specialist to assist maintenance and PLL records-keeping [III-6c(1)(c); pg. III-33].

RECOMMENDATIONS

68. MTOE authorizations for supervisory personnel be modified in each battalion/squadron transportation section to provide one NCO section leader (E7, MOS 64C40) and two squad leaders (E6 MOS 64C40), and to delete the authorization for a lieutenant, section leader, in the tank battalion and the armored cavalry squadron transportation sections.

69. The supply section of each battalion/squadron be augmented with one E4, MOS 76Y20, general supply specialist and one E3, MOS 76A10, supply clerk.

70. One E5, NCO (MOS 76Y40) assistant supply sergeant and two E4 (MOS 11D20) vehicle drivers be added to the separate cavalry troop headquarters.

71. An assistant squadron motor maintenance sergeant (E7, MOS 63C40) be authorized for the maintenance platoon of the regimental and divisional cavalry squadrons.

72. A materiel readiness NCO (E7, MOS 63C40) be authorized for each battalion/squadron headquarters section.

73. A maintenance data specialist (E4, MOS 71T20) be authorized for each company/troop/battery headquarters section.

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RECOMMENDATIONS

74. Personnel management agencies, at all levels, place increased emphasis on procedures that will properly assign personnel to duty positions consistent with their qualifications.

75. CONUS schools for tracked-vehicle mechanic (MOS 63C), and turret mechanic (MOS 45G), be revised to produce graduates who are qualified to perform in their MOS with minimal transitional training at unit level.

76. Medical personnel MOS authorizations at battalion and company level for stability operations be reexamined.

77. Light and medium support vehicles be developed that possess the same mobility characteristics as the combat vehicles supported.

78. A light support vehicle configured to launch the assault bridge recommended in recommendation 28 above be developed.

79. Bulldozer requirements for armored and mechanized units be satisfied by mounting bulldozer blades on a mobile support vehicle possessing the characteristics described in recommendation 77.

80. Currently authorized M48A3 tank-mounted bulldozer blades be retained in tank companies, and command emphasis be placed on operator training in dozing techniques and proper use of the tank-mounted dozer blade.

CONCLUSIONS

k. Personnel assigned to armored and mechanized units should be properly trained on the tracked vehicles of that unit prior to assignment [III-6c(2)(a); pg. III-33].

l. Newly assigned tracked-vehicle mechanics (MOS 63C) and turret mechanics (MOS 45G) should be fully qualified to perform in their MOS upon their arrival in the field [III-6c(2)(b); pg. III-33 & 34].

m. Qualifications for senior company aidmen should be reviewed to determine the appropriate MOS for personnel engaged in stability operations [III-6c(3); pg. III-34].

n. The incompatibility between the mobility of the M578 LTR and M60 AVLB and the M113A1 APC/ACAV and M551 AM/AAV degraded the combat effectiveness of the units [III-6d(1); pg. III-34 & 35].

o. A requirement exists for armored and mechanized company-sized maneuver elements to have an organic bulldozer capability [III-6d(2); pg. III-35].

p. The authorized M48A3 tank-mounted bulldozer blade is qualitatively inadequate but, properly employed, has a limited interim value [III-6d(2); pg. III-35].

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CONCLUSIONS

q. For effective employment in RVN, flame service units should possess mobility equal to the M132A1 mechanized flamethrower [III-6a(3); pg. III-36].

r. The M4A2 truck-mounted flame service unit was unsatisfactory for RVN usage [III-6a(3); pg. III-36].

s. A ratio of one tracked service unit to one mechanized flamethrower is required to achieve the best utilization of mechanized flamethrowers [III-6i(3); pg. III-37].

t. The authorizations for utility vehicles (M151) were in excess of mission requirements in several armored and mechanized units [III-6d(4)(a); pg. III-37].

u. Additional M548 cargo carriers were required in tank and mechanized infantry battalions to replace M54 5-ton cargo trucks [III-6d(4)(b); pg. III-37].

v. There is a requirement for steam-cleaning equipment in all mechanized/armored units [III-6d(5); pg. III-38].

RECOMMENDATIONS

81. Two tracked flame service units (YM151 or a successor vehicle) be added to the mechanized infantry battalion and one to the divisional cavalry squadron.

82. One M132A1 mechanized flamethrower be deleted from the divisional cavalry squadron.

83. Issue of authorized YM151 flame service units to all mechanized flame platoons/squadrons be expedited.

34. Requirements for unit utility vehicles (M151) in a stability operation be reexamined.

85. Authorization for M548 cargo carriers and M54 5-ton cargo trucks be changed as follows:

a. Tank battalions - add three M548's, delete three M54's.

b. Mechanized infantry battalions - add one M548; delete four M54's.

86. Each battalion, squadron, and separate troop be provided with steam-cleaning equipment.

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CONCLUSIONS

v. Based upon evolved recovery techniques, there was a requirement for additional recovery accessories as BII on vehicles and in combat/ combat support elements [III-6d(6); pg. III-38].

x. The supply system should be more responsive in replacement of tow cables [III-6d(6); pg. III-38].

y. The self-recovery kit, which is BII to the Australian fitters' vehicles, may have a potential for use on US M113A1-family vehicles [III-6d(6); pg. III-39].

z. Armored and mechanized units require increased capability for storage, transport, and distribution of water and POL [III-6d(7); pg. III-39].

RECOMMENDATIONS

87. Recovery accessories be provided as indicated below:

a. One 20-foot x 1-inch tow cable per each M113A1 and M551 vehicle.

b. One 20-foot x 1 1/2-inch tow cable per M48A3.

c. One 50-foot x 1-inch tow cable and one light tow bar per combat and combat support platoon or separate section of units equipped with M113A1 and M551 vehicles.

d. One 50-foot x 1 1/2-inch tow cable and one heavy tow bar per M48A3-equipped platoon.

e. Evaluation of the Australian fitters' self-recovery kit for possible adaptation for US Army M113 series vehicles be conducted.

88. Armored and mechanized units be provided with one M50C 1200-gallon water tank and additional water trailers in the support platoon.

89. Units be provided with the centrifugal pumping unit, 50 gpm, and accessories (components of the drum and pump unit) in accordance with the following BOI:

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CONCLUSIONS

RECOMMENDATIONS

- a. One per mechanized rifle company, tank company, armored cavalry troop, and combat support company.
 - b. Two per battalion/squadron support platoon.
90. Chainsaws be provided for armored cavalry units on the basis of one per troop or comparable-size unit and one in the support platoon.
91. Continued emphasis be placed on the effective implementation of TAADS, and on the development of revised procedures where necessary, to insure simplicity and timely response to users' requirements.
92. Errors in existing MTOE documents be corrected.
93. Items of equipment listed in Appendix 3 to Annex C be deleted from existing MTOE.
- aa. There is a requirement for chainsaws for armored cavalry units [III-6d(8); pg. III-40].
 - bb. There is a continuing requirement for an authorization document system which is responsive to the user's requirement, yet simple to administer [III-6e; pg. III-40 & 41].
 - cc. There is a requirement to correct errors in existing MTOE documents [III-6e(2); pg. III-40].
 - dd. There is a requirement to delete minor items of equipment not needed by armored units in RVN from existing MTOE [III-6e; pg. III-40 & 41].

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ANNEX A

GLOSSARY

ACRONYMS

ACAV	Armored Cavalry Assault Vehicle
ACR	Armored Cavalry Regiment
ACV	Armored Command Vehicle (Australian)
AO	Area of Operations
AP	Ambush Patrol
ARV	Armored Recovery Vehicle (Australian)
AVLB	Armored Vehicle Launched Bridge
BDA	Battle Damage Assessment
BI	Basic Issue Items
C & C	Command and Control
CIF	Central Issue Facility
CRIF	Combined Reconnaissance and Intelligence Platoon
CVC	Combat Vehicle Crewman
DDAC	Department of Defense Ammunition Code
FASCOM	Field Army Support Command
FDC	Fire Direction Center
FOB	Forward Operating Base
FSA	Forward Support Area
FSE	Fire Support Base
FSCC	Fire Support Coordination Center
FSE	Fire Support Element

FWMAF	Free World Military Assistance Forces
GVN	Government of Vietnam
HHC	Headquarters and Headquarters Company
HHD	Headquarters and Headquarters Detachment
HHT	Headquarters and Headquarters Troop
I & I	Intelligence and Interdiction
ICAP	Intelligence Civic Action Program
KCS	Kit Carson Scout
LO	Liaison Officer
LP	Listening Post
LTL	Provincial Highway
LTR	Light Track Recovery
MACOV	Mechanized and Army Combat Operations in Vietnam, (Study)
MEDCAP	Medical Civic Action Program
MTAB	Marginal Terrain Assault Bridge
MTOE	Modification Table of Organization and Equipment
NCS	Net Control Station
NDP	Night Defensive Position
OPCON	Attached for Operational Control Only
PBO	Property Book Officer
PF	Popular Force
PSID	Patrol Seismic Intrusion Detector
QL	National Highway
RAAC	Royal Australian Armor Corps

RIF	Reconnaissance in Force
RF	Regional Forces
ROCAD	Reorganization of Combat Armor Division
ROCID	Reorganization of Combat Infantry Division
RON	Remain Overnight
RPG	Rocket Propelled Grenade
RRF	Ready Reaction Force
SMG	Submachinegun
SP	Strong Point
TAADS	The Army Authorization Document System
TASTA	The Administrative Support Theater Army
TC	Tank Commander
TCPC	Tank Crew Proficiency Course
VCi	Viet Cong Infrastructure
VTR	Vehicle Tank Recovery

DEFINITIONS

AIR DATA

Data announced to all aircraft in a given vicinity over an artillery warning net (FM) to alert them as to the direction, location, target grid and max ord (altitude) of indirect fire missions about to be fired.

AMBUSH PATROL (AP)

In RVN implies dismounted static ambush.

ARMORED CAVALRY ASSAULT VEHICLE (ACAV)

An M113A1 APC equipped with an M113 armament subsystem.

ARMORED COMMAND VEHICLE (ACV)

Australian nomenclature for the M577A1 command post vehicle.

ARMORED RECOVERY VEHICLE (ARV)

Australian term for their tracked recovery vehicle mounted on a Centurion tank chassis roughly equivalent to the M88 VTR except that it possesses no lift capability.

ANTI-INTRUSION DEVICE

Any device employed to provide warning of enemy movement to a ground unit, including trip-flares, noisemakers, and electronic sensors such as the PSID, AN/GSS-9 and AN/PSR-1.

AREA OF OPERATION (AO)

An area assigned to a FVMAF unit to conduct operations during a specific period of time in coordination with appropriate GVN agencies. An AO normally was assigned for a specific operation or for a specified time; however, some unit AOs became semi-permanent.

ARMAMENT SUBSYSTEM

Utilized by DA to identify an RVN modification for the M113A1 APC, sometimes referred to as subsystem A, consisting of hatch armor and ballistic shield for the vehicle commander's caliber .50 machinegun and two elbow pintle mounts with gun shields located on both sides of the crew compartment in the rear of the M113 for mounting two M60 machineguns. Also identifies armament subsystem mortar, or subsystem B, consisting of just the hatch armor and ballistic shield for the vehicle commander's caliber .50 machinegun.

BASE AREA

A section of terrain which contains installations, defensive fortifications, or other physical structures used by the enemy.

BASE CAMP

The location which provides a semi-permanent station for tactical organizations. Depending on its mission, the organization may operate in, out of, or totally away from its base camp. Base camps normally contain all or a part of organization's service support elements.

BLADE

A local name for 250- and 500-gallon rubberized fabric collapsible drums.

BLADE TIME

Used when referring to helicopter support. Units were generally allocated a specific amount of blade time daily for command and control and logistical support.

BLIVER

A local name for 250- and 500-gallon rubberized fabric collapsible drums.

BUSHMASTER

A local term used to describe a type of covert saturation patrolling operation, generally conducted by a company but occasionally by platoons, concentrating on night ambushes.

CHECKERBOARD SWEEP

A local term applied to a specific technique employed on combined mounted/dismounted reconnaissance operations. It consisted of dividing a fixed area into blocks into one of which a dismounted element is inserted while mounted elements operate around the periphery to completely saturate the area and deny enemy escape.

CIVIC ACTION

A local term used to describe a combination of MEDCAPs, ICAPs, and other civil affairs activities.

CIVILIAN IRREGULAR DEFENSE GROUP (CIDG)

A paramilitary force locally recruited, clothed, fed, armed, trained, and led by ARVN special forces personnel and advised by US special forces personnel.

CLOSE AIR SUPPORT

Air action against hostile targets that are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces.

COMBINED RECONNAISSANCE AND INTELLIGENCE PLATOON (CRIP)

A local organization formed in most 25th Infantry Division units to work in close coordination with local authorities in VCI operations and to gather intelligence.

CONTACT TEAM

A small element provided to the maneuver unit by the direct support maintenance unit to assist with maintenance and to expedite support level functions.

CONVOY ESCORT

The name applied to the mission of providing security for a convoy, accomplished by mixing the escort elements in the convoy or by outposting the route.

CORDON AND SEARCH

A military operation in which an area is sealed and then another force (or part of the sealing force) searches the sealed area. It normally implies an operation around a village or hamlet.

DUSTER

Local name for the M42 twin 40mm self-propelled anti-aircraft gun used in RVN for direct fire support of ground units.

FIRE SUPPORT BASE (FSB)

A semi-fixed artillery base established to increase indirect fire coverage of an area and provide security for the firing unit.

FITTERS' VEHICLE

Australian term for modified maintenance M113A1 with a lift boom/crane mounted on the left side of the vehicle.

FORWARD OPERATING BASE (FOB)

A combined CP and logistical base established in the field by a maneuver battalion/squadron.

FORWARD SUPPORT AREA (FSA)

A fixed or semi-fixed area utilized as a forward logistical base as differentiated from a more permanent base camp.

BAGNET

Refers to a mounted ambush by a tank element.

BEREILIGED FORMATION

A formation used by mechanized and armor units when ambushed or during battle when the unit is moving in column. The armored vehicles turn alternately to the sides of the road in such a manner as to orient their main armament and heaviest armor obliquely to the flanks.

BOI THANH

A rallier, ex-VN/VA soldier.

BOCK

Local term for CH-47 cargo helicopter.

INTELLIGENCE AND INTERDICTION (I&I)

Generally refers to planned night artillery fires employed on suspected enemy locations. Previously called N&I fire.

INTELLIGENCE CIVIC ACTION PROGRAM (ICAP)

A civic assistance project with the aim of gathering intelligence from the local population by gaining their trust, support, and confidence.

IMAGE INTENSIFICATION DEVICE

Passive night vision devices which amplify ambient night light to allow visual observation and aimed fire of weapons. The term includes the Starlight Scope, Crew Served Weapon Night Vision Sight, and the Night Observation Device, Medium Range.

INTEGRATED OPERATIONS

The term used to describe combined operations in which both the chain of command and the units were integrated; when the platoon leader was from a US unit, the platoon sergeant was from an ARVN or RF unit, and the platoons were intermingled with individuals from both forces.

JOINT CP

A temporary command post established for a brief operation or for a CP displacement, normally includes only those personnel and equipment necessary to control the immediate operation.

JUNGLE BUSTING

The technique of utilizing an armored vehicle to cut trails through the jungle or other heavy vegetation.

KIT CARSON SCOUT (KCS)

The name given to ex-VC/NVA soldiers employed by US units as scouts.

LAAGER

A formation and/or location used for night security by armored units, in which the elements form a circle with all weapons facing out, used interchangeably with NDP or RON by some units, implies an overnight position only.

LIGHT AID DETACHMENT (LAD)

Self-contained element attached to each Australian Army squadron or regiment to provide repair and recovery of equipment.

LIGHT TRACK RECOVERY (LTR)

Local term used to describe the M578 recovery vehicle, as opposed to the M88 VTR.

MEDICAL CIVIC ACTION PROGRAM (MEDCAP)

The program for providing medical support to a civic action program or mission. In general, MEDCAP is a part of all civic action programs. It may be continuing, as in the case of a unit with a continuing civic action mission, or it may be temporary, as in the case of a unit on an operation with a civic action component.

NIGHT DEFENSIVE POSITION (NDP)

A location to which a company/troop or platoon returns nightly to laager for periods in excess of one night.

NO-FIRE ZONE

An area in which the employment of all specified-type fires must be cleared by the appropriate agency.

PINK LIGHT

Near-infrared, can be used to complement ambient night vision devices.

POLITICAL CLEARANCE

Clearance for fire support granted by GVN officials based on location of population, economic effects, and other considerations.

POPULAR FORCES (PF)

Local Vietnamese forces with a primary mission of protecting hamlets and villages. They normally remain in the hamlet or village from which recruited. They are lightly armed and not authorized crew-served weapons, though some have acquired machineguns and 60mm mortars. They are full-time units normally under the command of the district, village, or hamlet chief.

READY REACTION FORCE (RRF)

A force whose mission is to be prepared to react rapidly to an enemy attack or to attack an enemy force located by a finding force.

RECONNAISSANCE IN FORCE (RIF)

A very broadly used term to describe a combination of mounted and/or dismounted sweeps aimed at finding the enemy. Variances in connotation make the term imprecise.

REGIONAL FORCES (RF)

Vietnamese forces recruited within a province and who normally remain within their province. They are full-time units equipped similarly to the ARVN and are under control of the province chief. They are often attached to a district for specific missions.

ROAD CLEARING

A mission to clear a road of enemy activity, to include mines and ambushes.

ROAD SWEEP

A method of road clearing using dismounted personnel with mine detectors and probes to sweep the roadway for mines.

REMAIN OVERNIGHT (RON)

A formation and/or location used for night security by armored units in which the elements form a circle with all weapons facing out, used interchangeably with NDP or laager by some units, implies an overnight position only.

RULES OF ENGAGEMENT

A directive or regulation which provides specific rules for the conduct of the air and surface battles within RVN which are applicable to US/FWMAF and RVNAF. (Specifically - MACV Dir 525-13. Subordinate units issue instructions as regulations).

SCRAMBLED

Cavalry troop technique of rearranging troop elements to form tank, scout, mortar, and infantry platoons.

SECURITY OPERATIONS

Operations to deny installations or specific areas to the enemy. This includes, but is not limited to the following: convoy escort, road clearing, outposting of roads, and securing of fixed or semi-fixed installations. Variances in connotation make the term imprecise.

SPECIFIED STRIKE ZONE

An area designated for a specific period of time by GVN/RVNAF in which there are no friendly forces or populace and in which targets may be attacked on the initiative of UC/FWMAF/RVNAF commanders.

STRONG POINT (SP)

Generally connotes a mounted ambush, but in some units also means a platoon NDP.

TACTICAL CLEARANCE

Clearance for supporting fires granted by the ground tactical commander.

THUNDER RUN

The technique of using an armored vehicle, normally a tank, to clear a road of mines by detonation under the vehicle. Employed when speed is essential.

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ANNEX B

ORGANIZATIONAL AND EQUIPMENT MODIFICATIONS

1. (U) INTRODUCTION

a. General

This section documents significant organizational and equipment modifications from the TOE, found in armor-equipped units in RVN. This documentation is designed to serve as an introduction to conditions that existed in the field at the time of the evaluation. There were two broad categories of modifications: first, those approved by DA and incorporated as MTOE changes to the G-series TOEs; and second, those locally implemented modifications made without DA authorization.

b. Contents

This section is composed of five paragraphs. Paragraph 1 is an introduction. Paragraph 2 discusses the DA-approved, MTOE-implemented, organizational and equipment changes and assesses the effect of each change on the unit combat capability. Paragraph 3 documents and presents the rationale for locally implemented changes in organization and equipment common to two or more different type armored units. Both Paragraphs 2 and 3 contain charts which summarize the changes that are discussed or documented. Paragraph 4 documents and presents the rationale for significant locally implemented changes made in a single type unit or in a single organization. Finally, Paragraph 5 documents the major items of unauthorized excess equipment on hand, its use, and the rationale for its acquisition.

2. (C) SIGNIFICANT DA-APPROVED CHANGES FROM G-SERIES TOEs TO MTOEs

a. General

The G-series TOEs of all mechanized and armored units in RVN were modified by MTOE. Many of the MTOE changes were based upon recommendations made in the MACOV study. Initially, the organization changes are discussed, followed by the equipment changes. The changes are summarized in Figure B-1. This figure indicates the change, the type unit to which the change applies, the sub-paragraph in which the change is discussed, and the effect of the change on unit combat capability. The determination of effect was based upon comments from the field and an ACTIV assessment. Four categories of change effect are used in the figure: (1) None, (2) Variable, (3) Enhanced, and (4) Degraded. "None" indicates that the change was superfluous and was not needed for its intended function. "Variable" indicates that, with some units, the change enhanced combat capability; in others it had no effect; and, in still others, it served to

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CHANGES	EFFECT ON UNIT COMBAT CAPABILITY	TYPE UNIT TO WHICH THE CHANGE APPLIES					DISCUSSION (PARAGRAPH)
		ARMED CAV REGT	DIV CAV SQDN	SEP CAV TRP	TANK BN	MECH INF BN	
1. ORGANIZATIONAL CHANGES							
a. Deletion of air defense section.	NONE	X	X		X	X	2b(1)
b. Formation of a service company.	ENHANCED				X	X	2b(2)
c. Formation of a maintenance section for the service company.	ENHANCED				X		2b(3)
d. Addition of maintenance personnel to HHC.	ENHANCED					X	2b(4)
e. Deletion of materiel readiness MCO and maintenance data specialist.	DEGRADED	X	X		X	X	2b(5)
f. Addition of mechanized flame platoon/section.	ENHANCED	X	X			X	2b(6)
g. Reduction in size of ground surveillance radar sections.	VARIABLE		X		X	X	2b(7)
h. Deletion of howitzer battery security section.	NONE	X					2b(8)
i. Deletion of battalion antitank platoon.	NONE					X	2b(9)

FIGURE B-1 (a). Summary of Significant Readiness Changes from References Notes to Items and Their Effect on Unit Combat Capability.

