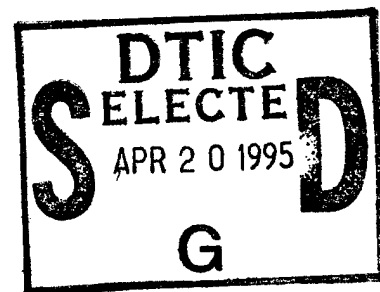
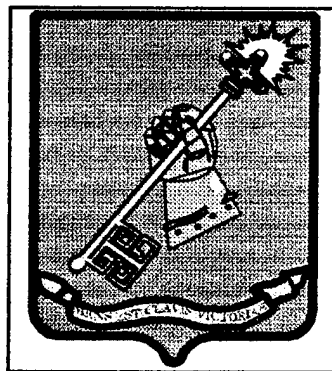


**FRATRICIDE:
REDUCING THE FRICTION THROUGH
TECHNOLOGY**

**A Monograph
by**

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ABSTRACT

FRATRICIDE: REDUCING THE FRICTION THROUGH TECHNOLOGY
by Major Henry S. Larsen III, USA, 56 pages.

This monograph examines the Army's near-term Battlefield Combat Identification System (BCIS) designed to reduce fratricide through use of technology. The near-term BCIS system represents the first use of an Identification Friend or Foe (IFF) device by the U.S. Army. The monograph provides information on the near-term BCIS system's capabilities and limitations. A significant limitation of the near-term BCIS system is the purchase of only 1520 systems which will require the corps planner to develop an allocation plan for the system.

The monograph provides historical background to fratricide within the U.S. military concentrating on wars in the 20th Century. Fratricide is an intraservice, joint, and combined phenomena. The monograph examines three cases of fratricide from the Persian Gulf War. The cases are evaluated for fratricide risk using METT-T as an analysis tool.

A hypothetical case study of the VII U.S. Corps in the Persian Gulf War is used to illustrate how METT-T could be utilized to develop an allocation plan for the near-term BCIS system. The monograph concludes by emphasizing the need for the near-term BCIS system at its original purchase quantity, makes recommendations on how it should be allocated, and suggests what improvements the Army should look for in future BCIS systems.

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I. INTRODUCTION

On 29 January 1991, a Maverick missile fired from a United States Air Force A-10 plane slammed into a Light Amphibious Vehicle (LAV) killing seven U.S. Marines and wounding two others. This was the third friendly fire incident of the Persian Gulf War and the first to result in the deaths of U.S. service members. By the end of the war, a well-trained military force which surprised the world with its easy victory over Iraq would have committed twenty-eight fratricide incidents.¹ The American press initially reported a fratricide rate for the Persian Gulf War at twenty-four percent of all U.S. battle casualties. This figure stood well above the two percent expected from the historical data of past wars.² The frequently asked question to the U.S. military was how could such an apparently competent fighting force be so incompetent in this crucial area?

The high rate of fratricide in the Persian Gulf War, officially seventeen percent of all U.S. casualties,³ initiated fratricide prevention programs in all four services of the U.S. Armed Forces. Within the Training and Doctrine Command (TRADOC), the Army initiated the Combat Identification Program in 1991 and created both the Combat Identification Task Force and the Fratricide Prevention Task Force. The Army's goal is to reduce fratricide primarily through the enhancement of training, doctrine, and technology. The Battlefield Combat Identification System

(BCIS) represents the Army's program to reduce ground-to-ground and air (rotary)-to-ground fratricide by use of technology.

This monograph examines the Army's BCIS program. Specifically, what are the tactical planning considerations for a corps staff using the Army's near-term Battlefield Combat Identification System? The research question addresses corps operations in both a joint and combined environment during conventional combat operations. The monograph is of utility to the corps planner conducting military operations using the near-term BCIS system. The monograph will inform the corps planner of the near-term BCIS system's capabilities and limitations. The monograph will also make recommendations for its employment in both joint and combined combat environments by using METT-T (Mission, Enemy, Terrain and weather, Troops and equipment, and Time) as an analysis tool.

II. Fratricide Historical Background

Fratricide, as defined by Field Manual 100-5 Operations, 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."⁴

Besides the definition of fratricide in the Army's keystone doctrinal manual, the 1993 Field Manual 100-5 Operations mentions fratricide three additional times. The Army's

current doctrine adds fratricide avoidance as a sub-element of combat power under protection.⁵ Fratricide prevention is also mentioned twice in the chapter concerning combined operations. In comparison with the 1993 version of Field Manual 100-5 Operations, the 1986 version makes no mention of fratricide prevention nor does it attempt to define fratricide.

The Persian Gulf War set into motion a campaign to reduce fratricide within the Army. During the war, U.S. fratricide losses were 35 killed and 72 wounded soldiers and marines out of a total loss of 146 killed and 467 wounded.⁶ The Army's fratricide losses for its premier combat vehicles were 7 M1A1 Abrams tanks and 20 Bradley Fighting Vehicles out of a total loss of 10 and 25 respectively.⁷ When compared to previous wars a surprising majority of the 28 fratricide incidents occurred in direct fire engagements between ground forces. Indirect artillery fire accounted for only one incident which is a major change from U.S. experiences in WWI, WWII, Korea and Vietnam. Also, compared with other wars, the seventeen percent fratricide rate far exceeded the two percent fratricide rate the military habitually expected from past war experiences. The problem is that the American military has never made a significant attempt to quantify fratricide losses in past wars.

Fratricide has existed in every major U.S. war or conflict from the Revolutionary War through Operation Desert Storm. During the French and Indian War, Colonel George

Washington's infantry detachment engaged in an accidental skirmish with other friendly troops resulting in the death of between 13 and 40 soldiers. Washington never reported the incident to his superiors and did not mention the occurrence until almost thirty years had past.⁸

Reporting of fratricide incidents throughout American history has always been haphazard with only fratricide events that significantly affected operations receiving any great attention. Coverage of fratricide by the media and the military has also been scarce until post Operation Desert Storm. From 1959 to 1990, no military article on fratricide is listed in the Air University Library Index to Military Publications. From 1991 to August 1994, thirty-four articles on fratricide appear in this reference publication. During the Vietnam War, one book by C.D.B. Bryan titled Friendly Fire covered a family's woes from the loss of their son to friendly indirect artillery fire. Coincidentally, in the same book Lieutenant Colonel Norman Schwarzkopf dominates two of the chapters as the dead soldier's battalion commander.

In 1982, Lieutenant Colonel Charles R. Schrader wrote a Combat Studies Institute study titled Amicicide: The Problem of Friendly Fire in Modern War which became the definitive study on the subject of fratricide in the American military. Schrader's study contained a large collection of historical "anecdotes"⁹ on fratricide in American military history focusing on WWII, the Korean War,

and the Vietnam War. Schrader's study examines fratricide cases in the four broad categories of artillery amicide, air amicide, antiaircraft amicide, and ground amicide.

