CAPTURING INSIGHTS FROM FIREFIGHTS TO IMPROVE TRAINING

ANACAPA SCIENCES, INC.
Santa Barbara, California 93101

“The telling and retelling are important. Platoons have institutional memory. They learn, and they change. Most of that learning happens after a firefight. Some officers squelched the stories, considering them unprofessional and distracting. I encouraged them, as psychological unburdening and as improvised classrooms where we sharpened our blades for the next fight.”

Nathaniel Fick, *One Bullet Away*

CAPTURING INSIGHTS FROM FIREFIGHTS TO IMPROVE TRAINING

PHASE I FINAL REPORT

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14. ABSTRACT: The study determined that, on average, mission outcome and survival rates improve following units' third and fourth firefights, respectively. In addition, 190 survival factors, casualty factors, and lessons learned were derived from a database of 208 firefight accounts, and 87 factors, skills, and lessons from interviews and correspondence with combat veterans. Data were analyzed and reduced to five categories of skills, knowledge, and behaviors, which are presented in order of their contribution to survival during firefights: Weapons Proficiency, Situational Awareness, Tactics and Drills, Cover and Concealment, and Leadership/Communications. Each of the categories is composed of many specific behaviors and skills, which are described in the report. Implications of the results and recommendations for training and further research are provided.

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EXECUTIVE SUMMARY

This study examines the widely held belief that surviving a few firefights enhances soldiers' and Marines' likelihood of surviving later, prolonged exposure to combat. The objectives of the study have been to, 1) test the hypothesis concerning the relationship between experience and long-term survival in combat; and 2) identify factors with training implications that contribute to casualties and survival during firefights.

More than 400 accounts of military firefights were reviewed, among which 208 were found to provide sufficient detail for analysis; those accounts were further reviewed and encoded for 88 variables (operational, environmental, outcome, etc.) to form a database of firefight experience. Information also was collected through personal interviews and correspondence with a sample of highly-experienced combat veterans.

Statistical analysis of the firefight data found substantial evidence to support the study's primary hypothesis. We determined that, on average, mission outcome improves following units' third firefight and survival rate improves following units' fourth engagement. In addition, we identified 190 survival factors, casualty factors, and lessons learned from the database of firefight accounts, and 87 factors, skills, and lessons from interviews and correspondence with subject matter experts. Further analysis combined and reduced the results to five categories of skills, knowledge, and behaviors and listed them in order of their contribution to survival during firefights: Weapons Proficiency, Situational Awareness, Tactics and Drills, Cover and Concealment, and Leadership/Communications. Each of the categories is composed of many specific behaviors and skills, which are described in varying detail in the report.

The current study confirmed the importance of training and rehearsal of battle drills to surviving firefights. Also confirmed is an earlier survey's discovery that 30 percent or more of soldiers and Marines believe their preparation for combat to have been inadequate. We interpret this information to present an opportunity to increase combat survival rates *substantially* by incorporating study results in properly-designed instruction and exercises, and then ensuring that all personnel receive the training prior to deployment. We propose to continue the work described in this report and to prepare detailed scenarios to guide the development of mixed-reality and conventional military training to instruct personnel in the tactics, techniques, and procedures that study results indicate will improve the likelihood of surviving firefights.

“My training kept me alive.”
- Terry Griswold,
Veteran of Jungle, Desert, and Urban Warfare

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SECTION 1: INTRODUCTION

This document describes a study conducted for the Defense Advanced Research Projects Agency (DARPA) to identify factors that contribute to survival and to casualties during military firefights. The results presented here will be useful to developers of mixed-reality and other forms of training intended to improve individual and group performance during combat. The report is presented in four sections. This introduction describes why the research was conducted, provides background information and historical context of the study, and identifies critical research issues. The introduction is followed by a description of the research tasks performed to collect and analyze information about military firefights and, in turn, is followed by a section devoted to study results. The report concludes with a discussion of the training and operational implications of those results.

BACKGROUND

More than 2,100 US military personnel have died in firefights in Iraq and Afghanistan, nearly as many as killed by Improvised Explosive Devices (IEDs). Small arms tactics and reactions to contact and ambushes are typically rehearsed in the US Army and Marine Corps at the platoon or squad level as battle drills. Our research found that this practice can be essential to survival in combat, but even the high fidelity simulations provided by the National Training Center (NTC) can only approximate the chaos, noise, and danger of an actual armed engagement.[1] Anecdotal evidence suggests that a correlation exists between soldiers and Marines surviving their first few firefights and long-term survival in a combat environment. And, it is generally accepted that the first 90 to 120 days of a deployment are critical. It is during this initial period that individuals and units adjust to the tactical environment, the enemy, and each other. Our research confirmed that experience can be a survival factor, which implies that proper training could substitute for operational experience. Well-designed and conducted training can condition individuals to respond promptly with actions that are appropriate for the circumstances encountered. However, it is unlikely that any amount or quality of training can *fully* prepare a novice for the sudden, violent onset of combat, or for its consequences.

Mixed-reality systems such as the Infantry Immersion Trainer and the Mobile Counter-IED Tactical Trainer are intended to enhance pre-deployment preparation by repeatedly exposing soldiers and Marines to realistic combat scenarios during which they rehearse tactics, techniques, and procedures (TTPs). The objective of performing these battle drills is to condition automatic reactions that avoid the response lags that are typical of human decision-making behavior. Many veterans attribute their survival to the drills that taught them to respond to an attack immediately, without deliberation or orders. It is our hope that the results of this study will be used to inform the developers of training scenarios and battle drill doctrine in order to improve the likelihood of surviving firefights.

[1] The guidance provided by the Army's new *Operations Manual* concerning proper conduct during a firefight is to analyze the terrain for tactical operations according to the memory aid "OAKOC," which stands for, 1) Observe and identify fields of fire; 2) establish Avenues of approach; 3) identify Key and decisive terrain; 4) identify Obstacles; and, 5) identify and use Cover and concealment. *FM 3-0, Operations*. US Department of the Army, Washington, DC, February 2008 (3-8).

