BATTLEFIELD COMBAT IDENTIFICATION STUDY

BLUEPRINT OF THE BATTLEFIELD FUNCTIONAL ANALYSIS

AT THE TACTICAL LEVEL OF WARFARE

FINAL REPORT

20 JULY 1993

PREPARED FOR: PROGRAM MANAGER
COMBAT IDENTIFICATION

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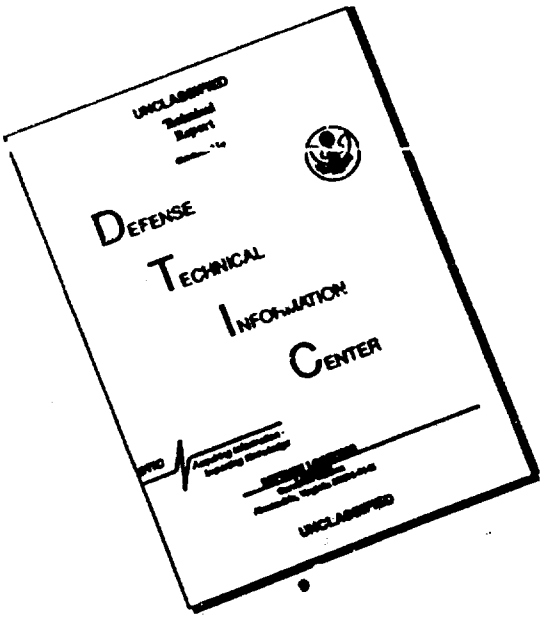

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"Doctrine that spurns new information in order to preserve the old order for its own sake is not doctrine, it is dogma. It no longer allows honest questioning. Debate is stifled; heretics are excommunicated. In such ways, the seeds of disaster are sown."

COL James R. McDonough
Military Review, October 1991

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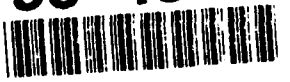
This study functionally analyzed the effects of fratricide, target identification, combat identification and situational awareness across the seven battlefield operating systems at the tactical level of war. It quantifies the functions, subfunctions, and tasks impacted by the above factors and qualitatively assesses their impact upon performance and force effectiveness.



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SECTION 1

INTRODUCTION AND SUMMARY RESULTS

1. PURPOSE

Section 1 describes the general background of the study and presents the key findings of the analysis which may be of interest to the Program Manager and other decision makers.

1.1 INTRODUCTION

This analysis examines the "ripple effect" of battlefield combat identification on essential operational functions of tactical forces. For study purposes:

> **Ripple effects are the direct and indirect results of battlefield combat identification, misidentification, and nonidentification analyzed across the spectrum of operations at the tactical level of warfare.**

The principal analytical focus is on fratricide resulting from lack of or improper battlefield combat identification (BCID) and its resultant impact on situational awareness (SA). The objective is to identify all battlefield functional elements upon which BCID may have an impact, either positive or negative, direct or indirect, active or passive. The analysis examines not only the traditional force-on-force functions normally examined in combat simulations, but also identifies affected combat support and combat service support functions. It describes the impact generated by the both proper identification and by misidentification in terms of the potential influences of near, mid-, and far term Battlefield Combat Identification/Battlefield Combat Identification Systems (BCID/BCIS).

1.1.1 Problem

Historically, the effects of fratricide have not been well documented and analyzed. The press of battle, political considerations, emotions, and most particularly the lack of a comprehensive and accessible automated data base have mitigated against thorough examinations of the problem. Recent analysis of empirical data from World War II, Viet Nam, and Operation Desert Storm indicates that historically accepted fratricide rates of about 2% cited by COL (Ret) Trevor N. Dupuy (Attrition: Forecasting Battle Casualties and Equipment Losses in Modern War) and LTC Charles R. Shrader (Amicicide: The Problem of Friendly Fire in Modern War) are woefully low. COL (Dr.) David Sa'adah posits in his paper, Friendly Fire: Will We Get It Right This Time, that fratricide rates range from 10% to 24% of all Killed In Action

(KIA), Died of Wounds (DOW), Wounded In Action (WIA) casualties. A preliminary analysis of training fratricide based upon National Training Center (NTC) data obtained from the Center for Army Lessons Learned (CALL) indicates that mean simulated training fratricide rates center in COL Sa'adah's range at approximately 15%. To assure continuity of analysis and results with the work of COL Sa'adah and CALL, we have used the U.S. Army Training and Doctrine Command (TRADOC) definition of fratricide, restated below, in our analysis.

> **Fratricide is the employment of friendly weapons and munitions with the intent to kill the enemy or destroy his equipment or facilities, which results in unforeseen and unintentional death or injury to friendly personnel.**

Casualties resulting from accidental weapon discharges, unexploded ordnance, or intentional acts of armed violence against other friendly personnel are not within the area of consideration for this analysis, since they are not a by-product of the intent to kill the enemy.

1.1.2 Problem Statement

Previous studies of the fratricide problem have focussed on the loss of combat systems and personnel, but have not examined the overall impact of fratricide on the broad spectrum of combat operations. As a result, the total impact of fratricide on force effectiveness is unknown.

1.1.3 Discussion

U.S. Army experience, gained from combat situations, training exercises, and simulations, indicates that target identification in general, and fratricide in particular, are continuing problems in the tactical arena. Present visual identification of entities on the tactical battlefield is inadequate to preclude fratricide. Despite extensive previous study of this problem, predecessor simulations and analyses of BCIS contributions to performance and force effectiveness have focussed on the direct combat impact of fratricide, expressed in traditional measures of effectiveness, such as loss exchange ratios (LER). They have examined neither the true dollar costs of fratricide, nor the burdening of other essential operational functions required to successfully conduct military operations. This analysis principally addresses the latter. Such analysis is necessary to properly solutions to identified problems through changes in doctrine, training, leader development, organization, and materiel (DTLOM).

1.1.4 Solution

Conduct research and analysis, based upon accepted analytical tools, to determine the tactical functional elements impacted by battlefield combat identification and fratricide.

1.2 BACKGROUND

1.2.1 Target Identification (TI)

Target identification on the tactical battlefield has essentially been a function of visual identification augmented by various imaging aids. While the quality of imaging aids has improved technologically, visual identification is still dependent on the quality of visual image presented and a rather large set of human and operational factors. Among these are stress, fatigue, anxiety, fear, motivation, physical attributes, leadership, state of training, command and control (C2), weather, and situational awareness (SA). SA, in particular, is extremely important in the target identification process, for many of the elements required for TI can be inferred from SA factors. In short, visual identification alone is inadequate to preclude fratricide.

Further, fratricide influences far more than losses and force ratios. It places additional burdens on a broad array of combat, combat support, and combat service support functions, and invariably has a negative effect on morale, which is a non-quantifiable but nonetheless critical component of relative combat power.

1.2.2 Doctrine

The advent of reliable BCIS technology presents the opportunity to improve the probability of correct identification of friendly forces and reduce or preclude fratricide, as well as enhance system performance and force effectiveness. However, in order to accurately estimate the overall contribution of BCIS to performance and force effectiveness, the examination of its impact must go beyond the previous narrow focus on firepower and force ratios. New analysis must support the Army's emerging warfighting doctrine stressing leaner forces in contingency operations projected on short notice into theaters of operations about which little is known, and where there is no established sustaining base. Operations Just Cause, Urgent Fury, and Desert Storm suggest strongly that total force functions must be analyzed to accurately assess the impact of BCID and fratricide on total force effectiveness.

In addition, doctrine must be developed to define the employment of BCIS devices and to describe how SA elements may or may not be factored into the TI process. Analogous to this description is the use of procedural identification habitually used by Army Air Defense Artillery and Air Force defensive counterair forces.

1.3 ESSENTIAL ELEMENTS OF ANALYSIS (EEA) AND OBJECTIVES

EEA and objectives combine to provide the basis for responding to the problem statement.

1.3.1 EEA

EEA development is a critical analytical step in the top-down decomposition methodology used for this study Development of EEA tailored to the purpose of the study are essential to ensure that a complete examination of the problem takes place.

1.3.1.1 Definition

To assure a common understanding of terms, the definition of EEA appears below.

> **EEA are statements in question form which delineate the subelements of the subject being studied for which answers must be produced.**
> **TRADOC Pamphlet 11-8**
> **Studies and Analysis Handbook**

The analytical decomposition is based upon the U.S. Army TRADOC Blueprint of the Battlefield (BOB), which is a hierarchical listing of functional elements whose execution is required to successfully accomplish an operational mission for a given level of war. At the tactical level, which is the focal level for this study, the BOB contains seven Battlefield Operating Systems (BOS), each of which contains a series of discrete functions, subfunctions, and tasks. Table 1-1 lists the identifying number and name of each BOS, and the number of functional elements which each contains. Section 2, Methodology, further explains the BOB and its application to this analysis.

BOS #	BOS NAME	# FUNCTIONAL ELEMENTS
1	MANEUVER	70
2	FIRE SUPPORT	85
3	AIR DEFENSE	40
4	COMMAND AND CONTROL	96
5	INTELLIGENCE	93
6	MOBILITY & SURVIVABILITY	155
7	COMBAT SERVICE SUPPORT	225
TOTAL FUNCTIONAL ELEMENTS		764

Table 1-1. Battlefield Operating Systems

The first column indicates the BOS number extracted from TRADOC Pam 11-9; the center column lists the BOS name from the same reference; and the last column indicates the number of functional elements (total functions/subfunctions/ tasks) in the BOS. The bottom line represents all the functional elements necessary for a force to perform to successfully accomplish its assigned combat mission.

1.3.1.2 EEA Listing
The study has three EEA which analysts derived from the problem statement:

> EEA 1 - Do Battlefield Combat Identification/Battlefield Combat Identification Systems affect Battlefield Operating Systems?
>
> EEA 2 - What proportion of BOS do BCID/BCIS affect?
>
> EEA 3 - What are the broad impacts of BCID/BCIS on BOS?

1.3.2 Objectives
Objectives state the specific tasks considered necessary to solve the problem addressed by the study. The successful accomplishment of all objectives provides the information necessary to satisfy EEA. The three study objectives are the taskings which provide information for responses to the EEA. They are numbered to correspond to the supported EEA to facilitate cross referencing.

> Objective 1: Identify for all BOS those battlefield functional elements impacted (FEI) directly and indirectly by battlefield combat identification and fratricide.
>
> Objective 2: Quantify FEI as a percentage of the total functional elements required to successfully accomplish operational missions.
>
> Objective 3: Qualitatively assess the operational effects of FEI.

1.4 SUMMARY RESULTS
Summarized results for each of the EEA/objectives appear below. Where applicable, data are in graphic form with explanatory notes. Section 3 contains details of the analysis, including a complete list of findings and supporting data.

1.4.1 EEA 1 - Do Battlefield Combat Identification/Battlefield Combat Identification Systems affect Battlefield Operating Systems?

1.4.1.1 Answer - Yes, Battlefield Combat Identification and Battlefield Combat Identification Systems affect each of the seven Battlefield Operating Systems.

1.4.1.2 Objective 1 - Identify for all BOS those battlefield functional elements impacted (FEI) directly and indirectly by battlefield combat identification and fratricide.

All functional elements impacted by BCID/BCIS have been identified. Impact includes fratricide dimensions, target identification influences, and situational awareness contributions. Functional elements appear with their definitions and supporting information in Section 3 - Analysis to avoid redundancy and cluttering the report. Table 2 presents the number of functional elements affected in each BOS.

BATTLEFIELD OPERATING SYSTEM	# FUNCTIONAL ELEMENTS IMPACTED
MANEUVER	32
FIRE SUPPORT	55
AIR DEFENSE	22
COMMAND & CONTROL	30
INTELLIGENCE	7
MOBILITY & SURVIVABILITY	12
COMBAT SERVICE SUPPORT	73
TOTAL	231

Table 1-2. BCID/BCIS Impact on BOS Functions

The Analysis section defines each impacted functional element and describes the nature of the impact. Appendix 1 contains a separate listing of impacted functional elements by BOB function number and name.

1.4.2 EEA 2 - What proportion of BOS do BCID/BCIS affect?

1.4.2.1 Answer: BCID/BCIS affect 30% of all functional elements contained in the seven Battlefield Operating Systems comprising the tactical level of warfare.