Although interesting reading, Schrader's study is not scientific in its research methodology as acknowledged by the author in his introduction:

"The methodology of this study is primarily historical, narrative, and highly selective. In the analysis of available data, time and resource constraints precluded the use of proven mathematical techniques and forward-looking war-gaming methods...."¹⁰

Later, in the introduction, Schrader attempts to quantify a standard fratricide rate as two percent of all combat casualties. He bases this assertion on the Korean War casualty report of "accidents in the use of own weapons" which caused 1,489 casualties out of 90,841 total for a 1.6 percent casualty rate;¹¹ and the Vietnam casualty report of "Hostile-Misadventure" resulting in 1,326 deaths out of a total of 46,397 for a 2.85 percent figure.¹² Schrader backs up his two percent assertion with a Korean War survey of the first one hundred men wounded in action only two claimed to have been wounded due to friendly fire.¹³ Also in the introduction, Schrader cites French General Percin as alleging 75,000 of the 4,945,470 French casualties (1.5 percent) in WWI were due to friendly fire.¹⁴ Later, in the Artillery Amicide chapter, General Percin is more accurately cited to have said the 75,000 friendly casualties were due to French artillery fire.¹⁵ Schrader does caveat

his two percent assertion by stating that fratricide has been historically under reported due to no fratricide category existing on casualty feeder reports, command reluctance to report incidents, medical reluctance to report incidents (especially resulting in death), and the fog of war causing some fratricides to occur and legitimately to go unreported.

Schrader's study of fratricide represented the first detailed look at this military problem. His assertion that fratricide accounted for two percent of all combat losses stood as the accepted figure from 1982 to 1991. Because of the seventeen percent fratricide rate experienced in the Persian Gulf War, Schrader's two percent figure has come under frequent attack from recent studies on fratricide and reports to congress.¹⁶ In a report to congress, the Office of Technology Assessment frequently cites Schrader's two percent assertion as erroneous and directly states that the figure may be part of the reason the military has not developed many anti-fratricide devices in the past. Concerning fratricide in the Persian Gulf War, the Office of Technology Assessment states

"in every case where data are available, the fratricide rate is significantly higher than the two percent that frequently appears in print as the nominal fratricide rate."¹⁷ (bold print in original source for effect)

and later,

"by any absolute measure, fratricide was not worse in the Persian Gulf War -- or in Panama or Grenada -- than in previous wars."¹⁸

Table 1 depicts fratricide rates as determined by Dr. Schrader's study, the Office of Technology Assessment, and a U.S. Army TRADOC briefing dated 22 June 1994. In comparison with Schrader's two percent assertion, Table 1 shows that fratricide rates between ten and twenty-four percent have occurred within the U.S. military during wars in the 20th century.

SOURCE EVENT	LTC SCHRADER'S AMICICIDE STUDY	OFFICE OF TECHNOLOGY ASSESSMENT	TRADOC BRIEFING DATED 22 JUNE 1994
WWI	1.5%		
WWII		17.9 AND 12.3%	15%
KOREA	1.6%		
VIETNAM	2.85%	>10%	15%
PANAMA			12%
GRENADA		24%	17%

Table 1: Estimated fratricide rates.

III. Fratricide in the Persian Gulf War

The Persian Gulf War is the best documented and most accurate account of fratricide losses in history. Several reasons for the accuracy in reporting were:

-- the shortness of the war allowed for detailed investigation of all vehicle/personnel losses.

-- the ten incidents of fratricide during the air campaign were relatively isolated events spread over time and facilitated rapid investigation. They also made the military more sensitive to the potential for fratricide prior to the ground campaign.

-- air supremacy by coalition air forces made any air-to-ground fratricide easy to determine and investigate.

-- U.S. depleted uranium rounds made a unique fratricide signature for U.S. forces.

-- aggressive reporting and investigation of fratricide events by the U.S. Army (all but one U.S. Army division involved in a fratricide incident conducted AR 15-6 investigations to determine causes of the fratricide incidents).¹⁹

Military operations for the U.S. Army are becoming predominately joint (two or more services) and combined (two of more nations) operations. Reflecting this trend, fratricide in the Persian Gulf War had both joint and combined incidents as well as those purely between U.S. Army forces (see table 2).

TYPES OF FRATRICIDE	INTRASERVICE	JOINT	COMBINED
GROUND TO GROUND (DIRECT FIRE)	15		
GROUND TO GROUND (INDIRECT FIRE)	1		1
AIR TO GROUND	2	6	1*
GROUND TO AIR		1	
SHIP TO SHIP	2		

Table 2: Fratricide in the Persian Gulf War

*Additional combined fratricide incidents are alleged to have taken place between USMC pilots and Saudi Arabian ground forces. The Saudi government was reported to be reluctant to report such incidences due to fear of damaging coalition unity.²⁰

The following three examples of fratricide illustrate the intraservice, joint, and combined fratricide experienced by U.S. and coalition forces in the Persian Gulf War.

A majority of the Persian Gulf War fratricides occurred within a single service.²¹ Task Force 1-41 Infantry, 1st Infantry Division (Mechanized) suffered three significant fratricide incidences causing the loss of nine combat vehicles and thirty soldiers.²² All three incidences involved Army forces only. The first incident was the much publicized air-to-ground fratricide involving an Apache attack helicopter battalion commander destroying a Bradley Fighting Vehicle and a ground surveillance radar mounted on an M113 armored personnel carrier. The cause of this

incident, like most fratricides, was a combination of factors. Factors involved in this incident included pilot error, target identification error,²³ and situational awareness error.²⁴

The other two cases of fratricide involved ground-to-ground incidents inflicted on Task Force 1-41 Infantry by 2-66 Armor. Again, like most fratricide incidences, a combination of events/conditions facilitated the occurrences. The first ground-to-ground incident occurred early in the morning on 27 February 1991. Task Force 1-41 was conducting a brigade attack to seize Objective Norfolk. The brigade had just completed a night forward passage of lines with the 2d Armored Cavalry Regiment in which one company commander (Bravo, TF 1-41) lost his vehicle due to a maintenance failure. The company commander jumped to one of his platoon leader's vehicles but forgot his Global Positioning System in the process. This event was to leave the company commander with no ability to determine self location which is a necessity for situational awareness.

The enemy in Objective Norfolk was a mixture of T55 and T62 tanks with dismounted infantry interspersed amongst numerous vehicles destroyed by the air campaign.²⁵ Because of this previous destruction of Iraqi vehicles, the Iraqi tankers and infantrymen had abandoned their operational track vehicles until it was necessary to use them. This made the vehicles "cold" targets and very difficult to identify using thermal sights and to differentiate from

equipment already destroyed during the air campaign. Throughout the night there were burning vehicles encountered producing smoke which further degraded the ability to perform accurate target identification.

Bravo Company, TF 1-41 Infantry, without its Global Positioning System, was having difficulty staying in its assigned position within the battalion's formation. At about 0200 hours on 27 February, Bravo Company found themselves to the right rear of a tank company they thought belonged to Task Force 1-41 Infantry. They were actually tanks from 2-66 Armor that were located to the right of Task Force 1-41 in the brigade formation. About the time the Bravo company commander was sorting out the navigation problem, the company was attacked by rocket propelled grenade (RPG) fires from Iraqi dismounted infantry. A couple of the RPG rounds struck the turrets of Bravo Company's Bradley Infantry Fighting Vehicles. These RPG hits could only cause light damage to a Bradley; however, in the sights of 2-66 Armor tank gunners the heat signature caused by the RPGs striking the Bradleys turrets gave the impression that the infantry vehicles were enemy tanks firing on 2-66 Armor.²⁶ The 2-66 Armor tank platoon fired multiple volleys of sabot into Bravo Company before a cease fire could be called for on the brigade command net. The result of this fratricide was three Bradley Fighting Vehicles destroyed, five soldiers killed, and twenty-four wounded.²⁷

Looking at the operation for fratricide potential using METT-T, the operation would have to rate high for fratricide potential. The mission was an extremely dynamic and fluid one that involved a difficult night forward passage of lines with an offensive movement to contact which was also occurring at night. The enemy was a heavy-light mix interspersed amongst numerous destroyed vehicles. The enemy, whether intentional or not, was staying out of their operational combat vehicles making them cold targets and difficult to identify using thermal sights. Finally, the enemy was presenting a 360 degree threat by allowing the U.S. tanks and infantry fighting vehicles to bypass them before attacking into the rear of the vehicles or attacking the company trains that followed the combat vehicles.

