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A METHOD OF ANALYSIS FOR THE BRADLEY FIGHTING VEHICLE SYSTEM

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Bradley Fighting Vehicle System (BFVS) is part of the U. S. Army's force modernization effort aimed at improving the overall posture of the force. This vehicle has recently come under considerable scrutiny regarding its cost effectiveness. Specifically, there is concern whether the BFVS is performing its originally intended function as a force multiplier. One source of information that bears on this issue is the performance of the BFVS under realistic combat conditions at the (NTC). The NTC provides as close to combat conditions as currently available and battalion task forces are now (OVER)		

ARI Research Note 87-1020. Abstract (continued)

→ routinely rotating to the NTC equipped with the BFVS.

The Army Research Institute, in support of the Combined Arms Training Activity's mission at the NTC, prepared a detailed method of analysis to investigate the BFVS at the NTC. The resultant method of analysis is a comprehensive plan for addressing the issue of the performance of the BFVS at the NTC. *Reviews*

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METHOD OF ANALYSIS FOR THE BRADLEY FIGHTING VEHICLE SYSTEM

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# A METHOD OF ANALYSIS FOR THE BRADLEY FIGHTING VEHICLE S.STEM

## INTRODUCTION

The Bradley Fighting Vehicle (BFVS) is part of the U. S. Army's force modernization efforts aimed at improving the overall posture of the force relative to likely foes. The BFVS program has recently been questioned regarding its cost effectiveness. Specifically, there is concern over whether the Bradley is performing its originally intended function as a force multiplier and additional killer on the battlefield. The purpose of the report is to present a method of analysis for the collection of performance data on the BFVS at the NTC and to evaluate its contribution to battalion task force effectiveness as compared to the M113.

## BACKGROUND

The National Training Center (NTC), Fort Irwin, California, has been designed as a realistic combat training ground for Army battalion task forces. As part of the normal training experience at the NTC, battalion task forces perform both force-on-force exercises using MILES simulation as well as live-fire exercises. In both types of exercises, scenarios have been developed to be as realistic as possible including employment of a simulated enemy.

Each battalion task force (TF) participates in approximately six force-on-force exercises during a two-week rotation period at the NTC. These exercises usually are more or less evenly divided between offensive and defensive operations using laser-based engagement simulation instrumentation to provide real-time casualty assessment. The simulator, the Multiple Integrated Laser Engagement System (MILES), is used on all principal weapons and casualties are assessed when a weapon fires and the MILES laser hits a target. In addition to force-on-force training, units also perform three missions on the live-fire range during their rotations (see figure 1.)

The scenario dictates the force ratios of the combatants. While terrain and scenario options are limited, no two scenarios are exactly the same. When the TF conducts defensive missions they are always attacked by an OPFOR that replicates a Motorized Rifle Regiment. When TFs conduct offensive operations, they originally encountered a defending Motorized Rifle Company. However, in the summer of 1984, the force ratio was changed to deploy a defending Motorized Rifle Battalion.

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### Missions Conducted

TF \_\_\_\_\_ conducted the following missions during their NTC training Period:

DATE	MISSION
	Deliberate Day Attack
	Defend in Sector
	Delay in Sector
	Defend Battle Position (day) (LFX)
	Defend Battle Position (night) (LFX)
	Movement to Contact (LFX)
	Movement to Contact
	Deliberate Night Attack
	Defend from a Battle Position

Figure 1. Typical Mission Schedule for An NTC Rotation

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### SCOPE

As indicated above, the BVFS is a critical weapon system for the modern Army. While tests of this system have been previously conducted, its performance in a realistic combat environment has not been determined. The National Training Center (NTC) offers as close to real modern battlefield as is currently available. Further, battalion task forces equipped with the BFVS are beginning to routinely rotate to the NTC for training. As part of this experience, the task forces undergo several mission scenarios using MILES equipment, thus allowing data collection on weapon system performance.

The method of analysis presented in the next section was developed specifically for use at the NTC. As such, it capitalizes on the scenarios and instrumentation currently available there. It also proposes new data collection where gaps between the need to investigate the BFVS and current instrumentation were known. All new data collection was constrained by the known limitations of the resources at the NTC.

The proposed method of analysis should be construed as a comprehensive plan for the utilization of NTC data for the investigation of the BFVS. The plan was prepared to be consistent with the TCATA Test Officer's planning manual (Memorandum 71-1 29 November 1979.)