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PROJECT OR UNIT COMBAT CAPABILITY	TYPE OF UNIT - WHICH THE PROJECT AFFECTS					DISCUSSION (PARAGRAPH)
	ARMED CAV REGT	ATV CAV SQDN	REP CAV TRP	TANK EN	MECH TRP EN	
CHAVAN						
1. Deletion of the antitank section, mechanized rifle company.					X	2-111
2. Addition of SF to unit staff.	X	X		X	X	2-111
2. <u>EQUIPMENT CHANGES</u>						
a. Replacement of M114 command and reconnaissance vehicles with M113 APC/ACAVs.	X	X	X	X	X	2-111
b. Addition of armament subsystems to M113-family vehicles.	X	X	X	X	X	2-111
c. Replacement of M14 rifles with M16 rifles.	X	X	X	X	X	2-111
d. Replacement of M16A2 tanks and M113 APC/ACAVs by M60 tanks in most cavalry platoon task sections.	X	X	X			2-111
e. Replacement of 5-ton vapor trucks (M54) by tracked engineer vehicles (M58) in battalion/ company support elements.	X	X		X	X	2-111
f. Replacement of M113 command and reconnaissance vehicles with M113 APC/ACAVs.	X	X	X			2-111

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CHANGES	EFFECT OF UNIT COMBAT CAPABILITY	TYPE UNIT TO WHICH THE CHANGE APPLIES					DISCUSSION (PARAGRAPH)
		ARMED CAV REGT	DIV CAV SQDN	SEP CAV TRP	TANK BN	MECH INF BN	
g. Replacement of 4.2-inch mortars with 81mm mortars in cavalry platoons.	ENHANCED	X	X	X			2c(7)
h. Adjustments in bulk POL handling equipment.	VARIABLE	X	X		X	X	2c(8)
i. Addition of one M548 to each battalion/squadron maintenance platoon.	ENHANCED	X	X		X	X	2c(9)
j. Addition of one M113A1 APC medical evacuation vehicle to the medical platoon.	ENHANCED				X	X	2c(10)
k. Addition of four M113A1 APC/ACAVs to the howitzer battery, regimental cavalry squadron.	ENHANCED	X					2c(11)
l. Replacement of the four regimental HMT scout 1/4-ton trucks with four M113A1 APC/ACAVs.	ENHANCED	X					2c(12)
m. Replacement of the ACT 3 1/4-ton truck with an M113A1 APC/ACAV.	NONE	X					2c(13)
n. Addition of one M578 LTR to the howitzer battery, regimental cavalry squadron.	ENHANCED	X					2c(14)

FIGURE B-1 (C). (Cont'd)

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CHANGES	EFFECT ON UNIT COMBAT CAPABILITY	TYPE UNIT TO WHICH THE CHANGE APPLIES						DISCUSSION (PARAGRAPH)
		ARMY CAV REGT	DIV CAV SODN	SEP CAV TRP	TANK BN	MECH INF BN		
c. Replacement of five M516 LTRs with five M16 VTRs, divisional cavalry squadron.	ENHANCED		X					2c(25)
f. Deletion of one 90mm recoilless rifle from the weapons squad of the rifle platoon.	NONE					X		2c(25)
g. Addition of nine M16 portable flamethrowers.	NONE					X		2c(25)
h. Addition of 60 automatic weapons squad weapons.	ENHANCED					X		2c(25)
i. Addition of two PELLONG rectifiers.	ENHANCED				X			2c(25)
3. <u>SIGNIFICANT DA APPROVED EQUIPMENT MODIFICATIONS FOR RVN</u>								
a. Addition of belly armor kits to M113-family vehicles.	ENHANCED	X	X	X	X	X		2c(25)
b. Modifications to the M113 ABV for RVN employment.	ENHANCED	X	X	X	X	X		2c(25)

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degrade unit combat capability. "Enhanced" indicates total agreement as to the positive effect of the change. Finally, "Degraded" indicates total agreement that the change had an adverse effect on unit combat capabilities in the RVN environment.

b. DA-Approved Organizational Changes from G-Series TOEs to MTOEs.

(1) Deletion of Air Defense Section

The battalion/squadron Redeye missile-equipped air defense section was deleted by MTOE. The absence of any enemy air threat in RVN made this section unnecessary. This change had no effect on unit combat capability.

(2) Formation of a Service Company

The HHC of the tank and mechanized infantry battalions was split by the MTOE into two companies: a headquarters/combat support company and a service company. This change was based upon recommendations made in the MACOV study. While the newly formed service company did facilitate battalion logistical activities, its formation created some unnecessary overlap of functions and separated the service support elements from the unit staff. Overall, the change was judged to be beneficial.

(3) Formation of Maintenance Section for the Service Company

As part of the reorganization outlined in paragraph (2) above, the MTOE provided a company maintenance section to the service company of the tank battalion. This section enhanced maintenance operations and capabilities. (Despite the parallel reorganization in the mechanized infantry battalion, no maintenance section was provided for the service company.)

(4) Addition of Maintenance Personnel to HHC

As part of the reorganization outlined in paragraph (2) above, the reorganized HHC of the mechanized infantry battalion was provided a 12-man maintenance section in the company headquarters. This section was added to compensate for the loss of the battalion maintenance platoon (transferred to the service company) which, under the TOE organization, had provided maintenance support for HHC vehicles. This change enhanced the mechanized infantry battalion maintenance capabilities. (Under the HHC and MTOE, the tank battalion has always been authorized a maintenance section in HHC.)

(5) Deletion of Materiel Readiness NCO and Maintenance Data Specialists

The MTOE deleted the authorized materiel readiness NCO in battalion/squadron headquarters and the E5 maintenance data specialist in each company/troop. These deletions degraded unit maintenance and logistical capabilities.

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(6) Addition of Mechanized Flame Platoon/Section

The MTOE authorized the mechanized infantry battalion and divisional cavalry squadron a flame platoon consisting of an officer, 20 EM, 1 M151 1/4-ton truck, 4 M132A1 mechanized flamethrowers, and 2 XM45E1 track-mounted flame service units. The regimental cavalry squadron was authorized a flame section consisting of 13 EM, 3 M132A1s, and 3 XM45E1s. There is no known reason for the difference in organization of flame elements. The platoon/section definitely enhanced unit combat capabilities; however, in many cases it was not fully utilized due to unavailability of XM45E1 track-mounted flame service units caused by shortage or equipment failure.

(7) Reduction in Size of Ground Surveillance Radar Sections

The ground surveillance radar section in the tank and mechanized infantry battalion was reduced in the MTOE from six to two radar teams. In the divisional cavalry squadron, the eight TOE radar teams (two in each ground troop including HHT) were reorganized as a six-radar-team squadron, ground surveillance section in HHT. This reduction and reorganization had a varied effect on unit target acquisition capabilities, as discussed in Volume II of this report.

(8) Deletion of Howitzer Battery Security Section

The 10-man security section in the howitzer battery of the regimental cavalry squadron was deleted. This section was intended by TOE to secure nuclear weapons, a requirement that did not exist in RVN. Based on this, the deletion had no effect on unit capability. The section, however, could still be advantageously utilized for local battery security.

(9) Deletion of Battalion Antitank Platoon

The antitank platoon of the mechanized infantry battalion was deleted by the MTOE. With the absence of enemy armor in RVN, there was no requirement for the platoon. This deletion had no effect on unit capability.

(10) Deletion of the Antitank Section, Mechanized Rifle Company

The antitank section of the rifle company in the mechanized infantry battalion was deleted by the MTOE. The rationale for this change was the absence of enemy armor in RVN. The loss of the two 106mm recoilless rifles degraded rifle company combat capability in some battalion AOs, where the weapon was required for limited HE direct fire and anti-personnel uses. In other AOs, the weapons were not needed.

(11) Addition of S5 to Unit Staff

The MTOE added an S5 officer to the battalion/squadron unit

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staffs. This addition was invaluable to most mechanized and armored units operating in RVN as discussed in Volume II.

c. DA-Approved Equipment Changes from G-Series TOEs to MTOEs

(1) Replacement of M114 Command and Reconnaissance Vehicles with M113A1 APC/ACAVs

All TOE-authorized M114s were replaced by M113A1s. The M114, when tested in RVN, did not have the required cross-country mobility and was consistently out-performed by the M113. This substitution greatly enhanced the combat capability of all armored and mechanized units in RVN.

(2) Addition of Armament Subsystems to M113 Family Vehicles

The MTOEs added the Armament Subsystem "A" (one caliber .50 machinegun ballistic shield, cupola armor, two M60 machinegun ballistic shields and pedestals) and one or two M60 machineguns with mounts, to each M113A1 vehicle, except ambulances. The MTOE also added the armament subsystem "B" (one caliber .50 machinegun ballistic shield and cupola armor) to each M106A1 and M125A1 mortar carrier. These Armament Subsystems greatly enhanced the capabilities of the vehicles.

(3) Replacement of M14 Rifles with M16 Rifles

All M14 rifles were replaced with M16 rifles by the MTOE. This substitution enhanced unit combat capabilities.

(4) Replacement of M48A3 Tanks and M113A1 APC/ACAVs by M551 AR/AAVs in Most Cavalry Platoon Tank Sections.

Three divisional cavalry squadrons had been equipped with M551 AR/AAVs which replaced M48A3 tanks on a one-for-one basis. The regimental cavalry squadrons, which had deployed to RVN without tanks, received M551 AR/AAVs on the basis of three per cavalry platoon, replacing one scout squad of two M113A1s. The M551 AR/AAV enhanced the combat capability of these units.

(5) Replacement of 5-Ton Cargo Trucks (M54) by Tracked Cargo Carriers (M548) in Battalion/Squadron Support Platoons

The MTOEs deleted varying quantities of M54s from the battalion/squadron support platoons and replaced them with M548s. Because of numerous inconsistencies and discrepancies in the detailed and summary authorization documents, the basis of exchange shown in Figure B-2 is only an approximation. The substitutions of the M548 for the M54 enhanced unit field resupply capabilities.

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UNIT	M54s Deleted	M548s Added
Regimental Squadron	10	8
Divisional Squadron	8	8
Tank Battalion	8	8
Mechanized Infantry Battalion	8	10

FIGURE B-2 (U). Replacement of M54 Cargo Trucks With M548 Tracked Cargo Carrier in Unit Support Platoons.

(6) Replacement of AN/PPS-4 and AN/TPS-33 Radars With AN/PPS-5 Radars

The MTOE substituted AN/PPS-5 radar sets for all AN/PPS-4 and AN/TPS-33 radars. When the radar was properly employed and maintained this substitution generally improved unit ground surveillance radar capability.

(7) Replacement of 4.2-inch Mortars With 81mm Mortars in Cavalry Platoons

In each cavalry platoon, the MTOE replaced the 4.2-inch mortar mounted on a M106A1 mortar carrier with an 81mm mortar mounted on a M125A1 mortar carrier. This substitution was made to gain the minimum-range advantages of the 81mm mortar. The change enhanced the combat capability of cavalry platoons in the RVN environment.

(8) Adjustments in Bulk POL Handling Equipment

Evolved POL resupply methods, which were recognized in the MACOV study, resulted in MTOE modifications in POL handling equipment authorized for each battalion/squadron. Generally, the changes decreased the quantity of tank and pump units while adding 500-gallon collapsible drums. While these adjustments improved POL aerial delivery capability, they have seriously degraded the ground delivery capability.

(9) Addition of M548 to Each Battalion/Squadron Maintenance Platoon

The MTOE added one M548 tracked cargo carrier to each battalion/squadron maintenance platoon to carry welding equipment. This provided a desirable cross-country capability and enhanced unit field maintenance.

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(10) Addition of M113A1 Medical Evacuation Vehicle

The MTOE increased the authorization for M113A1 ambulances in the evacuation section of the tank and mechanized infantry battalion medical platoons from two to three. The third ambulance was added in order to provide one tracked evacuation vehicle to each combat maneuver company. This change, which enhanced the medical platoon's ground evacuation capability, was not made in the cavalry squadrons.

(11) Addition of M113A1 APC/ACAVs to the Howitzer Battery, Regimental Cavalry Squadron

The MTOE added four M113A1 APC/ACAVs to the howitzer battery in the regimental cavalry squadron. This provided three forward observer teams and the battery detail (survey party) with mobility equal to that of the squadron. This change enhanced the operational capability of the howitzer battery.

(12) Replacement of Regimental HHT Scout 1/4-ton Trucks With M113A1 APC/ACAVs

The MTOE replaced the four M151 1/4-ton trucks authorized the regimental HHT scout section with four M113A1 APC/ACAVs. This change provided the scout section with increased self-protection, firepower, and mobility capabilities, and enhanced the section's effectiveness.

(13) Replacement of the Air Control Team 3/4-ton Truck With an M113A1 APC/ACAV

The MTOE replaced the regimental cavalry squadron air control team (ACT) 3/4-ton truck with an M113A1 APC/ACAV. This substitution was made to provide the ACT with mobility equal to squadron maneuver elements. This was unnecessary, as the ACT was not used for its intended TOE function, as discussed in Paragraph 3b(3)(c) below.

(14) Addition of M578 LTR to the Howitzer Battery, Regimental Cavalry Squadron

The MTOE provided the howitzer battery of the regimental cavalry squadron with one M578. The G-series TOE did not provide the battery with any recovery or lift capability. This addition enhanced the battery maintenance and resupply capability.

(15) Replacement of M578 LTRs With M88 VTRs, Divisional Cavalry Squadron

The MTOE replaced the five M578s authorized the squadron in the G-series TOE with five M88s. This change was correctly implemented, because, on deployment to F.W., all squadrons were equipped with M48A3

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tanks. However, three squadrons have subsequently received M551 AR/AAVs. In those squadrons the M551 has enhanced the recovery capability.

(16) Deletion of 90mm Recoilless Rifle From the Weapons Squad of the Rifle Platoon

The MTOE deletion of one of the two TOE-authorized 90mm recoilless rifles from the weapons squad of each rifle platoon had no effect on unit combat capability. The 90mm has had only limited use in RVN.

(17) Addition of M9-7 Portable Flamethrowers

The MTOE added one M9-7 portable flamethrower to each of the nine rifle platoons in the mechanized infantry battalion. The flamethrowers were rarely, if ever, employed by the majority of the mechanized infantry units in RVN. The change had no effect on unit combat capability of mechanized infantry units.

(18) Addition of AN/TVS-2/PA Crew Served Weapons Sights

The MTOE added 69 AN/TVS-2/PA crew-served weapons sights to the mechanized infantry battalion. This addition enhanced unit night fighting capability.

(19) Addition of PP1104G Rectifiers

The MTOE added two PP1104G rectifiers to the tank battalion in order to provide the means of converting electricity from AC to DC to operate radios and other equipment used in fixed installations. The rectifiers decreased the need for employing vehicle power and enhanced unit capabilities.

d. Significant DA-Approved Equipment Modifications for RVN

(1) Addition of Belly Armor Kits to M113-Family Vehicles

The addition of the belly armor kit to most M113-family vehicles has significantly decreased squad and crew casualties from conventional-sized antitank/antivehicular mines. This modification has been enthusiastically endorsed by all commanders.

(2) Modifications to the M551 AR/AAV for RVN Employment

Numerous official modifications were made to the M551 for RVN employment. Some of the more significant changes were the addition of belly and track-weel armor for protection against mines; addition of a turret bustle rack for external stowage; addition of front, side, and rear ballistic shields for the vehicle commander;

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repositioning of the commander's target control handle, and addition of a low-pressure air take-off system for cleaning filters and other components. These modifications enhanced the capability of the M551 in RVN.

3. (C) COMMON LOCALLY IMPLEMENTED CHANGES IN ORGANIZATION AND EQUIPMENT

a. General

In addition to the DA-approved changes discussed in Paragraph 2, above, every armored unit in RVN locally made changes to their organization and equipment. These changes were carried out without DA approval. Generally, they were in reaction to particular RVN conditions. In this paragraph, the organizational changes are documented initially, followed by the equipment changes. Only those changes common to two or more types of units are addressed. The documentation contains the rationale for the change. All documented changes are summarized in Figure B-3. This figure indicates the change, the type of unit to which the change applies, and the subparagraph in which the change is discussed. Significant organizational modifications peculiar to one type of unit or a single organization are discussed in Paragraph 4 below.

b. Organizational Changes

(1) Expanded Organizational Requirements

(a) General

The following organizational elements within armored units assumed expanded operational requirements to perform more effectively in the RVN environment. These organizational elements had to be augmented from other organic or excess resources

(b) Headquarters Dispersion

Almost all battalion/squadron-sized units were required to operate at least two base locations: a forward operational base and a rear logistical or support base. In addition, many units were required to operate other logistical and operational activities to fulfill particular local needs. To satisfy these multiple requirements, units fragmented their staff sections and service support elements. In many units this created organizational problems. Combat elements were commonly required to augment multiple locations with personnel and equipment as well as to provide for their security.

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CHANGES	TYPE UNIT TO WHICH THE CHANGE APPLIES						DISCUSSION, (PARAGRAPH)
	ARMED CAV REGT	DIV CAV SOON	SFP CAV TRP	TANK BN	MECH INF BN		
1. <u>ORGANIZATIONAL CHANGES</u>							
a. <u>Expanded Organizational Requirements</u>							
(1) Battalion/squadron headquarters were widely dispersed in multiple locations.	X	X		X	X		3-11(f)
(2) Battalion/squadrons were required to operate an FSCC.	X	X		X	X		3-11(f)
(3) The responsibility of the S5 was greatly expanded.	X	X		X	X		3-11(f)
b. <u>Variations in Organizational Usage</u>							
(1) The battalion medical platoon was removed from the evacuation chain.	X	X		X	X		3-12(f)
(2) A wide variety of economy of force units were formed from headquarters, combat, and combat support vehicles.	X	X		X	X		3-12(f)
(3) The infantry squad in the cavalry platoon lost its unit identity.	X	X	X				3-12(f)
(4) The M40, M451 crew functions and organization were modified in 1971.	X	X	X	X			3-12(f)

FIGURE B-3 (C). Summary of Locally Implemented Changes in Organization and Equipment (C).

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CHANGES	TYPE OF CHANGE APPLIES TO WHICH THE						DISCUSSION (PARAGRAPHS)
	ARMED CAV REGT	DIV CAV SODM	SEP CAV TRP	TANK BR.	MECH INF BN		
(5) The scout platoon assumed an offensive combat role.				X	X		3c(2)(5)
(6) PLL was generally consolidated at the battalion/squadron level.	X	X		X	X		3c(2)(2)
c. <u>Unused Organizational Elements</u>							
(1) The battalion mortar platoon FO teams were not used in their intended role.				X	X		3c(3)(2)
(2) The air control teams were not used in their intended role.	X	X		X	X		3c(3)(5)
2. <u>EQUIPMENT CHANGES</u>							
a. <u>Equipment Used in Other than Prescribed Location</u>							
(1) M548s from the battalion/squadron support platoons were commonly attached to the maneuver company/troop.	X	X		X	X		3c(1)
(2) Employment of ground surveillance radar differed significantly from doctrine.	X	X	X	X	X		3c(1)(5)

FIGURE B-3 (C). (Cont'd)

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CHANGES	TYPE UNIT TO WHICH THE CHANGE APPLIES						DISCUSSION (PARAGRAPH)
	ARMED CAV REGT	DIV CAV SQDN	SEP CAV TRP	TANK BN	MECH INF BN		
(3) Requirements for tactical communications equipment varied from the conventional.	X	X	X	X	X	3c(1)(d)	
(4) The battalion/squadron was provided special sniper equipment.	X	X		X	X	3c(1)(e)	
5. <u>Equipment Used for Purposes Other than Intended</u>							
(1) The roles of the three primary combat vehicles were modified in RVN.	X	X	X	X	X	3c(2)(b)	
(2) There were many armament and other modifications made to the M113A1 APC/ACAV.	X	X	X	X	X	3c(2)(c)	
(3) There were many modifications made to the M48A3 tank and M551 AR/AAV.	X	X	X	X		3c(2)(d)	
(4) The M106A1/M125A1 mortar carriers were modified to allow 360-degree traverse.	X	X	X	X	X	3c(2)(e)	
(5) Ambient night vision weapons sights were employed more for observation than as sights.	X	X	X	X	X	3c(2)(f)	

FIGURE F-3 (C). (Cont'd)

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CHANGES	TYPE UNIT TO WHICH THE CHANGE APPLIES					DISCUSSION (PARAGRAPH)
	ARMED CAV REGT	DIV CAV SQDN	SEP CAV TRP	TANK BN	MECH INF BN	
(6) In RVN, recovery vehicle usage varied significantly from conventional employment.	X	X	X	X	X	3c(2)(f)
c. <u>Under-utilized Equipment Capabilities</u>						
(1) The M48A3 tank-mounted bulldozer was under-utilized in RVN.	X			X		3c(3)(b)
(2) The M113A1/M551 swim capability was not used by US units in RVN.	X	X	X	X	X	3c(3)(c)
(3) Infrared equipment was under-utilized in RVN.	X	X	X	X	X	3c(3)(d)
(4) Electronic anti-intrusion devices were little understood and under-employed.	X	X	X	X	X	3c(3)(e)
(5) Wheeled cargo vehicles were under-utilized in RVN.	X	X		X	X	3c(3)(f)
(6) The M151A1 utility vehicle was under-utilized in RVN.	X	X		X	X	3c(3)(g)

FIGURE B-3 (c). (Cont'd)

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(c) Battalion/Squadron FSCC

The stringent requirements for close coordination and control of all fire support increased the duties of the artillery liaison team. In effect, each battalion operated an FSCC to control and clear all indirect fires and, in some cases, the direct fires in their AOs. The artillery LO became the central figure in the unit for this operational requirement. He also assumed staff supervision for the mortar platoon in the tank and mechanized infantry battalions.