Terrain did facilitate long shots (some over 2,000 meters) but the weather being a combination of darkness, cold, and drizzle would degrade target identification even at relatively close ranges. Troops available were well-trained armor and infantry soldiers according to both battalion commanders involved (1-41 Infantry and 2-66 Armor) as cited in personal reports filed after the Persian Gulf War.²⁸ Of significance is that the brigade arrived in theater on 9 January 1991 and closed in the initial assembly area (Forward Assembly Area Roosevelt) on 25 January which is after the air campaign started.²⁹ This did not give the brigade much in-theater time for either training or acclimatization.

Time for the mission began when the brigade crossed the line of departure at 0530 hours on 26 February. The first fratricide incident occurred approximately twenty hours later. Fatigue on the part of the tank gunners and commanders could have played a major role in the incidents.

By examining the operation using METT-T as an analysis tool, a planner could determine the movement-to-contact performed by 3d Brigade, 2d Armored Division (Forward) had a high risk potential for fratricide. Although a high risk of fratricide should never cause a mission to be aborted or drastically changed, it should cause planners and commanders to address issues that can minimize the risk while not compromising the mission. In the final evaluation of the two fratricide incidents that occurred within 3d Brigade on 27 February, the major causes were incorrect target identification combined with poor situational awareness.

Few bona fide cases of coalition fratricide exist from the Persian Gulf War. On 26 February 1991, two U.S. Air Force A-10s attacked a British convoy from the Royal Regiment of Fusiliers destroying a pair of British Warriors (armored personnel carriers). The A-10 pilots mistook the Warriors for Iraqi T-55 tanks after two verification passes at fifteen thousand and eight thousand feet. The incident killed nine and wounded eleven British soldiers. The pilots claimed that they were radioed guidance from a British air liaison officer and told that there "were no friendlies

within 10 kilometers."³⁰ The British air liaison officer claimed that the coordinates he sent the U.S. pilots were twenty miles from the spot that the pilots attacked. A combination of target identification error and poor situational awareness were the leading causes in this fratricide incident.

Coalition fratricide was relatively rare in the Persian Gulf War even though the potential for fratricide was high. Examining the overall USCENTCOM plan using a METT-T analysis, a great potential for fratricide occurrence existed in a mission that was offensive and rapid moving in nature combining a deliberate supporting attack into Kuwait with an encirclement of Iraqi forces through Iraq. Link-ups and forward passage of lines operations were planned throughout the operation. The enemy was equipped primarily with Soviet-bloc weapons spanning over thirty years in production but they also possessed a good number of other weapon systems including some from the U.S., Britain, and France.

Terrain varied significantly throughout the Kuwaiti Theater of Operations but some areas supported direct fires at weapon systems' maximum effective ranges. Troops available included U.S., French, and British forces with their respective national equipment along with Arab and other coalition forces equipped with a mixture of U.S., Soviet, British, French, and other equipment. Time

available also varied for units ranging from six months to a matter of a few weeks.

The reason coalition fratricide was rare is that a majority of coalition forces were isolated from U.S. forces. Also, during operations, both U.S. and coalition commanders were sensitive to potential fratricidal conditions. One set of orders required British 1st Armoured forces to attack north in front of U.S. forces. Lieutenant General Franks countermanded these orders to attack north less than six hours after they were issued. Of the original orders, the British commander, General Rupert Smith, concluded they would of "likely lead to the biggest blue-on-blue³¹ engagement of all time."³²

Historically, the most common incident of joint fratricide has occurred between the U.S. Air Force and Army or Marine ground forces. On 29 January 1991 in support of the Marine defense of the Saudi town Ras Al Khafji, a U.S. Air Force A-10 flying in close air support fired a Maverick missile destroying a Light Amphibious Vehicle, killing seven Marines, and wounding two others. The pilot claimed the missile malfunctioned and attacked the wrong vehicle.³³ Marines later interviewed claimed the A-10 pilot had been set up for the wrong target from the start of the pass.³⁴

Using METT-T as an analysis tool to determine fratricide potential this occurrence of fratricide does not rate as high in potential risk as the one encountered by Task Force 1-41 Infantry. The mission for the U.S. Marines

at the time of the fratricide incident was defensive in nature with the Iraqi army initially on the offensive. The Air Force A-10 was flying close air support for the Marines.

The enemy was T-55 equipped attacking to seize the town of Ras Al Khafji. The enemy's equipment was significantly dissimilar to that of the Marines. Terrain was generally open and the weather was optimum with clear conditions and a full moon that illuminated the entire battlefield. The troops involved were well-trained Marines with habitual experience in air-to-ground operations given to them by Marine pilots organic to the Marine air-ground task force (MAGTF). The A-10 pilots were not experienced in providing close air support at night and the A-10s were not equipped with the Air Force's most advanced thermal equipment.³⁵ Time was not a significant factor in this fratricide incident.

The Air Force's explanation for the fratricide incident is that of equipment failure. Immediately after firing the Maverick missile at the Iraqi T-55 tanks the missile went "dumb" and locked on the Marine LAV supposedly right below the A-10 pilot. The U.S. Air Force blamed a large number of the air-to-ground fratricides in the Gulf War on mechanical failure. In the separate cases of the three HARM (high-speed antiradiation missile) missile fratricides, the Air Force explained they were due to Iraqi radars shutting off and the HARM missile locking in on a U.S. radar sight. In the few cases where the U.S. Air Force

does not blame maintenance or technology as the failure, poor ground-to-air coordination is cited. A surprisingly few incidences of admitted pilot error exist in the Persian Gulf War or even in the Vietnam and World War II examples cited in Schrader's Amicide study. Based on Marine reports that the A-10 appeared to be lined up to attack the Light Amphibious Vehicle this fratricide would be listed as caused by pilot error in target identification and situational awareness.

The three fratricide cases mentioned in this monograph illustrate the fact that fratricide is an intraservice, joint, and combined phenomena. Also, in most fratricides a degree of error in both target identification and situational awareness exists as the two primary causes of fratricide incidences.

IV. Battlefield Combat Identification System (BCIS)

The BCIS program was initiated shortly after Operation Desert Storm in 1991 as a subcomponent of the Combat Identification Program. The BCIS program is a five phase program designed to minimize fratricide by using technology to enhance situational awareness and combat identification. Situational awareness is the knowledge of your own location, the location of other friendlies, the location of the enemy, and locations of neutrals/non-combatants. Situational awareness varies in degree from not knowing your own location to having the detailed knowledge

of knowing your own exact location and everything around you. Target identification is the ability to positively identify a potential target as friendly, enemy, neutral, or non-combatant. During Operation Desert Storm, lack of situational awareness and lack of the ability to correctly perform target identification were involved in more fratricide cases than any other causes.