DATA SOURCES

OPORDS, FRAGO, Overlays,  
Graphic, Commander's Guidance,  
Initialization Lists, RDMS  
Tape, CIS Tape, AAR Charts,  
THP's, Live Fire Printouts,  
Scenarios

OPORDS (BLUEFOR/OPFOR),  
FRAGO's, Overlays, Graphics,  
Commander's Guidance, OC/TAF  
Input, OC/OPFOR Count, RDMS,  
CIS, AAR's, THP's

METHOD OF ANALYSIS

OBJECTIVE: To compare the effectiveness of the M113 [M-2 Cal. 50 MG] (A) and the Bradley Fighting Vehicle (B).

SUBOBJECTIVES:

- 1.1 To compare the effectiveness of the two systems in Defense Operations
- 1.2 To compare the effectiveness of the two systems in Offense Operations
- 1.3 To compare the effectiveness of the two systems in Live Fire Defense Operations
- 1.4 To compare the effectiveness of the two systems in Night Operations

COMPONENT ATTRIBUTES:

- 1.1.1 What is the comparable effectiveness of the two systems in the defense in sector
- 1.1.2 What is the comparable effectiveness of the two systems in the defense from a BP
- 1.1.3 What is the comparable effectiveness of the two systems in the delay
- 1.1.4 What is the comparable effectiveness of the two systems in the defense counterattack
- 1.1.5 What is the comparable counter reconnaissance effectiveness of the two systems in defense operations
- 1.2.1 What is the comparable effectiveness of the two systems in the movement to contact
- 1.2.2 What is the comparable effectiveness of the two systems in the hasty attack
- 1.2.3 What is the comparable effectiveness of the two systems in the deliberate attack
- 1.3.1 What is the comparable effectiveness of the two systems in the live fire defense from a BP (day)
- 1.3.2 What is the comparable effectiveness of the two systems in the live fire defense from a BP (night)
- 1.4.1 What is the comparable effectiveness of the two systems in the night attack
- 1.4.2 What is the comparable effectiveness of the two systems in the night defense

COMPONENT SUB-ATTRIBUTES:

- 1.1.1.1. What is the comparable effectiveness of A & B to kill tanks
- 1.1.1.2. What is the comparable effectiveness of A & B to kill BMP's, MTLB's, ZSU-23/4, BRDM's, 122 SP's
- 1.1.1.3. What is the comparable effectiveness of A & B destructive fire power by range
- 1.1.1.4. What is the comparable effectiveness of A & B when disengaging
- 1.1.1.5. What is the comparable effectiveness of A & B in covering obstacles by fire
- 1.1.1.6. What is the comparable effectiveness of A & B in slowing the enemy attack
- 1.1.1.7. What is the comparable effectiveness of A & B under obscured conditions
- 1.1.1.8. What is the comparable effectiveness of A & B under MOPP 4 NBC defense conditions



## METHOD OF ANALYSIS

- 1.1.2.1. What is the comparable effectiveness of A & B to kill tanks
- 1.1.2.2. What is the comparable effectiveness of A & B to kill BMP's, MTLB's, ZSU-23/4, BRDM's, 122 SP's
- 1.1.2.3. What is the comparable effectiveness of A & B destructive fire power by range
- 1.1.2.4. What is the comparable effectiveness of A & B in covering obstacles by fire
- 1.1.2.5. What is the comparable effectiveness of A & B in slowing the enemy attack
- 1.1.2.6. What is the comparable effectiveness of A & B under obscured conditions
- 1.1.2.7. What is the comparable effectiveness of A & B under MOPP 4 NBC defense conditions

- 1.1.3.1. What is the comparable effectiveness of A & B to kill tanks
- 1.1.3.2. What is the comparable effectiveness of A & B to kill BMP's, MTLB's, ZSU-23/4, BRDM's, 122SP's
- 1.1.3.3. What is the comparable effectiveness of A & B destructive fire power by range
- 1.1.3.4. What is the comparable effectiveness of A & B when disengaging
- 1.1.3.5. What is the comparable effectiveness of A & B in covering obstacles by fire
- 1.1.3.6. What is the comparable effectiveness of A & B in slowing the enemy attack
- 1.1.3.7. What is the comparable effectiveness of A & B under obscured conditions
- 1.1.3.8. What is the comparable effectiveness of A & B under MOPP 4 NBC defense conditions