1.4.2.2 Objective 2 - Quantify identified FEI as a percentage of the total functional elements required to successfully accomplish operational missions.

Table 1-3 portrays the proportion of functional elements in each BOS which BCID/BCIS affect either directly or indirectly.

BOS #	# FUNCTIONAL ELEMENTS	% IMPACTED BY BCID/BCIS
1 MNVR	70	32/46%
2 FS	85	55/65%
3 AD	40	22/55%
4 C2	96	30/27%
5 INT	93	7/8%
6 M&S	155	12/8%
7 CSS	225	73/32%
TOTAL	764	231/30%

Table 1-3. BCID/BCIS Ripple Effect

The overall FEI proportion approaches one third. However, the first three BOS, which contain the majority of firing systems concerned with battlefield combat identification and capable of fratricide, have much higher proportions of FEI. In BOS 1 through 3, BCID/BCIS impact over 55% of all defined functional elements. The BOS containing the highest proportion of FEI is the Fire Support BOS, which historically has produced the most fratricides through indirect fire and CAS.

1.4.3 EEA 3 - What are the broad impacts of BCID/BCIS on BOS?

1.4.3.1 Answer - The broad impacts of BCID/BCIS involve tangible and intangible factors, and are both positive and negative. The positive impacts clearly outweigh the negative. However, the negative impacts should not be ignored, since they represent areas which must be addressed and rectified through DTLOM solutions.

1.4.3.2 Objective 3 - Qualitatively assess the operational impacts of identified FEI.

Impacts identified in the Analysis section have been rolled up into findings, which are brief statements reflecting the results of the study. Principal findings appear below with negative findings appropriately indicated. All findings appear in the Analysis section.

1.4.3.2.1 Maneuver BOS Findings:

BCIS enhances the capability to position and reposition forces, especially during periods of restricted visibility.

BCIS enhances the capability to navigate.

BCIS enhances direct fire engagement.

BCIS reduces direct fire fratricide.

BCIS improves integration of fire and maneuver.

BCIS facilitates control of terrain by fire.

1.4.3.2.2 Fire Support BOS Findings:

BCIS reduces fire support fratricide.

BCIS expedites fire support target processing.

BCIS improves fire support effectiveness and efficiency.

BCIS increases effectiveness of CAS.

BCIS preserves force effectiveness.

BCIS expedites and enhances fire support integration.

1.4.3.2.3 Air Defense BOS Findings

BCIS expedites air defense target processing.

BCIS enhances the integration of air defense operations in the forward area.

1.4.3.2.4 Command and Control BOS Findings

BCID/BCIS enables better force synchronization.

BCID/BCIS improves situational awareness.

BCID/BCIS expedites the decision making process.

BCID/BCIS improves coordination capabilities.

NEGATIVE - BCIS increases C2 workload.

1.4.3.2.5 Intelligence BOS Findings

BCID/BCIS expedites and increases accuracy of target identification.

1.4.3.2.6 Mobility & Survivability BOS Findings

NEGATIVE - BCIS creates added task loading for selected OPSEC personnel.

1.4.3.2.7 Combat Service Support BOS Findings

BCIS reduces recovery, repair, and exchange requirements.

BCIS reduces field services requirements for graves registration and salvage operations.

BCIS reduces health services requirements and enhances the triage process.

BCIS reduces personnel services and chaplaincy requirements.

BCIS reduces distribution requirements.

1.5 CONCLUSIONS

Conclusions are brief statements based upon study findings, but containing broader inferential meaning. Subsequent paragraphs present the study conclusions.

1.5.1 Improved BCID/BCIS will improve force integration and contribute to increased force effectiveness by enhancing performance in the Maneuver, Fire Support, Air Defense, Command and Control, and Intelligence BOS's.

1.5.2 BCID/BCIS will reduce the dollar cost of combat operations by reducing Combat Service Support requirements generated by fratricide.

1.5.3 BCID/BCIS will improve morale and fighting spirit by reducing fratricide, contributing to increased force effectiveness.

1.5.4 BCID/BCIS will create some additional work requirements and task loading in the Command and Control and Mobility/Survivability BOS's.

1.5.5 Functional elements identified in this analysis can contribute to the definition and characterization of Situational Awareness.

1.5.6 The negative impacts of fratricide, and the capability of BCID/BCIS to significantly reduce or eliminate them, are far greater than previously described.

1.5.7 The intangible results of fratricide prevention made possible by improved BCID/BCIS will reduce adverse publicity; avoid tarnishing of the Army's reputation and destruction of professional careers; and reduce/eliminate the cost of investigations, judicial proceedings, and post-combat administrative actions.

SECTION 2 - METHODOLOGY

2. PURPOSE

Section 2 presents a summary of the analytical conduct of the study. It describes the tools, techniques, and processes used to develop data, findings, and supporting information.

2.1 ANALYTICAL TOOL

There is an approved analytical tool, the Blueprint of the Battlefield (BOB), which provides a basis for the analysis of all essential tactical functions required to successfully accomplish a military operation. Although the BOB addresses all levels of warfare, from National Strategic to Tactical, this analysis addresses only the Tactical level, emphasizing small unit combat.

> The Blueprint [BOB] serves as a common reference system for field commanders, combat developers, analysts, trainers, and planners for analyzing and integrating operations. As such, the Blueprint assists staff and field organizations in relating Army needs to Army missions.
>
> TRADOC Pamphlet 11-9

An automated version of the BOB, called the Blueprint of the Battlefield Computer Analysis Tool (BOBCAT), employed in conjunction with TRADOC Pamphlet 11-9, served as the principal automated tool for the study. If desired, COLSA will make this tool available to PM Combat Identification and train government personnel in its use.

2.2 ANALYTICAL APPROACH

The BOB employs a functional analysis approach to identify the generic functions, subfunctions, and tasks required to successfully accomplish a combat mission. It uses a systems analysis approach featuring a top-down, successive decomposition process to identify each element of the overall complex operating system, characterize those elements, and determine their functional role. Although the total BOB describes all levels of war, including Operational, Theater Strategic, and National Strategic, this analysis examines only the Tactical level of war. The Tactical BOB contains seven functional groupings, called Battlefield Operating Systems (BOS), depicted in Table 2-1.

> NOTE: The BOB addresses generic functional elements. A functional analysis pinned to specific military systems

and Military Occupational Specialties (MOS)/Additional Skill Identifiers (ASI) would have a vastly larger array of tasks, e.g., direct fire gunner vs M-1 gunner/M-2 gunner/TOW gunner/etc.

BOS #	BOS NAME	# FUNCTIONAL ELEMENTS
1	MANEUVER	70
2	FIRE SUPPORT	85
3	AIR DEFENSE	40
4	COMMAND AND CONTROL	96
5	INTELLIGENCE	93
6	MOBILITY & SURVIVABILITY	155
7	COMBAT SERVICE SUPPORT	225
TOTAL 764		

Table 2-1. Battlefield Operating Systems

Functional elements are the total of functions, subfunctions, and tasks broken down in successive levels of detail. There may be multiple levels of subfunctions before reaching the task level. Tasks contain the highest degree of detail and are not further subdivided. Functions and tasks are discrete, meaning that no function or task appears in more than one place in the BOB.

2.2.1 Analytical Process

Each functional element within the BOB underwent scrutiny to determine if it might be affected by BCID/BCIS, either positively or negatively. Affected elements were tagged, extracted, and analyzed to determine the relationship to BCID/BCIS. We then defined each element and developed discussion notes explaining impacts and relationships where necessary. In those cases where BCID/BCIS influenced a functional element, appropriate descriptions of how the influence occurred and its impact were developed.

2.2.2 Quantification

After identification, the ratio of BCID/BCIS affected elements to total elements in each BOS and for the entire BOB were computed. The ratios quickly identify how widely BCID/BCIS generated information and effects (ripple effect) permeate the overall realm of combat operations, and provided the basis for development of the percentage of elements impacted. The computation used to quantify effects were:

F + SF + T = TFE
FI + SFI + TI = FEI
FEI/TFE = % FEI

where:

F = BOB functions	TFE = total functional elements
SF = BOB subfunctions	FEI = functional elements impacted
T = BOB tasks	FE = functional elements

2.1.3 Impact Assessment

Identification of functional elements affected and analysis of their definitions provided a basis to develop findings about the general impact on the overall combat operations system due to BCID/BCIS and fratricide. Discussion paragraphs provide the rationale behind the impact statements, which describe both positive and negative effects of BCID/BCIS contributions.

2.1.4 Associated Analyses

There are two in-process analyses associated with this effort.

2.1.4.1 Automated Fratricide Data Base/Fratricide Analysis

A parallel effort to develop an automated fratricide data base, scheduled for completion at the end of September 1993, will provide a means to develop levels of fratricide based on past combat and training experiences. Initial research indicates that the historical level of fratricide may be in the range of 12 - 15% of total battle casualties, which is significantly higher than the commonly accepted level of 2% and is an unacceptable burden on tactical operations. Creation of the data base will enable further analysis to pin down the characteristics of fratricide, perform more sophisticated quantitative statistical analyses, and develop the mid- and far term solutions to it. The data base will reside at PM Battlefield Combat Identification and will be continuously updated and analyzed as reports are received from training centers, exercises, and actual field operations. The analysis will enable the prompt identification of trends in fratricide and the immediate development and implementation of remedial measures. The data base will be accessible to all activities authorized by PM Battlefield Combat Identification (BCID).

2.1.4.2 Front End Analysis (FEA)

A FEA is underway at Ft. Knox to define and characterize Situational Awareness. A copy of this analysis will be provided to the FEA team for inclusion/use in their work.

SECTION 3 - ANALYSIS

3. PURPOSE
This section presents the analysis and findings of the study. It presents the analysis of the BOB/Tactical BOS to develop an estimate of the overall involvement of BCID/BCIS in tactical operations. It does not address other levels of war or operations short of war, although logical inferences may be made where functions are identical.

3.1 FUNCTIONAL ELEMENTS IMPACTED
This paragraph contains the number of functional elements impacted (FEI) by BCID/BCIS, including functions, subfunctions, and tasks, either by augmenting in an existing process (target identification); by precluding the occurrence of an undesirable effect (fratricide); or by changing work quality, work load, or resource requirements. The listed tasks are direct extracts from the respective BOS, including the task number. Successive levels of indentation represent descending levels of subordination within a function. The number of functional elements impacted (FEI) is summarized after each function, BOS, and the overall BOB. Table 3-1 portrays the results graphically; percentages are to the nearest whole percent.

BOS #	# FUNCTIONAL ELEMENTS	# / % IMPACTED BY BCID/BCIS
1 MNVR	70	32/46%
2 FS	85	55/65%
3 AD	40	22/55%
4 C2	96	30/27% *
5 INT	93	7/8%
6 M&S	155	12/8% *
7 CSS	225	73/32%
TOTAL	764	231/30%
* These BOS include one negative impact each		

Table 3-1. BCID/BCIS Ripple Effect

While the overall percentage of functional elements impacted by BCID/BCIS is significant, the percentage impacted in the Maneuver,

Fire Support, and Air Defense BOS's (1/2/3), where most fratricide occurs, is even greater at almost 56%. Subsequent paragraphs address each BOS discretely, and includes definitions, discussion, specific impacts of BCID/BCIS, number of FEI, and findings. Where applicable, descriptive notes have been included.

3.2 **BOS 1 - Maneuver**

Definition: The employment of forces on the battlefield through movement and direct fires in combination with fire support, or fire potential, to achieve a position of advantage, in respect to enemy ground forces, in order to accomplish the mission. This includes direct fire systems (e.g., small arms, tank guns, and attack helicopter fires).

3.2.1 **Function** 1.1 - Move

Definition: To position or reposition forces (units and equipment) relative to the enemy to secure or retain positional advantage making full use of terrain and formation. It is the dynamic element of combat - the means of concentrating forces at the critical pint to achieve the surprise, psychological shock, physical momentum, and moral dominance which enable smaller forces to defeat larger ones. Units supporting combat maneuver units are included since they are required to go wherever the combat units go.

> Note: The CSS BOS analysis discusses the movement of cargo, equipment, and personnel.

Subfunction 1.1.1 - Position/Reposition Forces (Units/Equipment)
Definition: To change physically the location of military organizations or units and their equipment from one pint or area to another using the terrain, formation, and techniques to gain an advantage over an enemy. Movement may be on or under the surface, or through the air. Position forces includes bypassing obstacles. It also includes movement of units by nonorganic organization: e.g., infantry units moved by a truck unit.