(d) S5 Section

The S5 officer, who was authorized by the MTOE, assumed an increasingly important role. In nearly all units, personnel and equipment had been taken from other assets to form an operational S5 section. Although the actual size and functions of the section varied considerably from one unit to the next, most commanders used the S5 to complement combat operations. In addition to conventional psychological warfare and civic action responsibilities, the S5 section performed liaison and a variety of intelligence-gathering activities with local SVN authorities.

(2) Variations in Organizational Usage

(a) General

Certain organizational elements with armored units were used in a manner other than that intended by doctrine. This discussion describes the modified uses of these organizational elements.

(b) Medical Platoon

1. The reliance by all units on air evacuation of casualties minimized the usage of the evacuation section of the medical platoon in its intended role. Most troops/companies had attached to them the tracked ambulance and company aidmen provided by MTOE. The ambulance had become a field aid station for patients who did not require evacuation and, on occasion, was used to evacuate casualties from contact areas to safe LZs for air evacuation. In many units, the M113A1 ambulances performed numerous other roles, such as an extra personnel carrier, logistical vehicle, special equipment carrier, and also assisted in NDP perimeter defense.

2. The battalion surgeon rarely operated a clearing station for battle casualties. Aerial evacuation bypassed the battalion, taking casualties direct to field hospitals. More often, the surgeon and remainder of the medical platoon established aid stations at multiple

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base locations and assisted the S5 with medical civic action projects (MEDCAPS).

(c) Economy of Force Units

With all the organic combat elements of the squadron/battalion committed to scattered reconnaissance and security operations, the commander retained little tactical flexibility with which to influence the action. This increased the reliance on organic combat support elements to perform economy-of-force missions. Many units formed small economy-of-force formations from headquarters assets. These included command, radar, ACT, and, on occasion, medical M113A1 APC/ACAVs. Usually these elements were employed for CP security, convoy escort, and small mounted sweeps, either independently or in conjunction with other battalion elements.

(d) Infantry Squad, Armored Cavalry Platoon

Two factors caused the infantry squad of the armored cavalry platoon to lose its identity in most units. First, there was insufficient room for 11 US soldiers to ride on top of an M113A1 APC/ACAV when the armament subsystem was mounted, and personnel did not ride inside the vehicle. Cavalry units preferred to retain the armament subsystem in its entirety, as compared to the mechanized infantry units, which often did not mount all components of the kit. Therefore, infantrymen in the armored cavalry platoons were distributed among other platoon vehicles. Second, since the platoon was rarely up to strength, infantrymen were used to fill personnel shortages in other platoon sections. In spite of the universal loss of squad integrity, some platoons retained the squad's capabilities. In these units, whenever dismounted personnel were required, the squad reassembled and assumed its traditional function. Almost without exception, the infantry squad carrier was used as an additional scout vehicle.

(e) M48A3/M551 Crew Organization

1. Many factors contributed to variations in traditional crew organization and functions in RVN. Intense tropical heat, heavy retation, and the constant threat of mines and RPGs caused the crew to ve out of the turret onto the turret top. This shift caused a consequential change in the duties of each crewman.

2. The most significant change was the decreased role of the gunner. With the exception of one unit, the gunner did not ride in the gunner's seat, nor did he have primary responsibility for firing the main gun and coaxial machinegun. Instead, the gunner assumed the loader's duties or rode in the bustle rack armed with an M79 grenade

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launcher or M16 rifle to provide rear security and short-range (100 meters or less) reconnaissance by fire.

3. The vehicle commander, for all practical purposes, assumed the duties of the gunner. Because of the normal short range of engagement and lack of point targets, the main gun, loaded with canister ammunition, was generally employed in the "hipshot" manner with the TC override. The coaxial machinegun was fired in the same manner, relying on tracers for adjustment into the target area. On the tank, the commander's caliber .50 machinegun was universally removed from within the cupola and mounted on top of it (see Annex O). On both the tank and the Sheridan, a majority of crews in RVN employed the caliber .50 machinegun more than any other vehicle-mounted weapon. This preference was due to its lethality and jungle-penetrating capability, and the fear it instilled in the VC/NVA.

4. Most units provided the loader with some type of external machinegun. The addition of this weapon modified the loader's normal duties. He became responsible for the left flank/rear security and reconnaissance by fire into these sectors.

5. The driver's duties remained relatively unchanged. However, in jungle he could often see more from his position below the dense vegetation than could the remainder of the crew on top of the turret. He often detected spider holes, bunkers, and cleared firing lanes before any other members of the crew. He was able to alert the tank commander and engage the target with an M16 rifle, which was routinely carried in the driver's compartment.

6. Many vehicles were operated with only three-man crews, because of personnel shortages due to rear area security requirements or other reasons. One tank battalion, however, did not operate a tank unless its full four-man crew was available.

(f) Scout Platoon

The battalion scout platoon was employed by all units as an offensive combat element, rather than in its traditional reconnaissance role. Mounted reconnaissance, as defined by doctrine, was rarely conducted in RVN, as it was generally ineffective. Additionally, the platoon, with its M113A1 APC/ACAVs, had the additional firepower needed to develop a situation and perform offensive missions. In many units, the scout platoon operated as two separate maneuver sections, which provided the commander additional flexibility. The differences between scout platoon operations in tank battalions and in mechanized infantry battalions are discussed in Volume II, Annexes J and K.

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(g) PLL Management

Organization for management of basic loads of repair parts varied considerably throughout Vietnam. In some units company/troop-sized elements maintained their own PLLs as prescribed by doctrine. In cases where there was not frequent and detailed monitoring by the battalion maintenance technician, the PLLs were generally poorly organized and improperly maintained. In other battalions PLLs were maintained on separate registers for each company/troop-sized element, but storage of parts and location of records were consolidated under the battalion maintenance platoon. Commanders whose PLLs were administered in this manner stated that this enabled them to maintain the flexibility desired with separate PLLs, but still enabled them to take advantage of the experience of the battalion maintenance supervisors to overcome shortages of trained supply personnel. In other battalions, PLLs were consolidated within one document register in the battalion maintenance platoon. The platoon was normally supplemented with several additional personnel to administer the PLL. Commanders in these units generally felt that, because of shortages in qualified supply personnel and the lack of experience in junior officers in supervising supply, this procedure was the only efficient way to maintain the PLL. In all units, regardless of how the PLLs were administered, quantities of high-demand repair parts were carried on combat vehicles and on maintenance vehicles which accompanied the combat elements. These parts were generally not recorded on PLL status cards.

(3) Unused Organizational Elements

(a) General

Certain organizational elements within the armored units were either under-utilized or not utilized in their doctrinally intended manner. The authorized organizational elements and reasons for limited use are discussed below.

(b) FO Sections, Heavy Mortar Platoons

The function normally performed by FO sections of the heavy mortar platoons had been assumed by the artillery FOs attached to each company. This was a logical outgrowth of the revised duties of the artillery liaison officer at battalion. There was no longer an internal battalion mortar fire control system. Rather, it had changed into an internal battalion artillery fire control system, operated by the LO, who obtained external and internal clearances for all fires. Mortar FO team personnel and equipment were used elsewhere in the platoon and to augment attached artillery elements.

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(c) Air Control Team (ACT)

The unit air control team lost its identity. Its functions had been assumed by II AF airborne forward air controllers. As a result, the ACT personnel were absorbed into the latter S2/3 sections to enhance liaison with general aviation. II AF was used in a wide variety of other roles.

c. Equipment Modifications

(1) Equipment Used in Other than Prescribed Location

(a) General

Certain items of equipment within the armored units were commonly employed in other than the TOE/MIBI prescribed locations, as indicated below and summarized in Figure B-3.

(b) M548 Tracked Cargo Carrier

Many company/troops routinely had one M548 tracked cargo carrier attached from the battalion/squadron support platoon. This vehicle possessed mobility equal to the M113A1, which facilitated field resupply of bulk POL, ammunition, repair parts, and general cargo. In some units, the M548 accompanied the maneuver elements on tactical operations. Commanders of these units generally considered the M548 invaluable.

(c) Radar Employment

1. The employment of radar in RVN differed significantly from conventional doctrine. Radar sets were seldom used to support a unit's scheme of maneuver or to support a company-size element in the field. In many unit AOs, radar could not be effectively employed in the field because of dense vegetation or rugged terrain. In these cases, radar equipment was either used in fixed surveillance locations such as base camps, FSBs, ARVN/RF/PF outposts, or it was not employed at all. In some units radar sets were consolidated at higher headquarters for employment under artillery control. In others, radar employment was directed by higher headquarters in accordance with area surveillance plans.

2. In many units there was a lack of command interest in radar employment. Many radar sets were inoperative and operators were untrained. There was little unit follow-up action to insure prompt repair or to obtain required training for radar operators. Many of the problems with radar equipment resulted from qualitative problems with the equipment, as discussed in Volume III, Annex G.

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3. Commanders in many units considered the AN/PPS-5 radar too sensitive and fragile to be transported by any ground vehicle. In one division, movement of radar was prohibited except by helicopter, to minimize damage. These factors generally made the ground surveillance section vehicles available for other uses.

4. The AN/PPS-4 was issued to many units in lieu of the AN/PPS-5. Most commanders considered the AN/PPS-4 an inferior piece of equipment with an extremely limited detection capability.

5. User confidence in radar detection capability and accuracy was generally low. Numerous false readings and failure to detect known enemy movement greatly limited its value to maneuver elements and decreased command confidence.

(d) Communications Equipment

1. FM Radio Communications

a. FM Radio Nets

Unit dispersion and varying local requirements changed both the number of radio nets required and number of stations operating in the net at any given time. In many cases, this caused re-location of radios from their normal locations and created the need for additional radios to maintain effective communications. Typical net configurations for each type of unit at the time of the evaluation is shown in Volume III, Annex P.

b. Vehicular-Mounted FM Radios

(i) In each unit, there was a general increase in the number of radios mounted in tracked vehicles and a significant decrease in the number of radios mounted in wheeled vehicles. In addition, many radios were ground-mounted in CPs, FSBs, and base camps.

(ii) In nearly all units, a small float of radio receiver-transmitters was maintained by the communications platoon to provide immediate replacement for inoperable radios in the CP complex. Generally, float radios had been taken from unused or underused command and staff 1/4-ton vehicles. Several units had acquired significant quantities of unauthorized excess radios and accessory communications equipment.

(iii) The acquired float, regardless of type of unit, developed into a definite pattern, which in some units was extended down to the company/troop level. Most units had obtained additional AN/VRC-46, AN/VRC-47, and AN/PRC-25/77 radios, while several were

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AN/VRC-53 and AN/GRC-125 radios. Whenever possible, AN/VRC-46s were substituted for AN/VRC-53s because of an increase in range and reliability. Nearly all command vehicles had additional radios mounted to provide commanders with more responsive command and control communications. The typical relocation of radios by type of unit is also shown in Annex F. The estimated excess communications equipment on hand in each unit is depicted in Appendix 2 to Annex C.

c. Portable FM Radios

(i) Extensive dismounted and night operations, coupled with the reliance placed on the TSEC/KY-38 secure voice device, greatly increased unit usage of AN/PRC-25/77 radios.

(ii) Units that had no organic helicopter assets employed a minimum of two AN/PRC-25/77s with the commander when he was flying in a command and control helicopter.

(iii) Increased night ambush activities in all type units created a great demand for portable radios. In some commands, units were required to employ two of these radios with each ambush patrol. Also, portable radios were considered preferable for use by vehicle crews in mounted night ambushes because they eliminated the need of periodically running vehicle engines, and thus disclosing the ambush location. The authorized, general-purpose AN/GRC-125 was rarely used dismounted, because, when removed from the vehicle, it deprived the crew of communications required for fire control and RRP.

(iv) To satisfy these increased requirements, most units acquired unauthorized equipment.

d. Secure Voice Communications Equipment

(i) In all units there was considerable confusion concerning the correct authorization for secure voice communications equipment (TSEC/KY-38). As they became available, these items were issued through brigade and division signal personnel. Standard BOIs had not been developed for the theater or within divisions. Similar type battalions, within the same division, had different quantities of these devices on hand.

(ii) Secure equipment was used extensively for battalion/squadron command nets. It was considered essential for use down to the troop/company command level by all commanders except those in the ACR. While most units considered their quantities on hand inadequate, many maintained a small float for immediate replacement of inoperative sets

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in the TOC. Quantitative and interface problems are discussed in Volume III, Annex O. The specific uses of secure equipment in each type of unit and expressed unit requirements are documented in Volume II.

2. AM Radio Communications

a. With rare exceptions, standard AM voice radio nets were not required. For example, the AN/GRC-5 air warning broadcast net was not used in any unit visited. Likewise, the traditional AM air request and air control nets were not employed, because USAF air-borne forward air controllers employed FM equipment.

b. Approximately 70 percent of the units used their AM equipment exclusively for radio-teletype communications with brigade or division headquarters. However, with the increased use of secure FM, the requirement for radio-teletype decreased. Annex P shows the AM radio nets entered by each type unit.

3. Wire Communications

a. Wire communications equipment was used primarily in FSBs and base camps for administrative and base defense purposes. It was rarely used for tactical communications, except within a howitzer battery or mortar platoon. Seldom, if ever, was wire used for communications between battalion/squadron headquarters and subordinate elements or between company/troop CPs and platoons.

b. Wire requirements were similar for all types of units. Switchboards were established in both the forward and rear locations and used extensively to handle internal communications in the FSB or base camp. In many units, the majority of administrative and logistical traffic was handled by wire or signal support VHF.

c. The reliance on wire in fixed locations and its nonuse for tactical communications decreased the requirement for motor messenger/wireman personnel. In many units, at least one, and often two, wiremen were used to augment the radio repair section of the communications platoon.

(e) Sniper Equipment

Many units had organic personnel specially trained as snipers and equipped with National Match-Grade M14 7.62mm rifles, telescopic sights, and passive night vision sights. Mechanized infantry battalions were the only units authorized this equipment by MTOE. Other types of units were authorized this equipment by local letter authorities. The specific quantities maintained on hand in each unit varied considerably,

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depending upon the emphasis from higher headquarters. In nearly all units, the training, maintenance, and manner of employment was either controlled or closely monitored by the brigade or division headquarters. Snipers proved extremely effective, particularly on night ambushes.

(2) Equipment Used for Purposes Other Than Intended

(a) General

Certain items of equipment within the armored units were commonly employed for purposes and functions other than those intended. This modified usage commonly resulted in equipment modifications. Commonly observed equipment modifications are shown in Annex O.

(b) Combat Vehicle Roles

Modified roles and methods of employment of the three primary armored combat vehicles have evolved in RVN. These modifications are discussed in Section II. Many of the local vehicle modifications made to these vehicles resulted from user efforts to adapt the vehicle better for accomplishing the evolved roles.

(c) M113A1 APC/ACAV Modifications

1. Armament Changes

a. The authorized armament for the M113A1 consisted of one caliber .50 machinegun mounted at the vehicle commander's position and two side-mounted M60 machineguns. The Armament Subsystem "A" authorized for RVN provides each machinegun with a ballistic shield. In addition, the commander's cupola had additional hatch armor to provide the commander all-around armor protection, Figure B-4.

b. Many local variations were made in the authorized M113A1 armament. These were based on crew preference and on providing additional firepower for specific tasks. Many vehicles installed additional caliber .50 machineguns in place of M60 machineguns, while others had 7.62mm miniguns or 40mm rapid-fire grenade launchers mounted in place of the commander's caliber .50 machinegun, Figure B-5. Some vehicles had mounted 106mm recoilless rifles in place of an M60 machinegun, while others had as many as five crew-served weapons mounted on a wide variety of mounts. The variety of weapons mixes on the M113A1 APC/ACAV commonly observed during the evaluation are shown in Annex O.

2. Armor Modifications

a. Changes to the standard armor configurations were

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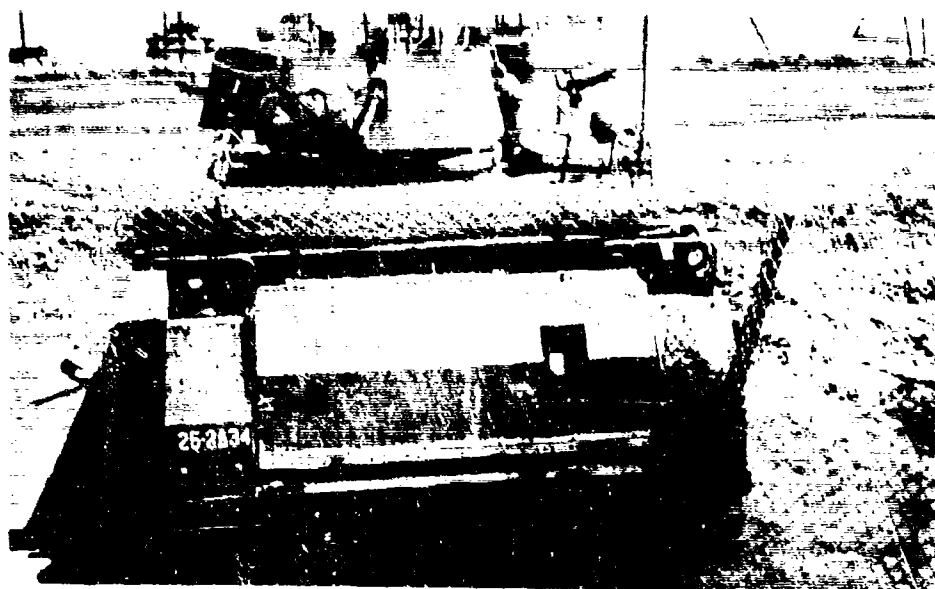


FIGURE B-4 (U). M113A1 Equipped with Armament Subsystem "A".

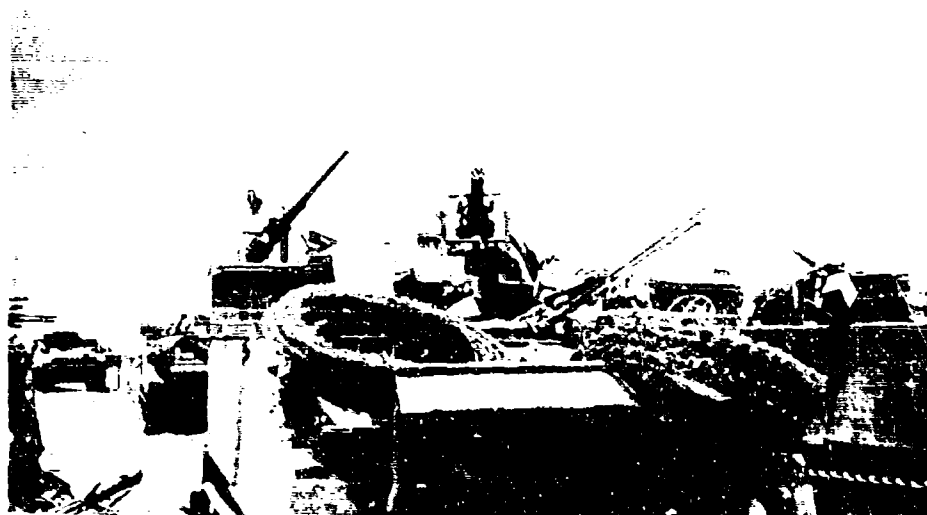


FIGURE B-5 (U). M113A1 with Vehicle Commander's Minigun and Other Unauthorized Weapons.