- 1.1.4.1. What is the comparable speed of march from the SP to the LD for systems A & B in the counterattack
- 1.1.4.2. What is the comparable effectiveness of A & B to kill tanks
- 1.1.4.3. What is the comparable effectiveness of A & B to kill BMP's, MTLB's, ZSU-23/4, BRDM's, 122SP's

- 1.1.5.1. What is the comparable effectiveness of A & B to kill enemy reconnaissance vehicles

- 1.2.1.1. What is the distance that A & B bound under overwatch

- 1.2.1.2. What is the direct fire effectiveness of A & B bounding element when in initial enemy contact
- 1.2.1.3. What is the overwatch direct fire effectiveness of A & B when the bounding element is in initial enemy contact

- 1.2.1.4. What is the comparable effectiveness of A & B base of fire element

- 1.2.1.5. What is the comparable effectiveness of A & B assault element

- 1.2.1.6. What is the comparable effectiveness of A & B in protecting assaulting tanks from enemy fire

- 1.2.1.7. What is the comparable Effectiveness of A & B in overwatching obstacle clearing operations

METHOD OF ANALYSIS

- 1.2.2.1. What is the distance that A & B bound under overwatch
- 1.2.2.2. What is the direct fire effectiveness of A & B bounding element when in initial enemy contact
- 1.2.2.3. What is the overwatch direct fire effectiveness of A & B when the bounding element is in initial enemy contact
- 1.2.2.4. What is the comparable effectiveness of A & B base of fire element
- 1.2.2.5. What is the comparable effectiveness of A & B assault element
- 1.2.2.6. What is the comparable effectiveness of A & B in protecting assaulting tanks from enemy fire
- 1.2.2.7. What is the comparable Effectiveness of A & B in overwatching obstacle clearing operations
- 1.2.2.8. What is the difference in time from LD to seizure of the objective by A & B forces
- 1.2.2.9. What is the difference in momentum of the main effort when supported by a supporting attack or base of fire consisting of A & B systems
- 1.2.2.10. What is the difference in tanks allocated to the main effort when the supporting attack or base of fire consists of A & B forces

- 1.2.3.1. What is the distance that A & B bound under overwatch
- 1.2.3.2. What is the direct fire effectiveness of A & B bounding element when in initial enemy contact
- 1.2.3.3. What is the overwatch direct fire effectiveness of A & B when the bounding element is in initial enemy contact
- 1.2.3.4. What is the comparable effectiveness of A & B base of fire element
- 1.2.3.5. What is the comparable effectiveness of A & B assault element
- 1.2.3.6. What is the comparable effectiveness of A & B in protecting assaulting tanks from enemy fire
- 1.2.3.7. What is the comparable effectiveness of A & B in overwatching obstacle clearing operations
- 1.2.3.8. What is the difference in time from LD to seizure of the objective by A & B forces
- 1.2.3.9. What is the difference in momentum of the main effort when supported by a supporting attack or base of fire consisting of A & B systems
- 1.2.3.10. What is the difference in tanks allocated to the main effort when the supporting attack or base of fire consists of A & B forces

- 1.3.1.1. What is the comparable effectiveness of A & B to kill BMP, MTLB, ZSU-23/4, BRDM, 122 SP
- 1.3.1.2. What is the comparable effectiveness of A & B to kill tanks
- 1.3.1.3. What is the comparable difference of A & B equipped task forces to attrit the enemy
- 1.3.1.4. What is the comparable direct fire destruction contribution against armored targets by A & B
- 1.3.1.5. What is the comparable effectiveness of A & B when defending under obscured conditions
- 1.3.1.6. What is the comparable effectiveness of A & B when defending under MOPP 4 NBC defense conditions

DATA SOURCES

1.3.2.1 )  
 1.3.2.2 )  
 1.3.2.3 ) Same as 1.3.1.1 thru 1.3.1.6  
 1.3.2.4 )  
 1.3.2.5 )  
 1.3.2.6 )

1.4.1.1 What is the comparability of A&B to maintain orientation on designated control measures  
 1.4.1.2 What is the length of time from point of departure to probable line of deployment  
 1.4.1.3 What is the direct fire destructive fire effectiveness against tanks by A&B  
 1.4.1.4 What is the direct fire destructive fire effectiveness against BMP, BRDM, MTLB by f&B