> Subfunction 1.1.1.2 - Move On or Under the Surface
> Definition: To move on the ground, or on or under water. This movement may be mounted or dismounted.
>
> > Subfunction 1.1.1.2.1 - Move while Mounted
> > Definition: To move forces on, in, or astride a vehicle. The vehicle could be tracked or armored, wheeled, air cushion, waterborne, or other.
> >
> > > Task: 2) Use mounted formations and movement techniques
> >
> > Subfunction 1.1.1.2.2 - Move while Dismounted

Definition: To move forces without vehicular assistance; e.g., foot, SCUBA.

Tasks: 2) Use dismounted formations and movement techniques

Subfunction 1.1.1.3 - Move through Air
Definition: To move forces by fixed or rotary winged aircraft, parachute, etc.

Tasks: 2) Use air formations and movement techniques

Subfunction 1.1.1.4 - Close into Tactical Position
Definition: To complete movement or deployment into a tactical position.

Tasks: 2) Deploy into fighting/halt position
3) Deploy into assembly/staging area

Discussion: During periods of reduced light and visibility, it is frequently difficult to visually identify adjacent friendly elements. Use of BCIS enables a formation leader, or subordinate elements within the formation, to rapidly and positively identify other friendly systems within and adjacent to the formation or position. Positive identification of what might otherwise be merely an outline or vehicle noise within a dust cloud or at night enables individual vehicles within the formatic to maintain station and report accurately. In turn, this enhancement of positional awareness enhances the ability of the small unit leader to control his formation and accurately report its progress to higher headquarters. Further discussion appears in the C2 BOS analysis.

BCIS Impact:
Movement enhanced
Lost systems and fragmented formations reduced
Unit confidence (element of moral force) enhanced

Finding:
BCIS enhances the capability to position and reposition forces, especially during periods of restricted visibility.

Subfunction 1.1.3 - Navigate
Definition: To plan, record, and control the course of an individual, unit, or vehicle on land, air, or water while mounted or dismounted. Navigate includes the use of navigational aids (map/compass/charts/stars) or dead reckoning.

Task: 3) Determine location
7) Maintain orientation

Discussion: The location and orientation elements of navigation require that individual systems within a formation maintain situational and positional awareness not only of their ground truth location and direction, but of their spatial relationship to other elements within their formation. Use of BCIS to identify friendly elements not otherwise clearly discernible and identifiable due to reduced visibility enhances the ability of the unit to maintain internal orientation and navigate as a coherent whole. Further discussion appears in the C2 BOS analysis.

BCIS Impact:
Formation integrity maintained
Intermixing of force elements reduced
Navigation enhanced

Finding:
BCIS enhances the capability to navigate.

FEI = **15**

3.2.2 **Function** 1.2 - Engage Enemy
Definition: To enter into conflict or combat on the ground with the enemy using direct fire or close combat. Note: Air targets are covered in the Air Defense BOS.

Subfunction 1.2.1 - Employ Direct Fire
Definition: To take the enemy under fire using gunfire delivered on a target,using the target itself as a point of aim for either the gun or the director. Examples include small arms, tanks, antitank guns and rockets, automatic weapons, directed energy weapons. Attack helicopter fires are included here.

Subfunction 1.2.1.1 - Process Direct Fire Targets
Definition:To select direct fire targets and match the appropriate response to them taking account of operational requirements and capabilities. In the case of a soldier using a small arm, processing targets might be relatively instantaneous; however, as a part of a unit it might be quite deliberate.

Subfunction 1.2.1.1.1 - Select Direct Fire Targets
Definition: To determine targets to be attacked.

Tasks: 1) Designate target areas/fields of fire
2) Prepare range cards/sector sketches
3) Choose direct fire target for engagement

Discussion: BCIS plays a key role in this task by providing a high probability of positive friendly identification under a wide variety of conditions. When designating target areas, the small unit leader can also determine which of his elements can identify friendlies in the area, and the identification coverage areas can

be noted on range cards. BCIS expedites target processing by enabling the small unit leader to optimize tactics, techniques, and procedures (TTP) for direct fire by pre-assigning areas for interrogation, determining electronic challenge lines of sight (LOS) and dead space, and preplanning and disposing forces to cover dead space. The C2 BOS discussion expands this application. BCIS enhances performance by providing identification of friendly systems at long ranges, under all conditions of light and visibility. In target selection, BCIS reduces dependence on highly variable elements of direct fire engagements, including:

o Image quality of optical and electro-optical fire control sensors (TTS/FLIR/I2/Magnified Optical)

- TTS and FLIR lack sufficient resolution for consistent correct positive identification
- I2/Optical/Magnified Optical are highly range and visibility dependent

o Training - ability of crew members to properly identify targets

- ARI studies of combat vehicle identification training at Ft. Hood from 1980-1985 indicate correct visual identification rates in training vary from 47% to 79%
- Identification depends on a wide range of variables, including experience, motivation, grade, aptitude, and eyesight

BCIS Impact:
Identification of friendly vehicles improved under all conditions
Fratricide potential greatly reduced
Engagement of hostile targets expedited by reducing target set

Subfunction 1.2.1.1.2 - Select Direct Fire System
Definition: To determine direct fire weapon to engage a specific target.

Tasks: 1) Determine system capability
3) Choose direct fire weapon for engagement

Discussion: By quickly filtering positively identified friendly vehicles from the target set, instead of waiting for vehicles to close to visual ID ranges, tentative target assignments can be made at longer ranges, giving the firing system more time to determine if the target is enemy or non-combatant. During unit crossfeed, the small unit leader can determine which of his elements have identified friendlies, sort friendlies from the target set, and more effectively assign those targets remaining in the set.

BCIS Impact:
Weapon range capabilities optimized
Fire distribution enhanced
Weapon selection optimized
Fratricide reduced by eliminating friendly systems from target set

Subfunction 1.2.1.2 - Engage Direct Fire Targets
Definition: To engage enemy equipment and materiel, personnel, fortifications and facilities with direct fire.

Tasks: 3) Update fire control systems
6) Aim direct fire weapon
7) Fire direct fire weapon

Discussion: Since BCIS will be an integral component of the fire control process, updating the fire control system prior to firing will eliminate the engagement of friendlies. Aiming and firing of the weapon will also be expedited because there will be fewer potential targets upon which to lay the system. The combination of longer range identification, expedited fire distribution, and enhanced laying and firing times will extend the times and ranges composing the direct fire engagement window, resulting in greater firing effectiveness. Additional comments based upon firing appear in the CSS BOS analysis.

BCIS Impact:
Engagement ranges extended
Available engagement time increased
Firers achieve more second and third shot opportunities

Finding:
BCIS enhances direct fire engagement.
BCIS reduces direct fire fratricide.

Subfunction 1.2.3 - Integrate Direct Fire with Maneuver
Definition: To combine all tactical direct fires with the maneuver of forces into a cohesive action maximizing their effect in accomplishing the mission.

Note: The C2 BOS addresses synchronization of all fires (e.g., direct, fire support, air defense), mobility/countermobility means, and other combined arms activities in the various operating systems.

Discussion: Rapid identification of all friendly elements permits the small unit commander to rapidly dispose and redispose his forces and integrate direct fires to counter the actual enemy threat. It eliminates indecision which frequently occurs adjacent to external unit boundaries, during high density of forces operations, and in reduced light and visibility conditions. It

also enables small unit leaders to rapidly identify friendly systems which do not, for a variety of reasons, adhere to the planned scheme of maneuver which, in turn, precludes fratricide.

BCIS Impact:
Use of maneuver space enhanced
Space/time integration enhanced
Unit agility enhanced
Unit effectiveness enhanced
Fratricide reduced

Finding:
BCIS improves integration of fire and maneuver.

FEI = **15**

3.2.3 **Function** 1.3 - Control Terrain
Definition: To dominate an area to prevent enemy occupation of the position through fire, fire potential, or occupation of the terrain.

Subfunction 1.3.1 - Control Terrain through Fire/Fire Potential
Definition: To use direct fires, or to request and adjust indirect fires, or the threat of such fires on a geographic area to intimidate the enemy from occupying the ground or to make occupation of the area too costly.

Discussion: Control of terrain by fire frequently involves the employment of long range direct fires, or adjustment of supporting and indirect fires at ranges which exceed the visual identification capabilities of most systems and personnel. Positive identification of friendly systems impinging, either intentionally or unintentionally, upon terrain controlled by fire presents a high fratricide situation. Further, since terrain controlled by fire is normally key terrain, it is both tactically sensible and routine for forces moving onto key terrain features to screen their movements with obscurants. Thus, first indications of movement onto the controlled terrain may be other than visual, such as noise, surveillance radar, or low resolution electro-optical devices, which are incapable of providing positive recognition at extended ranges. Positive identification by BCIS provides the information necessary to preclude fratricide, or to enhance fire control and engagement of enemy forces. Additional discussion appears in the Fire Support, C2, Intelligence, Mobility/Survivability, and CSS BOS analyses.

BCIS Impact:
Reduced fratricide
Enhanced fire discipline/control
Enhanced control of terrain by fire

Finding:

BCIS facilitates control of terrain by fire.

FEI = 2

Total BOS 1 FEI = 32

3.3 BOS 2 - FIRE SUPPORT

Definition: The collective and coordinated use of target acquisition data, indirect fire weapons, armed aircraft (less attack helicopters) and other lethal and nonlethal means against ground targets in support of maneuver force operations. It includes artillery, mortar and other non- line-of-sight fires, naval gun fire, close air support, and electronic countermeasures.

3.3.1 **Function** 2.1 - Process Ground Targets

Definition: To select targets and match the appropriate response to them, taking account of operational requirements and capabilities.

Subfunction 2.1.1 - Select Target to Attack

Definition: To analyze each target to determine if and when it should be attacked in accordance with tactical benefit and the maneuver commander's guidance.

Tasks: 2) Compare sensor data to target selection standards
6) Create target nomination list
7) Perform target file maintenance
8) Choose targets

Discussion: BCIS performs a sensor role in that it acquires information about a target system. As such, it furnishes a governing factor for target selection by identifying friendly system. This enables fire support elements to screen identified friendly systems against the friendly/enemy selections standard; filter positively identified friends from the target file; and to **NOT** choose friendly systems as targets. Since elements of the fire support chain have the capability to designate and engage targets at extremely long ranges (Copperhead/HELLFIRE/laser guided CAS weapons), it is essential that Fire Support Team (FIST) members have the capability to identify targets reliably beyond normal visual ranges. Historically, the leading causes of fratricide have been indirect fire and associated fire support means. BCIS will enable FIST's and other elements requesting fire support to positively identify friendlies and preclude their engagement.

EXAMPLE

An illustrative example of the filtering process appears in Table 7-1, based upon a balanced Tank/Mech Blue Battalion Task Force conducting an early evening hasty attack against a reinforced Red defending Tank Company. The Blue TF zone is on the Brigade right flank, which is on the Division right flank, which is the right flank element of the Corps. The adjacent element across the Corps boundary is a Mech Task Force. This situation presents the most external boundaries and greatest coordination problem for fire support elements. Forces for both sides include recon elements and a slice of combat support vehicles and artillery. Blue forces are operating in close proximity to one another, producing a high

density of Blue vehicles along the Corps boundary. The perspective represented is that of the FIST supporting the right most company team in the TF, the company commander concerned with right and left flank units and the enemy, and the supporting TF Fire Support Officer. Engagement of noncombatants, low light levels, and battlefield obscuration are factors. While the numbers of systems in the example may vary from case to case, they are representative of U.S. Army and Threat Force doctrinal strengths and supporting slices. Noncombatant numbers are nominal. The bases for the numbers are:

Tanks: Attacking Blue Company = 13
Adjacent Blue Platoon = 4
Defending Red Company = 13

IFV: Adjacent Mech Team = 4
Defending Red Co + = 4

Noncombatant: nominal mix of refugees/local traffic = 20

Combat Support: Blue = 19
Red = 5

ARTY: DS Slice Blue Tank Co = 8
DS Slice Adj Blue Mech = 8
DS Slice Red Co + = 6

Recon: Blue Tank TF = 6
Adj Blue Mech TF = 6
Red Co + = 4

Table 3-2 portrays the results of the BCIS filtering process graphically.