HISTORICAL CONTEXT

> Out of every 100 men, ten shouldn't even be there, eighty are just targets. Nine are the real fighters and we are lucky to have them, for they make the battle. Ah, but the one. One is a warrior, and he will bring the others back. – Heraclitus (circa 500 BCE)

Attempts to quantify soldiers' fitness for duty and likely performance in battle certainly predate the historic period, but Heraclitus's harsh but hopeful assessment of the Ephesian army is among the earliest recorded examples. More relevant to the current study are S.L.A. Marshall's comments concerning battlefield performance; he interviewed soldiers in the Pacific and European theaters during World War II and later famously reported that only 15 to 25 percent of those in battle actually fired their weapons, explaining that most men were paralyzed by fear in combat.[2] Marshall's claims of having systematically surveyed the experiences of at least 400 rifle companies provided substantial credibility to what was a shocking assertion. He possessed the ability to relate an engaging story which, combined with what later has been revealed as misrepresentation of his personal experience, contributed to the acceptance of his claims about the ratio of fire and other matters that influence soldiers' performance in battle. Marshall's claims were criticized by veterans and questioned by observers who were present during his group interviews, but publication of *Men Against Fire* in 1947 led directly to changes in doctrine, training, and weapons that were intended to increase the number of rounds fired in the direction of the enemy during combat. The 55 percent ratio of fire among US servicemen during the Korean War and 90 percent ratio in Vietnam were attributed to the changes that were implemented in response to Marshall's WWII estimates.

Marshall was neither constrained by a scientist's concern for the integrity of data, nor by a historian's requirement for verification.[3] He boasted of having filled more than 800 notebooks during his "prolonged personal research" and to have systematically analyzed the ratio of fire data. However, only a few pages of interview notes were found among nearly 140 boxes of personal papers following Marshall's death in 1977; none contained any reference to ratios of fire, there were no statistical calculations in the materials, and no one could recall his inquiring about this topic in the field.[4] Marshall's assertions concerning the importance of group solidarity, leadership, and logistics have not been challenged, but it appears that his claims of low fire ratios during WWII were based on speculation, rather than empirical evidence.[5]

It is ironic that S.L.A. Marshall is best remembered for his dubious ratio of fire because the accomplishment for which he was proudest was the methodology that he developed to better understand human performance in combat—informal, open-ended, group interviews of enlisted personnel, conducted as soon as possible following battle. Marshall's focus on the experiences of individual soldiers is consistent with the research methods of Human Factors Engineering, which emerged as a professional discipline during WWII in response to the same urgency to improve the performance of people and their machines that motivated Marshall's research. Attention to human factors issues has been institutionalized in the government procurement process and now contributes to the design of *all* military systems, from software

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[2] S.L.A. Marshall, *Men Against Fire: The Problem of Battle Command in Future War*. New York: William Morrow, 1947.

[3] Marshall had served with the American Expeditionary Forces in France and received a commission at the end of World War I. He began his career as a journalist at the *El Paso Herald*, progressing from sportswriter to city editor before moving to the *Detroit News* where he was a syndicated columnist for most of his career (1927 to 1961), except for his military service in World War II, during which he served with the Army's Historical Branch.

[4] Roger J. Spiller, "S.L.A. Marshall and the Ratio of Fire," *Royal United Services Institute Journal*, Winter 1988.

[5] It is possible that Marshall's surprisingly low fire ratio estimate was accurate, despite the unsettling absence of documentary evidence. For example, it is common for soldiers to experience enemy fire without actually seeing individual members of the opposing force (i.e., a target). Furthermore, Marshall's field work was conducted very late in the war, when Germany's surrender was inevitable; these circumstances might have inhibited soldiers equipped with ineffectual carbines from exposing themselves to enemy snipers firing high-powered rifles from standoff distances.

to submarines, and the field has expanded its influence into nearly all human endeavors during the past 60 years.[6] Approaching the subject of firefights from a human factors perspective, we assumed that the practice of conducting after action reviews to identify lessons learned had continued as an institutionalized legacy of Marshall's influence. However, we discovered that not only was the practice discontinued many years ago, but also the study and development of infantry tactics, in general, had been eclipsed by more fashionable and malleable aspects of warfare.

The neglect of small unit, dismounted tactics can be traced to the methods used during WWII to produce large numbers of soldiers, which were similar to the methods used to mass-produce the vehicles, weapons, and other material to equip the new recruits. The traditional reverence for the role of the skilled rifleman operating independently and with initiative throughout US history (e.g., The Minutemen, Sergeant York) was replaced by the concept of soldiers as interchangeable parts. Group solidarity and the ability to respond promptly to changing conditions have been characteristics of the best fighting units from the days of Alexander to the present. However, this shift to an industrial approach to personnel selection, coupled with the mistaken belief that infantry are the unskilled labor of the military, resulted in policies that systematically siphon off many of the most capable soldiers for other duty and enable replacement and rotation practices that erode solidarity.[7] This combination of circumstances has persisted into the era of the all-volunteer services and requires non-commissioned officers (NCOs) to assume increasing responsibility for supervision, training, and mentoring of troops to compensate for systemic impediments to performance imposed by the organization.

Officers come and go in the military services; they go to other specialties, are promoted up the ranks, or leave the service altogether. Those same options are available to NCOs, but for the most part, NCOs remain in their initial occupational specialties, continuously developing specialist technical and leadership skills and abilities. NCOs are the cross-generational carriers of military knowledge, tactics, and culture and provide the continuity necessary to supervise and train recruits. More important, as section leaders, NCOs are the only level of command that maintains constant and direct contact with personnel conducting actual fighting. It is critical that NCOs possess leadership skills and the abilities to think and act independently under rapidly changing conditions. Perhaps the greatest strength of the US military services is the effective fostering of these qualities among their Non-Commissioned Officers.

CRITICAL RESEARCH ISSUES

The government's original solicitation for the current study stated that anecdotal evidence suggested individuals who survive their first three-to-five firefights tend to survive their subsequent engagements; the statement implies that those who survive their first few firefights learn instrumental behaviors during those initial experiences that contribute to long-term survival. Our augmentation of the hypothesis is described later. However, the challenges to previous research concerning combat performance require that the investigators devote more than the usual attention to factors that might affect the internal validity of study results. The most salient issues are described below.

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[6] See for example, *Human Factors and Ergonomics Society: Stories From the First 50 Years*, Jack Stuster (Editor), Human Factors and Ergonomics Society, Santa Monica, CA, 2006.

[7] John A. English and Bruce I. Gudmundsson report in their classic, *On Infantry* (Revised Edition), Praeger, Westport CT, 1994 (page 163), that, "Even after studies conducted during World War II indicated that above average intelligence was an important prerequisite for success as a combat infantryman, America consistently refused to put its brighter sons into rifle squads." However, the "cult of the rifleman" still exists in American mythology and the challenges of the infantry appeal to a certain subsection of highly-qualified recruits and aspiring leaders.