The first two phases of the BCIS program, quick-fix and quick-fix plus, have already been completed. The quick-fix phase focused on fielding the passive infrared identification systems (BUDD and DARPA lights) that became available at the very end of Operation Desert Storm.³⁶ The quick-fix plus phase increased the number of positive location identification systems like the Global Positioning System to enhance situational awareness and produced a number of thermal identification systems for passive target identification.³⁷ The quick-fix and quick-fix plus phases basically took off-the-shelf technology and accelerated its fielding to Army units. The target identification systems are passive and can be easily duplicated and mimicked by a sophisticated enemy. In addition, passive identification measures can be seen by enemy forces equipped with sophisticated weapon sighting capabilities. The wider fielding of the GPS increases the number of friendly units that have positive self location but does not address the need to know where other friendly units are or the locations of enemy forces, neutrals, and non-combatants.

A common theme in service member statements during fratricide AR 15-6 investigations is that the particular fratricide case being investigated could have been avoided if the Army had an Identification Friend or Foe (IFF) device similar to the ones used by the U.S. Air Force. The U.S. Air Force started development of IFF devices during World War II. The U.S. Army Armor Center identifies a common Army problem of maximum effective weapon ranges far exceeding the weapon's sighting capacity on Army weapon systems.³⁸ This is especially true during night and limited visibility operations. The near-term phase of the BCIS program is an IFF device designed to enhance target identification through positive control measures by use of a millimeter wave question and answer system. The near-term BCIS system is designed to fit on seventeen ground platforms (see Appendix A) to include the USMC's Light Amphibious Vehicle. The near-term BCIS system will also be fitted on two aerial platforms (Kiowa and Apache). The near-term BCIS system is not compatible with the IFF Mark XII system used by U.S. air forces.

Until recently, the near-term BCIS was a fully funded project that would purchase 1,520 systems for 100 million dollars. The contract was awarded to TRW but has been recently reduced to 25 million dollars for a purchase of 200 systems.³⁹ Concerns by congress that the system is not required to be integrated into the mid-term and far-term

BCIS phases has caused this reduction of 75 percent in budget and 86 percent reduction in available systems.

While the near-term phase is concerned with target identification, both the mid- and far-term systems will integrate situational awareness and target identification into one complete system. From General Sullivan (Army Chief of Staff) came this mission guidance:

"For the near term (requirements and solutions) concentrate on tactical level for surface to surface and air to surface. For far term (requirements and solutions) expand to operational level and include air to air and surface to air."⁴⁰

The long-term BCIS solution will provide both situational awareness and positive target identification to the Army to include IFF of friendly and enemy weapons systems by type. The mid-term BCIS system is scheduled to begin fielding in fiscal year 2003. The far-term BCIS system is scheduled to begin fielding in fiscal year 2007. The near-term BCIS system is scheduled for fielding in the fourth quarter of fiscal year 1996 and will be combined with quick-fix and quick-fix plus programs to enhance situational awareness and target identification. The near-term BCIS system must bridge the six year gap between the initial fielding of the near-term BCIS system in 1996 and the mid-term system fielding in 2003. The corps planner must understand the near-term BCIS system's capabilities and

limitations before deciding on how best to employ the system.

The near-term BCIS system will automatically query targets when lased for range by a gunner on a shooter platform. The millimeter wave query will go out in the direction the weapon system is oriented ± 22.5 mils and will inform the gunner if the target is friendly (direction and range match), possible friendly (direction matches but range does not match), or unknown target (no response).⁴¹ Unlike the Air Force's IFF system, the near-term BCIS does not discriminate between friend, foe, or neutral/non-combatant and has a performance rate of 90 percent.⁴² The Army's near-term BCIS Operational Requirements Document (ORD) requires that the system minimize firing response time by adding less than one second to the process of identifying the target through to firing on the target.⁴³ TRADOC stresses that the near-term BCIS system is a tool to facilitate target identification and is not an aid to make target identification an automatic process. Other key characteristics/requirements of the near-term BCIS systems are that it:

- gives the friendly receiver an audible/visual alarm that he is being queried.

- operates at 1.5 times the maximum effective weapons range for the weapon it is mounted on.

- is resistant to spoofing, jamming, or deception countermeasures.

- will not increase target engagement times.
- is a bolt-on/strap-on system.
- possesses zero out memory protection.
- operates using current U.S. Army secure communications methods.

Considerations for employment of the near-term BCIS system for the corps planner will be presented in the analysis section. The near-term BCIS system does have shortfalls that a corps planner must be aware of. These shortfalls are that:

- it is not compatible with fixed-wing aircraft.
- at a total purchase of 1,520 systems, there will not be enough systems available for every combat vehicle during a major operation. During Operation Desert Storm the Army deployed 2,300 Abrams tanks, 2,200 Bradley fighting vehicles, 20,000 HMMWVs (high mobility multipurpose wheeled vehicle), 4,400 HEMMTs (heavy expanded mobility tactical truck), and 29,000 other tactical vehicles in the two U.S. corps.⁴⁴

- Joint and combined forces will probably not be equipped with a compatible system and may demand some portion of the available systems.

- In a close fight, friendly or possible friendly signals may be received even while lasing an enemy threat.

V. Corps Planning and Fratricide Risk Assessment

Corps planners must examine plans and operations for fratricide risk potential and where necessary allocate scarce fratricide reduction resources like the near-term BCIS system accordingly. The Center for Army Lessons Learned (CALL) has published a handbook and newsletter addressing fratricide and preventive measures that can be taken to reduce the risk of fratricide. CALL Handbook 92-3 examines fratricide risk assessment from a company commander's perspective and presents a risk assessment matrix which quantifies fratricide risk in the major areas of Situational Awareness (Fire and Maneuver Control, Fire Distribution Plan, Land Navigation, Fire Control and Battle Tracking, Battlefield Hazards), Positive Identification (Combat Identification), Discipline (Fire Control Discipline), and Troops (Soldier and Leader Preparedness).⁴⁵ The handbook assigns points for each specific area and allows the company commander to assess his units fratricide risk as low, caution, or high risk. The handbook would not be of utility at the corps planning level.

CALL Newsletter 92-4 also has a fratricide risk assessment guide for battalion leadership using METT-T as an analysis tool for assessing fratricide risk potential before executing a mission. The newsletter does not attempt to quantify fratricide risk numerically but gives the battalion commander and staff lists of considerations (see Appendix B). This list, modified for the corps planner, could be a

valuable tool for assessing fratricide risk and allocating resources designed to reduce fratricide.