SYSTEM TYPE	TOTAL TARGET SET	BCIS FILTERED FRIENDLY SYSTEMS	FILTERED TARGET SET
TANK	30	17	13
IFV	8	4	4
DS ARTILLERY	22	16	6
COMBAT SUPPORT*	24	16	8 (5R/3B*)
RECON	16	12	4
NONCOMBATANT	20 (Nominal)	0	20
TOTAL	120	65	55
PERCENTAGE	100%	54%	46%

Table 3-2. BCIS Filters Target Sets

* In the Combat Support vehicle group, note that three vehicles remain in the Filtered Target Set. These are Tracked Recovery Vehicles (VTR), which do not appear in the Basis of Issue Guidance and are not equipped with BCIS.

However, even with the VTR's in the target set, it has been cut by more than 50%.

BCIS Impact:
Enhance target selection
Expedite target processing
Reduce fire support fratricide

Finding:
BCIS expedites observed indirect fire support target processing.

Subfunction 2.1.2 - Select Fire Support Attack System
Definition: To determine the appropriate attack system for a particular target.

Subfunction 2.1.2.1 - Determine System Capability
Definition: To determine the attack system which can provide the required effects.

Tasks: 1) Determine fire support systems capable of defeating target
2) Determine rank order of fire support systems capable of defeating target
3) Determine fire unit capability

Discussion: The potential target set has a great impact on selection of attack systems. When friendly systems and forces can be accurately and effectively filtered from the target set, thereby reducing the total number of targets to be analyzed for engagement, the prioritization of the remaining potential targets becomes simpler. Thus, the number of attack systems which can defeat the remaining targets, ranges to targets, required ammunition expenditures, and individual target priorities/values may all change as a result of positively identifying friendly elements. The result may be a completely different and more accurate rank ordering of fire support units and capabilities. In addition, a reduced target set will expedite processing and conflict resolution time, and reduce workload.

BCIS Impact:
Expedited system capability determination
Better match of system capability vs targets

Subfunction 2.1.2.3 - Select System
Definition: To designate an attack system to perform a required operation.

Discussion: Through more accurate matching of fire support system capability against a filtered target set, fire support system selection will be optimized.

BCIS Impact:
Expedited engagement
Enhanced effectiveness (better fire support results)
Enhanced efficiency (reduced expenditure of fire support resources)

Finding:
BCIS improves fire support effectiveness and efficiency.

Subfunction 2.1.3 - Develop Order to Fire
Definition: To create firing instructions (e.g., selected target, required effects, time on target) for transmission to the selected attack system.

Task: 1) Conduct tactical fire control

Discussion: Identifying friendly units is implicit to tactical fire control. Because fire support is normally delivered at longer ranges than direct fires (with some exceptions), and a call for fire may come from a wide variety of sources (FO-FIST/aeroscout-scout/maneuver element/sensor operators), visual identity may be very difficult. The exercise of tactical fire control, especially the interface with fire support coordination activities for target clearance, then becomes in part a function of SA, in which target location and suspected nature are compared to known battlefield geometry. If the proposed target does not match with known friendly locations, it normally will be identified as enemy and engaged. This type of fratricide situation was quite common in the Viet Nam conflict. However, when elements requesting fire are equipped with a BCIS device and can identify targets beyond visual range as friendly, the burden on the fire direction center to perform tactical fire control is reduced and the probability of fratricide lowered.

BCIS Impact:
Reduced indirect fire fratricide
Enhanced tactical fire control.

Finding:
BCIS reduces fire support fratricide through enhanced tactical fire control.

FEI = **14**

3.3.2 **Function** 2.2 - Engage Ground Targets
Definition: To enter into conflict with the enemy using fire support systems.

Subfunction 2.2.1 Conduct Lethal Engagement
Definition: To use weapon systems designed to cause casualties to troops, or to destroy materiel or facilities.

Subfunction 2.2.1.1 - Conduct Surface Attack
Definition:To apply ground-based weapon systems to destroy, suppress, or neutralize enemy equipment (including aircraft on the ground), materiel, personnel, fortifications, and facilities.

Tasks: 6) Receive firing data
7) Prepare ammunition
8) Set firing data
9) Load/enable weapon
10) Fire weapon

Subfunction 2.2.1.2 - Adjust/Illuminate Fire Support Targets
Definition: To request and adjust fire support, and/or illuminate (designate) fire support targets.

Tasks: 1) Issue warning order
2) Provide target location
3) Provide target description
4) Specify method of engagement
5) Specify method of fire and control
6) Designate targets
7) Sense the strike of rounds
8) Determine adjustment to strike of round

Subfunction 2.2.1.3 - Conduct Air-to-Ground Attack
Definition: To request the employment of Navy, Marine, and Air Force aircraft to deliver rocket, cannon and missile fires, and bombs on enemy ground positions.

Tasks: 3) Provide target description
6) Designate targets

Discussion: Historically in this century, indirect fire and air support have created the greatest number of fratricide casualties. In the near term, positive friendly identification provided by BCIS will permit elements requesting indirect fire support and Close Air Support (CAS) to preclude requesting attack of friendly forces. Fire support workload can be reduced through elimination of missions targeted against friendly forces, and resources conserved. Scarce fire support resources can then more efficiently be scheduled against true hostile targets.

However, emerging technologies, such as automated engagement handoff and smart submunitions, may create new problems for solution. Similarly, U.S Army forces presently enjoy a distinct advantage in night fighting technology over current potential

enemies. Erroneous illumination through indirect fire or air delivered flares could not only provide enemy forces with needed light, but could also decrement the performance of some friendly night vision devices.

In the mid-far term, attacking CAS systems themselves will have an integral BCIS capability to preclude attack of friendlies. In the split second environment surrounding delivery of CAS ordnance, it is imperative that accidental inclusion of friendly elements in the target set be precluded. This is particularly true when CAS is the only available source of fire support and the normal fire support coordination infrastructure is not available, as in support of Special Operations Forces (SOF). The devastating effects of fratricidal air attack on both force effectiveness and morale have been amply documented from World War II through Operation Desert Storm.

Additionally, there is an inverse effect to CAS fratricide - high value targets which should be attacked escape destruction because of the scarcity of CAS assets.

BCIS Impact:
More efficient employment of fire support resources
Enhanced CAS efficiency by improved resource allocation
Reduced fire support workload
Reduced fratricide

Finding:
BCIS increases effectiveness of CAS.

Subfunction 2.2.2 - Conduct Nonlethal Engagement
Definition: To employ means designed to impair the performance of enemy personnel and equipment.

Subfunction 2.2.2.1 - Reduce Enemy Personnel Effectiveness
Definition: To degrade enemy soldier performance through direct action or indirect influences.

Subfunction 2.2.2.1.1 - Employ Incapacitating Agents
Definition: To use chemicals that produce temporary disabling conditions that (unlike those caused by riot control agents) can be physical or mental and persist for hours or days after exposure to the agent has ceased.

Tasks: 1) Select incapacitating agents for desired effect
2) Select delivery means

Subfunction 2.2.2.2 - Reduce Enemy Equipment Effectiveness
Definition: To degrade enemy equipment performance or render the equipment ineffective for its intended purpose.

Subfunction 2.2.2.2.1 - Conduct Jamming
Definition: To use deliberate radiation, reradiation, or reflection of electromagnetic energy with the objective of degrading the effectiveness of electronic devices, equipment, or systems used by a hostile force.

Tasks: 1) Determine system to be jammed
2) Determine desired result
3) Select jamming method
4) Initiate jamming
5) Determine jamming effects on target
6) Adjust jamming

Subfunction 2.2.2.2.2 - Counter Target Acquisition Systems
Definition: To suppress (e.g., using hasty smoke, dazzling illumination) or degrade enemy direct observation, day and night vision optics, radar, sensors, electronic direction-finding equipment, and imaging systems used to detect, locate, classify, and identify friendly targets.

Tasks: 1) Employ obscurants
2) Use electronic/electromagnetic countermeasures
3) Use electro-optical countermeasures

Subfunction 2.2.2.2.3 - Employ Disabling Agents
Definition: To employ chemical agents or other means to degrade enemy equipment.

Tasks: 1) Select disabling agents for desired effect
2) Select delivery means

Discussion: Although these subfunctions do not result in the destruction of personnel and equipment, they do have a degrading effect upon force effectiveness. As a result, preclusion of inadvertent nonlethal attack due to misidentification of targets is a very important factor in maintaining operational and tactical momentum. Nonlethal effects resulting from accidental chemical incapacitating (personnel)/disabling (equipment) agent attack, jamming, and obscurants may degrade friendly force performance to the point where the enemy succeeds in the accomplishment of his mission. The same rationale applies in the nonlethal attack. As with other active measures, engagement of friendly forces results in increased expenditure of resources and workload. Additionally, scarce resources allocated to perform these functions can be more efficiently targeted against true enemy targets.

BCIS Impact:
Force effectiveness enhanced

Momentum and agility preserved
Resources conserved
Workload reduced

Finding:
BCIS preserves force effectiveness.

FEI = **40**

3.3.3 **Function** 2.3 - Integrate Fire Support
Definition: To combine and coordinate all fire support means for the tactical commander in battles and engagements in support of the commander's concept of operations and intent.

Discussion: Identification may be a critical factor in this function, especially in those areas adjacent to boundaries and other maneuver/fire support control measures, and in combined coalition operations where U.S. and Allied doctrine may differ. Use of BCIS may negate the need for complex ROE and judgmental human decision making.

Impacts of identification upon operations which have been previously described also apply to the integration of fire support. The expenditure of time and resources which is unnecessary, and which can be prevented by BCIS, may well provide the impetus for victory, rather than defeat. Both integrated fire support and integrated maneuver are essential to the execution of the U.S. Army's joint service combined arms doctrine. Measures which contribute to the execution of that doctrine are essential to the successful accomplishment of the warfighting mission.

BCIS Impact:
Better integration of fire support means

Finding:
BCIS expedites and enhances fire support integration.

FEI = 1

Total BOS 2 FEI = 55

3.4 BOS 3 - AIR DEFENSE

Definition: All measures designed to nullify or reduce the effectiveness of attack by hostile aircraft or missiles after they are airborne.

Discussion: The Air Defense argument for positive identification and BCIS is similar, in principle, to that made for direct fire and fire support. Precluding engagement of friendly elements, preserving resources, and expediting of engagement processes (discussed in greater detail in the C2 BOS analysis) are the key contributions of BCIS and form the backbone of the Air Defense operation. Of all operating systems, Air Defense is the only one which historically has emphasized positive identification and its impact on Rules of Engagement (ROE) and Weapons Control Status (WCS) which are governing factors in conducting air defense operations. However, in Air Defense, early identification is even more important than in other BOS due to the high speed and long standoff ranges of air systems, high lethality of air delivered weapons (including weapons of mass destruction), relative scarcity of air defense assets, and the extreme concern of sister services about the impact of AD fratricide on air operations and morale. The present battlefield combat identification paradigm, inadequate though it may be, is Army Air Defense.

3.4.1 **Function** 3.1 - Process Air Targets

Definition: To select targets and match the appropriate response to them, taking account of operational requirements and capabilities.

Subfunction 3.1.1 - Select Air Targets to Attack
Definition: To analyze each target to determine if and when it should be attacked in accordance with tactical benefit and the maneuver commander's guidance.

Tasks: 1) Receive early warning/target information
2) Compare air target data to target selection standards
3) Determine priorities of engagement
4) Choose air targets

Subfunction 3.1.2 - Select System for Air Targets
Definition: To determine the appropriate air defense system for a particular target.

Subfunction 3.1.2.1 - Determine System Capability for Engaging Air Targets
Definition: To determine the attack system which can provide the required effects.