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widespread, particularly in mechanized infantry units. Most frequently, the rear M60 machinegun shields and mounts were removed to provide more room on top of the vehicle to carry the squad.

b. Medical tracked ambulances were not authorized an armament subsystem; however, in nearly all units they had been equipped with a complete or partial armament subsystem. Generally, in cavalry and tank units the full kit was installed. In mechanized infantry units, only the caliber .50 machinegun ballistics shield and commander's cupola armor were mounted. These modifications were considered necessary to provide self-protection, to permit the vehicle to be employed in a dual medical/ combat role, and to give all carriers the same appearance in order to avoid target signature.

3. Other Modifications

a. Nearly all units had modified the M113A1 to enhance stowage and crew comfort. These modifications included mounting salvaged aircraft or vehicle seats on top of the carrier and construction of stowage racks and/or boxes on top of and inside of the vehicle. All crews had removed the vehicle commander's seat and vertical support inside the vehicle to make room for additional ammunition, personal gear, sleeping gear and the inevitable soft-drink cooler.

b. Many units had moved the radio control intercommunication set to the top of the M113A1 to facilitate net selection by the vehicle commander. Nearly all command vehicles had additional radios mounted for more responsive communications.

c. Several units employed extended steering laterals for the driver. This modification allowed the driver to ride on top of the carrier, and thus reduced his vulnerability to mines.

(d) M48A3/MC51 Modifications

1. M48A3 Machineguns

Very few tanks had retained the authorized mix of machineguns. The M2 HB (electric) caliber .50 machinegun mounted in the cupola almost universally was modified for manual firing and repositioned on top of the cupola. All commanders considered the internal cupola mounting unsatisfactory for RVN employment. With the caliber .50 machinegun mounted externally on either a pedestal or a tripod welded to the top of the cupola, the commander could rapidly fire the gun in any direction. The top mount also provided for an increased quantity of readily available ammunition at the gun, which facilitated loading, troubleshooting, and allowed the weapon to be fired at targets closer to the tank, Figure B-6. Most tanks also had a

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FIGURE B-6 (U). M2 Caliber .50 Machinegun Mounted on Top of M48A3 Tank Cupola.

machinegun mounted near the loader's hatch. This was either an M60 machinegun, an M73 coaxial machinegun modified for manual fire, or a caliber .50 machinegun.

2. M551 Machineguns

The M551, as modified for RVN employment, provided the commander with a top-mounted caliber .50 machinegun, a ballistic shield, side shields, and rear ballistic armor. A few M551s mounted a second caliber .50 machinegun at the commander's position. As with the M48A3 tank, many M551 loaders also had a mounted machinegun.

3. Stowage Modifications

As with the M113A1s, many modifications were made to facilitate stowage of additional ammunition, starlight scopes, mine detectors, water cans, personal gear, packaged POL, RPG screens and stakes, concertina wire, and other items. These included removal of turret-floor ammunition boxes and welding additional brackets, boxes, and racks externally on the turret, fenders, and rear deck.

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4. Fire Direction and Communications Control

Modifications

Many crews had moved the turret gun selector switches and TC override handle into, or closer to, the vehicle commander's position to facilitate firing the main gun and coaxial machinegun. Additionally, on many vehicles, the radio control boxes had been relocated to eliminate the requirement to climb down inside the turret to change radio frequencies.

5. Cupola Modifications (M48A3)

In addition to moving many of the controls up to the TC position, on many tanks the cupola was welded in place to prevent traverse. The caliber .50 machinegun was traversed freely on its mount or the whole turret was traversed to lay the machinegun. Accessory storage racks and equipment carried on top of the turret made cupola traverse impractical on some vehicles and impossible on others.

6. Crew Individual Weapons

Most crews obtained at least one M16 rifle and one M79 40mm grenade launcher. Crews were dissatisfied with the authorized caliber .45 pistols and submachineguns because of their weight, limited range, and inaccuracy. The pistol was considered a safety hazard by many commanders. As a result two major commands had restricted the issue of pistols to include only officers, senior NCOs, and a small selected group of maintenance personnel, issuing M16 rifles to all others. The CAR-15 submachineguns authorized some M551 AR/AAV crewmen were rarely on hand.

(e) M106A1 and M125A1 Mortar Carriers

Many units had removed the traversing stops from the mortar carrier turntables. This allowed 360-degree traverse of the 4.2-inch and 81mm mortars without having to move the vehicle or ground-mount the mortar. In many cases, the mortar carriers were positioned facing out around a perimeter so that their caliber .50 machinegun faced the threat (Figure B-7). This practice made it undesirable to turn the carrier for a fire mission. The 360-degree capability increased responsiveness and massing of mortar fires; however, it also created a hazard which could damage the turntable, injure a crewman, or cause erratic firing.

(f) Passive Night Vision Devices

All passive night vision devices were extremely popular in mechanized and armored units in RVN. In most cases, however, the individual starlight scopes and crew-served weapons sights were used primarily as surveillance devices rather than as mounted weapons sights. This modified usage resulted from a variety of factors, ranging from

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FIGURE B-7 (U). M106A Mortar Carrier Employed in Perimeter Defense.

convenience to qualitative aspects of the devices, as discussed in Volume III, Annex O. In all units, opinion was unanimous that the passive night vision devices provided an improved night fighting capability.

(g) Recovery Vehicles

1. M88 and M578 Tracked Recovery Vehicles

a. Due to the dispersion of combat and combat service support elements, usage of tracked recovery vehicles varied from conventional methods. The company/troop level recovery vehicles usually remained in the NDP or FSB rather than accompanying the maneuver elements. As a result, nearly all initial recovery efforts for battle-damaged or mired vehicles were made by like-size or larger combat vehicles. Combat-damaged vehicles, recovered in this manner, were towed to either an NDP, FSB, or a road accessible to the recovery vehicle. The battalion/squadron maintenance platoon recovery vehicles were rarely used for recovery/evacuation, except between FSBs and base camps over relatively secure roads.

b. The limited use of the recovery vehicles for primary recovery and evacuation resulted from the fact that the VTR/LTR possessed the only organic lift capability at company/troop level. It was retained at a forward maintenance facility, either an NDP or FSB, to

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support routine and periodic maintenance services by lifting powerpacks, rear decks, tracks, and other heavy components. Tracked recovery vehicles were also frequently used for the lift of heavy supplies on helipads and for lifting 500-gallon collapsible fuel drums to allow gravity refueling, Figure B-8. As a result of these uses, commanders were extremely reluctant to expose these vehicles to mine danger or to limit their use to field recovery.

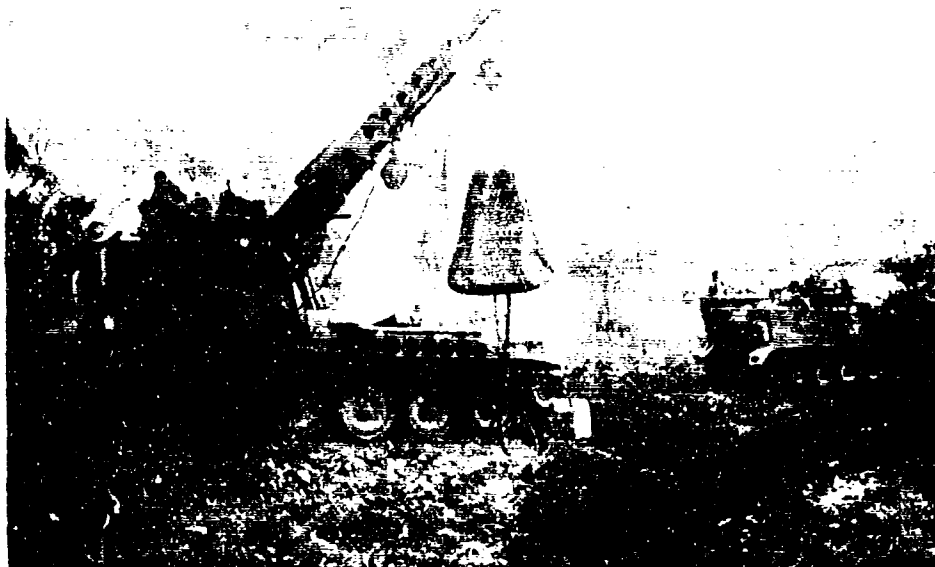


FIGURE B-8 (U). M576 Light Recovery Vehicle in Refueling Operation.

2. M543 Wrecker

Wreckers were seldom used for recovery of wheeled vehicles. They provided additional lift capability to support maintenance operations in the battalion/squadron motor pool. In addition, they were frequently used to support logistical activities. In some units, wreckers were committed by higher headquarters to support other units, such as attached and adjacent units.

(3) Under-utilized Equipment Capabilities

(a) General

Certain items of equipment within the armored units were commonly not utilized or were under-utilized. These changes were

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brought about by inherent equipment limitations, or improved alternate capabilities.

(b) M48A3 Tank-Mounted Bulldozer

The M48A3 tank-mounted bulldozer was designed primarily for clearing loose rubble and debris in built-up areas, knocking down road blocks, and assisting in stream crossings. In RVN, there was little need for the bulldozer to perform these functions. Additionally, it proved inadequate for heavier earthmoving tasks such as constructing berms around NDPs or FSBs and digging bunkers and defilade positions. The bulldozer-equipped M48A3 tank was more difficult to maneuver in heavy vegetation and over rough terrain because the blade tended to dig in during movement. When the blade was raised to its highest position, it blocked the driver's vision. These limitations made the vehicle slow in relation to other tanks. As a result, most vehicles that were authorized bulldozer blades were either left in static defensive positions, where the blade capabilities were seldom used, or the blade was removed. Most personnel interviewed thought the M48A3 tank-mounted bulldozer had very limited value in RVN operations (Figure B-9).



FIGURE B-9 (U). M48A3 Tank-Mounted Bulldozer.

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(c) Swim Capability, M113A1 APC/ACAV and M551 AR/AAV

1. It was generally thought by users that the M113A1 and M551 did not require a swim capability in RVN. Areas of operation for mechanized forces were generally selected to minimize the number of unfordable water obstacles. Excluding the Delta, a majority of the unfordable rivers had steep or soft banks and swift currents that rendered such operations infeasible. In addition, the nature of the conflict precluded planning operations in which crossing sites had to be prepared in advance. Thus, the need for the swim capability seldom arose.

2. Vehicles rarely retained their swim capability after a few days operating in jungle or thick brush. Increased internal loads, belly armor, and armament kits made the M113A1 a great deal heavier. Drain plugs and access plates were often missing; ram doors were commonly warped and the seals had deteriorated; bilge pumps were frequently inoperative; trim vanes were damaged or missing, having been torn off in the jungle; and many belly armor flotation devices were missing, damaged, or perforated by RPGs or small arms. Also, the M113A1 was generally lacking track shrouds, which either were not present upon issue from depot or had been removed by the unit when the vehicle was received. In the case of the M551, surfboards and barriers were commonly damaged during jungle operations and, in many cases, the watertight seals had deteriorated, Figure B-10.

(d) Infrared Equipment

1. General

The infrared equipment authorized for armored and mechanized units in RVN was used infrequently. With the exception noted below, this statement applies equally to all types of infrared equipment, including the AN/VSS-1/2 tank searchlight (with associated fire-control instruments and M18 binoculars), vehicular IR night driving equipment, IR individual weapon sights, and metasopes. The availability of, and preference for, passive night vision devices contributed to the non-use of IR equipment. In most units there was very little command interest or emphasis on IR employment. The sole exception to this was the AN/VSS-3 M551 AR/AAV mounted searchlight. It was commonly used in its "pink light" mode in conjunction with passive devices. As in the case of the M48A3 tank, however, it was only rarely used in conjunction with vehicle-mounted IR sights.

2. Tank-Mounted IR Sighting Equipment

The AN/VSS-1/2 searchlight in the IR mode and associated IR sighting and fire-control equipment on the M48A3 tank were seldom used in RVN. Much of the equipment had become inoperative from operational damage, maintenance difficulties, weather deterioration, and

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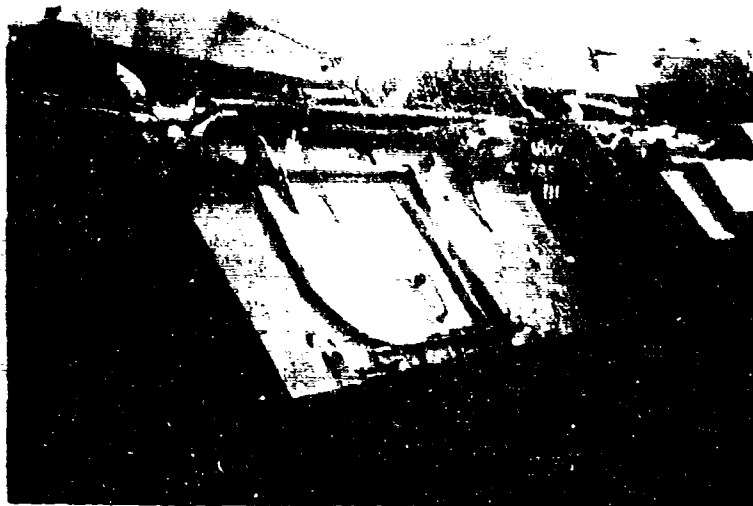


FIGURE B-10 (U). Degraded M113A1 Swim Capability.

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normal wear. Most tank crews were not knowledgeable about the capabilities or employment of IR equipment. When questioned concerning the use of IR, most crewmen and junior commanders explained that they were reluctant to employ it because it necessitated running the vehicle engine and thus created noise. Most company commanders had little confidence in the equipment, even though few tried it or had even considered using it. One significant exception was the 1st Brigade, 5th Infantry Division (Mechanized), which had placed a great deal of command emphasis on tank IR employment and maintenance. As a result, this unit had achieved considerable success on combat operations using this equipment.

3. Vehicular IR Driving Equipment

a. The tracked-vehicle driver's infrared periscope was rarely, if ever, used by any unit visited. Personnel interviewed felt that an IR night driving capability was not needed in RVN because night movement by an armored unit could not be covert. Mainly, night movement was performed in response to contact or intelligence. Moves of this nature were rapid and relied on moonlight, headlights, or flare illumination. In addition, numerous vehicle IR headlights had been torn off or damaged during jungle operations. The majority of IR driver's periscopes were reported inoperative, while others had been removed from the vehicle and placed in storage.

b. The wheeled-vehicle driver's IR driving body was not used. No one interviewed could remember an occasion when this equipment was needed or utilized. Most units had not removed the equipment from depot pack and considered it an unnecessary storage burden on the unit.

4. IR Weapon Sights and Metascopes

The IR weapon sights and metascopes were not used in any unit visited, nor could anyone interviewed ever remember having seen one employed in RVN. Generally, this equipment had been turned in or put into unit storage. All personnel interviewed considered the family of passive night vision devices superior to the IR and suggested deletion of the latter items.

(a) Electronic Anti-Intrusion Devices

1. Three basic types of anti-intrusion devices were found in mechanized and armored units in RVN. Two types, the AN/GSS-9 breakwire device and the AN/FRS-1 seismic intrusion detector, were authorized in varying quantities to different type units by MTOE. The third type, the patrol seismic intrusion detector (PSID) was on hand in most units, although not authorized by MTOE. Both level of training and knowledge of capabilities and employment techniques were poor, in most units.

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Many devices had not been used, primarily because no one knew what they were or how to use them. In some units that had used the devices, there were complaints about false readings, oversensitivity, and length of time required for emplacement. A few units had achieved some favorable results with the PSID and AN/PRS-1, but had little or no use for the AN/GSS-9.

(f) Wheeled Cargo Vehicles (M35, M37, M54)

As a result of insecure ground lines of communication, a limited road network, and generally poor cross-country trafficability in RVN, wheeled cargo vehicles of armored units were not used extensively for resupply in forward areas. The M548 tracked cargo carrier filled the requirement for cross-country, forward area resupply. Wheeled cargo vehicles were mainly used in base camps, between base camps and FSBs, in FSBs, and when the unit had a highway security mission.

(g) M151A1 Utility Vehicle

The M151A1 1/4-ton utility vehicle was not used as intended. Insecure lines of communications, unit dispersion, and the vehicle's relative lack of cross-country mobility limited its employment in forward areas. It was used in FSBs and base camps to provide administrative transportation. Many units considered the MTOE authorizations for these vehicles to be in excess of their requirements. The authorized M151A1 radios provided a major source to meet increased communications requirements, as discussed in paragraph 3c(1)(d).

4. (C) SUMMARY OF SIGNIFICANT CHANGES PECULIAR TO ONE TYPE UNIT

a. General

In addition to the locally implemented organizational and equipment changes common to more than one type of unit discussed in paragraph 3 above, there were other changes made that were peculiar to one type of unit. Only those significant changes which were semi-permanent in nature are discussed in this paragraph.

b. Armored Cavalry Regiment

(1) Regimental HHT

The regimental headquarters was expanded to fulfill operational, administrative, and logistical requirements over and above those doctrinally associated with that element. The regiment was required to operate a rear base and to support and administer a large number of support attachments from within its own resources, as discussed in Annex G.

(2) Changes Common to Two or More Squadrons

(a) Each squadron had an armored engineer platoon permanently

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attached. All squadron commanders felt this attachment significantly enhanced their units' combat capability.

(b) In each squadron, the organic tank company was provided an M577A1 CP vehicle from squadron assets. This vehicle was employed as the company CP and NCS to facilitate tactical and administrative operations.

(c) In two squadrons, an additional M113A1 APC/ACAV was provided, from squadron assets, to the howitzer battery. The vehicle was employed as a battery CP, battery commander's command vehicle, and second FDC when the battery operated by platoons.

(3) 3rd Squadron, 11th ACR

(a) The 3/11 Cavalry had retained the TOE-authorized 4.2-inch mortars instead of the MTOE authorized 81mm mortars. It had consolidated all mortars under squadron control in a provisional mortar battery. This provisional organization centralized planning, training, maintenance, and logistical mortar operations and facilitated rapid massing of mortar fires.

(b) The 3d Squadron also consolidated all radar sets under squadron control, along with 50 percent of the radar M113A1 APC/ACAVs. As a result, all operator training and maintenance functions were centralized to maximize efficient radar utilization. The squadron then re-attached trained radar teams to each troop, retaining some radar sets at squadron as an operational float.

c. Divisional Cavalry Squadrons

Every divisional cavalry squadron had lost operational control of its air cavalry troop. The air cavalry troop was generally under control of division headquarters. All squadron commanders felt that this loss seriously degraded their units' combat capability.

d. Separate Cavalry Troops

All separate cavalry troops augmented their supply sections to facilitate resupply of dispersed platoons. On the average, this consisted of three EM and an unauthorized vehicle.

e. Tank Battalions

The 2/34 Armor had significantly modified its organization. This battalion had two tank companies permanently detached, which seriously reduced the battalion's organic combat strength. To compensate for this, the battalion had reorganized the sections of HHC and D Company to form a second combat maneuver company, Figure B-11. The reorganized HHC consisted of a company headquarters, the scout platoon, mortar platoon, and

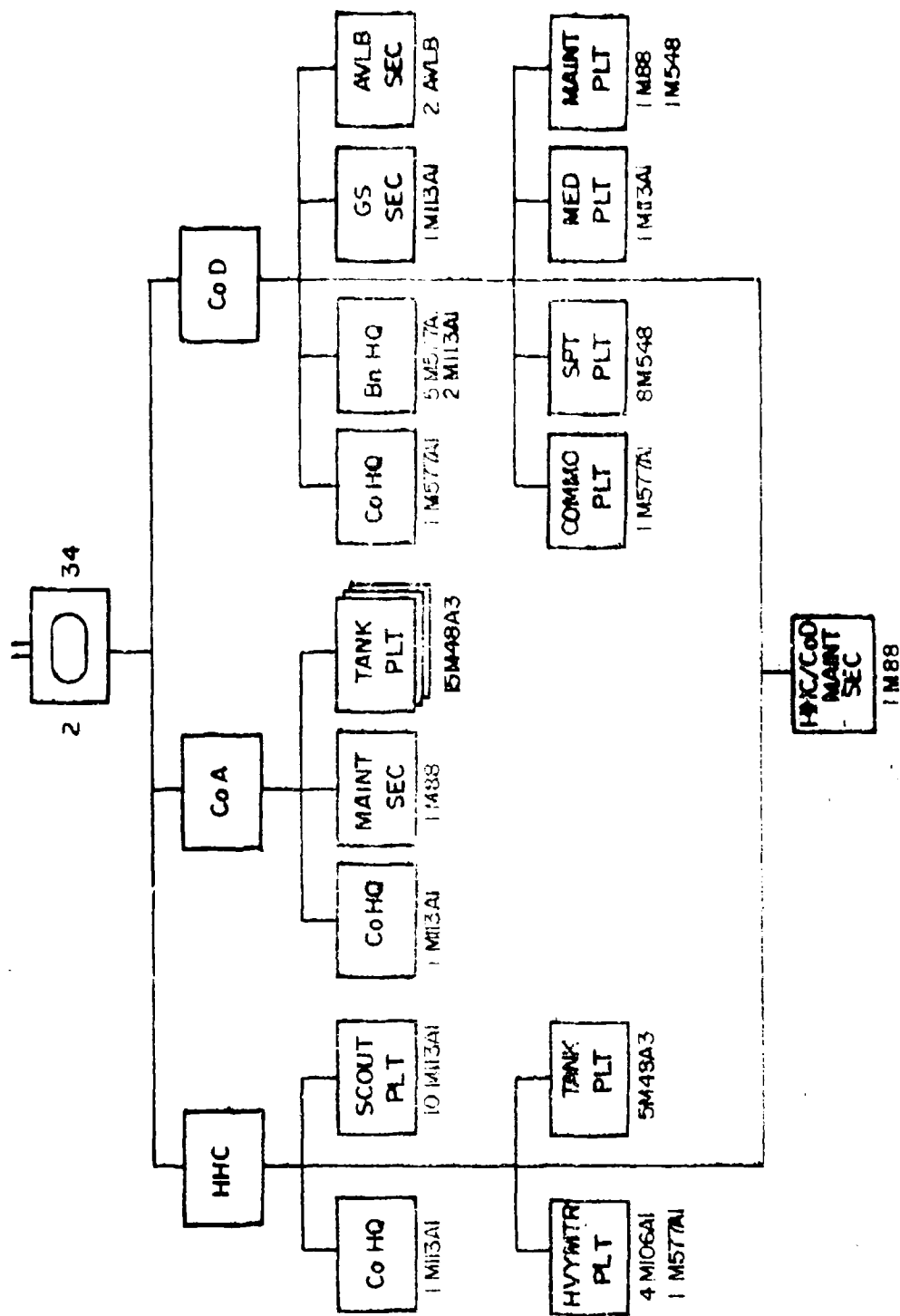


FIGURE B-11 (U). Reorganization of 2/34 Armor.