VI. Analysis

With its initial purchase quantity of 1,520 systems, the near-term BCIS is a limited resource that the corps planner must allocate smartly. An Army corps is a flexible organization that varies in size and structure depending on the mission requirements. Major units found in an Army heavy corps could be 2-5 Army divisions, an armored cavalry regiment, 2-5 field artillery brigades, an aviation brigade, an air defense artillery brigade, and a corps support command. During Operation Desert Storm, VII U.S. Corps had under its command, at one time, three U.S. armored divisions (1st Armored, 1st Cavalry, and 3d Armored), one U.S. infantry division (1st Infantry), the British 1st Armoured Division, the 2d Armored Cavalry Regiment, the 11th Attack Aviation Brigade, and a large assortment of supporting specialty brigades (field artillery, air defense, combat service support).⁴⁶

An example of a typical heavy corps structure that could be deployed in a major regional conflict would be two armor and one mechanized infantry divisions, one armored cavalry regiment, one combat aviation brigade, three field artillery brigades, and a air defense artillery brigade. Major weapon systems that would be deployed in the corps

main battle area for this typical corps are listed in Table 3.

EQUIPMENT DENSITY FOR A THREE DIVISION HEAVY CORPS	
WEAPON SYSTEM	QUANTITY
M1A1 ABRAMS TANK	1,109
M2 BRADLEY INFANTRY FIGHTING VEHICLE	868
M3 BRADLEY CAVALRY FIGHTING VEHICLE	416
AH-64 APACHE ATTACK HELICOPTER	216
AH-58D KIOWA ATTACK HELICOPTER	72
M109A2/3/6 155MM SP HOWITZER	360
MLRS	165
M981 FISTV	231
SCOUT HMMWV	300
AVENGER	108
STINGER FIGHTING VEHICLE	162
TOTAL	3,977

Table 3: Equipment Density for a Three Division Heavy Corps⁴⁷

The total number of vehicles that could have the near-term BCIS system is over 2.5 times the amount of the full \$100 million purchase. Other types of vehicles that could have the near-term system mounted on them are command and control HMMWVs and M577 Command Posts, engineer vehicles (M9 ACE, M728 CEV, and M60 AVLB), and M1064 4.2 inch mortar systems found in every armor and mechanized infantry battalion.

For the corps planner the significant difference between total requirements and available systems means an allocation plan for the system must be developed. The goal in the development of this allocation plan should be to support the tactical plan while providing the optimum fratricide prevention for the corps as a whole. In

determining which units and/or systems will receive the near-term BCIS system the corps planner must have a system to analyze the problem. The Fratricide Risk Assessment for Battalion Leadership (see Appendix B) using METT-T as an analysis tool is a good method for a corps planner to use.

The Fratricide Risk Assessment for Battalion Leadership is designed for the battalion-sized unit and does not have all the considerations a corps planning staff needs to consider. Because of the corps size, some units will be involved in security operations while other units could be conducting offensive operations, defensive operations, or both. The major mission considerations for the corps planner is which units are conducting high-risk fratricide operations. Two high-risk fratricide operations are offensive operations and operations involving converging forces.

Examples where converging friendly forces might occur in corps operations are during forward or rearward passages of lines, an encirclement or envelopment of enemy forces, link-up with an encircled friendly force, break-out of an encircled friendly force, attack aviation operations, and commitment of the reserve. Because of the movement of forces, all types of offensive operations listed in Field Manual 100-15 Corps Operations involve high fratricide risk. In addition, the mobile defense with its one-half to one-third of the units combat power retained as the strike

force, is a very offensively-minded defensive operation that lends itself to a high fratricide risk.

Because of the size of the corps, enemy considerations could vary within the corps' area of operations and must be considered as such. Two major fratricide considerations are enemy equipment composition/capabilities and enemy tactics. When examining the enemy's equipment composition a planner should look for whether the enemy is a homogeneous organization with like vehicles throughout the organization (former Soviet Union, North Korea, China as examples) or is a mixed-bag of purchases from various military equipment producers (Iran and Iraq as examples). The obvious low fratricide risk situation is the homogeneous enemy that is equipped with hardware produced by one nation. Even when faced with a "mixed-bag" enemy, analysis of how he has positioned his assets within the corps' area of operations may indicate areas that are low or high risk fratricide areas. An area would be considered low risk because the particular unit (division) occupying the area is equipped in a homogeneous manner using Soviet equipment. A area would be considered high risk if the units occupying the area are not homogeneously equipped and are using NATO produced weapon systems or even equipment produced by U.S. manufacturers.

Enemy capabilities include their ability to perform target identification. When operating against an enemy force that possesses sophisticated thermal and infrared

sighting systems, the quick-fix and quick-fix plus target identification methods become target enhancers for the enemy by acting as beacons for the enemy to fire on. If the enemy does not have sophisticated target identification abilities or if the targeting abilities exist only in certain units then passive (infrared or thermal) target identification measures can be used in the low risk areas while the near-term BCIS positive identification system can be used in high risk areas. Enemy tactics like leaving their vehicles cold, mixing heavy and light forces, and allowing forces to bypass before attacking can also affect the decision on which anti-fratricide devices (if any) should be used.

Terrain and weather have significant effects on fratricide prevention based on their effects on situational awareness and target identification. Terrain can also vary within the corps' area of operations. Open terrain that allows for target engagements out to maximum effective ranges will tend to exacerbate target identification problems but render situational awareness less difficult. Forces operating in open terrain should be equipped with the near-term BCIS system that gives positive identification out to 1.5 times maximum effective weapons range.⁴⁸ Close compartmentalized terrain increases a units chances for surprise short-range encounters with both enemy and friendly forces. In close compartmentalized terrain situational awareness decreases but target identification is easier making passive target identification measures less risky.

Weather conditions will usually be fairly consistent throughout a corps' area of operations. Fog, rain, and dust degrade target identification using passive measures (thermal and infrared) and situational awareness. The near-term BCIS system is not degraded by the effects of adverse weather.⁴⁹ Based on weather and available options, the corps planner might commit different forces based on different fratricide prevention measures within those forces (i.e. near-term BCIS versus non-BCIS equipped forces).

By combining enemy capabilities, composition and tactics with terrain and weather analysis, the corps planner can create an IPB-like (Intelligence Preparation of the Battlefield) product in the form of a map overlay that breaks down the corps area of operations into high-, mid-, and low-risk potential fratricide areas. Also, the areas can be identified based on the fratricide threat due to situational awareness or target identification problems. This product would assist the planner in identifying units/weapon systems that should receive passive or active target identification systems and units that will require additional positive navigation devices.

Troops and equipment also affect the decision making process by influencing who will receive anti-fratricide devices. Within the corps, the level of tactical proficiency amongst subordinate units may vary. An example would be if one of the units were rounded-up or rounded-out with National Guard forces. Due to the phased deployment of

the corps into the theater, a heavy U.S. corps will arrive in stages. This means that units deploying early will benefit from in-theater acclimatization to the terrain and weather.

Another troop consideration for the corps is the possibility of attached joint and/or combined forces. Marines and allies will bring equipment that is significantly different from Army equipment and increases the difficulty in target identification. Not allocating a portion of the near-term BCIS system to these forces can effect both the tactical operation and the moral cohesiveness of the force. Napoleon said that in war "the moral is to the physical as three is to one."⁵⁰ The significance of having coalition partners not equipped with a positive target identification device could also affect operations at the operational and strategic level. The same moral argument can be made in only partially equipping specific Army units to maximize the number of units with near-term BCIS capability. An example would be only equipping every other tank in a tank battalion with the system. What is the moral effect of having some "fratricide protected" vehicles in the unit? This partial equipping would also increase the number of "possible friendly" readings in an engagement leading to indecisiveness in the decision to fire.