Tasks: 1) Consider weapons engagement zones
2) Consider weapons system characteristics

Discussion: While High to Medium Altitude Air Defense (HIMAD) systems are highly automated and have a relatively lengthy time to respond to enemy air attack (normally minutes or tens of seconds), Short Range and Forward Area Air Defense systems (SHORAD/FAADS) conduct engagements which are more analogous to the direct fire battle in terms of target selection and engagement timelines. Due to short ranges, terrain masking effects, and possible intermingled forces (all of which tend to contribute to fratricide), SHORAD/FAADS forces must use either visual identification or rapid response electronic systems to provide positive identification of potential targets. Present doctrine requires air defense systems to positively identify friendly aircraft when operating in weapons control status "Weapons Free", which is the most effective control status for defending designated assets. Positive identification can be accomplished by two means under current doctrine:

- o Visual identification
- o Correct IFF response in Mode IV

Unfortunately, most US aircraft turn off their IFF over the combat zone to avoid broadcasting their location through electronic signature. Also, the problem of masking is present in the IFF system because of the long ranges and relatively wide bands utilized in the system. The fallback is then visual identification, which is only as good as the weapons crew skill in aircraft recognition. Visual identification is also limited by restricted visibility due to low light levels and obscurants, again analogous to the direct fire battle.

BCIS makes a contribution under these conditions by matching identification capability more closely with weapons ranges and engagement zones, reducing the size of the challenge and reply fan, and enhancing the automated identification capability of SHORAD/FAAD systems.

BCIS Impact:
Enhanced friendly identification within engagement zones
Improved SHORAD/FAAD system characteristics and capabilities

Subfunction 3.1.2.3 - Select System for Air Engagement
Definition: To designate an attack system to perform a required operation.

Discussion: Air defense design, particularly for SHORAD/FAAD systems, assigns sectors of fire to individual systems. Each sector normally contains right and left limits and a primary target line (PTL). Simply stated, the proximity of a target to the PTL, combined with the perceived severity of threat, determines the priority of that target for engagement by the defending air defense system. Current doctrine requires that air defenses provide

overlapping and reinforcing fires to produce a seamless defense and mutual support against attacking air. It is possible that intruding aircraft may appear in the overlap zones equidistant from the PTL's of two defending systems, creating a dilemma in the selection of the appropriate system to engage the target. The ability to identify friendly aircraft beyond weapon and visual ranges reduces the probability that this situation will occur, since the track of the friendly aircraft will be dropped upon positive identification, thus reducing the size of the target set to be considered for engagement. The increased time made available to the selecting authority by identification of friendlies at greater ranges also enables more effective and efficient system selection relative to probability of kill, criticality of defended assets, and ammunition availability.

BCIS Impact:
Increased effectiveness in engagement system selection
Enhanced efficiency of system selection
Increased time volume for selection decision making

Finding:
BCIS expedites air defense target processing.

FEI = **11**

3.4.2 **Function** 3.2 - Attack Enemy Air Targets
Definition: To intercept, engage, destroy or neutralize enemy aircraft and missiles in flight.

Subfunction 3.2.1 - Conduct Lethal Engagement of Air Targets
Definition: To apply firepower to destroy enemy air targets.

Subfunction 3.2.1.1 - Employ Air-To-Air Weapons.
Definition: To use weapon systems carried on aircraft to attack enemy air targets.

NOTE: This function is not a Phase I near term BCIS concern. It is of concern for the mid- and far terms.

Subfunction 3.2.1.2 - Employ Surface-to-Air Weapons
Definition: To use weapon systems positioned on the surface to attack enemy air targets.

Subfunction 3.2.1.2.1 - Employ Air Defense Artillery
Definition: To use dedicated air defense systems to destroy enemy air targets.

Tasks: 4) Enable weapon
5) Engage air targets

Subfunction 3.2.1.2.2 - Employ Other Unit Fires

Definition: To use weapon systems other than dedicated air defense systems (e.g., small arms and crew-served weapons systems, TOW missiles) to destroy enemy air targets.

Tasks: 1) Engage air targets with small arms, crew served weapons, and cannons
2) Engage air targets with other surface means

Discussion: Positive identification of friendly aircraft by BCIS will preclude accidental attack due to identification/recognition errors by air defense and other combat system crew members. Since BCIS identification of friendlies occurs beyond visual range, more time will be available to defending systems to concentrate on hostile targets, reducing the probability of the defense being saturated.

BCIS Impact:
More effective target attack
Reduced fratricide

FEI = **10**

3.4.3 **Function** 3.3 Integrate Air Defense Fires
Definition: To combine and coordinate all tactical air defense means for the tactical commander in battles and engagements in support of his concept of operations and intent.

Discussion: The same logic applies here as in Fire Support. In order to integrate, including the assignment of air targets to defending systems, positive friendly identification is needed in order to discriminate friend from foe and make timely and accurate coordination, including early warning. This may be especially true in those instances where friendly CAS aircraft and helicopters are operating in an environment where enemy aircraft are also present, or their presence is anticipated. In weapons control status "Weapons Tight", when weapons may be fired "... only at targets identified as hostile", it is essential to sort the friendlies out early, since friendly aircraft habitually turn off their IFF system in the forward area to avoid presenting an electromagnetic signature to the enemy. Combat units other than ADA which possess an antiaircraft capability do not have IFF. Thus, the control and integration of air defense fires in the forward area is very complex and BCIS should aid in this area.

BCIS Impact:
Enhanced coordination
More accurate and timely early warning

Finding:
BCIS enhances the integration of air defense operations in the forward area.

FEI = 1

Total BOS 3 FEI = 22

3.5 BOS 4 - COMMAND AND CONTROL

Definition: The exercise of authority and direction by a properly designated commander over assigned forces in the accomplishment of the mission. C2 functions are performed through an arrangement of personnel, equipment, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission.

> Note: C2 is conducted in all functional areas and at all echelons, because it is the decision making and direction performed by military leaders. For analytical purposes the C2 functions are written generically and consolidated under the C2 BOS. For example, planning for transportation movements control and highway regulation is specialized planning for transportation operations; this specialized planning is analyzed under the function, TA.4.3 Determine Actions. The actual control and supervision of transportation movements is also a C2 function; it is executed through the feedback of information and its assessment and accomplished through the next iteration of the C2 cycle.

Discussion: By extrapolating C2 to the lowest level, individual fighting systems or even individual soldiers, it becomes obvious that all elements of a combat organization actually execute some C2 functions. One need not be a formally designated unit commander to have C2 responsibilities. A tank commander, for example, is responsible for the command and control of his vehicle and crew; for its spatial and temporal relationships to other elements within the platoon; for its response to designated control measures; and for inputs and responses up and down the chain of command.

Within this operational framework, BCIS is an item of equipment which assists the execution of C2 processes, primarily by providing information pertaining to friendly forces.

3.5.1 **Function** 4.1 - Acquire and Communicate Information and Maintain Status

Definition: To gain possession of information on the mission, enemy forces, friendly troops, terrain and weather and time available (METT-T), by or for the commander or his staff, to translate that information into usable form and to retain and disseminate it.

> NOTE: The distinction between this function (TA.4.1) and the intelligence function, TA.5.1 (Collect Information) is that TA.4.1 refers to the physical aspect of exchanging METT data or information with the C2 echelons under consideration, whereas TA.5.1 refers to the process of collecting or generating enemy and terrain information from the battlefield environment.

Discussion: There are three BCIS subsets to this function.

The first is the acquisition of information by the BCIS operator, which requires an electronic query and reply (communication) to acquire information.

The second is the communication of the acquired information to the other elements within the unit of the system acquiring the information, such as the other elements of a tank platoon.

The third subset is the communication of information laterally and vertically to elements outside the immediate acquiring unit. Continuing the previous analogy, platoon reports to company and adjacent platoons.

The three subsets involve three communications nets, at a minimum. The first net is that which supports the operation of the BCIS itself, in the case of the near term system - a millimeter wave device. The second is the system or individual communication system, including the vehicle intercommunications system and the associated platoon level combat radio net. The third net is the combat radio net connecting the company commander and the adjacent platoon leaders. Provisions for communications management must be made at all levels. This is particularly true in the case of emerging automated systems, such as Combat Vehicle C2 and Combined Arms C2, with their associated automated polling and reporting systems.

Subfunction 4.1.1 - Communicate Information
Definition: To send and receive data (e.g., verbal, electronic, written) from one person or place to another. This function includes the distribution of data and information by any means.

Subfunction 4.1.1.2 Receive and Transmit Enemy Information
Definition: To receive or send combat information or processed intelligence information of every description on the enemy, to include social, political, and economic aspects.

Discussion: BCIS will help tactical units increase the accuracy of reports by enhancing identification capability. By affirming that unidentified elements on the battlefield are definitely not friendly, then fusing that information with situational awareness elements, the accuracy and timeliness of battlefield information collection can be expedited. This information will then be communicated both laterally within the originating unit for situational awareness updates, and up the collection chain for intelligence purposes.

Subfunction 4.1.1.4 - Receive and Transmit Friendly Troop Information
Definition: To receive or send data on friendly forces.

Discussion: BCIS communicates information conveying the nature of a system or individual as friendly. This is essential information for the processes of fire control, maneuver control, and situation assessment. BCIS can contribute through identification of adjacent or intermixing units which do not belong to the same major command, as recon elements across a Corps or Division boundary. BCIS can expedite C2 through early positive identification of friendly units which might otherwise be misclassified as enemy, or classified as unknown. This information will then be rapidly communicated internally, laterally, and vertically for situational awareness updates.

BCIS Impact:
Enhanced acquisition and communication of combat information
Improved situational awareness and assessment
Increased communications requirements

Subfunction 4.1.2 - Manage Means of Communicating Information.
Definition: To direct, establish, or control the instruments used in sending or receiving information, and to use communication networks of various means (e.g., radio, wire and cable, visual and sound communications and messenger) and modes (e.g., FM, multichannel, RATT, CW, tactical satellite, data, facsimile) for obtaining or sending information. These nets include Area Common User, Combat Net Radio, and Data.

Discussion: Since much of the communication of information will be conducted on combat radio networks, in either real time or near real time, the possibility of interference among friendly systems increases. Because much, but not all, of the information exchange will be automated by emerging systems, care must be exercised in net design, operation, and management. The potential for network overloading is real, particularly at the lower levels of operations where C2 and battle drill occur simultaneously. Since information aging is of critical concern to the small unit leader and situational awareness, interference, retransmission, or loss of information are undesirable characteristics which must be minimized.

BCIS Impact:
Increased communications management requirements.

Subfunction 4.1.3 - Maintain Information and Force Status.
Definition: To screen, circulate, store, and display data in a form that enables the decision maker to assimilate what he requires.

Subfunction 4.1.3.2 - Display Information
Definition: To represent data by audio and visual means to support decision making.

Subfunction 4.1.3.4 - Manage Information Distribution
Definition: To decide on the routing of relevant data to the appropriate user or custodian.

Discussion: BCIS information must be displayed to the operator in a non-interfering, unambiguous manner. Displays which force the operator to interpret multiple information elements, interfere with a primary duty, or increase the time required for engagement are unacceptable. There is also a potential, documented by users of SIMNET-D and MWTB, that information overload may result in distraction from key tasks. Thus, when introduced as battlefield information, BCIS inputs should integrate seamlessly with the automated C2 systems using standard symbology. Further, displays should be updated at rates responsive to the using elements operational needs, while concurrently providing a common picture. Timeliness and clarity of displayed information are key elements in providing good situational awareness, therefore BCIS netting should be thoroughly planned for each operation, and should be variable. A battalion task force commander may normally be interested in company level operations, but may have requirements to focus on individual systems in certain situations. Since a display containing all task force elements all the time would be too cluttered to be usable, the commander must be able to selectively vary the unit and level of detail upon which he focusses.

BCIS Impact:
Enhanced situational awareness and C2
Increased information display and processing requirements
Increased planning and coordination requirements
Increased information distribution network requirements

Finding:
BCIS improves situational awareness

Finding:
BCIS increases C2 workload.

FEI = **8**

3.5.2 **Function** 4.2 - Assess Situation
Definition: To continuously evaluate information received through reports or the personal observations of the leader or commander to decide whether different actions are required from those that would result from the most recent orders issued.

Subfunction 4.2.1 - Review Current Situation
Definition: To examine on-hand information.

Subfunction 4.2.1.2 Fuse Information

Definition: To combine incoming data with other previously held data.

Tasks: 1) Determine nature and source of relevant information
2) Determine form/content of integrated information
3) Produce integrated information product

Discussion: Information fusion is the combining of information generated by separate sources to produce synthesized information. At small unit and system level (platoon and below), fusion is normally a rapid and informal process which expedites the leader's decision making process, and may have a great impact on unit disposition. At higher level input fuses with intelligence data, sensor data, feedback from subordinate elements, and the commander's read of the battlefield. Fusion is not normally a problem until one or more of the information sources disagrees with the others. The resultant problem becomes one of determining the "real truth" and creates delay and confusion, possibly leading to fratricide.