1.4.2.1 )  
 1.4.2.2 )  
 1.4.2.3 )  
 1.4.2.4 ) Same as 1.1.2.1 thru 1.1.2.7  
 1.4.2.5 )  
 1.4.2.6 )  
 1.4.2.7 )

MEASURES OF PERFORMANCE

1.1.1.1 What is the comparable effectiveness of A&B to kill tanks  
 1.1.1.1.1 (A)  
 # RDS fired  
 # Hits  
 # NM  
 # Kills  
 1.1.1.1.2 (B)  
 # RDS fired (25mm)  
 # Hits  
 # NM  
 # Kills  
 1.1.1.2 1.1.1.2.1 (A)  
 Same as above  
 1.1.1.2.2 (B)  
 Same as above

Graphics, OC/TAF input,  
 RDMS, CIS, OC count, OPFOR count

OC/OP for count, OC/TAF input,  
 RDMS, CIS

1.1.1.3	1.1.1.3.1 (A) # Hits by range # NH by range # Kills by range	1.1.1.3.2 (B) # Hits by range (25mm) # NH by range (25mm) # Kills by range (25mm)	Graphics, OC/TAF input, RDMS, CIS
1.1.1.4	1.1.1.4.1 (A) Time from start to stop # H, NH, K during disengage # Own losses during disengage	1.1.1.4.2 (B) Time from start to stop # H, NH, K during disengage # Own losses disengage	Graphics, OC/TAF input, RDMS, CIS
1.1.1.5	1.1.1.5.1 (A) # Hits at obstacle # Kill at obstacle # Firing position range from obstacle Length of time enemy to force obstacle	1.1.1.5.2 (B) ( Same	Graphics, RDMS, CIS OC/TAF input OC/OPFOR count
1.1.1.6	1.1.1.6.1 (A) EN rate of advance before engaged EN rate of advance when engaged	1.1.1.6.2 (B) ( Same	Graphics, RDMS, CIS
1.1.1.7	1.1.1.7.1 (A) # Hits # NH # Kills	1.1.1.7.2 (B) ( Same	OC/TAF input, color graphics, RDMS, CIS
1.1.1.8	1.1.1.8.1 (A) # Hits # NH # Kills	1.1.1.8.2 (B) ( Same	Same as above

NOTE: 1.1.2.1 and 1.1.3.1 Same logic

1.1.4.1	What is the comparable effectiveness of the two systems in the defense counter attack		
1.1.4.1.1 (A)	Time from SP to LD		RDMS, CIS, OC count
1.1.4.1.2 (B)	Same		RDMS, CIS, OC count
1.1.4.2.1 (A)	# RDS fired	# RDS fire 25mm	
# Hits	# Hits (TOW)	# Hits 25mm	
# NM	# NM (TOW)	# NM 25mm	
# Kills	# Kills (TOW)	# Kills 25mm	
1.1.4.3.1 (A)	Same as above		
1.1.4.2.2 (B)	# RDS fired (TOW)		
# Hits (TOW)			
# NM (TOW)			
# Kills (TOW)			
1.1.4.3.2 (B)	Same as above		

DATA SOURCES

1.3.2.1 )  
 1.3.2.2 )  
 1.3.2.3 ) Same as 1.3.1.1 thru 1.3.1.6  
 1.3.2.4 )  
 1.3.2.5 )  
 1.3.2.6 )  
 1.4.1.1 What is the comparability of A&B to maintain orientation on designated control measures  
 1.4.1.2 What is the length of time from point of departure to probable line of deployment  
 1.4.1.3 What is the direct fire destructive fire effectiveness against tanks  
 1.4.1.4 What is the direct fire destructive fire effectiveness against BMP, BRDM, MTLB by I&B

Graphics, OC/TAF input, RDMS, CIS, OC count, OPFOR count

1.4.2.1 )  
 1.4.2.2 )  
 1.4.2.3 )  
 1.4.2.4 ) Same as 1.1.2.1 thru 1.1.2.7  
 1.4.2.5 )  
 1.4.2.6 )  
 1.4.2.7 )

MEASURES OF PERFORMANCE

1.1.1.1 What is the comparable effectiveness of A&B to kill tanks  
 1.1.1.1.1 (A)  
 # RDS fired  
 # Hits  
 # MW  
 # Kills  
 1.1.1.1.2 (B)  
 # RDS fired (25mm)  
 # Hits  
 # MW  
 # Kills  
 1.1.1.2 1.1.1.2.1 (A)  
 Same as above  
 1.1.1.2.2 (B)  
 Same as above