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a tank platoon formed from the battalion headquarters tank section and the two headquarters tanks from Company A. The radar, air control team, and medical platoon M113A1 APC/ACAVs were used as command vehicles for the battalion CO, S3, HHC CO, and A Company CO to make up for the loss of command tanks. All other HHC sections were concurrently attached to D Company, which became in effect a "headquarters & service company." The HHC and D Company maintenance sections were consolidated, and supported both companies.

F. Mechanized Infantry Battalion

(1) Changes Common to Two or More Battalions

(a) With the deletion of the antitank section (two 106mm recoilless rifle squads) from the weapons platoon of the mechanized rifle company, the platoon had become, in effect, a light mortar platoon. The platoon leader operated from the FDC M113A1.

(b) The weapons squad of the rifle platoon had become, in effect, another rifle squad. The one remaining 90mm recoilless rifle, if carried, was rarely used. Platoon leaders did not differentiate between this squad and the other three rifle squads.

(2) 2nd Battalion, 47th Infantry

(a) The 2/47 Infantry faced a problem unique among mechanized infantry units in RVN. Its battalion AO was in the northern Mekong Delta region and contained numerous unfordable streams, irrigation canals, and rivers. As a result, this unit used M4T6 bridge sections carried by M113A1s for field-expedient bridging, Figure B-12.

(b) Each rifle company had an M548 attached to recover mired M113As, instead of the authorized M578 recovery vehicle. The M548 performed better than other available vehicles in that AO, because of its lighter weight and greater flotation in soft marshy terrain.

5. (U) USAGE OF EXCESS EQUIPMENT

a. General

All units had acquired excess equipment. While the majority of the excess consisted of weapons and communications equipment, some units had obtained additional vehicles, generators, rectifiers, water and POL handling equipment, engines, and maintenance accessory equipment. The specific quantities of excess equipment on hand could not be determined, since most of it was not recorded on unit property books and was therefore not subject to normal property accountability procedures. The tabulated quantities of on-hand excess equipment included at Appendix 2 to Annex C were compiled from a combination of sources, including estimates based upon partial counts and interviews with unit personnel. The usage of

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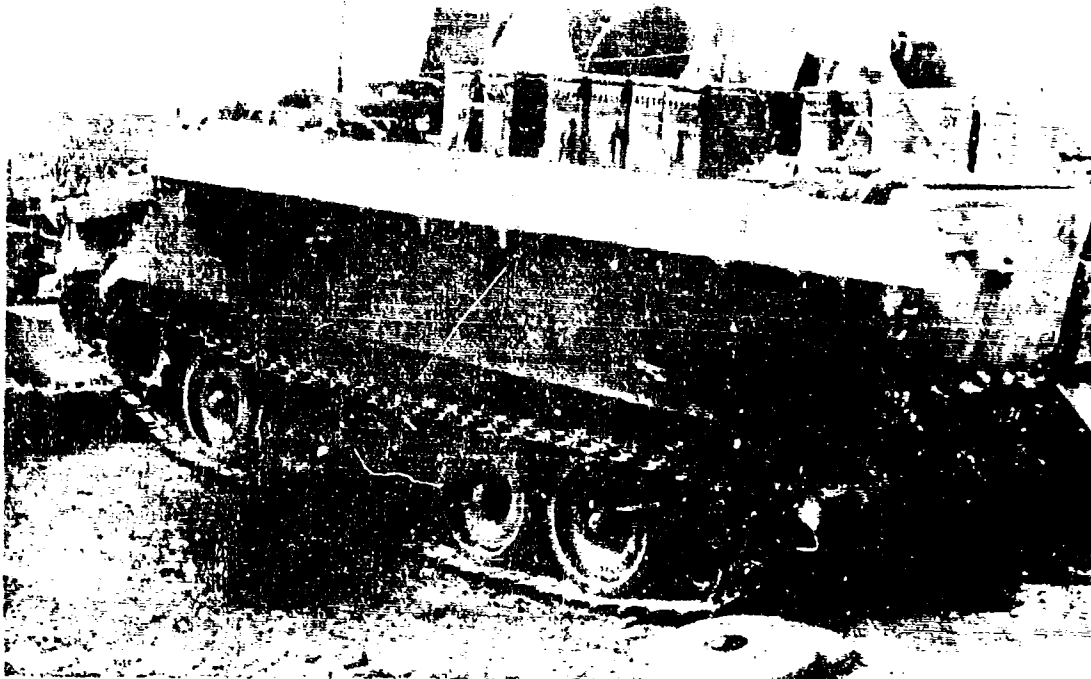


FIGURE B-12 (U). M4T6 Bridges Section Carried
by M113A1.

this equipment, and the rationale for acquiring it, are discussed in this paragraph.

b. Communications Equipment

For the reasons indicated in Paragraph 3c(1) above, all units had on hand sizable quantities of excess communications equipment. This was particularly true of vehicle-mounted radios (AN/VRC-46 and AN/VRC-47), portable radios (AN/PRC-25/77), secure communications equipment, antennas (RC-292 and AB-577), repair and test equipment, rectifiers and accessory equipment.

c. Weapons

(1) Machineguns

Every armored and mechanized unit in RVN had acquired some excess machineguns. In some units, the excess was as high as 50 percent above authorized levels. As shown in Annex O, many combat vehicles had extra machineguns mounted in a wide variety of configurations. Excess machineguns mounted in bunkers, watch towers, and fighting positions were to be used for base defense security requirements. Using excess weapons to satisfy these requirements precluded the necessity of taking weapons from combat units. Excess machineguns were also used as an operational float to provide direct exchange or parts for inoperable weapons.

(2) Individual Weapons

In most unit unauthorized M16 rifles and M79 40mm grenade launchers had been acquired, particularly for M48A3 and M551 crewmen, mortar crewmen, mechanics, and many other personnel who were normally authorized caliber .45 pistols or submachineguns.

(3) Other Weapons

As seen in Annex O and discussed in Paragraph 3c(2) above, many M113A1 APCs/ACAVs had mounted unauthorized 40mm automatic grenade launchers and 7.62mm miniguns. These weapons were used extensively in mechanized infantry units. Generally, the sources of these weapons were salvaged helicopters and Navy and Air Force base security units. Some other units had mounted unauthorized 106mm recoilless rifles.

(4) Accountability

On-hand excess weapons created an accountability problem, since very few had been recorded on unit property books. As a result, many of them were not adequately maintained. Users knew a replacement weapon was always available. In three units, weapons were seen lying around in the unit motor pool unsecured, covered with rust and mud. In other units, this problem had been recognized and steps were being taken to account for all excess and to turn in items that were not needed for operations or a reasonable maintenance float.

d. Night Vision Devices

Particularly in the tank and mechanized infantry battalions, excess passive night vision devices had been obtained. Some of these had been locally authorized by brigade or division letter, while in other units they had been acquired to meet requirements above MTOE authorizations.

e. Maintenance Equipment

Many battalion/squadron maintenance sections had acquired tools and other repair and test equipment above authorizations. These items ranged from M109 shop vans, welding equipment, air compressors, and generators to spare float engines and major components.

ANNEX C

STATUS OF EQUIPMENT

1. (U) GENERAL

This annex includes supplemental information concerning authorizations and status of equipment in the units at the time of the evaluation. Three categories of information are discussed.

2. (U) AUTHORIZATION DOCUMENT COMPARISON

In Appendix 1 is an analysis of current TOE/MTOE authorization documents by type unit. This analysis reveals certain document usage problems and apparent inconsistencies in the authorization documents.

3. (U) EQUIPMENT EXCESS AND SHORTAGE

In Appendix 2 are tables depicting quantities of mission-essential equipment on hand at the time of the evaluation. These tables show that the quantities of certain items of equipment on hand have consistently tended to be either in excess or short. In some cases these trends indicate a change in requirements.

4. (U) NONREQUIRED EQUIPMENT

Listings of items of equipment authorized by the MTOE, but which are considered unnecessary in RVN by unit commanders, are included in Appendix 3. As in Appendix 2, specific trends have developed.

APPENDICES

- 1 - AUTHORIZATION DOCUMENT COMPARISON
- 2 - EQUIPMENT EXCESS AND SHORTAGE
- 3 - NONREQUIRED EQUIPMENT

Appendix 1 (Authorization Document Comparison) to Annex C

1. (U) INTRODUCTION

a. General

A detailed analysis of the TOE/MTOE authorization documents was made to determine actual equipment authorizations in each type unit. This analysis revealed certain document usage problems in addition to significant authorization document inconsistencies in each type unit. **Samples of these inconsistencies are discussed in the attached tabs.**

b. Authorization Documents

The Army Authorization Documents System (TAADS) provides four basic types of authorization documents for each battalion/squadron organized under a MTOE. These documents and their contents are described below.

(1) Recapitulation TOE

This document contains a master table of equipment for a battalion/squadron or higher organization performing its normal mission. The table includes the total authorized equipment allowances for all subordinate elements.

(2) Summary MTOE

This document contains a master table of equipment, as modified from the Recapitulation TOE for the adaptation of its capabilities, organization, and equipment to the combat operational needs of specific units in specific locations. This is the document on which requisitions for equipment for all units in RVN are based.

(3) Detail TOE

This document prescribes the normal mission, organizational structure, and location of equipment within that structure for company or smaller sized units. It also contains a summary of the total quantities of equipment for the entire unit.

(4) Detail MTOE

This document contains Department of Army approved adjustments to the Detail TOE for company or smaller sized units. It changes equipment authorizations to meet the specific needs of particular units in specific locations. The document is patterned after the Detail TOE, but includes only those parts of an organization that are modified. It does not contain a revised equipment summary.

c. Authorization Document Usage

(1) General

Figure C-1 portrays how the family of authorization documents is used. The example applies to a type battalion/squadron which has three different types of subordinate elements, as an example: HHC, Rifle Company, and Service Company. To employ the system for this example unit, seven correctly matched documents are required. The Detail TOE documents (2, 4, and 6) must be complete with all changes. The Detail MTOE documents (3, 5, and 7) must carry the same MTOE number and effective date as the current Summary MTOE document (number 1).

(2) Correct Usage

As one example of TOE/MTOE usage, assume the MTOE recapitulation authorizes 5 widgets. In order to find their correct position in the battalion/squadron MTOE organization, a path similar to that depicted on Figure C-1 would have to be followed. First, the document 2 summary is checked. If a widget is located in company 1, according to the summary, then a check of the detailed equipment distribution within the company is made to find the widget's precise location. Second, equipped with resultant information, document 3 is checked, regardless of what was determined from document 2. If no widget was located in document 2, document 3 must still be checked to see if one was added. Conversely, if a widget was indicated in document 2, it is necessary to see if it was deleted in document 3. No mention in document 3 indicates it is still authorized. It is fundamental to remember that the Detail MTOE documents (3, 5, and 7) indicate only changes to the corresponding Detail TOE documents (2, 4, and 6). At this point a determination can be made of the number of widgets (if any) and their location in company 1. Subsequent similar steps are taken through type companies 2 and 3. At the completion of this process, the correct detailed location of each widget in the battalion/squadron should be known. As can be seen, this is an exceedingly complicated system, dependent upon the availability of complete and accurate documents.

(3) Actual Usage and Problem

(a) During the evaluation all battalion/squadron commanders, executive officers, supply officers, and property-book officers were questioned regarding their understanding of TAADS. Less than 10 percent of those interviewed had any real understanding of the system or how to request a change in authorization documents. All units had unauthorized equipment, obtained either through temporary loan or through means outside standard supply procedures. A normal request for a change in authorization had been initiated in only a very few cases.

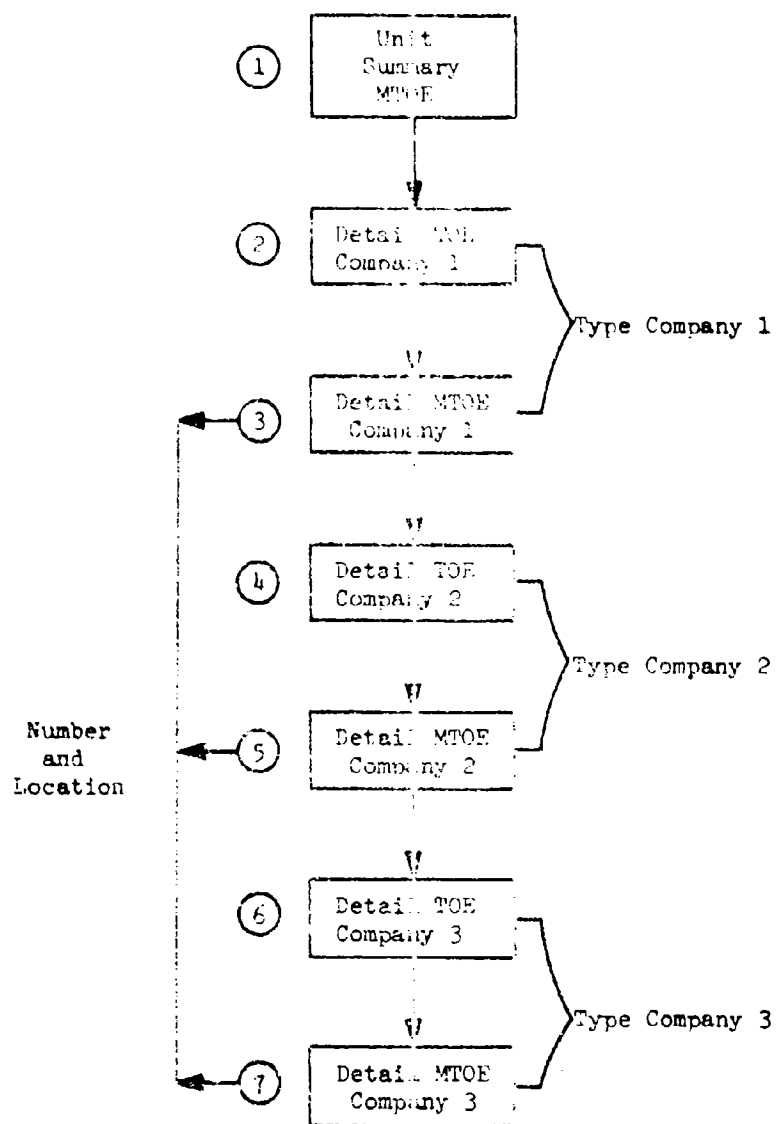


FIGURE C-1 (U). Authorization Document Usage.

(b) Most units did not possess necessary authorization documents. In some cases, the most recent Summary MTOEs were on hand, but the unit lacked the necessary Detail MTOEs; in other cases, the current Detail MTOEs were on hand, but not the matching Summary MTOE; and in other cases, the Summary or Detail MTOEs on hand were not current. Additionally, many units did not have all changes to TOEs, both Recapitulation and Detail. As a result, many units had failed to requisition equipment useful for the performance of the unit mission, or the unit did not know where authorized on-hand equipment belonged in the unit.

(c) There were many apparent inconsistencies between the Detail MTOEs, and the corresponding Summary MTOE. For example, the authorized totals of the Detail MTOEs for a given line number did not correspond to the Summary MTOE total. Samples of inconsistencies are indicated in tabs to this appendix.

(d) The omission of on-hand equipment in the MTOE was a complicating factor. There were standardized items of equipment that had been in the theater for a considerable time, originally authorized by letter or telegram, that had not been included in appropriate MTOEs. Examples of such items were the Night Vision Sight, Crew Served Weapon, AN/TVS-2; the Night Vision Sight, Miniaturized, AN/PVS-3; and, the voice security equipment, TSEC/KY38. This resulted in a lack of standardized authorizations or approved BOI for on-hand quantities of these items. One battalion had on hand more TSEC/KY38s than considered necessary, while another similar-type unit in the same division, had less than were required.

(e) In general, most personnel interviewed were confused as to precisely what equipment they were authorized by the MTOEs. (Although not included in this study, this problem was equally apparent for personnel). A fundamental problem was the apparent breakdown in field distribution of newly published authorization documents. It is essential that units organized under a MTOE receive the Summary and Detail documents soon after publication. There was normally a three month lag between publications of the Summary MTOE and the Detail MTOE. Ideally, these documents should be published at the same time.

2. (U) METHODOLOGY

As described above, several documents had to be correlated to ascertain the correct MTOE authorization and the location for each item of equipment within an organization. Where MTOE discrepancies appeared to exist, this document correlation has been accomplished. Figure C-2 explains the format used in this process.

- (1) Quantity authorized each section/platoon by Detail TOE document.
- (2) Quantity authorized each section/platoon by Detail MTOE document.
- (3) Total quantity authorized company/troop by Detail TOE document.
- (4) Total quantity authorized company/troop by Detail MTOE document.
- (5) Total of quantity authorized battalion/squadron by Detail TOE document.
- (6) Total of quantity authorized battalion/squadron by Detail MTOE document.
- (7) Quantity authorized in battalion/squadron by Recapitulation TOE document.
- (8) Quantity authorized in battalion/squadron by Summary MTOE document.

FIGURE C-2 (U). Methodology of TOE/MTOE Document Comparison (Format Used in Figures C-3 thru C-7).

TABS

- A - ARMORED CAVALRY SQUADRON, ACR
- B - ARMORED CAVALRY SQUADRON, DIVISIONAL
- C - SEPARATE ARMORED CAVALRY TROOP
- D - TANK BATTALION
- E - MECHANIZED INFANTRY BATTALION

Tab A (Armored Cavalry Squadron, ACR) to Appendix 1 to Annex C.

1. (U) TOE/MTOE DOCUMENTS

The TOE/MTOE documents applicable at the time of the evaluation are summarized below:

<u>Unit Type Document</u>	<u>TOE</u>	<u>Date</u>	<u>MTOE</u>	<u>Effective</u>
ARMD CAV SQDN (Recapitulation/Summary)	17-55G	31 Oct 66	17-55GPO1	25 Jul 69
HHT (Detail)	17-56G	31 Oct 66	17-056G(1/69)	25 Jul 69
ARMD CAV TRP (Detail)	17-57G	31 Oct 66	17-057G(1/69)	25 Jul 69
TANK CO (Detail)	17-27G	31 Oct 66	17-027G(1/69)	25 Jul 69
HOW BTRY (Detail)	6-37G	30 Sep 66	06-037G(1/69)	25 Jul 69

2. (U) TOE/MTOE AUTHORIZATION DOCUMENT COMPARISON

Figure C-3 is a comparison of the TOE/MTOE authorization documents for the regimental armored cavalry squadrons. Items of equipment are included where apparent discrepancies exist. The format for this table is explained in Figure C-2.

3. (U) DISCUSSION OF DISCREPANCIES

a. M113A1 APC/ACAV

The Detail MTOE and Summary MTOE totals agree on the authorization for 100 M113A1 vehicles for each squadron; however, both are incorrect. Each document shows six M113A1 scout vehicles authorized per cavalry platoon scout section. In 1969, three M551 AR/AAV's were issued to each platoon and two M113A1 scout vehicles were deleted. Neither of the MTOE documents reflect the deletion of 18 M113A1's from each squadron. Total authorization for the squadron in both these documents should be 82 M113A1 vehicles.

b. M114 Command and Reconnaissance Vehicle

The squadron Summary MTOE authorizes three M114 vehicles. This is an apparent residual error, as all M114 vehicles have been replaced by the M113A1.