Compounding the information integration and fusing process is a factor known as correlation, which is the problem of determining whether two or more sensors or observers are looking at the same target when they make their identification, so that their information may be legitimately fused.

BCIS, because of its very high probability of identification of friendlies and its real time functioning, provides the combat system commander and small unit leader with reliable information upon which to base decisions.

Subfunction 4.2.1.3 - Evaluate Incoming Information
Definition: To examine and separate critical from common information.

Tasks: 1) Determine relevance of new information to situation
2) Determine reliability/credibility of new information

Discussion: This is a rapid and informal process at the tactical level. BCIS has a significant impact on Task 2 due to its high credibility/reliability. BCIS reduces qualitative considerations (training/human reliability), thereby expediting the C2 process. Task 2 becomes virtually automatic, enabling the small unit leader to concentrate on Task 1.

Consider the following example in relation to SF 4.2.1.2 and 4.2.1.3:

Without BCIS: A tank battalion reconnaissance platoon executing a screen and counter-recon mission receives a report of suspected enemy activity from battalion. Recon platoon detects vehicle movement at 6 km, but cannot identify. Platoon Leader dispatches Scout section, which ID's vehicles as friendly. Platoon Leader reports to Battalion. Result - primary mission degraded, time and fuel consumed, unit agility reduced while battalion awaits results.

With BCIS: Platoon Leader identifies vehicles as friendly beyond visual range and immediately reports to battalion. No mission degradation or resources wasted. Friendly unit now known to be in proximity.

BCIS Impact:
Information fusion and integration expedited
Situation accurately assessed
Battalion C2 enhanced
Small unit leader decision making enhanced
Fratricide potential reduced

Subfunction 4.2.3 - Decide on Need for Action or Change
Definition: To decide whether actions are required which are different from those which the unit or organization has already been directed to execute; to determine when to make decisions.

Discussion: When unknown forces which are friendly can be accurately and rapidly identified as such, tactical situations can be clarified more easily and tactical units can concentrate on those elements on the battlefield which present a real threat to them. Organizational agility and momentum are maintained, and synchronization of forces expedited.

BCIS Impact:
Streamlined decision making

Finding:
BCIS increases accuracy of situation assessment and streamlines decision making.

FEI = **10**

3.5.3 **Function** 4.3 - Determine Actions
Definition: To conduct the continuous process of making estimates and decisions for assigned or projected tasks. This function involves a detailed and systematic examination of all aspects of contemplated operations including deciding to alter planned or on-going actions. This function also includes the formulation of the commander's concept and intent. Inherent to this function, TA.4.3 Determine Actions, is the planning for the conduct of all functions found in each BOS to include countermeasures (e.g., C3CM, counterfire, countermobility).

Note: The function TA.4.3 includes planning for C3CM and the determination of (a) C3 defensive measures for friendly critical C3I facilities and capabilities, and (b) C3 offensive measures directed against enemy critical C3I facilities and capabilities. C3CM actions include OPSEC, deception, jamming, and fires (destruction); the conduct of the functions associated with these measures is analyzed under the BOS appropriate to each C3 countermeasure.

Subfunction 4.3.5 Select or Modify Course of Action
Definition: To decide on the course of action which offers the best prospect for success and to issue a clear and concise statement of the general scheme of maneuver and supporting fires for the operation. This function includes finalizing the commander's concept and intent. This function also includes modifying a course of action previously selected and is therefore a continuous process.

Tasks: 1) Choose a course of action
4) Establish priorities

Discussion: BCIS enables real time clarification of vague tactical situations through positive identification of friendly forces previously categorized as unknown (or even enemy). This capability enables a small unit leader or tactical commander to immediately react by choosing an alternative course of action or by modifying a previously selected course, thus seizing the tactical initiative and attaining an agility advantage over the enemy.

BCIS Impact:
Enhanced agility
Increased flexibility

Finding:
BCIS expedites the decision making process.

FEI = 4

3.5.4 **Function** 4.4 - Direct and Lead Subordinate Forces
Definition: To provide direction to subordinate forces such that they understand and contribute effectively and efficiently to the attainment of the commander's concept and intent. This function includes the preparation and completion of orders.

Subfunction 4.4.1 - Prepare Plans or Orders
Definition: To complete written or oral communications that convey information governing action.

Subfunction 4.4.1.2 Coordinate Support

Definition: To coordinate with commanders and staffs of higher, adjacent, and supporting organizations (fires, communications, logistics, etc.) including air and naval services and allied organizations while finalizing plans or orders or while conducting operations.

Tasks: 1) Coordinate Army, other services, and Allied support
2) Tie in physically with units on left and right
4) Coordinate combat support for own plan of operation
5) Coordinate combat service support for own plan of operation

Discussion: Coordination of support and tie in of adjacent elements often result in the creation of high fratricide situations. Combat support depends upon accurate identification and location of targets, particularly when employing joint or combined fire support assets with whom they cannot directly communicate. Service support elements habitually lack the communications and land navigation equipment and expertise of combat units, and occasionally become lost or misoriented, cross boundaries, and generally become ripe for engagement by other friendly forces. Tie in occurs most often along or on unit boundaries, which are sometimes ill defined and difficult to identify. When these boundaries are external battalion level or higher control measures, the adjacent units may not be operating on the same communications frequencies, as occurred in the case of the Desert Storm 3d ACR fratricide incident. BCIS enables proper identification of friendly forces during the execution of fire support operations and during the tie in and link up processes, when friendly forces operate in close proximity and may intermingle.

BCIS Impact:
Enhanced coordination
Reduced fratricide

Finding:
BCIS improves coordination capabilities.

FEI = 7

3.5.5 Subfunction 4.4.5 - Synchronize Tactical Operations
Definition: To arrange land, air, and sea tactical forces in time, space and purpose to produce maximum relative combat power of combined arms at the decisive point. It includes the vertical integration of functions within each BOS and the horizontal integration of the functions across the BOS to maximize combat output and to achieve tactical success.

Discussion: Aside from fratricide prevention, the enhancement of tactical synchronization may be the greatest BCIS contribution to force effectiveness.

This is the doctrinal tenet which enables Army forces to execute their combined arms and joint operations without fear of fratricide to gain a position of tactical advantage over the enemy. Identification of friendly elements is one of the keys to effective synchronization, particularly in contingency operations involving vague situations, unfamiliar terrain, and lack of rehearsal time.

BCIS Impact:
Enhanced force effectiveness
Reduced fratricide
Enhanced synchronization

Finding:
BCIS enables better force synchronization.

FEI = 1

Total BOS 4 FEI = 30

3.6 BOS 5 - INTELLIGENCE

Definition: That knowledge of the enemy, weather, and geographical features required by a commander in planning and conducting combat operations. It is derived from an analysis of information on the enemy's capabilities, intentions, vulnerabilities, and the environment.

3.6.1 **Function** 5.1 - Collect Information

Definition: To obtain information in any manner.

Subfunction 5.1.2 Collect Target Information
Definition: To acquire information that supports the detection, identification, and location of a target in sufficient detail to permit attack by friendly weapons. The target acquisition system may be closed loop (i.e., target acquisition system is an inherent part of friendly weapons system) or open loop (i.e., target acquisition system is separate from the firing system but nevertheless is part of the overall weapon system).

Subfunction 5.1.2.3 - Locate Targets
Definition: To determine the placement of a target on the battlefield. Target location can be expressed, for example, as a 6-digit grid coordinate.

Discussion: Target location may be assisted by the same process used to reduce target sets. By identifying those systems on the battlefield which are friends and eliminating them from further consideration, the acquiring friendly system can concentrate on determining the location of enemy targets.

Subfunction 5.1.2.4 Identify Targets
Definition: To discriminate between recognizable objects as being friendly or enemy, or the name that belongs to the object as a member of a class.

Task: 1) Determine friend or foe

Discussion: This is the primary purpose of BCIS. BCIS brings a high probability of correct identification of friendly forces to the tactical battlefield, thereby eliminating previous dependence upon visual ID, individual and crew training in system recognition, and good visibility. While BCIS in the near term identifies only friends, it may eventually identify all combat systems anticipated to be present on the future battlefield. However, even in the near term, positive identification of friends under virtually all conditions is a significant increase in present capability and performance.

Subfunction 5.2.4 - Integrate Intelligence Information
Definition: To combine and analyze combat information, preprocessed information, and intelligence database information in order to

project significant battlefield events and enemy activities, to predict enemy intentions, and to develop targeting data.

Subfunction 5.2.4.2 - Develop Targeting Information
Definition: To provide direct targeting data (combat information) for immediate engagement, and to develop correlated target information from all sources.

Discussion: By sorting friendlies from the enemy/target set, identification of enemy targets can be accomplished with greater reliability and swiftness. This enables more expeditious hand off of enemy targets to engagement means and more effective engagement of fleeting targets.

BCIS Impact:
- Enhance identification
- Reduce target location workload
- Expedited target hand off and engagement
- Eliminate fratricide

Finding:
BCIS expedites target identification.

FEI = 7

Total BOS 5 FEI = 7

3.7 MOBILITY and SURVIVABILITY BOS
Definition: The capability of the force that permits freedom of movement, relative to the enemy, while retaining the ability to fulfill its primary mission. It also includes those measures the force takes to remain viable and functional by protection from the effects of enemy weapon systems and natural occurrences.

3.7.1 **Function** 6.3 - Enhance Survivability
Definition: To protect personnel, equipment, and supplies from enemy systems and natural occurrences while simultaneously deceiving the enemy.

Subfunction 6.3.2 - Employ Operations Security
Definition: To deny adversaries information about friendly capabilities and intentions by identifying, controlling, and protecting indicators associated with planning and conducting military operations.

Subfunction 6.3.2.1 - Employ Signals Security (SIGSEC)
Definition: To deny the enemy access to electronic information (both communications and noncommunications) that could be used to identify friendly capabilities and intentions.

Subfunction 6.3.2.1.1 - Employ Communications Security (COMSEC)
Definition: To deny the enemy information of value which might be derived from the possession and study of telecommunications.

Subfunction 6.3.2.1.2 - Maintain Electronic Security
Definition: To deny unauthorized persons information of value that might be derived from their interception and study of noncommunications electromagnetic radiations; e.g., radar.

Tasks: 1) Conceal electromagnetic signatures
2) Deny location and identification of emitters

Discussion: Since BCIS is an active emitter with a distinctive signature, the using unit must plan and implement electronic security measures. Planning and implementation will place an additional burden on small unit leaders, including users and first line supervisors. TTP must be developed to address this issue. However, it is improbable that the additional burdening of small unit leadership resulting from this requirement will outweigh the benefits achieved by BCIS.

BCIS Impact:
Increased planning and supervision requirements

Subfunction 6.3.3 - Conduct Deception in Support of Tactical Operations

Definition: To take actions that mask the real objectives of tactical operations and delay effective enemy reaction by misleading the enemy about friendly intentions, capabilities, objectives, and the locations of vulnerable units and facilities. It includes manipulating, distorting, or falsifying evidence available to the enemy to ensure security to REAL plans, operations, or activities.

Subfunction 6.3.3.2 - Employ Electronic Deception
Definition: To deliberately radiate, reradiate, alter, absorb, enhance, or reflect electromagnetic energy in a manner intended to mislead hostile forces in the interpretation or use of information received by their electronic systems.

Subfunction 6.3.4 - Provide Security and Readiness
Definition: To take actions to protect a military unit, an activity or installation against acts designed to, or which may, impair its effectiveness and to retain the capability to perform the unit missions and functions.

Tasks: 1) Identify friendly force profiles (signatures, patterns, and indicators)
2) Identify friendly force vulnerabilities

Discussion: Use of BCIS will require additional unit vulnerability analysis. Identification and analysis of usage patterns may require additional support from communications/electronic warfare organizations at appropriate support levels. There will be some added burdening of organizational staffs from battalion level up. However, like the OPSEC requirement, it is unlikely that the added burden will outweigh the benefits of employing BCIS, and the requirement may be easily integrated with existing OPSEC/SIGSEC/COMSEC activities.

BCIS Impact:
Added task loading for selected staff members and sections.

Finding:
BCIS creates added task loading for selected OPSEC personnel.