OC/OP for count, OC/TAF input, RDMS, CIS

Same as above

		Data Sources
1.1.5.1	1.1.5.1.1 (A) # EN Vehicles Entering Sector # Hits # Near Misses # Kills	CIS RDMS EMC/OPFOR/OC COUNT
	1.1.5.1.2 (B) Same	
1.2.3.1 (Examples of MOP)	1.2.3.4.1 (A) # Rounds Fired # Hits # Near Misses # EN Rounds Fired # EN Hits # EN Near Misses # Kills	CIS RDMS OC COUNT OPFOR COUNT
	1.2.3.4.2 (B) Same for TOW & 25mm	
1.2.3.6 (Another Example)	1.2.3.6.1 (A) # Tanks in Assault # Tanks Hit # Tanks Near Miss # Tanks Killed # Tanks on Objective	RDMS - PL CIS - PL OC COUNT
	1.2.3.6.2 (B) Same	
1.3.1.1 (Another Example - Live Fire)	1.3.1.1.1 (A) # Rounds Fired # Hits # Kills # Hits by Range # Kills by Range	RDMS CIS Live Fire Prime Out Hole Count OC Count
	1.3.1.1.2 (B) Same For TOW & 25mm	

## COLLECTION PLAN

### GENERAL:

Scenarios, Time Event Schedules,  
Significant Event Lists, OPORDS,  
FRAGO's, Verbal Orders, Graphics,  
AAR OC Charts, THP's, Live Fire Printouts,  
Obscuration & NBC Conditions,  
RDHS & CIS Tapes, Initialization Lists.

### SUBOBJECTIVES:

- 1.1.1 - # rounds fired, # hits, # near misses, # kill for CAL .50 (M113), TOW (M-2), 25mm (M-2)
- 1.1.2 - # hits by range, # near miss by range, # kill by range for CAL .50 (M113), TOW (M-2), 25mm (M-2)
- 1.1.3 - Disengagement times: #H, NM, K (enemy) during disengagement; #H, NM, K (BLUFOR) during disengagement  
# Hits, near misses, and kills at obstacle; M113 unit range from obstacle; M-2 range from obstacle  
Length of time enemy to force obstacle  
Enemy rate of advance in attack
- 1.1.4 - Time from SP to LD  
# Rounds fired; # H, NM, K for (M113, CAL .50, TOW-M-2, 25mm (M-2));
- 1.1.5 - # EN Vehicles entering sector (RECON vehicles)  
# EN RECON vehicle engaged before EN main attack (Hit, NM, Kills) & # rounds fired (CAL .50, M-2 TOW, M-2 25mm)
- 1.1.6, 1.1.7, 1.1.8 - EN rate of advance; Degree of obscuration; Degree of NBC conditions
- 1.2.1 - # Rounds fired; # H, NM, Kill BLUFOR (M113, CAL .50, TOW M-2, 25mm M-2)
- 1.2.2 - # EN Rounds fired; # H, NM, Kill
- 1.2.3 - Distance from bounding element to overwatch element  
# Hits, NM, kill by bounding element & rounds fired by type  
# Hits, NM, kill by overwatch element & rounds fired by type  
# Hits, NM, kill by support attack/base of fire  
# Hits, NM, kill by assault element  
# Tanks in attack; # Tanks killed by EN direct fire during attack/assault; # tanks alive after attack on OBJ  
Time of forces reaching obstacle; time of forces forcing obstacle; # casualties during breaching  
Time from LD to seizure of objective  
Rate of advance of main attack during attack  
# Tanks in main attack, # tanks in supporting attack
- 1.3.1 - # Rounds fired; # H, Kill by type weapon (M113, CAL .50, M-2 TOW, M-2 25mm)
- 1.3.2 - # and type EN vehicle H, killed by M113, CAL .50, M-2 TOW, M-2 25mm  
# Targets hit by M113, CAL .50, M-2 TOW, M-2 25mm  
Degree of obscuration; degree of NBC conditions
- 1.4.1 - Relation of unit movement to designated control measure  
Time from point of departure to probable line of deployment  
Engagement data as in 1.2.1 above
- 1.4.2 - Engagement data as in 1.1.1 and 1.1.2 above