DEFINITIONS

The first step in any research is to define the terms that will be used to describe the phenomena under study. Military firefights are defined here to be exchanges of weapons fire between opposing forces and can be precipitated by a variety of events; some are initiated deliberately, others occur in response to an unexpected encounter, and yet others ensue when a force is caught by ambush. Firefights also vary in environmental conditions, weapons used, and the numbers of personnel engaged, among other variables. Military actions commonly described as firefights range in duration from a brief exchange of gunfire in which no one is injured to a continuous sequence of engagements over a prolonged period, such as the two-day "Fight at *Ia Drang*."[8]

Information reviewed while preparing the proposal to conduct this study suggested differential risks associated with the various precipitating events to firefights and that casualties are disproportionately suffered during different phases of encounters, depending on environmental conditions (e.g., urban, rural), initiating action, force size, tactics, and access to supporting fires, reinforcements, and medical care. For example, chance meetings of opposing forces usually begin with an initial exchange of poorly-aimed small arms fire that gradually escalates in volume and accuracy as both forces are brought to bear at the point of contact. Engagements such as these and others that are described as harassing fire might end with both forces withdrawing without casualties on either side or even without opportunities for aimed fire. In contrast, ambushes are characterized by a sudden onset of massed fire from concealed positions and are typically preceded in the Afghanistan and Iraq theaters by IED and/or RPG attacks, which often cause casualties even before the firefight begins and can render survivors of the initial blast stunned and vulnerable. These and many other variables with potentially distinct influences are represented in the full range of firefights. For this reason, we proposed to conduct a systematic analysis of the tasks involved in a broad spectrum of engagements and to develop a taxonomy of firefights to better understand the factors that contribute to casualties, individual survival, and mission success. The results of that effort are presented later in this report.

INCIDENCE, FREQUENCY, AND EXPOSURE TO RISK

The government's solicitation implied that evidence exists to support the notion that surviving three to five firefights is correlated with long-term survival of an individual soldier or Marine. The logic of the hypothesis assumes that, 1) most casualties occur within new recruits' first few combat experiences, and 2) soldiers and Marines typically experience many more than three to five firefights during their tours of duty (i.e., three to five firefights can be viewed as the "treatment condition"). However, we suspected that many soldiers and Marines deployed in the current conflicts have not experienced a single firefight, others have experienced a few, and a relatively small proportion, primarily special operations personnel, has survived many. We estimated the average number of firefights experienced by personnel to be low and that few personnel would experience a sufficient number of firefights for the hypothetical advantage to be expressed. Accessing the records necessary to test these assumptions statistically is beyond the scope of the current research. However, the published and archival sources reviewed and the interviews conducted during the study provide substantial evidence that large proportions of soldiers, Marines, and Navy SEALs have experienced multiple firefights during their tours of duty in the Iraq and Afghanistan theaters, with many reporting several firefights each day during prolonged periods of operation—so many that they quickly lose count of the engagements. In other words, our initial assumptions substantially underestimated the actual exposure to combat.

[8] The "Fight at *Ia Drang*," ended on the morning of November 16, 1965 with 79 US soldiers killed, 121 wounded, and none missing; enemy losses included 634 known dead, 581 estimated dead, and 6 prisoners. The battle, precipitated by a US movement to contact, was described in meticulous detail by Major John A. Cash in *Seven Firefights in Vietnam*, which was published by the Office of the Chief of Military History in 1970.

FUNDAMENTAL ASSUMPTION ABOUT SURVIVAL

The government's original characterization of the research topic also implies that surviving a firefight is the primary dependent variable. However, individual survival might be achieved by refraining from exposing one's position during a firefight, withdrawing from combat, or some other behavior that fails to contribute to mission success. That is, it is possible that some individuals survive firefights because they do not expose themselves to risk and/or because others do. Thus, it is reasonable to question the assumption that *individual* survival is paramount. If it is, the most appropriate measure would be the ratio of experienced personnel killed (i.e., those who survived the criterion number of firefights) to inexperienced casualties (i.e., personnel killed or injured within the first three to five firefights). It is a relatively simple statistical procedure, but would require casualty and combat record data for a large, representative sample of engagements to test the hypothesis. Access to the required records is beyond the scope of the current study, but we address the research question with the information collected.

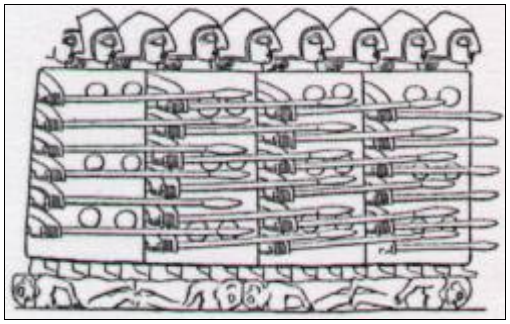
SAMPLE BIAS

It was impossible to collect a random sample of engagements for analysis, because not all firefights are described in published accounts or archival records. In fact, for a firefight to be described in print at all requires a combination of at least two factors: 1) A notable occurrence, and 2) A participant or observer who is motivated to relate the sequence of events. Firefights can be notable for many reasons, but usually because of a significant event, such as a tactical achievement, a strange experience, or the loss of a comrade. For these reasons, at least one member of the friendly force was killed in action (KIA) in more than 30 percent of the firefights contained in our database and friendly force casualties (injuries and/or KIA) occurred in 65 percent of the total. We believe that a larger proportion of firefights occurs without friendly force casualties than is represented in the database, because many of the accounts refer to preceding and/or subsequent engagements that are not described in the narrative, with no mention of casualties. A sampling bias of this type would be a threat to the validity of study results if we intended to characterize all combat by extrapolation from the sample. However, it is not our intention to imply that the experiences described in the database are representative of *all* firefights, but rather, only those engagements that are sufficiently noteworthy to be described in detail for posterity. In this regard, the bias helps to focus the analysis on the key variables of interest to the study: the factors that contribute to survival and casualties during firefights.