FEI = **12**

Total BOS 6 FEI = 12

3.8 BOS 7 - COMBAT SERVICE SUPPORT

Definition: The support and assistance provided to sustain forces, primarily in the fields of logistics, personnel services, and health services.

> NOTE: The analysis predicates BCIS impact on this BOS on additional CSS requirements generated by fratricide incidents. These impacts are directly quantifiable in terms of damage and casualties caused by friendly engagement or by estimation of more subjective factors dealing with ancillary effects of fratricide, such as investigations and information management. The analysis assumes that BCIS will perform as described in the System ORD, thereby eliminating or reducing greatly the probability of engagement of friendly systems by friendly systems.

3.8.1 **Function** 7.1 - Arm

Definition: To provide munitions to weapon systems.

> NOTE: Details of this function are covered under Function 7.5, Distribute

Discussion: Fratricide, by definition, involves the expenditure of munitions by friendly weapons systems. Since the onboard ammunition loads for a combat system are finite, those rounds expended against friendly systems must be replaced through rearming and/or cross levelling within units. Further, they are not available for attack of enemy targets. Likewise, overall ammunition expenditures increase due to fratricide, thereby increasing the cost of conducting combat operations. In the case of precision guided munitions, the dollar costs of ammunition expended in fratricide engagements may be quite high. Since BCIS increases the probability of correct recognition of friendly systems drámatically, thereby reducing or eliminating fratricide, it can negate the previously mentioned ammunition expenditure aspects of fratricide.

BCIS Impact:

- Reduced expenditure of ammunition
- Increased availability of ammunition for attack of enemy targets
- Reduced dollar costs of combat
- Reduced rearm/cross level requirements

Finding:

BCIS reduces arming requirements to a minor degree.

FEI = 1

3.8.2 **Function** 7.3 - Fix
Definition: To preserve the availability of weapon systems and equipment. It includes the provision of repair parts and end items at the right place and time, and all the actions taken before, during, and after battle to keep equipment operational.

Subfunction 7.3.2 - Fix/Maintain Equipment
Definition: To retain materiel in or to restore it to a specified condition. It includes inspection, testing, servicing, classification as to serviceability, repair, rebuilding, and reclamation.

Subfunction 7.3.2.2 - Recover
Definition: To remove disabled or abandoned materiel, either enemy or friendly, from the battlefield and its movement to a recovery collecting point or to a maintenance or supply establishment.

Tasks: 1) Determine recovery method
2) Recover disabled equipment
3) Evacuate disabled equipment to collection/service point

Discussion: In fratricide events, a catastrophic kill of the attacked vehicle may not occur. It is probable that a mobility kill may occur which will leave a disabled but salvageable friendly vehicle on the battlefield. Recovery of vehicles disabled by fratricide will place an added burden on scarce recovery assets, and may even force recovery of combat systems by other combat systems (tank recovers tank), which may effectively change the force ratio in favor of the enemy in local engagements. It also places an added C2 burden on unit leadership to develop and select alternative courses of action when unit recovery assets are completely committed. In addition to battlefield recovery, other assets must be dedicated to evacuating the disabled equipment to a collection point or a service/repair facility. This process ties up recovery assets; increases mileage, fuel and repair parts consumption; recovery crew stress and fatigue; and wear and tear on the recovery systems, evacuation assets, and operating personnel. By reducing or eliminating fratricide, BCIS negates these additional requirements for recovery and evacuation.

BCIS Impact:
Reduced recovery requirements
Reduced fuel and repair parts consumption
Reduced burden on unit leadership
Reduced recovery crew fatigue and stress

Subfunction 7.3.2.3 - Diagnose
Definition: To detect and isolate a malfunction or a mistake.

Tasks: 1) Perform fault isolation/troubleshoot malfunctions
2) Assess damage

3) Determine level of repair required
4) Determine repair parts required
5) Determine serviceable parts/equipment

Discussion: Combat damage caused by fratricide increases work level burdening on skilled diagnostic maintenance personnel and test equipment. It impacts across maintenance MOS's and levels, since there may be damage to automotive, communications, electronic, or armament components of the major end item. Each of these areas must be examined by a soldier with the appropriate MOS and experience. In addition, many systems with fratricide induced combat damage will have disabled BIT/BITE, increasing the difficulty of checking subsystems. It is possible that the vehicle or system may have to be evacuated to a level of maintenance with greater diagnostic capability.

BCIS Impact:
Reduced workload for skilled maintenance personnel
Reduced burdening of diagnostic/maintenance equipment

Subfunction 7.3.2.4 - Substitute
Definition: To remove serviceable parts from one item of equipment in order to install them on another item of equipment.

Tasks: 1) Perform controlled exchange of parts
2) Perform cannibalization

Discussion: Substitution is labor and time intensive and requires suitable facilities and conditions, such as power and lighting. Fratricide damage increases the loading of facilities and personnel which may already be overburdened by legitimate combat damage and normal repair and substitution. In turn, the overburdening will reduce the turnaround rate to get systems back into the hands of the user, resulting in unit scarcities and reduced combat power.

BCIS Impact:
Reduced loading of the maintenance system
Increased availability of maintenance personnel for repair tasks

Subfunction 7.3.2.5 - Exchange
Definition: To trade an unserviceable system or component for a serviceable system or component.

Discussion: This subfunction overlaps with supply functions. However, exchange requires the inspection and tagging of each part for exchange, plus associated maintenance system paperwork. Tagging is normally done by the maintenance personnel removing the unserviceable part, which detracts from the more important readiness function of repair. Considering that a large number of parts from a disabled vehicle may require exchange, the amount of

time required for the exchange process could have a significant negative effect on the repair of damaged or malfunctioning systems.

BCIS Impact:
Reduced time spent in non-repair functions
Increased time available for other critical maintenance functions

Subfunction 7.3.2.6 - Repair
Definition: To restore an item to serviceable condition through correction of a specific failure or unserviceable condition.

Tasks: 1) Test/check equipment
2) Adjust, align, repair components and assemblies
3) Repair and modify defective end items
4) Replace components and assemblies
5) Remove/replace piece parts
6) Mark/paint equipment

Discussion: These are absolutely essential tasks required to maintain an operational unit at effective strength. Fratricide increases the number of repairs required, as well as the consumption of repair parts and supplies, effectively reducing the efficiency of the repair/maintenance system. The direct result is a prolonged reduction in the combat power of units which are awaiting the return of damaged combat vehicles.

BCIS Impact:
Reduced repair load
Reduced consumption of repair parts and supplies
Enhanced availability of combat systems
Enhanced combat power

Subfunction 7.3.2.7 - Return
Definition: To provide serviceable equipment to the original owner, a maintenance facility, or supply activity.

Tasks: 1) Provide operational readiness items to supply stream/float
2) Provide repaired equipment to units

Discussion: Return of combat and supporting systems is an essential component in maintaining operational readiness and combat power. Added burdens to the return system caused by fratricide slow the process and degrade combat readiness.

BCIS Impact:
Increased system return rate to user units
Increased restock rate of supply system, replacement of floats

Finding:
BCIS reduces recovery, repair, and exchange requirements.

FEI = 26

3.8.3 **Function** 7.4 - Man the Force
Definition: To provide all support to the individual soldier as well as provide healthy, fit soldiers to units.

Subfunction 7.4.2 - Provide Field Services
Definition: To perform service functions of logistics by and for the Army in the field.

Subfunction 7.4.2.2 - Graves Registration
Definition: To supervise and execute matters pertaining to the identification, removal, and burial of the dead and collection and processing of their effects.

Tasks: 1) Operate collection point
2) Recover deceased soldiers
3) Determine and report identities of deceased soldiers
4) Register [field] burial sites

Discussion: Obviously, any reduction of KIA achieved by BCIS will reduce the GR requirement. However, body recovery and field burial site survey may also expose GR personnel to battlefield hazards and create added combat casualties and damage, thereby decrementing GR unit strength and capability. Consequent reduction in GR unit performance may slow the processing of remains and shipment to CONUS for interment, with resulting morale and possibly political repercussions.

BCIS Impact:
Sustained GR capability
Reduced GR requirements

Subfunction 7.4.2.3 - Salvage
Definition: To save or rescue condemned, discarded or abandoned property, and of materials contained therein, for reuse, refabrication, or scrapping.

Tasks: 1) Receive material at collection point
2) Classify material
3) Determine disposition of material
4) Dispose of material

Discussion: This subfunction is an excellent example of the ripple effect of fratricide continuing from the Substitute and Exchange subfunctions through higher organizational levels. Prevention of fratricide through BCIS reduces the volume of salvage work to be performed and conserves resources.

BCIS Impact:
Reduced salvage volume

Reduced resource expenditure

Finding:
BCIS reduces field services requirements for graves registration and salvage operations.

Subfunction 7.4.3 - Provide Personnel Service Support
Definition: To manage and execute all personnel-related matters to sustain combat forces, primarily in the fields of personnel administration, finance and resource management services, chaplaincy activities, public affairs, and legal services.

Subfunction 7.4.3.1 - Provide Personnel Administration Services
Definition: To carry out the functions of strength management, replacement operations, and casualty reporting and to provide personnel administration, postal, morale services, and band support to the command.

Subfunction 7.4.3.1.1 Maintain Personnel Strength
Definition: To account for soldiers available for duty and to
- provide for troop replacements.

Subfunction 7.4.3.1.1.1 - Provide Strength Management
Definition: To keep track of the troops on hand, identify those that have been lost, and identify those that are needed to sustain combat.

Subfunction 7.4.3.1.1.2 Conduct Replacement Operations
Definition: To provide timely assignment and arrange movement of individual soldiers and small units to sustain forces on the battlefield. This includes the assignment of return-to-duty soldiers.

Subfunction 7.4.3.1.1.3 - Perform Casualty Reporting Operations
Definition: To report and provide an accounting of personnel losses on the battlefield.

Discussion: Fratricide has an effect on each and every subfunction in this category. According to research conducted in the development of the Battlefield Combat Identification fratricide data base, which analyzed data from combat experience and instrumented Combat Training Centers, the fratricide incidence in combat operations exceeds 10% of casualties. Reduction or elimination of more than 10% of total casualties significantly unburdens the maintaining of personnel strength. There are also some ancillary effects on appointments, promotions, and awards.

BCIS Impact:
Reduction of effort required to manage personnel strength
Reduced amount of replacement assignments and movements

Decreased personnel loss reporting
Reduced administrative load

Subfunction 7.4.3.4 - Perform Chaplaincy Activities
Definition - To provide religious support to soldiers on the battlefield, and to advise the commander on religion, morale, and morals as affected by war.

Discussion: The frequency of requirements for a chaplain's presence and services are often determined by the casualties incurred by friendly forces. There are real resources required to transport the chaplain and assistants to the location where their services are required. In some cases, as was the norm during the Viet Nam conflict, this movement is by helicopter, which is an expensive mode of transportation. Generally, reduction of fratricide casualties will reduce the requirements for selected types of chaplain support, and reduce transportation costs as well. Admittedly, in the overall huge cost of combat operations, this may be a drop in the bucket. However, as the impact of fratricide and the potential for BCIS to prevent fratricide are examined across the Blueprint of the Battlefield, it becomes obvious that there are many drops in the bucket, and that the overall magnitude of the BCIS contribution may be greater than initially anticipated.

NOTE:This particular subfunction was chosen for this discussion because it a good example of an area that has not been analyzed or associated with BCIS and fratricide impact.

Subfunction 7.4.3.4.1 Provide Religious Support
Definition: To provide collective worship services and denominational religious coverage in an area of operations; to conduct or arrange for memorial ceremonies and funerals, and other sacraments, rites, and ordinances; and to promote individual and Army beliefs and values.

Tasks: 1) Conduct/administer sacraments, rites, and ordinances
2) Conduct/provide worship services

Discussion: Fratricide has several effects on chaplaincy operations. First, KIA/WIA due to fratricide increase the requirements for chaplain services, such as administration of communion or last rites to dying or dead soldiers, and the conduct of memorial services. Second, the requirement for these services in the forward areas increases the exposure of chaplains to hostile fire, accident, or fratricide, thereby increasing the probability of injury or death. It is not uncommon to see chaplains in the battle area administering to casualties or comforting soldiers.