Considerations as to which equipment receives the near-term BCIS system is decided by numerous factors.

Weapon destructiveness, weapon fratricide potential, personnel density, and criticality of the system must all be considered. Weapon destructiveness is the destruction potential for the weapon if it accidentally attacks friendly forces. The Abrams tank sabot round and Apache Hellfire missile can destroy any U.S. vehicle and would rate high in weapon destructiveness. The M2 Bradley, artillery, or mortar systems are less destructive to friendly combat vehicles. Fratricide potential for some systems is higher than for other systems due to maximum effective weapon ranges and sight capabilities combined with habitual mission usage. Again, the Abrams tank and Apache helicopter stand out in this category because of their inherent high mobility and fluidity of missions assigned.

Personnel density is the consideration of systems you desire to protect because their catastrophic destruction would result in numerous casualties. A good example is the M2 Bradley Infantry Fighting Vehicle when fully mounted can have nine to eleven personnel on board while the M3 Bradley Cavalry Fighting Vehicle has only five mounted personnel. The loss of either the M2 or M3 Bradley represents basically the same material loss but the loss of the M2 Bradley is significantly higher in personnel.

Criticality of the weapon system is how easily the weapon system can be replaced and how the loss of the system will affect current operations. Low density items like attack helicopters as well as critical command and control

vehicles might be considered for protection based on their criticality.

Time available affects the decision making process. Depending on time available, the transfer of the near-term BCIS system from a unit that has the system to a unit that needs the system might not be practical. The near-term BCIS system is a strap-on/bolt-on system designed for quick transfer from one system to another.⁵¹ The greater time consideration is not the transfer time but the training time for the receiving unit. For a tank gunner the near-term BCIS system gives three different indication signals (friendly, possible friendly, and unknown) combined with an additional tank command between the gunner and tank commander.⁵² Fielding the near-term BCIS system to an untrained unit without enough train-up time could result in an increased potential in fratricide and losses to enemy fire due to tentativeness and inexperience.

VII. A Case Study

Examining the VII U.S. Corps operations in Operation Desert Storm provides an example of how the METT-T analysis system can be used by the corps planner as an analysis tool to determine allocation of the near-term BCIS system and passive target identification measures. A number of assumptions must be made for this hypothetical example. These assumptions are:

1. The 1,520 near-term BCIS systems have been procured and are available for the operation.

2. USCENTCOM makes the decision to use the 1,520 near-term systems in the VII U.S. Corps based on the Corps' mission and the Corps' composition of all heavy forces making VII Corps the most optimum to receive the near-term BCIS system.

3. The VII Corps' commander provides force protection guidance that all attack aviation assets are critical to the operation and will receive the near-term BCIS system.

The following is an examination of VII U.S. Corps operation using METT-T as an analysis tool to assess fratricide risk potential and to allocate the near-term BCIS system within the corps.

Mission. -- 1st ID(M) conducts breach, passes 1st AD (UK), follows and assumes. (HIGH RISK)

-- 1st AD (UK) passes through 1st ID(M) and continues to attack 2d echelon enemy forces. (HIGH RISK)

-- 1st AD and 3d AD attack in zone around the right flank of enemy 1st echelon forces. (MODERATE RISK)

-- 1st Cavalry initially conducts a feint up the Wadi Al Batin (separate from other corps units), follows and supports. (LOW-MODERATE RISK).

-- 2d ACR screens forward of 1st and 3d AD. (HIGH RISK).⁵³

ENEMY. The enemy is in a prepared deliberate defense. Enemy composition and capabilities vary throughout the corps' area of operations. 1st echelon enemy forces in southern Iraq are infantry divisions with a light-heavy organizational mix. These 1st echelon forces are equipped with a mixed-bag of equipment including various older models of Soviet tanks, towed artillery, and some self-propelled artillery. These forces have come under recent air and artillery attacks causing some forces to leave their operational vehicles "cold" until they are needed. Enemy forces are generally poorly trained and are giving up in huge numbers while others are expected to hide while coalition forces bypass them then attack into the rear or trains of the coalition forces. This combination of bypassed forces, a mixed bag of equipment, and surrendering forces creates a high fratricide risk potential especially in the 1st ID(M)'s area of operations.

2d echelon forces are armored and mechanized infantry divisions along with the elite Republican Guard Divisions. These forces are equipped in a relatively homogeneous manner with modern Soviet-bloc armored equipment. Although in defensive positions, 2d echelon forces do have the ability to conduct offensive operations or counterattack. These forces have been under air attack from coalition air forces but desertion and surrender rates are not expected to be as high as the 1st echelon forces due to higher discipline and training within these units. Due

to the units' homogeneous composition, the fratricide potential in the 2d echelon is lower than in the 1st echelon. The enemy throughout the corps' area of operations is primarily equipped with unsophisticated weapon sighting systems⁵⁴ facilitating coalition use of passive target identification measures.

Terrain and Weather. Terrain varies throughout the corps' area but is generally flat and rocky west of the Wadi Al Batin. This flat open terrain supports possible engagements out to maximum effective ranges and a high degree of situational awareness. The potential of long-range engagements supports the need for the active near-term BCIS system over the passive target identification measures. Recommend combining enemy composition/capabilities and tactics with terrain analysis to create a fratricide risk potential overlay similar to the Modified Combined Obstacles Overlay (MCOO) found in the IPB process.

Winter weather from January through March is characterized by cold temperatures and an increase in precipitation, high winds, and dust storms. These weather conditions combined with night operations require the use of positive target identification measures. The adverse weather conditions also degrade situational awareness for all units.

Troops and equipment. The corps' combat forces are active duty U.S. Army forces. They are equipped with modern AOE equipment and are highly trained. 1st AD (UK) is similarly

trained and equipped with the Cheiftain and Warrior combat vehicles. The addition of coalition forces with different vehicle types presents an increased potential for coalition fratricide. The modern weapon systems have maximum effective ranges exceeding the systems' abilities to perform target identification. GPS is available to corps units but in very limited quantities. The shortage of GPS combined with limited quantities of maps will cause problems with situational awareness especially during limited visibility operations.

Time. 1st Cavalry closed in theater on 22 October 1990.⁵⁵ The remainder of the corps was alerted on 8 November 1990 and has been deploying into theater with the last unit, 3d AD, closing on 6 February 1991.⁵⁶ The late arrival of a majority of the VII Corps has limited the amount of in-theater training and acclimatization and raises the fratricide risk for these units.

Based on the METT-T analysis of the potential fratricide risk the following allocation plan was established:

VII CORPS NEAR-TERM BCIS ALLOCATION PLAN	
UNIT	BCIS SYSTEMS
1ST ID(M)	493
1ST CAVALRY	144
1ST AD	144
1ST AD (UK)	225
3D AD	144
2D ACR	263
11TH AVIATION BDE	87
VII CORPS	20
TOTAL	1520

Table 4: VII Corps Near-term BCIS Allocation Plan

1st ID(M) received 493 near-term systems because of the criticality of their mission and the high potential for fratricide when passing the 1st AD (UK) through the breach. 1st ID(M) was allocated enough systems to equip two maneuver brigades (400 systems), their attack helicopters (64 systems), and critical command and control vehicles.