Item	Squadron HHT										Armd Cav Trp										Tank Co				How Btry				Tot	Discussion																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry			Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	Infantry	In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FIGURE C-3 (U). TOE/ATOE Document Comparison, Regimental Armored Cavalry Squadrons.

c. Flamethrower Service Units, XM45E1 and M4A2

As indicated in Figure C-3, the HHT Detail MTOE indicates three XM45E1 track-mounted flame service units and no M4A2 truck-mounted flame service units. However, the squadron Summary MTOE authorizes three M4A2 service units and no XM45E1 service units. The XM45E1 is not a standard "A" item, and this is the apparent cause of this discrepancy.

d. Recovery Vehicles, M88 and M578

Figure C-3 shows that the squadron Summary MTOE authorizes five M88 medium recovery vehicles, while the Detail MTOEs total two M88's and five M578's. This discrepancy is assumed to have arisen from the two variations contained in TOE 17-55G. The first TOE variation is for a squadron equipped with the M551 AR/AAV which authorizes two M88's and four M578's. The second TOE variation is for a squadron equipped with the main battle tank which authorizes four M88's and two M578's. Apparently, when computing the Summary MTOE, the latter TOE variation was used as a basis for computation. The squadron MTOE 17-55P01 should reflect two M88's and five M578's. The seventh squadron recovery vehicle (one M578) was authorized by MTOE for the howitzer battery.

e. Radio Set AN/VRC-46

Although the Detail MTOE totals and the squadron Summary MTOE quantity agreed, there was an error in both documents. Currently, there is an AN/VRC-46 radio authorized in each cavalry troop headquarters section for use on the commander's M113A1 vehicle in place of the AN/VRC-12 authorized by TOE. This is not in accordance with the conventional configuration. The reason for this discrepancy could not be determined. The squadron Summary MTOE should authorize 65 AN/VRC-46 radios (instead of 69) and the Detail MTOE for the cavalry troop should reflect three AN/VRC-46 radios (not four) in the troop headquarters section.

f. Radio Set AN/VRC-12

Several discrepancies were noted in AN/VRC-12 radio authorizations.

(1) MTOE 17-056G(1/69) - HHT, Squadron Headquarters Section

The TOE authorized three AN/VRC-12 radios for use in the M114 command vehicles. The MTOEs deleted the M114's and added three M113A1's. However, no radios were authorized for these vehicles.

(2) MTOE 17-057G(1/69) - Cavalry Troop

(a) Troop Headquarters Section

The discrepancy in AN/VRC-12 radios in this section is as explained in paragraph 3e, above.

(b) Cavalry Platoon Scout Section

The MTOEs authorized one additional AN/VRC-12 for each scout section. This gives one scout vehicle an AN/VRC-12 in addition to an AN/VRC-46 or AN/GRC-129 radio. The AN/VRC-12 is not required.

(3) MTOE 17-027G(1/69) - Tank Company

Although the tank company Detail MTOE indicates a total of eight AN/VRC-12 radios mounted in tanks, the squadron MTOE Summary authorizes only six. This leaves two tanks in the tank company without an authorized radio.

(4) The correct authorization for AN/VRC-12 radios in the squadron should be as follows:

	<u>UNIT TYPE</u>	<u>SECTION</u>	<u>PROPER AUTHORIZATION</u>
17-056G(1/69)	HMT	Sqdn Hq	3
17-057G(1/69)	CAV TRP	Trp Hq	1
		3 Plt Hq	3
		3 Tank Sec	3 (7 Trp Total)
17-027G(1/69)	TANK CO	Co Hq	2
		3 Tank Plt	6 (8 Co Total)
17-55GP01(1/69)	SQDN	N/A	32

Tab B (Armored Cavalry Squadron, Divisional) to Appendix 1 to Annex C

1. (U) TOE/MTOE DOCUMENTS

The TOE/MTOE documents in effect at the time of the evaluation are summarized below:

<u>Unit Type Document</u>	<u>TOE</u>	<u>Date</u>	<u>MTOE</u>	<u>Effective</u>
ARMD CAV SQDN (Recapitulation/Summary)	17-105G	31 Mar 66	17-105GP01	5 Feb 70
HHT (Detail)	17-106G	31 Mar 66	--	--
ARMD CAV TRP (Detail)	17-107G	31 Mar 66	--	--

MTOE 17-105GP01 was applicable for all squadrons except the 3rd Squadron, 5th Cavalry, which had a separate squadron MTOE recapitulation document, dated 23 January 1970. Detail MTOE documents for MTOE Summary 17-105GP01 were not on hand at HQ USARV or in any divisional cavalry squadron during the evaluation.

2. (U) TOE/MTOE AUTHORIZATION DOCUMENT COMPARISON

It was not possible to make a comparison of authorization documents of the troops of the divisional cavalry squadrons because the Detail MTOE documents were not available. For all units, Summary MTOE documents were published and made effective several months before corresponding Detail MTOE documents were published. This made it very difficult for unit commanders to determine where a piece of equipment was either added or deleted in their organization. This problem was further complicated in the divisional cavalry squadrons with the detached status of the air cavalry troop. These troops, in all cases except one, maintained separate property books. When quantities of equipment authorized for the air cavalry troop by detail MTOE were subtracted from the squadron Summary MTOE total, the remaining total often did not equal that authorized by the Detail MTOE of HHT and the line troops. This caused problems in equipment allocations at unit level.

3. (U) DISCUSSION OF DISCREPANCIES

Items of equipment where significant differences exist between the latest Summary MTOE document and the latest available Detail MTOE document are summarized below:

<u>ITEM</u>	<u>Summary</u> <u>MTOE</u>	<u>Detail</u> <u>MTOE Total</u>
Truck, Cargo, 2-1/2T, M35	19	18
Truck, Cargo, 5T, M54	8	10
Radio Set, AN/VRC-47	16	18
Radio Set, AN/PRC-25	21	15
Tracked Cargo Carrier, M548	11	10

Tab C (Separate Armored Cavalry Troops) Appendix 1 to Annex C

1. (U) TOE/MTOE DOCUMENTS

The TOE/MTOE documents in effect at the time of the evaluation are summarized below:

<u>Unit Type Document</u>	<u>TOE</u>	<u>Date</u>	<u>MTOE</u>	<u>Effective</u>
ARMD CAV TRP (Recapitulation/Summary)	17-57G	31 Oct 66	17-57GP01	17 Dec 69
ARMD CAV TRP (Detail)	--	--	--	--

Detail MTOE documents for Summary MTOE 17-57GP01 were not on hand at HQ USARV or in any separate cavalry troop during the evaluation. Copies of draft input data were used for evaluation purposes and for completing Figure C-4.

2. (U) TOE/MTOE AUTHORIZATION DOCUMENT COMPARISON

Figure C-4 is a comparison of the TOE/MTOE authorization documents. Items of equipment are included where apparent discrepancies existed. Format for this table is explained in Figure C-2.

3. (U) DISCUSSION OF DISCREPANCIES

a. Recovery Vehicles, M88 and M578

The troop MTOE Summary authorized one M88 medium recovery vehicle while the Detail TOE/MTOE indicated one M578 light recovery vehicle. This discrepancy is assumed to have developed from the two variations in TOE 17-57G. The first TOE variation authorized one M578 for a troop equipped with the M551 AR/AAV. The second TOE variation authorized one M88 for a troop equipped with the main battle tank. Apparently when developing the Summary MTOE document, the latter TOE variation was used.

b. Passive Night Vision Devices

The Detail TOE/MTOEs indicate a total of 20 individual type passive night vision devices and 36 crew-served devices, while the Summary MTOE authorizes 29 and 27, respectively. The reason for this discrepancy could not be determined.

ITEM	Trp Lg Sec	Enl Caval Sec	Maintenance Sec	Mess Tm	3 Cav Plt Hq	3 Scout Sec	3 Tank Sec	3 Rifle Sqd	3 Spt Sqd	TOTAL Detail Dist.	Troop Recapitulation Summary Totals	Discussion Paragraph
M58		1								0	1	3a
M575		1								1	1	3a
Individual NVD	2				12	12	6	20	20	20	20	3b
Crew NVD	0	2	2		3	12	9	3	3	36	36	3b
AN/VRC-12	1				3		3			7	7	3c
AN/VRC-46	2	1				6				16	12	3d

FIGURE C-4 (U). TOE/MTDE Document Comparison, Separate Cavalry Troops.

c. Radio Set, AN/VRC-12

The troop Detail MTOE and the Summary MTOE authorized six AN/VRC-12 radios. Both are in error. In TOE 17-57G, the troop commander's M114 command and reconnaissance carrier was authorized one AN/VRC-12 radio. The MTOEs deleted the M114 and the associated AN/VRC-12 and authorized one M113A1 APC/ACAV with one AN/VRC-46 radio. This is not in accordance with conventional configurations for command vehicles. The correct MTOE authorizations for AN/VRC-12 radios should be seven, with one added to the troop headquarters section.

d. Radio Set, AN/VRC-46

As shown in Figure C-4 (Tab C), the troop Detail MTOE indicates a total of 11 AN/VRC-46 radios, while the Summary MTOE authorized only four radios. These two documents placed the AN/VRC-46 radio in the following locations:

Detail MTOE			Summary MTOE	
<u>Qty VRC-46</u>	<u>Vehicle</u>	<u>Section</u>	<u>Qty VRC-46</u>	<u>Vehicle</u>
1	M113A1	Trp Hq	3	1/4-Ton
3	1/4-Ton	Trp Hq	1	M578
1	M578	Maint		
6	M113A1	3 Scout		
<hr/>			<hr/>	
11			4	

Both authorizations are believed incorrect. The authorization in both documents should be as follows:

<u>Qty VRC-46</u>	<u>Mtd in Type Vehicle</u>	<u>Section</u>
3	1/4-Ton	Trp Hq
1	M578	Maint
6	M113A1	3 Scout
<hr/>		
10		

Tab D (Tank Battalion) to Appendix 1 to Annex C

1. (U) TOE/MTOE DOCUMENTS

The TOE/MTOE documents in effect at the time of the evaluation are summarized below:

<u>Unit Type Document</u>	<u>TOE</u>	<u>Date</u>	<u>MTOE</u>	<u>Effective</u>
Tank Battalion (Recapitulation/Summary)	17-35G	31 Mar 66	17-35GP01	10 Dec 69
HHC (Detail)	17-36G	31 Mar 66	--	--
Tank Company (Detail)	17-37G	31 Mar 66	--	--
Service Company (Detail)	17-37G	31 Mar 66	--	--

Detail MTOE documents for MTOE Summary 17-35GP01 were not on hand at HQ USARV or in any tank battalion during the evaluation. Copies of draft MTOE input data were used for evaluation purposes and for completing Figure C-5.

2. (U) TOE/MTOE AUTHORIZATION DOCUMENT COMPARISON

Figure C-5 is a comparison of the TOE/MTOE authorization documents for the tank battalion. Sample items of equipment are included where apparent discrepancies existed. The format for this table is as explained in Figure C-2.

3. (U) DISCUSSION OF DISCREPANCIES

a. Searchlight, 23-inch Xenon

The draft Detail MTOE and the Detail TOE documents provided for 18 searchlights. The Summary MTOE provided for 23 searchlights. The discrepancy evolved through the addition to the battalion of the HQ section of the service company, which, in its TOE organization as a tank company, was authorized five searchlights. Although deleted in the draft document, the five searchlights were never subtracted from the MTOE summary total.

b. Tank, Trailer Mounting, 600-gallon

The draft Detail MTOE for the service company did not authorize

ITEM	Battalion HHC										Tank Co	Service Co										
	Bn Hq	Co Hq	Bn Plt Sec	3d, Curvl Plt	Comp Plt	Scout Plt	Heavy Mort Plt	Bn Plt Sec	Air Cont Bn	HHC Total	Co Hq	3 Trk Plt	3 Trk Co Total	Co Hq	1st Plt	Maint Plt	Vel Plt	AT Plt Sec	AT Plt Total	Detail Total	Summary Detail	Discussion
Searchlight, Xenon 23-inch																						
Tank, 600-gallon																						
Maintenance Tent																						
Maintenance Tent Liner																						
at Observation Co, AN-TH-4																						

* Company not organized under TOE. Co Hq authorized five searchlights and one MOD by TOE.

FIGURE C-5 (U). TOE/TOE Document Comparison, Tank Battalion.

either tank and pump units or 600-gallon tanks for the transportation section as had the TOE. The Summary MTOE, however, provided authorization for five tanks.

c. Maintenance Tent and Liner

Maintenance tents were not authorized by TOE. The MTOE authorized maintenance tents for the maintenance sections of the tank companies, the maintenance section of the service company, and the battalion maintenance platoon. The HHC maintenance section was not authorized a tent. Tent liners were authorized for the HHC and service company maintenance sections and for the maintenance platoon. It appears that the HHC maintenance section should have had a tent, but it was omitted in both Summary and Detail MTOEs.

d. Night Observation Device (NOD), AN/TVS-4

The MTOE and TOE authorizations for the NOD were the same, except for the addition of one NOD in the MTOE for the company headquarters of the service company. The MTOE of the service company was based on a tank company TOE, which had a NOD. The NOD was not deleted by the MTOE, even though the company HQ had no tactical requirement for the equipment.

Tab E (Mechanized Infantry Battalion) to Appendix 1 to Annex C

1. (U) TOE/MTOE DOCUMENTS

The TOE/MTOE documents in effect at the time of the evaluation are summarized below:

<u>Unit Type Document</u>	<u>TOE</u>	<u>Date</u>	<u>MTOE</u>	<u>Effective</u>
Mech Inf Battalion (Recapitulation/Summary)	7-45G	31 Mar 66	7-45GPO1	25 Feb 70
HHC (Detail)	7-46G	31 Mar 66	7-46G(1/70)	25 Feb 70
Rifle Company (Detail)	7-47G	31 Mar 66	7-47G(1/70)	25 Feb 70
Service Company (Detail)	7-47G	31 Mar 66	7-47G(3/70)	25 Feb 70

Updated TOE documents 7-45G (dated 27 Oct 69) and 7-46G, 7-47G, and 7-48G (dated 12 Sep 69) were on hand in some units. These documents had not been received by HQ USARV, and no implementing instructions had been formulated for reorganization, if applicable to RVN.

2. (U) TOE/MTOE AUTHORIZATION DOCUMENT COMPARISON

Figure C-6 is a comparison of the TOE/MTOE authorization documents listed in paragraph 1. Items of equipment are included where apparent discrepancies existed. The format for this table is as explained in Figure C-2.

3. (U) DISCUSSION OF DISCREPANCIES

a. Antenna, RC 292

TOE documents authorized nine RC 292 antennas, the Summary MTOE authorized 12 antennas, and the Detail MTOE showed 15 antennas. Two antennas were authorized in the rifle company headquarters. With the MTOE organization of the service company TOE, two antennas remained in the new headquarters. These antennas were not picked up in summary totals. The antenna remaining, over the summary total, could not be explained.

ITEM	Bn Hq	Co Hq	Bn Hq Sec	Gnd Survl Sec	Commo Plt	Scout Plt	Hvy Mort Plt	Air Cont Tm	Mech Flame Plt	HHC Total	Co Hq	3 Rifle Plts	Wans Plt	3 Rifle Cos Total	Co Hq	Sgt Plt	Maint Plt	Med Plt	Svc Co Total	Detail Total	Summary Total	Discussion	Paragraph
Antenna, RC-292			3	4						3	2			3	2*				3*	3	3	3	
Carrier, M548																2	1		2	2	2	2	
Tank & Pump Unit																2			4	4	4	4	
Tank, 600-Gallon																2			2	2	2	2	
Truck, 5-Ton																2			2	2	2	2	
Drum, Fabric, 250-Gallon																2			2	2	2	2	
Public Address System, AN/PIQ5																			2	2	2	2	

Note: * Company not organized under TOE. Co Hq authorized two RC-292 by TOE.

FIGURE C-6 (U). TOE/MTOE Document Comparison, Mechanized Infantry Battalion.

b. Tracked Cargo Vehicle, M548

The M548 was not authorized by TOE. The Detail MTOE document for the service company provided one M548 for the maintenance platoon and eight for the transportation section. The Summary MTOE authorized 11 M548's for the battalion. The quantity of M548's authorized by the Summary MTOE changed three times since the evaluation started. In the current Summary MTOE no change was indicated in the "change" columns of the document, even though there had been an increase of two vehicles.

c. Tank and Pump Unit

The Detail TOE authorized four tank and pump units for the support platoon. The Detail MTOE deleted the entire support platoon from HHC. When the support platoon was added to the service company, the tank and pump units were not included. Thus, none were authorized by the detail documents. The Summary MTOE authorized four tank and pump units. There was considerable confusion over this issue.

d. Tank, Trailer Mounting, 600-gallon

Remarks pertinent to the tank and pump unit apply.

e. Truck, Cargo, 5-Ton, M54

The Detail TOE authorized 14 M54 trucks for the support platoon. The MTOE, after the addition of the M548, reduced this authorization. The MTOE summary document calls for 12, while the detail documents call for six. Most units had more than six on hand. The situation with the M54, relative to frequency of authorization change, is similar to that of the M548.

f. Drum, Fabric, 250-gallon

No 250-gallon drums were authorized by TOE. The Detail MTOE authorized one drum for the support platoon. The MTOE summary document authorized seven drums. This is believed to be a typographical error.

g. Public Address System, AN/PlQ5

No public address systems were authorized by TOE. None of these items were reflected in the Detail MTOE. The Summary MTOE authorized 13 of these items. They were not listed in previous summary documents, yet the "change" column indicates "no change". There is no basis given for distribution of these items to subordinate elements of the battalion.

Appendix 2 (Equipment Excess and Shortage) to Annex C

1. (U) INTRODUCTION

Tabs to this appendix list on-hand quantities of significant items of equipment in each unit during the evaluation. Items are identified in column (a); the quantity authorized by the unit MTOE recapitulation document is shown in column (b); and the remaining lettered columns indicate quantities on hand over (+) or under (-) the quantity authorized in each unit visited. Lack of an entry indicates that on-hand quantities equalled MTOE authorizations.

2. (U) SPECIAL CONSIDERATIONS

Items annotated with an asterisk (*) indicate an average of the estimates by unit personnel of the quantity of a given item of equipment on hand. All personnel, while aware of unaccounted excess, did not know the exact quantities. Some equipment had been authorized by USARV letter authorizations. Records of these authorizations were incomplete in all units. For purposes of the TOE/MTOE evaluation the equipment was considered unauthorized.