Subfunction 7.4.3.4.2 - Provide Pastoral Care and Counseling
Definition: To provide care and specialized counseling skills to soldiers for spiritual comfort, moral support, and encouragement.
Discussion: One of a chaplain's more difficult roles is rationalizing a soldier's role in the wake of friendly casualties and death. This is particularly true in cases of fratricide, when anger and dismay prevail, and requires the chaplain's transportation to and presence in the field. However, every fratricide case is an unnecessary and potentially preventable occurrence, given the employment of BCIS.

BCIS Impact:
Reduced requirements for chaplain services
Reduced exposure of chaplain personnel to casualty hazard
Reduced cost of providing chaplain support

Finding:
BCIS reduces personnel services and chaplaincy requirements.

Subfunction 7.4.4 - Provide Health Services
Definition: To perform, provide, or arrange for services regardless of location, which promote, improve, conserve, or restore the mental or physical well-being of individuals or groups.

Subfunction 7.4.4.1 - Provide Medical Treatment
Definition: To apply medical procedures by trained professional and technical personnel, and manage patients under such procedures, for the purpose of the relief of pain and suffering, the saving of life and limb, curing disease, injury, or other disorders.

Tasks: 1) Administer first aid
2) Provide advanced trauma life support
3) Provide initial surgical care/medical treatment
4) Provide definitive medical treatment
5) Manage/treat battle fatigue
6) Provide dental services

Discussion: Preclusion of fratricide casualties through the employment of BCIS will reduce the medical services required, with associated conservation of resources, reduced loading of medical personnel, and potential impact on the triage process. In the last case, fratricide casualties may result in a hostile fire casualty being bumped down the treatment chain, possibly resulting in death. Through the use of BCIS, this eventuality can be precluded.

BCIS Impact:
Reduced casualties
Reduced medical support requirements
Decrease in hostile fire deaths through enhanced triage

Conservation of medical assets

Subfunction 7.4.4.2 - Evacuate Casualties
Definition: To move any person who is wounded, injured, or ill to and/or between medical treatment facilities.

Tasks: 1) Remove sick/wounded/injured soldiers from the immediate
battlefield area
2) Determine destination for evacuation
3) Remove sick/wounded/injured to appropriate treatment facility

Discussion: The basic logic argument continues - reduction or elimination of fratricide casualties through BCIS reduces the resources and labor required to perform functions and subfunctions. In the case of evacuation, which may be in the face of enemy fire or under other extremely hazardous conditions, such as air evacuation in poor weather, which put the evacuating personnel at risk of also becoming casualties. In addition, critical medical evacuation resources are frequently in short supply, and the added burdening of the system due to fratricide may result in unnecessary deaths because available assets cannot satisfy evacuation requirements. This precise situation occurred as a result of an air to ground fratricide during the Battle of Dak To in the Central Highlands of Viet Nam during November 1967.

BCIS Impact:
Enhanced evacuation of hostile fire casualties
Reduced overall evacuation requirements
Reduction of hazard to evacuation crews

Finding:
BCIS reduces health services requirements and enhances the triage process.

FEI = **35**

3.8.4 **Function** 7.5 - Distribute
Definition: To provide the various classes of supply and services to military units by employing transportation and supply services, or unit means.

Subfunction 7.5.2 - Supply the Force
Definition: To provide the items necessary to equip, maintain, and operate a military force.

Subfunction 7.5.2.1 - Request Supplies
Definition: To identify, requisition, and order supplies.

Tasks: 1) Determine requirements
3) Prepare requisitions

Subfunction 7.5.2.2 - Receive Supplies
Definition: To acquire supplies through normal supply channels or redistribution.

Tasks: 1) Determine type and quantity of shipment
2) Perform quality assurance of items

Subfunction 7.5.2.8 - Issue Supplies
Definition: To make supplies available to a unit.

Tasks: 1) Determine method of issue
3) Reissue supplies (redistribute within a unit)

Discussion: End items and repair parts required for systems and equipment damaged or destroyed by friendly fire impose an unnecessary added burden on planning and operating the distribution system and add to the workload of involved personnel. Reduction/prevention of these incidents through BCIS employment enhances the overall system efficiency.

BCIS Impact:
Reduced supply requirements
Reduced personnel workload
Reduced movement of supplies

Finding:
BCIS reduces distribution requirements.

FEI = 11

Total BOS 7 FEI = 73

APPENDIX 1

BLUEPRINT OF THE BATTLEFIELD
TACTICAL LEVEL OF WAR
FUNCTIONAL ELEMENTS IMPACTED
BY NAME

1-1. PURPOSE

This appendix presents a concise listing of all functional elements from the BOB upon which BCID/BCIS have an impact. It may be useful to the reader who wishes to cross reference with TRADOC Pamphlet 11-9 or other documents, or to the analyst who wishes to define and characterize identification or situational awareness. If used for analytical purposes, TRADOC Pam 11-9 should be used for task description and function definition.

1-2. FUNCTIONAL ELEMENTS IMPACTED

Function Title	
TA.01	**MANEUVER BOS**
TA.01.01	Move
TA.01.01.01	Position/Reposition Forces (Units and Equipment)
TA.01.01.01.02	Move on or under Surface
TA.01.01.01.02.01	Move while Mounted
TA.01.01.01.02.02	Move while Dismounted
TA.01.01.01.03	Move through Air
TA.01.01.01.04	Close into Tactical Position
TA.01.01.03	Navigate
TA.01.02	Engage Enemy
TA.01.02.01	Employ Direct Fire
TA.01.02.01.01	Process Direct Fire Targets
TA.01.02.01.01.01	Select Direct Fire Targets
TA.01.02.01.01.02	Select Direct Fire System
TA.01.02.01.02	Engage Direct Fire Targets
TA.01.02.03	Integrate Direct Fire with Maneuver
TA.01.03	Control Terrain
TA.01.03.01	Control Terrain through Fire or Fire Potential
TA.02	**FIRE SUPPORT BOS**
TA.02.01	Process Ground Targets
TA.02.01.01	Select Target to Attack
TA.02.01.02	Select Fire Support Attack System
TA.02.01.02.01	Determine System Capability
TA.02.01.02.03	Select System
TA.02.01.03	Develop Order to Fire

TA.02.02	Engage Ground Targets
TA.02.02.01	Conduct Lethal Engagement
TA.02.02.01.01	Conduct Surface Attack
TA.02.02.01.02	Adjust/Illuminate Fire Support Targets
TA.02.02.01.03	Request Air-to-Ground Attack
TA.02.02.01.03	See TA 2.2.1.2 Adjust/Illuminate Fire Support Targets and 4.412 Coordinate Support
TA.02.02.02	Conduct Nonlethal Engagement
TA.02.02.02.01	Reduce Enemy Personnel Effectiveness
TA.02.02.02.01.01	Employ Incapacitating Agents
TA.02.02.02.02	Reduce Enemy Equipment Effectiveness
TA.02.02.02.02.01	Conduct Jamming
TA.02.02.02.02.02	Counter Target Acquisition Systems
TA.02.02.02.02.03	Employ Disabling Agents
TA.02.03	Integrate Fire Support
TA.03	**AIR DEFENSE BOS**
TA.03.01	Process Air Targets
TA.03.01.01	Select Air Targets to Attack
TA.03.01.02	Select System for Air Targets
TA.03.01.02.01	Determine System Capability for Engaging Air Targets
TA.03.01.02.03	Select System for Air Engagement
TA.03.02	Attack Enemy Air Targets
TA.03.02.01	Conduct Lethal Engagement of Air Targets
TA.03.02.01.01	Employ Air-to-Air Weapons
TA.03.02.01.01	See TA 1.1.1.3 Move Through Air and TA 1.2 Engage Enemy
TA.03.02.01.02	Employ Surface-to-Air Weapons
TA.03.02.01.02.01	Employ Air Defense Artillery
TA.03.02.01.02.02	Employ Other Unit Fires
TA.03.03	Integrate Air Defense Fire
TA.04	**COMMAND AND CONTROL BOS**

TA.04.01	Acquire and Communicate Information and Maintain Status
TA.04.01.01	Communicate Information
TA.04.01.01.02	Receive and Transmit Enemy Information
TA.04.01.01.04	Receive and Transmit Friendly Troop Information
TA.04.01.02	Manage Means of Communicating Information
TA.04.01.03	Maintain Information and Force Status
TA.04.01.03.02	Display Information
TA.04.01.03.04	Manage Information Distribution
TA.04.02	Assess Situation
TA.04.02.01	Review Current Situation
TA.04.02.01.02	Fuse Information
TA.04.02.01.03	Evaluate Incoming Information
TA.04.02.03	Decide on Need for Action or Change
TA.04.03	Determine Actions
TA.04.03.05	Select or Modify Course of Action
TA.04.04	Direct and Lead Subordinate Forces
TA.04.04.01	Prepare Plans or Orders
TA.04.04.01.02	Coordinate Support
TA.04.04.05	Synchronize Tactical Operations
TA.05	**INTELLIGENCE BOS**
TA.05.01	Collect Information
TA.05.01.02	Collect Target Information
TA.05.01.02.03	Locate Targets
TA.05.01.02.04	Identify Targets
TA.05.02.04	Integrate Intelligence Information
TA.05.02.04.02	Develop Targeting Information
TA.06	**MOBILITY AND SURVIVABILITY BOS**
TA.06.03	Enhance Survivability
TA.06.03.02	Employ Operations Security
TA.06.03.02.01	Employ Signals Security (SIGSEC)
TA.06.03.02.01.01	Employ Communications Security (COMSEC)
TA.06.03.02.01.02	Maintain Electronic Security
TA.06.03.03	Conduct Deception in Support of Tactical Operations
TA.06.03.03.02	Employ Electronic Deception
TA.06.03.04	Provide Security and Readiness
TA.07	**COMBAT SERVICE SUPPORT BOS**
TA.07.01	Arm

TA.07.03	Fix
TA.07.03.02	Fix/Maintain Equipment
TA.07.03.02.02	Recover
TA.07.03.02.03	Diagnose
TA.07.03.02.04	Substitute
TA.07.03.02.05	Exchange
TA.07.03.02.05	See TA.7.5.2 Supply the Force
TA.07.03.02.06	Repair
TA.07.03.02.07	Return
TA.07.04	Man the Force
TA.07.04.02	Provide Field Services
TA.07.04.02.02	Graves Registration
TA.07.04.02.03	Salvage
TA.07.04.03	Provide Personnel Service Support
TA.07.04.03.01	Provide Personnel Administration Services
TA.07.04.03.01.01	Maintain Personnel Strength
TA.07.04.03.01.01.01	Provide Strength Management
TA.07.04.03.01.01.02	Conduct Replacement Operations
TA.07.04.03.01.01.03	Perform Casualty Reporting Operations
TA.07.04.03.04	Perform Chaplaincy Activities
TA.07.04.03.04.01	Provide Religious Support
TA.07.04.03.04.02	Provide Pastoral Care and Counseling
TA.07.04.04	Provide Health Services
TA.07.04.04.01	Provide Medical Treatment
TA.07.04.04.02	Evacuate Casualties
TA.07.05	Distribute
TA.07.05.02	Supply the Force
TA.07.05.02.01	Request Supplies
TA.07.05.02.02	Receive Supplies
TA.07.05.02.08	Issue Supplies

APPENDIX 2

REFERENCES

1. PURPOSE
This appendix lists the basic references used for development of this analysis.

2. Joint Publications
   JCS Pub 1-01, Joint Publication System, Joint Doctrine and Joint Tactics, Techniques, and Procedures Development Program
   JCS Pub 1-02, DOD Dictionary of Military and Associated Terms
   USREDCOM M 310-1, Dictionary of Joint Terms (not listed in JCS Pub 1)

3. Army Regulations
   AR 310-25, Dictionary of United States Army Terms

4. Field Manuals
   AFM 2-14/FM 100-42, US Air Force/US Army Airspace Management in an Area of Operations
   FM 6-20, Fire Support in Combined Arms Operations
   FM 34-1, Intelligence and Electronic Warfare Operations
   FM 71-100, Armored and Mechanized Division Operations
   FM 100-5, Operations
   FM 101-5, Staff Organization and Operations
   FM 101-5-1, Operational Terms and Symbols

5. Pamphlets
   TRADOC Pam 11-8, Studies and Analysis Handbook
   TRADOC Pam 11-9, Blueprint of the Battlefield

6. Analytical Tools
   Blueprint of the Battlefield Computerized Analysis Tool (BOBCAT)