SURVIVAL FACTORS VS. CASUALTY FACTORS

Focusing on the knowledge, skills, and behavior that contribute to individual survival is a necessary approach to understanding human performance in combat. However this approach assumes that individual survival is the primary objective and, for results to have utility, further assumes that all personnel attempt to contribute to their comrades' efforts. For this reason, it must be known whether personnel participated fully in each engagement that they survived, but not all accounts include this information. Another method would be to study accounts of firefights in which soldiers or Marines were killed or seriously wounded. This would allow the application of an accident investigation model for identifying the contributing and precipitating factors that led to casualties. Factors could include tactics, equipment, environmental variables, and behavior, or actions taken by individuals during a firefight. It would be instructive to know when during the engagement the casualty occurred. Casualties suffered during the initial contact phase of surprise encounters and ambushes might indicate individuals' inabilities to maintain situational awareness or react quickly to the sudden onset of danger. Casualties during subsequent phases might be caused by inadequate cover, improper use of terrain, flawed reconnaissance, or ineffectual planning, among other possibilities.

Firefight in Pech Valley, Kunar Province, Afghanistan, November 2009



Detail of Sumerian Close-Order Formation from a Fragment of the Stele of Vultures.

Sumerian Order of Battle circa 2600 BCE.

SECTION 2: THE RESEARCH

This study examines the widely held belief that surviving a few firefights enhances soldiers' and Marines' likelihood of surviving later, prolonged exposure to combat; this belief is based on the assumption that skills, knowledge, or behaviors are acquired in the initial encounters that increase the novices' prospects of surviving subsequent battles. We added a corollary of this argument to the study as an alternative hypothesis, which is that some individuals bring special skills, knowledge, and/or capabilities to the task that predispose them to surviving combat; these could be behaviors that were learned during formal military training or derived from other experiences, or they could reflect the presence of innate cognitive, perceptual, or physical abilities that provide an advantage. These and related notions have doubtless been discussed for millennia in command posts, barracks, public houses, and hospitals; they address somber concerns and are the business of warfare. The objective of identifying factors that are amenable to explicit formal training of individuals and groups has motivated military practitioners' considerations of these issues since the first armies were formed.[9] Likewise, this intention guided our research, which used methods, such as content, task, and statistical analysis that have proved useful in a broad range of previous studies concerning skills, training, organization, equipment, communications, procedures, and behavior.

CONTENT ANALYSIS OF FIREFIGHT ACCOUNTS

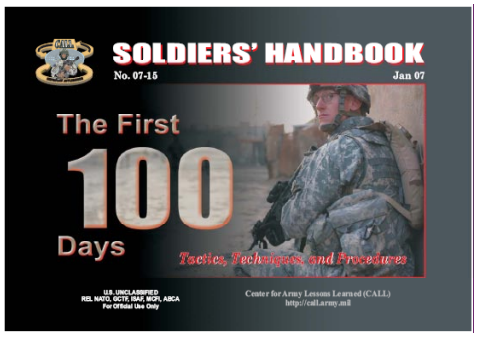
We assembled a database of published and archival accounts of firefights to enable the study of factors identified by subject-matter experts and the investigators as potentially relevant to the primary research questions. A matrix was constructed in Microsoft Excel with rows for individual engagements and columns populated by identifying information, the theater of operations, protagonists, dates, locations, source documents, and variables. Variables include force sizes, missions, weapons, ammunition, equipment, support available, time of initiation and duration, terrain, weather, visibility, and civilian presence/human-terrain constraints, among others. Assessments of communications, physical and mental condition, personal and unit preparation/training, intelligence and rules-of-engagement were described and/or assigned numerical ratings by the investigators to reflect the variables' influences on the firefights, as were environmental factors, and mission outcomes. Numerical ratings were: 1 = strongly negative, 2 = slightly negative, 3 = neutral, 4 = slightly positive, 5 = strongly positive, and zero for non-applicable or not reasonably inferable from the narrative. Casualties were tallied and recorded and causal factors of own-forces casualties, survival factors, lessons-learned, weapons fired, and commentary notes were appended to each record, which included a total of 88 data fields.

More than 400 combat narratives were reviewed during this phase of the project, but only those containing sufficient detail to permit a reasonable analysis consistent with the endeavor's objectives were selected for inclusion. Annotations to the bibliography that accompanies this report describe many of the accounts included in the analysis. Some of those not selected provided cogent and pertinent examinations of the battles and campaigns in which the selected firefights occurred, adding context and informing the research. Multiple published accounts described approximately 11 percent of the engagements selected for inclusion in the database. Those screened but not selected generally lacked details for key variables, precluding their comprehensive assessment. The most important criterion for inclusion was an explicit indication of previous firefight experience.

[9] The Sumerians invented the wheel, writing, mathematics, regulated irrigation, the state form of government, and the concept of a standing army—all more than 5,000 years ago. Evidence suggests that Sumerian soldiers and officers were among the first to consider the factors that contribute to individual survival and group success in battle. For example, the limestone fragment, depicted above and on the facing (or previous) page, shows a fully-equipped Sumerian infantry unit marching in well-drilled close-formation to meet the enemy. We are searching for lessons to improve military performance in the experiences of 21st Century warriors who are fighting in what was previously Sumer and Babylon (and equally ancient Afghanistan). The irony is monumental.

Candidate narratives were read carefully by the investigators before determining suitability for inclusion in the database. Marginal annotations and other notes were made during this initial reading to assist the subsequent selection and coding of engagements. Those selected were then reexamined, encoded and provisionally added to the database. Incomplete records and the relevant textual accounts were again scrutinized and amended when possible, but those found to be deficient were removed. Several accounts initially thought to be pertinent were abandoned after review indicated they were either redundant or were more properly considered major battles comprising a number of firefights and not consistent with the intent of the analysis. Two-hundred-eight firefight account records are contained in the primary database. Cases range in time from 1966 to 2009 and include engagements drawn from U.S. Army, Marine Corps, and Naval Special Warfare experience and several examples that describe actions involving coalition partners; the database also includes accounts from the Soviet-Mujahedeen war in Afghanistan.[10] The collection is far from exhaustive, but is believed to accurately characterize many of the tactical engagements fought in Vietnam, Iraq, and Afghanistan in recent decades. Admittedly, the investigators' interpretations and evaluations of the textual materials follow a myriad of interrelated determinations, martial, literary and otherwise, by the authors, publishers and editors of the accounts; however, we believe their intentions and competencies are closely aligned with our objectives.