TABS

- A - ARMORED CAVALRY SQUADRON, ACR
- B - ARMORED CAVALRY SQUADRON, DIVISIONAL
- C - SEPARATE ARMORED CAVALRY TROOP
- D - TANK BATTALION
- E - MECHANIZED INFANTRY BATTALION

Tab A (Armored Cavalry Squadron, ACR) to Appendix 2 to Annex C

a Item	b MTOE Auth	Units			Notes
		c	d	e	
<u>Combat Vehicles</u>					
M113A1 APC/ACAV	82		+1		MTOE auth based on detail total
M48A3 Tank	17		+1		
M551 AR/AAV	27				
<u>Combat Support Vehicles</u>					
M109 155mm How SP	6				
M106A1 4.2" Mortar Carrier	9		-9		
M125A1 81mm Mortar Carrier	0		+6		
M132A1 Flamethrower	3		-2		
AVLB	3				
<u>Combat Service Support Vehicles</u>					
M577A1 Command Post Carrier	10				MTOE auth based on detail total
M88 Medium Recovery Vehicle	2				
M578 Light Recovery Vehicle	5	-1	-2	-1	MTOE auth based on detail total
M45E1 Flame Service Unit	0	+2		+1	
M4A2 Flame Service Unit	3	-3	-3	-3	
M543A2 Wrecker	3			-1	
M548 Tracked Cargo Carrier	18	-7	-3	-4	
M35 2 1/2-ton Cargo Truck	23	-4	+4	+1	
M54 5-ton Cargo Truck	18		-1	-2	
M109 Shop Van	0	+4	+2	+4	
5000-gal Tanker & Tractor	2				
<u>Weapons</u>					
4.2" Mortar	0	+9		+9	MTOE & BII MTOE & BII 44 Auth BII
81mm Mortar	9	-9		-9	
M79 40mm Grenade Launcher	119				
M2, Cal .50 Machinegun	215	+18*	+41*	+15*	
M60 7.62mm Machinegun	209	+60*	+48*	+28*	
M13 7.62mm Machinegun	0	+5*	+12*	+10*	
Armament Subsystems "A" & "B"	38	+3	+4	+3	

a Item	b MTOE Auth	Units			Notes
		c	d	e	
<u>Communications Equipment</u>					
<u>Radio Sets</u>					
AN/VRC-12	36	-18	-19	+3	
AN/VRC-46	68	+49*	+68*	+15*	
AN/VRC-47	20	-14	-10	-7	
AN/VRC-53/64	46	-16	-19	-20	
AN/GRC-125/160	33	-20	-17	-8	
AN/PRC-25/77	12		+1	+6	
AN/GRC-106	11				
AN/VRC-24	3				
AN/VRC-29	3			+1	
AN/VRC-49	1		-1		
<u>Speech Security Equipment</u>					
TSEC/KY-8	2				
<u>Other</u>					
Tank Mounted Dozer	1				
Radar Set AN/PPS-4	0	+6	+7	+7	
Radar Set AN/PPS-5	10	-9	-8	-9	
Metallic Mine Detector	11	+4	+5	+9	
AN/PSR-1	48	-39	-4	-16	
AN/GSS-9	0			+6	
AN/GSQ-151 (PSID)	0		+7		
ML8 IR Binoculars	17	+5	-5	0	
Metascope, AN/PAS-6	47	-18	-7	-11	
Binocular, IR Driving,					
Metallic Body	34	-34	-27	-34	
Starlight Scope AN/PVS-1/2/3	66	-10	+30	+9	
Night Vision Sight AN/TVS-4	11	-5		-2	
Searchlight 23" Xenon (M48A3)	17	+5	-5		
Searchlight (VSS-3) (M551)	0	+27	+21	+27	
Water Trailer	12				
Tank & Pump Unit	2	+5	+4	+4	
Drum, 500-gallon	10	+4	+8	+20	
Drum, 250-gallon	0		+7	+2	

Tab B (Armored Cavalry Squadron, Divisional) to Appendix 2 to Annex C

a Item	b** MTOE Auth	Units					Notes
		c	d	e	f	g	
<u>Combat Vehicles</u>							c and d Equipped with M48A3 Tank; e-g Equipped with M551 AR/AAV
M113A1 APC/ACAV	73			+10		-1	
M48A3 Tank	27			N/A	N/A	N/A	
M551 AR/AAV	27	N/A	N/A				
<u>Combat Support Vehicles</u>							
M106A1 4.2" Mortar Carrier	0					+9	
M125 81mm Mortar Carrier	9	-9	-2	-9	-3	-9	
M132A1 Flamethrower	4		-4	-4			
MPAB	0			+2			
<u>Combat Service Support Vehicles</u>							
M577A1 Command Post Carrier	6						
M58 Medium Recovery Vehicle	5				-3		
M578 Light Recovery Vehicle	0				+3		
M445E1 Service Unit	2		-2	-2		-2	
M4A2 Service Unit	0						
M543A2 Wrecker	3						
M548 Tracked Cargo Carrier	11	-4	-5	-1	-2	-1	
M35 2 1/2-Ton Cargo Truck	19		-1	-1		-1	
M54 5-Ton Cargo Truck	8	+2	+7	+4	+2	+2	
M109 Shop Van	0	+1		+1	+1		
M49C Fuel Truck	0	+1		+1			
<u>Weapons</u>							
4.2" Mortar	0					+6	
81mm Mortar	9	-9				-6	
106mm Recoilless Rifle	0				+3		
90mm Recoilless Rifle	0	+15					
M79 40mm Grenade Launcher	97		+5	+3	-7	-3	

a Item	b MTOE Auth	Units					Notes
		c	d	e	f	g	
M2 Cal .50 Machinegun	149	+3*	+12*	+50*	+17*	+46*	MTOE & BII
M60 7.62mm Machinegun	151	+34*		+36*	+20*		MTOE & BII
M73 7.62mm Machinegun	0	+2	+7	+12*		+10*	27 Auth BII
Minigun	0			+1			
Armament Subsystem "A" & "B"	71		+6	+12	+2	-30	
<u>Communications Equipment</u>							
<u>Radio Sets</u>							
AN/VRC-12	23	+1		-10	-5		
AN/VRC-46	50	+17*	+15*	+66*	+30*	+53*	
AN/VRC-47	16	+4	+5	+25*	-3	-3	
AN/VRC-53	34		-5	+11	-3	-2	
AN/GRG-125/160	27		+2	-11	-5	-4	
AN/PRG-25/T7	21	-7	-5	-11	-7	-0	
AN/GRG-106	6			-4	-3	-2	
AN/VRC-24	1				+1		
AN/VRC-29	2					-1	
AN/VRC-49	1						
<u>Speech Security Equipment</u>							
TSEC/KY-8	2	+12	+7	+16	+3		
TSEC/KY-38	0				+6	+4	
<u>Other</u>							
Radar Set AN/PPS-4	0	+1	+2	+1		+5	
Radar Set AN/PPS-5	6	-4	-5	-3	-6	-4	
Metallic Mine Detector	1	+19	+5	+11	+1	+9	
Non-Metallic Mine Detector	1	-1	-1	-1	-1	-1	
AN/PSR-1	0		+6	+7		+2	
AN/GSS-9	0		+9	+7			
AN/GSQ-151 (PSID)	0	+2				+5	
M18 Binoculars	0				+27		
Metascope, AN/PAS-6	47	-19	-9	-20	-34	-21	
Binocular, IR Driving, Metallic Body	24	-24	-24	-24	-24	-24	
Starlight Scope							
AN/PVS-1/2/3	64		-6	-11	-1		
Night Vision Sight							
AN/TVS-2	0	+12	+15	+48	+41	+10	

a Item	b MTOE Auth	Units					Notes
		c	d	e	f	g	
Night Observation Device AN/TVS-4	15	-7	-9	-8	-7	-11	*M551 Equipped
Searchlight 23" Xenon (M55A3)	15	+10	+22	-15*	-15*	-15*	
Searchlight (VSS-3) (M551)	0			+27	+27	+27	
Water Trailer	5			+2	+1		
Tank & Pump Unit	5			-3		-3	
Drum, 500-gallon	5		+4	-1	-1	+1	
Drum, 250-gallon	0				+3		

** Column b, MTOE Authorized Quantities Are Less Air Cavalry Troop.

Tab C (Separate Armored Cavalry Troop) to Appendix B to Annex C

a Item	b MTOE Auth	Units					Notes
		c	d	e	f	g	
<u>Combat Vehicles</u>							
M113A1 APC/ACAV	22	-3		+2			
M551 AR/AAV	27						
<u>Combat Support Vehicles</u>							
M106A1 4.2" Mortar Carrier	0	+1	+3	+1			
M105A1 160mm Mortar Carrier	3	-2	-3	-2			
AVLB	0			+1			
<u>Combat Service Support Vehicles</u>							
M577A1 Command Post Carrier	1						
M58 Medium Recovery Vehicle	1	-1	-1	-1	-1		
M578 Light Recovery Vehicle	0	+1	+1	+1	+1	+1	
M543A2 Wrecker	0			+1			
M548 Tracked Cargo Carrier	0	+2	+1		+1		
M35 2 1/2-Ton Cargo Truck	2			+3	+1		
M490 Fuel Truck	0			+1			
<u>Weapons</u>							
4.2" Mortar	0			+1			
81mm Mortar	3						
M79 40mm Grenade Launcher	34	-6	-5	+6	+5	-4	
M2 Cal .50 Machinegun	35	+9*	+8*	+11*	+2	+8*	MTOE & B11
M60 7.62mm Machinegun	54	+20*	+9	+14*	+14*	+9*	MTOE & B11
M73 7.62mm Machinegun	0				+1		9 Auth B11
<u>Communications Equipment</u>							
<u>Radio Sets</u>							
AN/VRC-12	3			+1	+1	+1	
AN/VRC-46	4	+17*	+20*	+32*	+11	+21*	
AN/VRC-47	2	+4	+6	+11*	+2	+4	
AN/VRC-53	10	-7	-10	-6	-7	-10	
AN/VRC-125/160	11	-2	+1	-7			
AN/PRC-25/77	3	+3			+1	+7	
AN/GRC-106	1						

a Item	b MTOE Auth	Units					Notes
		c	d	e	f	g	
<u>Speech Security Equipment</u>							
TSEC/KY-8	0	+1				+1	
TSEC/KY-38	0	+4	+1				
<u>Other</u>							
Radar Set AN/PPS-4	0		+2	+1	+1	+2	
Radar Set AN/PPS-5	2	-2	-2	-2	-1	-2	
Metallic Mine Detector	3		-1	-1	-2		
AN/PSR-1	12	-12	-12	-12	-12	-12	
M18 IR Binocular	9	-1		+1		-9	
Metascope, AN/PAS-6	13	-13	-5	-9	-5	-13	
Binocular, IR Driving Metallic Body	6	-6	-6	-6	-6	+1	
Starlight Scope AN/PVS- 1/2/3	29	+9	-3	+3	-8	-10	
Night Vision Sight AN/TVS-2	27	-22	-11	-8	+17	-7	
Night Observation Device AN/TVS-4	3	-3	-3	-2	-3	-3	
Searchlight (VSS-3)(M551)	0	+8	+9	+9	+10	+9	
Water Trailer	1			+1		+1	
Tank, 600-gallon	0				+1		
Drum, 500-gallon	0	+2	+2			+2	
Drum, 250-gallon	0	+1	+1				

Tab D (Tank Battalion) to Appendix 2 to Annex C

a Item	b MTOE Auth	Units			Notes
		c	d	e**	
<u>Combat Vehicles</u>					
M113A1 APC/ACAV	19	-1			
M48A3 Tank	54		-1		
<u>Combat Support Vehicles</u>					
M106 4.2" Mortar Carrier	4				
AVLB	2				
<u>Combat Service Support Vehicles</u>					
M577A1 Command Post Carrier	7				
M60 Medium Recovery Vehicle	5			+1	
M543A2 Wrecker	2				
M548 Tracked Cargo Carrier	9	-1	-4	-1	
M35 2 1/2-Ton Cargo Truck	23		-1	-3	
M54 5-Ton Cargo Truck	12		-1		
M109 Shop Van	0		+2	+3	
M49C Fuel Truck	1		-1	-1	
M50C Water Truck	0	+1			
M151 Utility Truck	33	-2	-8	-5	
<u>Weapons</u>					
M2 Cal .50 Machinegun	117	+37*	+53*	+43*	
M60 7.62mm Machinegun	40	+10*	+12*	+20*	
M73 7.62mm Machinegun	54		+15*	+10*	
MT9 40mm Grenade Launcher	25	+35*	+45*	+27*	
Armament Subsystem "A"	16	+3	+3	+3	
Armament Subsystem "B"	4				
<u>Communications Equipment</u>					
<u>Radio Sets</u>					
AN/VRC-12	27	+2	+2	-2	
AN/VRC-46	22	+3	+16	+2	
AN/VRC-47	25		-6	+1	
AN/VRC-49	1				
AN/VRC-53/64	38	-2	-2	+6	
AN/GRC-125/160	10				
AN/PRC-25/77	6		+10	+2	
AN/GRC-106	2	-1		-1	
AN/VRC-29	0		+1		

a Item	b MTOE Auth	Units			Notes
		c	d	e**	
<u>Accessories</u>					
RC-292 Antenna	14	-3	+7	+4	
AB-577 Antenna Base	0		+1	+1	
<u>Speech Security Equipment</u>					
TSEC/KY-3	2				
TSEC/KY-38	0	+7	+4	+13	
<u>Other</u>					
Tank Mounted Dozer	3	-3		-1	
Radar Set AN/FPS-4	0			+1	
Radar Set AN/FPS-5	2		-1	-1	
Metallic Mine Detector	7	-4	+19	+1	
Non-Metallic Mine Detector	5		-1	-3	
AN/GSQ-151 (PSID)	0	+1	+4	+4	
IR Weapon Sight	79	-78		-50	
Metascope, AN/PAS-6	19	-8		-8	
Starlight Scope, AN/PVS-1/2/3	12	+28	+28	+6	
Night Vision Sight, AN/TVS-2	0	+21	+46	+12	
Night Observation Device, AN/TVS-4	8	-4	-1	-2	
M18 12 Binocular	26	+18	+18	+4	
Searchlight, 23" Xenon	23	+23	+21	+4	
Water Trailer	5		+1	+4	
Tank & Pump Unit	0	+4	+4	+4	
Tank, 600-gallon	0	+1	+6	+5	
Drum & Pump Unit	2	-2	-2	-2	
Drum, 500-gallon	14	-6	-2	-7	
Drum, 250-gallon	8	-8	-8	-8	

** Battalion Authorization for HHC, Service Company and Only One Tank Company.

Tab E (Mechanized Infantry Battalion) to Appendix 2 to Annex C

a Item	b MTOE Auth	Units								Notes
		c	d	e	f	g	h	i	j	
<u>Combat Vehicles</u>										
M113A1 APC/ACAV	64	-3	+2		-2					
<u>Combat Support Vehicles</u>										
M106A1 4.2" Mortar Carrier	4	+1					+1	-1		
M105A1 81mm Mortar Carrier	9	-1	-1			-3	-4	-2	-4	
M132A1 Flamethrower	4		-2		-2			-1	-1	
MTAB	0				+2	+2		+2	+2	
<u>Combat Service Support Vehicles</u>										
M557A1 Command Post Carrier	7	-1							-1	
M543 Tracked Cargo Carrier	11		-4	-4	-6	-6	-3	-2	-4	
M578 Light Recovery Vehicle	5		-1			-1	-2			
M543A2 Wrecker	1			-1					+1	
XM45E1 Flame Service Unit	2		-1		-1		-1	-1	-2	
M4A2 Flame Service Unit	0		+1		+1		+1	+1	+2	
M35 2 1/2-Ton Cargo Truck	11	+1	-1	+2	-1		-1		+2	
M54 5-Ton Cargo Truck	12		+2	-7	-4					
M109 Shop Van	2			+1						
M49C Fuel Truck	0					+1			+1	
M50C Water Truck	0			(+1)		+1		(+1)	(+1)	() M50C bed mounted on M54.
M151 Utility Truck	25	-5	-4	-7	-6	-1	-6		-2	

a Item	b MTOE Auth.	Units								Notes
		c	d	e	f	g	h	i	j	
<u>Weapons</u>										
M2 Cal .50 Machine- gun	121	+9	+41*	+50*	+120*	+29*	+39*	+34*	+37*	
M60 7.62mm Machine- gun	126	+9	+27	+14	+12	+10	+15	+12	-8	
100mm Recoilless Rifle	0				+6	+2		+1	+5	
90mm Recoilless Rifle	9			-1						
M79 40mm Grenade Launcher	95	-1	-4	-1	-5				-7	
Minigun	0				+1	+5	+3	+3	+2	
Automatic Grenade Launcher	0					+3	+2		+3	
Armament Subsystem "A"	61	+3	-1	+3	+3	+3	+3	+3		
Armament Subsystem "B"	13		-1							
<u>Communications</u>										
<u>Radio Sets</u>										
AN/VRC-12	5	+1				+3			-1	
AN/VRC-46	25	+5	-1	+9	+26*	+7	+6	+41*	+6	
AN/VRC-47	35		+2		-13	+6	+5	-13	+5	
AN/VRC-49	1									
AN/VRC-53/64	34	-1	-5	+5	+6	-4	-5	+6	+2	
AN/GRC-125/160	22	-2	-5	-3	+6	-4	+1	+2	+4	
AN/PRC-25/77	40	-4	+3	+3	+8	+18	-3	+9	+22	
AN/GRC-106	2	-1	-1				-1	-1		
AN/VRC-29	0				+1	+1	+1	+1	+1	
AN/PRC-74	5		-3	-1		-5	-5	-3		
<u>Accessories</u>										
RC-292 Antenna	12	-1	+2	-1	+10	+6	+2	+3	+2	
AB-577 Antenna Base	0			+1	+2	+2	+1	+1		
<u>Speech Security Equipment</u>										
TSEC/KY-8	2	+2	+2			+7	+1	+1	+2	
TSEC/KY-38	0	+9	+9	+5	+10	+13	+14	+13	+9	

a Item	b MTOE Auth	Units								Notes
		c	d	e	f	g	h	i	j	
<u>Other</u>										
Radar Set AN/FPS-4	0	+1	+2			+3	+1	+2		
Radar Set AN/PPS-5	2					-1	-1	-1		
Metallic Mine Detector	12	-12	-6	-10	+4	-5	-4	-2		
Non-Metallic Mine Detector	2	-2	-2			-1		-2		
AN/PSR-1	0					+5	+4			
AN/CSS-9	54	-54	-53	-54	-54	-27	-38	-54	-54	
AN/GSQ-151 (PSID)	0	+3		+8	+5	+5	+5	+4	+8	
IR Weapon Sight	102	-82	-102	-102	-102	-93	-84	-88	-102	Turned in
Metascope, AN/PAS-6	34		-34	-1	-4	-20	-1	-19	-3	
Starlight Scope, AN/PVS-1/2/3	62	+15	-6	-4	+10	-9	-20	-21	+10	
Night Vision Sight AN/TVS-2	69	-1	+2	-3	-4	+2	+3	-4	-34	
Night Observation Device, AN/TVS-4	11	-8	+2	-2	-2	-5	-5	-6		
Water Trailer	5	+3	+5	+4	+3	+1		+3	+5	
Tank & Pump Unit	0	+4	+6	+4	+5	+4	+4	+4	+4	
Tank, 600-gallon	0	+5	+2	+6	+6	+7	+8	+5	+9	
Drum & Pump Unit	2	-2	-2	-2	-2	-2	-2	-2	-2	
Drum, 500-gallon	8		-1	+4	+7	+7	-8	+4	+2	
Drum, 250-gallon	7	-7	-7	-7	-7	-7	-7	-7	-7	

Appendix 3 (Non-Required Equipment) to Annex C

There were several items of equipment authorized by TOE/MTOE which commanders considered unnecessary for the accomplishment of their mission in RVN. These items are listed in the attached tabs by type unit.

TABS

- A - ARMORED CAVALRY SQUADRON, ACR
- B - ARMORED CAVALRY SQUADRON, DIVISIONAL
- C - SEPARATE ARMORED CAVALRY TROOP
- D - TANK BATTALION
- E - MECHANIZED INFANTRY BATTALION

Tab A (Armored Cavalry Squadron, ACR) to Appendix C to Annex C

Items of equipment authorized by MTOF 17-55GP01 but considered unnecessary by commanders are listed below:

<u>ITEM</u>	<u>Quantity</u> <u>Authorized</u>
Alignment Set IR Transmitter, GM Remote Control System-----	1
Binocular, IR Driving Body-----	24
Charger, Radiac Detector, PP/1578-----	1
Flare Set, M-238-----	150
Metascope, AN/PAS-6-----	17
Panel Marker Set, AP-30-C-----	1
Panel Marker Set, AP-30-D-----	1
Radiacmeter, IM-93/UD-----	5
Radiacmeter, IM-174/PD-----	1
Radiac Set, AN/PDR-27-----	1
Radio Set, AN/GRR-5-----	1
Sling, Carrying, Universal Load-----	312

Tab B (Armored Cavalry Squadron, Divisional) to Appendix 3 to Annex C

Items of equipment authorized by MTOE 19-105QPO1 but considered unnecessary by commanders are listed below:

<u>ITEM</u>	<u>MTOE Quantity Authorized</u>
Binocular, IR Driving Body-----	27
Charger, Radiac Detector, PP 1578 PD-----	5
Detector Kit, Chemical Agent-----	5
Flag Set, M-238-----	88
Heater, Duct Type, 250,000 BTU-----	1
Heater, Immersion, 37 1/4 in-----	5
Life Preserver-----	502
Metascope, AN/PAS-6-----	47
Multimeter, AN/PRM-15-----	4
Panel Marker Set, AP-30-C-----	4
Panel Marker Set, AP-30-D-----	4
Radiacmeter, IM-93/UD-----	31
Radiacmeter, IM-174/PD-----	12
Radiac Set, AN/PDR-27-----	1
Radio Set, AN/GRR-5-----	1
Sling, Carry Ing, Universal Load-----	362
Weapon Sight Infrared-----	128

Tab C (Separate Armored Cavalry Troop) to Appendix 3 to Annex C

Items of equipment authorized by MTOE 17-57GP01 but considered unnecessary by commanders are listed below:

<u>ITEM</u>	<u>MTOE Quantity Authorized</u>
Alignment Set IR Transmitter: GM Remote Control System-----	1
Binocular, IR Driving Body-----	6
Flag Set, M-238-----	26
Panel Marker Set, AP-30-C-----	1
Panel Marker Set, AP-30-D-----	1
Metascore, AN/PAS-6-----	13

Tab D (Tank Battalion) to Appendix 3 to Annex C

Items of equipment authorized by MTOE 17-35GP01 but considered unnecessary by commanders are listed below:

<u>ITEM</u>	<u>MTOE Quantity Authorized</u>
Binocular, IR Driving Body	33
Charger, Radiac Detector	19
Flag Set, M-238	36
Heater, Duct Type, 250,000 BTU	2
Heater, Immersion, 37 1/4 inch	5
Infrared Weapon Sight	79
Life Preserver	153
Metascope, AN/PAS-6	19
Multimeter, AN/PRM-15	5
Panel Marker Set, AP-30-C	1
Panel Marker Set, AP-30-D	1
Radio Set, AN/GRR-5	1
Sling, Carrying, Universal	92

Tab E (Mechanized Infantry Battalion) to Appendix 3 to Annex C

Items of equipment authorized by MTOE 7-45GP01 but considered unnecessary by commanders are listed below:

<u>ITEM</u>	<u>MTOE Quantity Authorized</u>
Alarm Set, AN/GSS-9	54
Bag, Water, Sterilizing, 36-gallon	31
Case, Water Can	4
Charger, Radiac Detector	8
Dispenser, Riot Control	12
Flag Set, M-238	90
Heater, Immersion, 37 1/4 inch	5
Infrared Driving Binoculars	17
Intrenching Outfit	1
Latrine, Box	1
Life Preserver	649
Metascope, AN/PAS-6	34
Packboard	175
Pad, Shoulder Packboard	350
Panel Marker Set, AP-30-C	14
Panel Marker Set, AP-30-D	1
Periscope, Battery Command	1
Radio Set, AN/GRR-5	1
Sling, Carrying, Universal Load	872

Stove, 5000 BTU	150
Strap, Quick Release, Packboard	543
Tableware Outfit	8
Telescope, Straight Military	7
IR Weapon Sight	102

ANNEX D

MACOV CORRELATION

This annex contains selected MACOV study recommendations. They are included in two appendices: the first, table of organization and equipment recommendations; and second, equipment recommendations. They are arranged in their order of presentation in Volume 1 of the MACOV study. In each appendix, the applicable MACOV recommendation is correlated to the implementation of the recommendation, if any, and to the position of ACTIV as regards the recommendation. Referrals to applicable ACTIV study recommendations are included for reference.