1st AD (UK) was given enough near-term systems to equip one of their two brigades (200) and their critical command and control and aviation assets (50). The intent of allocating a brigade's worth of systems is that the 1st AD (UK) can use the systems in their lead brigade passing through the breach site. This brigade has the greatest fratricide risk.

1st Cavalry, 1st AD, and 3d AD were each given 144 systems. This number is for these divisions' attack

helicopters (64 per), division cavalry squadron (65 per), and essential command and control vehicles (15 per). The attack helicopters throughout the corps were designated a critical asset by the corps commander for force protection. With the division cavalry squadron and attack helicopter battalions of each division protected by the BCIS system, the divisions (1st Cav, 1st AD, and 3d AD) can use these forces to minimize their fratricide risk during operations that involve converging friendly forces.

The 11th Aviation Brigade is allocated 87 near-term systems for its attack helicopters. Besides adhering to the corps commander's guidance, the attack helicopter battalions of the corps aviation brigade possess an extremely high risk fratricide potential from passing through other friendly forces while conducting deep attacks in support of VII U.S. Corps' mission.

VIII. CONCLUSION AND RECOMMENDATIONS

The recommendation for the allocation of the near-term BCIS system emphasizes just how limited the supply of this system is for the corps planner. Based on the above allocation recommendation, no artillery, engineering, or air defense systems would receive the system. Only a few command in control vehicles (none below brigade level) would be equipped.

At 1520 systems, the corps planner must allocate this asset carefully. Giving all the systems to one

division in the corps would provide positive target identification to only one unit. The one division would have no problem allocating all 1520 systems but a majority of the systems would go to vehicles that would have a potential fratricide risk lower than other units within the corps. If applicable, the corps planner must also consider joint and combined forces' needs both from an operations and moral standpoint.

Another method to maximize the number of units receiving the near-term BCIS system is to only partially equip units by giving the system to every other tank as an example. This would double the amount of units that could receive the system but it would also result in a greater increase in unknown and possible friendly readings from the system. These readings, plus the knowledge that only half the force is equipped with the system, could put doubt into the minds of gunners and vehicle commanders which would elevate the chances of fratricide and losses to enemy fire due to tentativeness.

If the original purchase of 1,520 systems is reduced to 200 systems, the Army has only enough systems to equip a heavy brigade. This heavy brigade would be protected against fratricide within the brigade and only between its M1A1 tanks and M2 Bradleys. The brigade would not be protected from fratricide fires from other brigades within the division or the division's attack aviation assets. The purchase of only 200 systems takes this system out of the

corps planner's realm and puts it below the division planner level. More importantly, the purchase of only 200 systems represents the minimization of this severe problem from a technological stand point. The U.S. Army would not possess a significant positive control anti-fratricide device from 1996 until 2003. This represents a significant risk to U.S. force protection if a major regional conflict like the Persian Gulf War is encountered during this period. A fratricide rate of thirteen to seventeen percent has been a historical fact for the U.S. military during the wars of the 20th Century. Although the near-term BCIS system will not eliminate fratricide, and doesn't even address some types of fratricide, it still represents a significant step toward the reduction of fratricide through use of technology.

The BCIS program is an evolutionary process with the far-term system being much more advanced than the near-term system. The near-term system does not combine situational awareness with target identification. The near-term system is not integrated with the U.S. Air force Mark XII IFF system. The near-term system is not comprehensive in the numbers required nor does it protect the individual soldier on the ground. The far-term system, scheduled for the year 2007, will bring these significant improvements in fratricide protection to the battlefield. The near-term system does give the Army its first positive identification device and represents a step towards the far-term system.

In conclusion, technology can not eliminate fratricide. When combined with the more important training and doctrinal initiatives, the BCIS program will reduce fratricide risk and will provide the Army with substantial force protection capabilities by enhancing situational awareness and target identification. Enhanced situational awareness and target identification not only makes the Army a force less likely to commit fratricide; but, also increases the Army's ability to perform its combat mission in a more decisive and confident manner.

Appendix A: Near-term BCIS Systems⁵⁷

Ground Platforms

M1A1 Abrams
M1A2 Abrams
M2A2 Bradley
M3A2 Bradley
Scout HMMWV
M981 FISTV
M577 Command Post Vehicle
M113A3 Armored Personnel Carrier
M9 ACE
M728 CEV (M60)
AVLB (M60)
M109A6 Paladin
M992 FAASV
Multiple Launch Rocket System (MLRS)
Avenger
M93 FOX NBC Vehicle
Light Amphibious Vehicle (LAV) (USMC)
M1064 Mortar

Air Platforms

AH-68 Apache
AH-58D Kiowa

Appendix B: Risk Assessment for Battalion Leadership⁵⁸

Mission: Have soldiers and leaders done this before?
Do we know our critical attachments?
Are assigned tasks and commander's intent
simple or complex?
Do we have a simple, decisive, synchronized
plan?
What is the MISSION-related FRATRICIDE risk
(**converging forces, weapons density**)?

Enemy: Do we know the enemy's strength and options?
What key terrain and weather advantages help
the enemy?
Are enemy soldiers in any way superior?
Is enemy equipment in any way superior?
Threat air or ADA?
What was the enemy preparation time? **How
fast can he react?**
Are enemy equipment and uniforms similar to
friendly and Allied?

Terrain and Weather:

What crucial OCOKA factors increase risk?
Is navigation tricky or decisive?
How do engagement and identification ranges
compare?
Is terrain familiar or foreign?
What known battlefield hazards exist?
What is the likelihood and impact of
obscuration?
What is the weather impact on soldiers and
equipment?
What is the TERRAIN- and WEATHER-related
FRATRICIDE risk (**visibility**)?

Troops: Are we physically prepared? Soldier and
Leader condition?
Individual Proficiency in Combat ID, Rules of
Engagement (ROE), direct fire SOPs?
Are subunits experienced and proficient in
collective tasks?
Are soldiers confident in themselves and
their leaders?
Are our attachments proficient and
experienced?
Is this Task Organization READY for this
mission?
What is the TROOPS-related FRATRICIDE risk

(fatigue, Rules of Engagement)?

Equipment:

What is the distribution and reliability of..

- Night-Vision Equipment
- Range Finders or Laser Designators
- Navigation Equipment (GPS or PADS)
- IFF Expedients
- Batteries (NVDs, GPS, Commo, etc.)

Is communication capability redundant or robust?

Do we know our own weapons effects or limitations?

Can we sustain our effort?

What is the EQUIPMENT-related FRATRICIDE risk (weapons effects, equipment backups)?

Appendix C: Abbreviations

ACE		Armored Combat Earth mover
AD		Armored Division
AOE		Army of Excellence
AVLB		Armored Vehicle Launched Bridge
BCIS		Battlefield Combat Identification System
CAV		Cavalry
CEV		Combat Engineer Vehicle
HARM		High-speed antiradiation missile
HEMMT		Heavy expanded mobility tactical truck
HMMWV		High-mobility multipurpose wheeled vehicle
ID		Infantry Division
IPB		Intelligence Preparation of the Battlefield
LAV		Light Amphibious Vehicle
MAGTF		Marine Air-Ground Task Force
MCOO		Modified Combined Obstacle Overlay
METT-T		Mission, Enemy, Terrain and weather, Troops available, and Time.
ORD		Operational Requirements Document
TF		Task Force
TRADOC		Training and Doctrine Command
U.S.		United States
USMC		United States Marine Corps
WWI		World War One
WWII		World War Two

ENDNOTES

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³U.S. Army, TRADOC Briefing "Combat Identification: Functional Area Assessment," (Fort Monroe, VA: U.S. Army Training and Doctrine Command, 22 June 1994): p 5.