War as a subject of storytellers precedes the invention of writing in the form of epic poems that were sung at banquets and ceremonies and rendered as pictographs and decorative art. War stories later were recorded in cuneiform on clay tablets, then on parchment scrolls, and eventually by moveable type. Stories about war are civilization's earliest forms of literature and have inspired and instructed through the ages. All wars in the modern era have been documented in both fiction and non-fiction and the current conflicts have generated exceptional numbers of first-person accounts. More than 30 volumes of non-fiction concerning the Afghanistan and Iraq wars have contributed cases to our database of firefights; authors include private soldiers, NCOs, platoon leaders, senior commanders, embedded journalists, and historians. Other sources include magazine articles, after-action reports, and accounts discovered in the archives of the Center for Army Lessons Learned (CALL), maintained by the US Army's Combined Arms Center at Fort Leavenworth, Kansas. Many additional sources of relevant information that did not contain firefight accounts suitable for coding are included in the bibliography to this report and some are described in subsequent sections. These items include websites, articles, books, and military publications that offer advice for surviving combat.[11]



[10] The Soviet-Mujahedeen accounts were found in *The Bear Went Over the Mountain: Soviet Combat Tactics in Afghanistan*, which was originally compiled by the Frunze Military Academy to instruct Soviet command and general staff combat arms officers. The volume was translated and edited by Lester W. Grau of the Foreign Military Studies Office, Fort Leavenworth, Kansas, and published by the National Defense University Press in 1996. The accounts include analyses by staff of the Academy and by Lester Grau. Forty-three of the 47 engagements contained in the book were determined to be suitable for inclusion in our firefight database; however, the cases were excluded from several analyses due to substantial differences between Soviet and US tactics and procedures. We learned of the collection from Pete Blaber's meticulous account of US special operations in Afghanistan, in which he described a "required reading" table in his headquarters that was covered with maps, reports, and books; Colonel Blaber described *The Bear Went Over the Mountain* as among the most instructive of the documents.

[11] See for example, Soldiers' Handbook Number 07-15, *The First 100 Days: Tactics, Techniques, and Procedures*. This guide to survival was produced by the Center for Army Lessons Learned based on responses to a survey conducted by CALL staff in August 2006; the survey asked returning veterans to identify the reasons why soldiers become casualties during their first months following deployment. In many ways, CALL provides the mechanisms and institutionalized "corporate memory" necessary for an organization as large as the US Army to adapt to changing conditions and threats. The Navy and Marine Corps also maintain centers for lessons learned.

Data contained in the master spreadsheet comprising the 208 firefights described in terms of 87 coded variables were analyzed through a series of sorts, tallies, and statistical tests. The first objective was to derive descriptive statistics to characterize the database, as summarized in Table 1.

TABLE 1
SUMMARY CHARACTERIZATION OF THE FIREFIGHT DATABASE

Category	Number of Cases	Percent of Total
Special Operations Forces*	49	24%
Non-Special Operations Forces	159	76%
Own Force Casualties	134	64%
No Own Force Casualties	74	36%
Vietnam	20	10%
Afghanistan	72	34%
Iraq	116	56%
US Army	71	34%
US Marines	61	29%
US Navy	24	12%
Soviet Army	43	21%
Canadian Army	5	2%
British Army	2	1%
Italian Army	2	1%
0 Previous Firefights	32	15%
1 Previous Firefight	18	9%
2 Previous Firefights	19	9%
3 Previous Firefights	17	8%
4 Previous Firefights	19	9%
0-4 Previous Firefights	105	51%
5 or More Previous Firefights	103	49%

*Includes Special Forces, Airborne, Rangers, SEALs, Recon, Snipers, and Spetznaz.

The next step was to conduct additional sorts and tallies to calculate the values of subsets of the database for comparison to expected values. For example, special operations forces are known to possess exceptional technical and physical capabilities, due largely to the influence of training and operational experience. Calculations derived from the 54 special operations and 149 non-special operations firefights contained in the database found special operations forces to have better communications, to be in better physical and psychological condition, and to be better trained and prepared than the conventional forces, across the theaters, as shown in Table 2. These analyses further characterize the database of firefights and serve as measures of internal validity of study results; that is, the preponderance of calculations that is consistent with known or expected differences in values increases our confidence in other results and inferences about which there are no *a priori* expectations. The results of those calculations, which address the study's primary research questions, are presented in Section 3.

TABLE 2
MEASURES OF INTERNAL VALIDITY

Category	Within Unit Comms	Outside Comms	Physical Condition	Psychological Condition	Personal Preparation	Unit Training
Special Operations	3.69	3.37	4.49	4.41	4.45	3.88
Non-Special Operations	3.26	2.90	3.68	3.88	3.85	3.50

Scale: 1 = strongly negative; 2 = slightly negative; 3 = neutral; 4 = slightly positive; 5 = strongly positive; 0 = not-applicable

WAR STORIES

Reading firefight accounts is easier than writing them, but not so much as listening to war stories is easier than telling them. A printed tale cannot be adjusted or refocused to suit its audiences' understanding of recounted perceptions, activities or context, while an oral narrative is delivered in reactive circumstances where nuances of articulation go beyond word choice and structuring. The interplay of a narrator's and audience's gestures, postures, voicing and facial expressions augment a story and its comprehension beyond the abilities of all but the most competent writer. Something in war stories often seems frozen out by print on paper, not so much any particular element but perhaps the immediacy of memory and its relationship with every physiological sensation and reaction that recall produces. The literature of battle, however, reaches beyond the physical and temporal presence of participants and their memories, at least 2,500 years beyond in surviving texts still counted as useful by warriors. They may not be the best accounting, but written reports of combat have accessibility and durability that permit close study and facilitate wide understanding of the conduct of this ancient political activity.

Reading firefight stories should bring to mind Mark Twain's reflection that composing a good fiction tale is harder than writing non-fiction, because fiction has to make sense. Professional journalists and students of military arts often seem to discount this notion's legitimacy, at least in terms of providing readers context and overview that is rarely evident to those involved in combat. "*. . . in the middle of a firefight . . . You can only track about 1/10 of what is happening. (Maybe 1/4 of what is going on for the most experienced and coolest guys on the scene, those with many previous firefights.)*"[12] If you think you understand what is going on in the midst of a firefight, you are probably thinking too much. Muscle memory and reactions honed by drill and rehearsals are more appropriate than deliberation; simple awareness is more relevant than understanding.