Appendix 1. (MACOV Table of Organization and Equipment Recommendations) to Annex D

MACOV	IMPLEMENTATION	ACTIV RECOMMENDATION
<u>Section III to Volume 1</u>		
<u>GENERAL</u>		
1. There is a requirement for a helicopter command post for each committed maneuver battalion [Paragraph 2f(8)].	Nonapparent.	Concur (Recommendation 60).
2. Action should be taken to establish a military occupational specialty (VOS) for ground surveillance radar operators [Paragraph 2h(7)].	Accomplished.	Concur; however, there has been insufficient input of trained personnel to armored and mechanized units (Recommendation 14).
3. Maintenance personnel should receive sufficient training under field conditions in CONUS to enable the trainee to take his place in an RVN combat unit without additional training [Paragraph 2h(10)].	Unknown.	Concur; the problem still exists (Recommendation 75).
4. Add an S5 officer and two enlisted assistants with necessary equipment to each battalion/squadron headquarters section [Paragraph 3b(4)(c)].	S5, only, added.	Concur; however, the S5 continues to require an operational section (Recommendation 45).

MACOV RECOMMENDATION	IMPLEMENTATION	~ACTIV RECOMMENDATION
5. Provide one M113 to each medical platoon on the basis of one per line company/troop [Paragraph 3b(4)(1)].	Accomplished in tank and mechanized infantry battalions. Not accomplished in regimental or divisional cavalry squadrons.	Concur (Recommendation 29).
6. The "A" weapons system, modified by substituting a 40mm high-velocity grenade launcher for one half of the caliber .50 machineguns in the system, should be provided for each M113 [Paragraph 3b(5)].	Not accomplished. Concept Nonconcur in BOI; recommend smaller and BOI pending evaluation BOI of one 40mm Grenade launcher per of ENSURE 189, XM182 system. mechanized rifle platoon and scout platoon (Recommendation 32).	
7. Air control teams and air defense sections should be deleted from battalion/squadrons [Paragraph 3b(6)].	All air defense sections deleted. Air control teams retained in all type units except the divisional cavalry squadron.	Concur (Recommendation 61).
8. Reorganize the headquarters and headquarters company into a headquarters and headquarters company and a service company [Paragraph 3c(2)].	Accomplished, except that AVLB section was placed in service company, instead of at headquarters and headquarters company as MACOV recommended.	Reorganize headquarters and headquarters company and service company to form a headquarters and service company and a combat support company [Recommendation 44b(1)].
9. Add a fourth tank company [Paragraph 3c(2)].	Not accomplished.	Fourth tank company undesirable. Investigate feasibility of adding a mechanized infantry company [Recommendation 44b(2)].
10. Add one mortar forward observer team for use with fourth tank company [Paragraph 3c(3)(a)].	Not applicable without a fourth tank company.	Nonconcur; delete mortar platoon FO teams [Recommendation 44b(2)].

MACOV RECOMMENDATION	IMPLEMENTATION	ACTIV RECOMMENDATION
11. Add one M113 armored personnel carrier to each tank company for use as a company command post [Paragraph 3c(3)(c)].	Not accomplished.	Provide each tank company with an M113A1 [Recommendation 44c(3)].
12. Add an additional tank with four man crew to the battalion headquarters tank section, for use of artillery liaison officer [Paragraph 3c(3)(h)].	Not accomplished.	Nonconcur; [Paragraph 2d(2)(c), Annex J].
<u>MECHANIZED INFANTRY BATTALION</u>		
1. Add a fourth rifle company to the battalion [Paragraph 3d(1)].	Not accomplished.	Concur [Recommendation 44b(2)(a)].
2. The antitank platoon should be deleted from the headquarters and headquarters company [Paragraph 3d(4)(a)].	Accomplished.	Concur (Paragraph 2, Annex L).
3. Organize a headquarters and headquarters company maintenance section from assets in battalion maintenance platoon [Paragraph 3d(4)(b)].	Accomplished.	Transfer HHC Company maintenance personnel and equipment to Delta Company: [Recommendation 44b(1)].
4. Add a flamethrower section of three self-propelled flamethrowers and three service units [Paragraph 3d(4)(c)].	Accomplished except that platoon consists of four M132A1 flamethrowers and two XM45E1 flame service units.	Add two additional flame service units to the flame platoon: (Recommendation 81).

MACOV RECOMMENDATION	IMPLEMENTATION	ACTIV RECOMMENDATION
5. Delete the antitank section from the rifle company weapons platoon and add one 106mm recoilless rifle, mounted on an M113, to each platoon [Paragraph 3d(4)(f)].	Section deleted. Addition of one 106mm recoilless rifle to each rifle platoon was not accomplished.	Concur in actual implementation action [Paragraph 2h(4), Annex 2].
6. Convert the weapons squad of the rifle platoon to a fourth rifle squad [Paragraph 3d(4)(e)].	Not accomplished.	Nonconcur [Paragraph 2d(2)(c), Annex 1].
7. Delete the two M67 90mm recoilless rifles from the weapons squad of the rifle platoon [Paragraph 3d(4)(e)].	One 90mm recoilless rifle was deleted.	Concur in actual implementation [Paragraph 2d(4), Annex 1].
<u>DIVISIONAL ARMORED CAVALRY SQUADRON</u>		
1. Add a flamethrower section of three M132A1 self-propelled flamethrowers and three flame service units to headquarters and headquarters troop [Paragraph 3e(4)(a)].	Accomplished, except that platoon consists of four M132A1 self-propelled flamethrowers and two XM45E1 flame service units.	Delete one M132A1 flamethrower and add one XM45E1 flame service unit (Recommendations 61 and 82).
2. Add one armored-vehicle-launched bridge (AVLB) section, two launchers and two AVLBs, to headquarters and headquarters troop [Paragraph 3e(4)(b)].	Not accomplished.	Nonconcur as regards AVLBs: (Recommendation 27). Concur, when light assault bridging is developed (Recommendation 28).

MACOV RECOMMENDATION	IMPLEMENTATION	ACTIV RECOMMENDATION
<u>ARMORED CAVALRY REGIMENT</u>		
1. Substitute the M113 armored personnel carrier for the wheeled vehicles in the regimental headquarters and headquarters troop scout section [Paragraph 3f(3)(c)].	Accomplished.	Concur.
2. Add one M113 armored personnel carrier and one full tracked recovery vehicle to the artillery battery [Paragraph 3f(3)(e)].	Accomplished.	Concur [Paragraph 2g(2)(a), Annex G].
<u>SEPARATE CAVALRY TROOP</u>		
1. Armored cavalry troops (separate airborne and light infantry brigade) should be organized and equipped identical to armored cavalry troops of the 11th Armored Cavalry Regiment [Paragraph 3i].	With the advent of Phase II M551 deployment, this was accomplished except for A/4/12, 1st Brigade, 5th Mechanized Division.	Concur.

Appendix 2, (MACOV Equipment Recommendations) to Annex D

MACOV	IMPLEMENTATION	ACTIV RECOMMENDATION
<u>TAB D to Volume 1 (MACOV)</u>		
<u>M48A3 Tank</u>		
1. Replace the M1 Cupola with the M19 Cupola [Paragraph 2a(1)(a)].	ENSURE 230 trade-off.	Nonconcur; doubtful validity.
2. Equip the M48A3 tank with the complete xenon searchlight night vision kit [Paragraph 2a(1)(a)].	Accomplished by M40.	Concur in addition of xenon searchlight (Recommendation 3).
3. Equip the M19 Cupola with a M85 caliber .50 machinegun and the M34/M36 tank commanders periscope [Paragraph 2a(1)(b)].	ENSURE 239 trade off.	Nonconcur (Recommendations 36 and 37).
4. Issue M18 infrared binoculars on a one-per-tank basis [Paragraph 2a(1)(d)].	Accomplished.	Concur.
5. Equip all tanks with a mounting bracket for the crew-served weapons night vision sight [Paragraph 2a(1)(e)].	Not accomplished	Concur (Paragraph 7c, Annex N).
6. Equip all tanks deployed to RVN with a cutting bar, except those which mount a dozer blade [Paragraph 2a(1)(c)].	Not accomplished.	Nonconcur.

MACOV RECOMMENDATION	IMPLEMENTATION	ACTIVE RECOMMENDATION
7. Equip one tank in each tank platoon and tank-equipped armored cavalry platoon with a dozer blade [Paragraph 2a(1)(g)].	Not accomplished. AFCE authorizes one dozer per tank company and none in the armored cavalry troop/platoon.	Concur; retain current dozer blade ROI (Recommendation 80). Provide additional dozer capability on service support vehicle (Recommendation 79).
8. Improve the M48A3 tank by providing a device similar to a duck bill end connector to lessen vehicle ground pressure [Paragraph 2a(1)(h)].	LML - Tank Traction Assist/Traction Augmentation for M48 Tanks. Two sent to RVN in Oct 68; rejected by USARPV.	Recommendation concept is desirable but probably infeasible.
<u>M113A1 APC</u>		
1. Improve configuration of the commander's hatch armor and caliber .50 machinerun shield to facilitate ease of operation and manipulation [Paragraph 2a(2)(a)].	Not accomplished.	Technical improvements required [Paragraph 2b(2)(c), Annex O].
2. Provide the M113A1 with a capability to minimize danger from direct-fire weapons (recoilless rifles and RPG-2) [Paragraph 2a(2)(e)].	Several schemes tried and failed.	Concur; still valid (Recommendation 21).
3. Reinforce the floor of the driver, squad, and engine compartments with armor plate to reduce antitank mine effects [Paragraph 2a(2)(g)].	Accomplished by Relly-armor Kit (ENSURE 218).	Kit requires minor modification [Paragraph 2b(2)(h), Annex O].

MACOV RECOMMENDATION	IMPLEMENTATION	ACTIV RECOMMENDATION
4. Equip M113 vehicles in mechanized infantry and armored cavalry platoons with a lightweight xenon searchlight and compatible night vision devices [Paragraph 2a(2)(h)].	Prototype searchlight included in Project WASSUP.	Partially concur; searchlight not required for armored cavalry; mechanized infantry battalion requires 11 (Recommendation 5). Adjustments suggested in night vision sight BOIs (Recommendation 9).
5. Provide an organic AVLB capability for each mechanized infantry battalion and armored cavalry squadron in RVN compatible with the unit's vehicle weight class [Paragraph 2a(2)(i)].	ENSURE 84 - Marginal Terrain Assault Bridge (MTAB). Equipment needed modifications as indicated in ACTIV Final Report.	Concur (Recommendation 28).
6. Equip one M113 in each mechanized infantry and armored cavalry platoon (where there are no tanks) with a dozer blade [Paragraph 2a(2)(j)].	ENSURE 43 proved unsatisfactory for US Army use.	Nonconcur; dozer capability should be on service support vehicle (Recommendation 79).
7. Equip each M113 with a separate Control Intercommunications Set, C-2298/VRC, and headset with microphone for each side-firing machine gunner [Paragraph 2a(2)(l)].	Local modifications only.	Nonconcur.

MACOV RECOMMENDATION	IMPLEMENTATION	ACTIV RECOMMENDATION
<p>8. Provide one M113 in mechanized infantry and armored cavalry battalion/squadrons in RVN with a demountable hoisting device with boom-and-chain hoist capable of lifting the M113 or M113A1 power pack [Paragraph 2a(2)(m)].</p>	<p>XM806F1 arrived in country after evaluation period.</p>	<p>Concur for battalion/squadron maintenance platoons.</p>
<p>9. Equip each mechanized infantry and armored cavalry platoon with a capstan kit and a 10-foot push bar made of lightweight rigid material and equip each M113 in tactical units with one 30-foot cable [Paragraph 2a(2)(n)].</p>	<p>Various capstan kits tried with mediocre results.</p>	<p>Nonconcur in capstan kit. Other recovery aids required (Recommendation 87).</p>
<p>10. Procure polyurethane foam for use in the fuel tank of the M113 and all other vehicles (combat) with gasoline-powered vehicles [Paragraph 2a(2)(o)].</p>	<p>ENSURE 218 rejected; ENSURE 246, addressing this problem.</p>	<p>Requirement still exists for an improved fuel tank.</p>
<p><u>FLAME SERVICE UNIT</u></p>		
<p>1. Mount the M4A1 flame service unit in the M113 [Paragraph 2a(3)].</p>	<p>ENSURE 199, XM45F1 (M548 tracked cargo carrier).</p>	<p>Concur (Recommendation 83).</p>
<p><u>M106 4.2-INCH MORTAR CARRIER</u></p>		
<p>1. Delete the M106 mortar carrier and its 4.2-inch mortar weapons system from the armored cavalry troop [Paragraph 2a(4)].</p>	<p>Accomplished.</p>	<p>Concur.</p>

MACOV RECOMMENDATION	IMPLEMENTATION	ACTIV RECOMMENDATION
<u>M125A1 81mm MORTAR CARRIER</u>		
1. Replace the M106A1 mortar carrier and 4.2-inch mortar with the M125A1 mortar carrier and 81mm mortar in the armored cavalry platoon [Paragraph 2a(5)].	Accomplished.	Concur (Recommendations 40 and 41).
<u>M577 ARMORED COMMAND POST</u>		
1. Equip each M577 with one DA-approved modification kit "B" (hatch armor and caliber .50 machinegun with gun shield) [Paragraph 2a(6)].	Not accomplished.	Nonconcur; provide each M577A1 with an M60 machinegun and a rear gun shield from an M113A1 APC/ACAV (Recommendation 31).
<u>RECOVERY VEHICLES</u>		
1. Replace the M578 recovery vehicle in mechanized infantry battalions and armored cavalry squadrons with a full-tracked, amphibious recovery vehicle with mobility (speed, floatation, and traction) equal to or greater than the M113 [Paragraph 2b(1)].	Requirement may be partially filled by XM806E1.	Concur (Recommendation 77).
2. Equip the M88 recovery vehicle with a means to improve its mobility (floatation and traction) [Paragraph 2b(2)].	Not accomplished.	Concur; however appears infeasible (Recommendation 77).

MACOV RECOMMENDATION	IMPLEMENTATION	ACTIV RECOMMENDATION
<u>CARGO CARRIERS</u>		
1. Replace eight 5-ton trucks in each mechanized infantry and armor battalion/squadron with eight M548 tracked cargo carriers, four for cargo and four modified as fuel-servicing vehicles [Paragraph 2c(1)(2)].	Generally accomplished.	Concur; however, minor BOI adjustments are required (Recommendation 85).
2. Equip each M548 with DA approved modification kit "B", and provide sufficient armor protection for the driver's compartment to defeat small arms fire and anti personnel mines [Paragraph 2c(1)(2)].	Not accomplished.	Concur in armor protection; doubt practicality of modification kit "B" (Recommendation 35).
<u>WEAPONS</u>		
1. Delete the two M67 40mm recoilless rifles from the weapons squad of the mechanized rifle platoon [Paragraph 2d(2)(a)].	One weapon per squad was deleted.	Concur in actual implementation [Paragraph 2d(4), Annex L].
2. Provide one M40A1 106mm recoilless rifle, mounted on the M113, per mechanized rifle platoon. Modification should be accomplished in-country [Paragraph 2d(2)(b)].	Not accomplished officially.	Nonconcur, except on a special-case basis [Paragraph 2d(4), Annex L].
3. Delete the ENTAC from the TOE of all units in RVN [Paragraph 2d(3)].	Accomplished.	Concur.

MACOV RECOMMENDATION	IMPLEMENTATION	ACTIV RECOMMENDATION
<u>MUNITIONS</u>		
1. Insure early delivery of operational quantities of 90mm tank gun REFHIVE ammunition [Paragraph 2e(2)].	Accomplished.	Concur; however, old style 90mm canister ammunition is still required [Paragraph 8a(1)(2), Annex O].
2. Insure early delivery of 90mm and 106mm recoilless rifle REFHIVE ammunition in operational quantities for those units authorized these weapons [Paragraph 2e(3)].	ENSURE 24.1 and 24.2 accomplished with satisfactory results.	Concur [Paragraphs 8a(1) and (2), Annex O].
<u>FM RADIO</u>		
1. Provide an adequate cooling system for AN/VRC-12 new series radios to preclude radio failure [Paragraph 2f(1)(a)].	No known action taken.	Concur; still valid [Paragraph 6a(2)(a)1, Annex O].
2. Replace the AN/PRC-6 with the AN/PRT-4 and AN/PRR-9 (AN/PRC-88) [Paragraph 2f(1)(c)].	Accomplished.	Delete all AN/PRC-88 radios [Paragraph 2d(3)(d), Annex L]. Develop a reliable squad radio [Paragraph 6a(5), Annex O].
3. Provide a method for reducing or eliminating power surges to vehicle-mounted radios [Paragraph 2f(1)(e)].	Not accomplished.	Concur, still valid [Paragraph 6a(2)(a)3, Annex O].
<u>AM RADIO</u>		
1. Replace radio sets AN/GRC-19 and AN/VRC-20 with radio set AN/GRC-106 [Paragraph 2f(2)].	Accomplished.	Concur; however, further adjustments are required (Recommendation 57).

<u>MACOV RECOMMENDATION</u>	<u>IMPLEMENTATION</u>	<u>ACTIV RECOMMENDATION</u>
<u>SPECTRY SECURE EQUIPMENT</u>		
Problems experienced with the TSEC/KY-8 should be investigated to determine corrective action required [Paragraph 2f(5)].	TSEC/KY-38 programmed to replace TSEC/KY-8.	Qualitative problems continue to exist (Recommendation 50).
<u>GROUND SURVEILLANCE RADAR</u>		
Replace the AN/PPS-4 and AN/TPS-33 with radar set AN/PPS-5 [Paragraph 2f(7)].	Accomplished.	Concur; however, AN/PPS-5 is not rugged enough (Recommendation 13).
<u>AMBIENT NIGHT VISION DEVICES</u>		
Equip maneuver battalions/squadrons with the starlight scope crew served weapons night vision sight, and the medium range night observation device in required quantities as rapidly as possible [Paragraph 2f(6)].	Accomplished.	Concur; however, the recommendation is vague and MTOE ROI require adjustment (Recommendation 9).
<u>MINE DETECTION EQUIPMENT</u>		
1. Develop a vehicular-operated mine detector/detonator device that can detect, detonate, or neutralize electric blasting caps contained in explosive materials/devices [Paragraph 2f(10)].	ENSURE 202/201.1.	Concur; still valid; ENSURE is interim measure at best (Recommendation 17).
2. Develop an improved handheld mine detector capable of detecting metallic and nonmetallic explosive material [Paragraph 2f(11)].	P153 handheld non-metallic mine detector introduced into theater.	Current family of handheld mine detectors are not fully satisfactory (Recommendation 19).

MACOV RECOMMENDATION

IMPLEMENTATION

ACTIV RECOMMENDATION

ACCESSORY EQUIPMENT

1. Equip each command combat vehicle with a dead-reckoning land vehicle navigation system [Paragraph 2j(1)(a)].
2. Equip all combat vehicles with an odometer/speedometer assembly calibrated in kilometers and suitable compass (heading indicator) [Paragraph 2j(1)(b)].
3. Improve the durability and reliability of the push-to-talk switch, break-away cord, and connection components of the CVC helmet [Paragraph 2j(3)].

Various prototypes still under development.

Concur (Recommendation 24).

Not accomplished.

Concur (Recommendation 25 and 26).

Not accomplished.

Concur [Paragraph 6b(1), Annex O].

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