⁴U.S. Army, Field Manual 100-5: Operations, (Washington, DC: Department of the Army, June 1993): p Glossary-4.

⁵Ibid., p 2-11.

⁶Who Goes There: Friend or Foe?, p 26.

⁷Charles R. Schrader, "Friendly Fire: The Inevitable Price," (Parameters, Autumn 1993, Vol XXII, No. 3): p 30.

⁸Who Goes There: Friend or Foe?, p 7.

⁹Ibid., p 8.

¹⁰Amicicide: The Problem of Friendly Fire in Modern War, p vi.

¹¹Ibid., p xii.

¹²Ibid.

¹³Ibid.

¹⁴Ibid.

¹⁵Ibid., p 2.

¹⁶LTC Schrader's two percent assertion has come under attack from numerous sources to include the Office of Technology Assessment, U.S. Army Training and Doctrine Command, and the U.S. Army Office of the Surgeon General.

¹⁷Who Goes There: Friend or Foe?, p 22.

¹⁸Ibid., p 31.

¹⁹Copies of AR 15-6 fratricide investigations conducted by 1st ID(M), 3d AD, 3d ACR, and 2d ACR can be found in the Automated Historical Archives System, Fort Leavenworth, Kansas. 24th ID(M) did not conduct an AR 15-6 investigation in a fratricide incident resulting in the deaths of two U.S. soldiers and nine wounded on 27 February 1991.

²⁰David H. Hackworth, "Killed by Their Own Comrades," (Newsweek, 18 November 1991): p 45.

²¹Nineteen of the twenty-eight fratricide incidents involved the actions of a single service (i.e. Army on Army). Of the nineteen single-service incidents, the Army accounted for fifteen, the Marines for three, and the Navy for one.

²²James L. Hillman, Task Force 1-41 Infantry: Fratricide Experience in Southwest Asia, (Carlisle Barracks, PA: U.S. Army War College, April 1993): p 29.

²³Target identification is the ability to identify a potential target as friendly, enemy, neutral, or non-combatant.

²⁴Situational awareness is the knowledge of your position in respect to the position of adjacent friendly units/vehicles, enemy forces, neutrals and non-combatants. Situational awareness varies in degree from perfect knowledge of the combat environment to not even knowing one's self location.

²⁵Task Force 1-41 Infantry: Fratricide Experience in Southwest Asia, p 12.

²⁶David S. Weisman, Memorandum: "Informal Investigation of the Night Attack Conducted by 3d Brigade on 26-27 February, 1991," (APO New York: Headquarters, 3d Brigade, 2d Armored Division (Forward), 10 March 1991): p 3.

²⁷Task Force 1-41 Infantry: Fratricide Experience in Southwest Asia, p 14.

²⁸LTC Hillman would write a monograph concerning the battalion's fratricide experiences in the Persian Gulf War. 2-66 Armor's battalion commander wrote a handwritten letter

to the Combat Identification Program describing the two fratricide incidents between his battalion and TF 1-41. (Author requested anonymity). In both personal accounts, the battalion commanders expressed confidence in their units' training readiness and their units' abilities to perform their combat mission.

²⁹Task Force 1-41 Infantry: Fratricide in Southwest Asia, p

³⁰Glenn Frankel, "In Britain, Fallout From Friendly Fire," (The Washington Post, May 18, 1992): p D9.

³¹"Blue-on-Blue" is the British term for a friendly fire incident.

³²Rick Atkinson, Crusade: The Untold Story of the Persian Gulf War, (Boston: Houghton Mifflin Company, 1993): p 464.

³³Ibid., p 207.

³⁴"Killed by Their Own Comrades," p .

³⁵Crusade: The Untold Story of the Persian Gulf War, p 206.

³⁶Dwight B Dickinson and Elwin L. Hundley, "Avoiding Not So Friendly Fire," (Military Review, July 1992): p 58.

³⁷U.S. General Accounting Office, Minimizing Friendly Fire: The Army Should Consider Long-term Solution in Its Procurement Decision on Near-term Needs, (Washington, DC: U.S. General Accounting Office, October 22, 1993): p 4-5.

³⁸U.S. Army, Battlefield Combat Identification System (BCIS) Tactics, Techniques, and Procedures (Draft), (Fort Knox, KY: U.S. Army Armor Center, undated): p 1-2.

³⁹Jon R. Anderson, "Missing in Action: New Fratricide Protections," (The Army Times, October 24, 1994): p 16.

⁴⁰U.S. Army, TRADOC Briefing "Combat Identification: Functional Area Assessment," (Fort Monroe, VA: U.S. Army Training and Doctrine Command, 22 June 1994): p 6.

⁴¹Battlefield Combat Identification System (BCIS) Tactics, Techniques, and Procedures (Draft), p 2-1.

⁴²Ibid.

⁴³Ibid.

⁴⁴U.S. General Accounting Office, Minimizing Friendly Fire: The Army Should Consider Long-Term Solution in Its Procurement Decision on Near-Term Needs, (Washington, DC: U.S. General Accounting Office, 22 October 1993): p 4.

⁴⁵U.S. Army Center for Army Lessons Learned, CALL Handbook 92-3: Fratricide Risk Assessment for Company Leadership, (Fort Leavenworth, KS: U.S. Army Combined Arms Command, March 1992): p B-1.

⁴⁶Robert H. Scales, Certain Victory: The U.S. Army in the Gulf War, (Fort Leavenworth, KS: U.S. Army Command and General Staff College Press, 1993): p 263.

⁴⁷U.S. Army, Student Text 100-3 Battle Book, (Fort Leavenworth, KS: U.S. Army Command and General Staff College, 1 May 1994): p 4-6.

⁴⁸Jay M. Garner, Memorandum: "Proposed Operational Requirements Document (ORD) for the Battlefield Combat Identification Program (BCIS)," (Washington, DC: Office of the Deputy Chief of Staff for Operations and Plans, 14 March 1993): p 6.

⁴⁹Ibid., A-3.

⁵⁰David G. Chandler, The Campaigns of Napoleon, (New York: The MacMillian Company, 1966): p 155.

⁵¹"Proposed Operational Requirements Document (ORD) for the Battlefield Combat Identification System (BCIS)," p 7.

⁵²Battlefield Combat Identification System (BCIS) Tactics, Techniques, and Procedures (Draft), p 7.

⁵³Certain Victory: The U.S. Army in the Gulf War, p 223-253.

⁵⁴Ibid., p 118.

⁵⁵Ibid., p 392.

⁵⁶Ibid., p 393.

⁵⁷U.S. Army, Briefing: "Review of the Army Combat Identification Program for MG Joe W. Rigby, Army Digitization Office," (Washington, DC: Program Executive Office, Combat Identification Program, 29 August 1994): p 5.

⁵⁸U.S. Army Center for Army Lessons Learned, CALL Newsletter No. 92-4: Fratricide: Reducing the Self-Inflicted Losses, (Fort Leavenworth, KS: U.S. Army Combined Arms Command, April 1992): p A-3.

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