Later recollections from the heat of battle often set precise and highly detailed scenes among others muddled by distortions of focus or concentration. Making sense of what happened after the fact is one thing and recognizing that facts are not established by perceptions during combat is quite another. Memory is both fallible and malleable, and only rarely do participants' battle accounts correspond in all, or even most, of their particulars until they share their stories. Memories become stories as they are shared and confused jumbles of sensation produced by the physiologic and cognitive distress of combat are reshaped into useful narratives. Distinctions between accuracy and usefulness may blur, but the utility of war stories comes mostly from the need to identify known and suspected faults and inadequacies in skills, abilities and the relationships that govern the future survival of the narrators and their audiences.

This study was undertaken to determine if soldiers and Marines surviving their first few firefights have some enhanced long-term survivability in a combat environment and, if so, to identify responsible factors and behaviors and the feasibility of enhancing pre-combat training with these lessons. Our goal is the identification of overt and tacit awarenesses resident in veteran individuals, or within their membership in groups, and facilitation of the transfer of those skills in training. Highly experienced practitioners identified numerous pertinent environmental and operational factors that guided the investigators' careful reading and subsequent encoding of a data matrix designed to facilitate identification of explicit and implicit knowledge sets and the effectiveness of their expression as skills and modes of behavior. This technique is useful in analysis of the relationships of organization, doctrine, procedures, technology, social and physical environments, and operational outcomes. Its successful application depends on reading, listening and coding with a balance among a critical familiarity with the discipline, sympathetic acceptance of the informant's overt assumptions, discerning recognition of inferential foundations and a sincere appreciation of the role of story in knowledge generation. Reading and analysis were also guided by a genuine affection for GIs and their use of anecdotal narratives as educational instruments in acquisition of veterans' proficiency and surviving the adventure of a lifetime.

[12] Ed Fitzgerald, an accomplished writer and Special Forces veteran, quoted by Colby Buzzell in *My War*, *Killing Time in Iraq*, G.P. Putnam's Sons, New York, 2005. p. 282.

ANALYSIS OF INTERVIEW DATA

Our proposal to DARPA offered to interview veterans of military firefights with the intention of identifying insights concerning firefight survival from their experiences. We formed an Institutional Review Board (IRB) to comment on our research plan, the draft interview protocol, and informed consent briefing, all of which are required by the Army's Human Subjects Research Review Board (HSRRB) before almost any form of research involving humans can be conducted. The IRB consisted of the following three members, each of whom was selected for complementary qualifications and experience.

> Dr. Peter Suedfeld: psychologist, Professor Emeritus at the University of British Columbia, Past President of the Canadian Psychological Association, and foremost expert on the content analysis of transcribed and written text.
>
> Dr. Douglas Harris: psychologist, Past President of the Human Factors and Ergonomics Society, former U.S. Navy officer and Underwater Demolition Team leader.
>
> Dr. Harry Holloway: U.S. Army psychiatrist and former Chairman of the Department of Psychiatry at the Uniformed Services University of the Health Sciences--USUHS.

The documents were reviewed by Drs. Suedfeld and Harris, who offered substantive suggestions, which were incorporated in the draft documents. In the meantime, the PI discussed the research plan with Dr. Holloway, whose 40 years of service as an Army psychiatrist extends in time and space from the jungles of Vietnam to the deserts and mountains of Iraq and Afghanistan; his field, clinical, and academic experience uniquely qualify him to comment on the advisability of interviewing combat veterans. Dr. Holloway reported initially that he believed the risks to those who might volunteer to be interviewed would be negligible; however, later in his formal review comments he cautioned that even a voluntary interview with a seemingly stable combat veteran could precipitate a Post Traumatic Stress Disorder (PTSD). We were skeptical of this claim until the PI asked a Command Sergeant Major who had experienced more than a dozen IED attacks and countless firefights to comment on the psychiatrist's concerns. CSM Todd Burnett is the epitome of the tough, but analytical warrior and he exudes the confidence that comes only from having survived the most extreme challenges of military service. When the Sergeant Major responded it was not in his briefing voice as before, but rather, in a tender and thoughtful tone. He answered the PI's question, "Yes, many soldiers suffer emotional damage and some realize it only later." A list of PTSD symptoms is included as Appendix A to this report.

The Army is experiencing alarming increases in PTSD and suicide rates, and there have been several spectacular cases of disturbed veterans in the news, including a soldier who murdered three comrades and two counselors at an Army mental health clinic in Baghdad; that attack occurred in May 2009 while Dr. Holloway was reviewing our research plan.[13] He directed us to the relevant literature where we learned that nearly 20 percent of veterans returning from Iraq develop symptoms of PTSD and nearly ten percent of those returning from Afghanistan are affected.[14] We also learned that suffering a physical injury increases the likelihood of developing PTSD and experiencing a loss of consciousness, even briefly, greatly increases the probability of developing symptoms. Several studies concerning the psychological consequences of war show a clear association between combat exposure and PTSD, with greater exposure correlated with greater incidences of the disorder.[15] Dr. Holloway's concerns about triggering symptoms of PTSD by interviewing veterans came as a surprise, but they reflect a serious problem that is likely to continue for many years; his comments and guidance are appreciated.

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[13] This coincidence of events might explain his question concerning the measures that are planned to ensure the physical safety of the interviewer (i.e., the principal investigator).

[14] We believe the differential rates to be the result of greater exposure to IEDs in Iraq than in Afghanistan and hypothesize that the rate of PTSD among veterans returning from Afghanistan will increase in response to the Taliban's increased use of IEDs and suicide bombers, beginning in 2007.

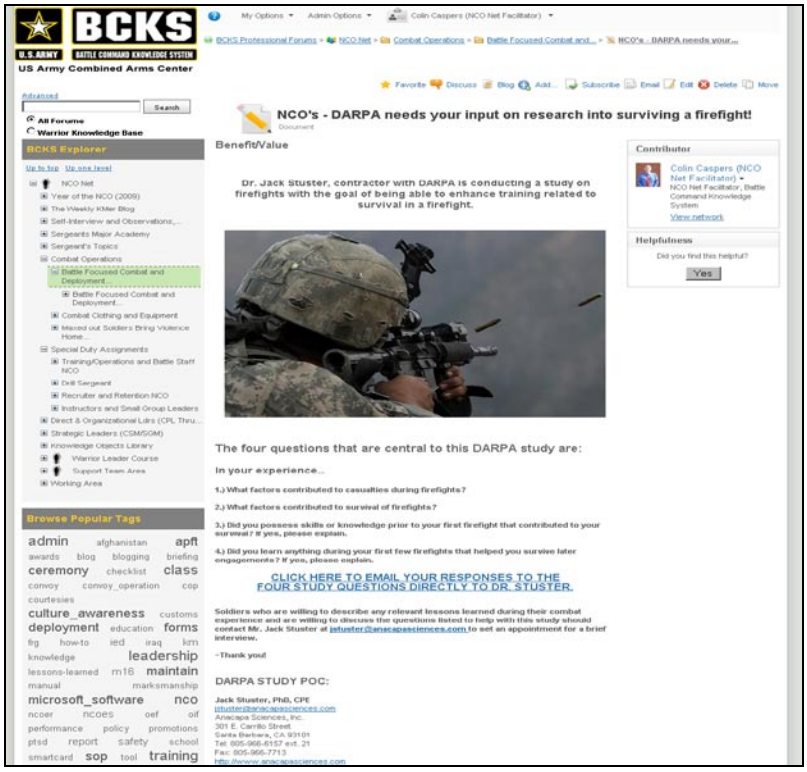
[15] See for example, Stephen J. Cozza, "Combat Exposure and PTSD," *PTSD Research Quarterly*, Vol. 16, No. 1, Winter, 2005 (pages 1-3).

We eventually received an exemption from the Army HSRRB and were authorized to conduct interviews. However, veterans with considerable combat experience compose the category of individuals we had intended to interview, but they also form the category at greatest risk of PTSD. We remained concerned about the possibility of causing discomfort or long term harm to volunteers, despite our good intentions and the authorization to proceed. For this reason, we restructured the interview protocol, abandoned the plan to ask about specific firefights, and focused instead on the following four questions that are central to the study.

In your experience…

1) What factors contributed to casualties during firefights?
2) What factors contributed to survival during firefights?
3) Did you possess skills or knowledge prior to your first firefight that contributed to your survival? If yes, please explain.
4) Did you learn anything during your first few firefights that helped you survive later engagements? If yes, please explain.

The managers of the Battle Command Knowledge System (BCKS) at Fort Leavenworth agreed to post the questions and an invitation to be interviewed on the discussion boards, or forums, that are accessed through the BCKS website. More than 168,000 military personnel are members of one or more of the BCKS online forums (e.g., NCO Net, Protection Net). The response to the postings was less than we had hoped it would be, but the qualifications of those who did respond and the utility of the insights, observations, and technical information they provided were outstanding. Most of the respondents were NCOs, including two highly-experienced Command Sergeants Major, but the sample of subject matter experts (SMEs) also included lieutenants and field grade officers. The results of the content analysis of interview data and answers to the four research questions are provided in following section of this report.



Invitation to participate in the study posted on the BCKS NCO Net Forum.

SECTION 3: RESULTS

Study results are presented in three categories: 1) Statistical Analysis of the Firefight Database; 2) Observations and Recommendations of Subject Matter Experts; and 3) Survival Tips and Suggestions.

STATISTICAL ANALYSIS OF THE FIREFIGHT DATABASE

Results of preliminary analyses were reported in the previous section to characterize the database and assess measures of internal validity. The following paragraphs present the results of a detailed interrogation of the data to test the study's primary hypotheses and identify any data-driven lessons-learned and other correlations that have operational or training implications.

CASUALTY AND SURVIVAL RATES

Except as noted, statistical treatment of casualties does not differentiate among KIA, WIA, POW or MIA. Most of the few POW/MIAs noted in the accounts selected for inclusion in the database were killed by the insurgent forces or died of wounds. Doubtless, a significant number of those noted as WIA in the accounts succumbed to wounds after evacuation, although many returned to duty. All casualties were counted as a loss of force strength in calculation of survival ratios (force size after-combat divided by initial force size, an inverse casualty ratio). Survival rates were chosen as an analytic measure rather than casualty rates to better reflect the purpose of the research.

The database includes 23,881 western-force combatant exposures (sum of own-force sizes). Overall, the database's 208 firefights had an average survival ratio of 90 percent; 64 percent of firefights in the database had casualties and an average force survival ratio of 84 percent. The database tallied 1,901 casualties with 646 known dead; these numbers include indigenous allied forces fighting under western-force leadership. These local allied forces were incorporated in statistical treatments whenever the chroniclers specifically included them in the narrations' discussions of force strength, casualties, experience and other pertinent analytic measures. A majority of these allied casualties were incurred in a few large, violent and prolonged encounters.

The 20 cases included in the database from the Vietnam War were especially severe with an overall survival ratio of 77 percent and the 14 firefights with casualties had an average survival ratio of only 67 percent. These included the 1965 battle of the *Ia Drang* with 200 US casualties and the 1968 battle at *Lang Vei* with 21 US and 275 Civilian Irregular Defense Group (CIDG) casualties.

Of the 72 firefights from Afghanistan, 56 percent had western-force casualties: 53 percent of the 43 Soviet firefights and 59 percent of the 29 US and Canadian battles. The Soviet's overall firefight survival ratio of 96 percent is higher than the US and Canadian's 90 percent, but differences between Soviets' and North Americans' doctrine and tactics make direct comparisons problematic. Of the 116 firefights in the database from Iraq, 70 percent had western-force casualties with an average survival ratio of 85 percent and an overall survival ratio of 90 percent. Units in the third or fourth firefights had the lowest survival ratios; for US and Allied units in Iraq and Afghanistan, those minimum ratios were 74 and 66 percent, respectively.

SEALs, Special Forces, Airborne, Rangers, Scouts, Snipers, Recces, Recon and Spetznaz were included in the analytic category "Special Operations Forces," accounting for 24 percent of the database with an average survival rate of 86 percent; 59 percent of Special Operations Forces' firefights had casualties, as did 41 percent of non-SOF's firefights; corresponding averaged survival ratios were 75 percent and 87 percent in those firefights with casualties.

EXPERIENCE

Previous firefight experience of involved combatants was a primary operational variable in the analysis in order to determine if soldiers and Marines who survived their first few firefights possess some form of enhanced long-term survivability in a combat environment. Western Force participants in 15 per-

cent of cases in the database had no previous firefight experience, although some of them had encountered sniping, indirect fire, mines or IEDs before their initial exchanges of fire with enemy forces; 105 of the actions involved participants with four or fewer previous firefights and 103 had five or more. The average previous-experience was 7.5 firefights and the median rank was four; 19 percent of US and allied forces had no previous firefight experience. The 165 US and Allied Force cases had an average previous-experience of 6.9 firefights and also had a median rank of four.

TABLE 3
PREVIOUS FIREFIGHT EXPERIENCE

Experience Category	Number of Cases	Percentage of Database	Cumulative Percentage
No previous firefights	32	15%	15%
1 previous firefight	18	9%	24%
2 previous firefights	19	9%	33%
3 previous firefights	17	8%	41%
4 previous firefights	19	9%	50%
5-7 previous firefights	22	11%	61%
8-10 previous firefight	20	10%	71%
11-14 previous firefights	21	10%	81%
15-19 previous firefights	17	8%	89%
20 or more previous firefights	23	11%	100%
	208		

A quarter of the 20 cases included in the database from the Vietnam War had no previous firefight experience; 60 percent had survived five or more previous firefights and were primarily Naval Special Warfare personnel. The median value was eight previous engagements for all Vietnam firefights.

Participants in the 29 US/Canadian forces' engagements in Afghanistan had a median prior-experience level of three firefights and 69 percent had four or fewer. Eight of the nine US SOF cases and 12 of 20 non-SOF engagements in Afghanistan had fewer than five previous firefights. The experience levels of Soviet engagements in the database were much higher, with two-thirds having survived five or more previous firefights.

The average prior-firefight experience of the 116 accounts of US and allied forces in Iraq was 6.6 with 16 percent having no previous combat experience. One third had experience levels of two or fewer, a third had three to seven and a third had eight or more previous firefights. Personnel in half of the 20 analyzed engagements by SOFs in Iraq had experienced four or fewer previous firefights.

MISSION OUTCOME

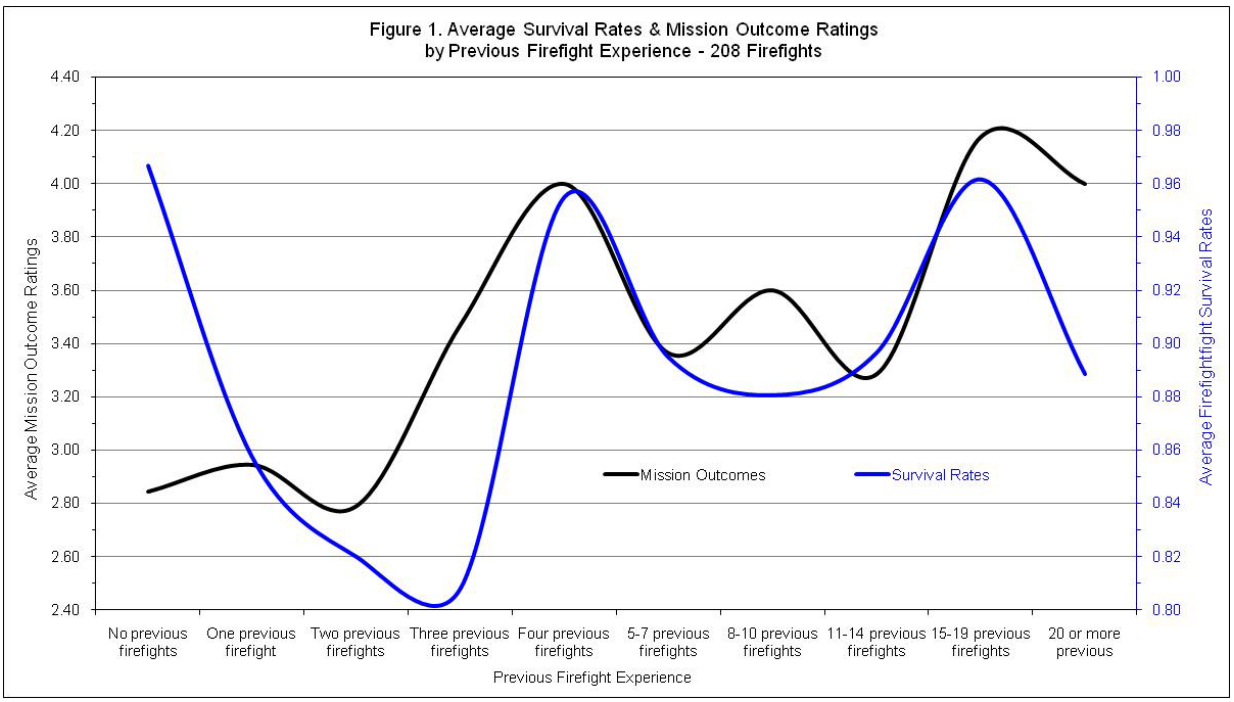
During the encoding process, units in the 208 firefights included in the database were evaluated for accomplishment of assigned missions. Numeric ratings were: one – strongly negative, two – slightly negative, three – neutral, four – slightly positive, and five – strongly positive. Fractional ratings were not used. While leaders of the engaged units would likely rate their success more highly, evaluations were based on the textual accounts, which quite consistently described mission objectives and commander's intentions. A rating of three was generally assigned for a successful mission, fours or fives to successful missions with higher degrees of exploitation or notable achievements despite operational and environmental impediments. Ratings of two indicated clearly serious deficiencies in mission accomplishment. The rarely used rating of one denoted failure: missions impossible, improvident or profoundly ill fated. We believe that the low incidence of such outcomes in the database reflects battlefield realities rather than a lack of knowledgeable survivors to report on them.

The average of the database's 208 mission outcome ratings was 3.42. Combatant units with four or fewer previous firefights averaged 3.17 while those with five or more previous engagements had average mission outcome ratings of 3.67. Similarly, units taking casualties averaged 3.23 and those without casualties 3.77. The averages for the cross categories were: less experienced and taking casualties, 2.94; less experienced and not taking casualties, 3.56; more experienced and taking casualties, 3.51; and more experienced units not taking casualties, 4.00.

An internal appraisal of analytic methods raised a question concerning the independence of the involved units' mission-outcome ratings from their survival rates. Subsequent review of the outcome ratings validated their objectivity. While the abilities of units sustaining casualties to accomplish assignments are clearly degraded, their levels of prior combat experience are more accurate predictors of mission success than are corresponding casualty measures.

It is not surprising that the database indicates that smaller units are less able to take casualties and achieve high ratings of mission success than larger units. Smaller units were found to be more successful than larger in Afghanistan and for the Special Operations units, while larger units had the higher mission success ratings in the Iraq firefights. Likewise, the success ratings of platoons and smaller units improved more strongly with greater experience than did the ratings of larger formations.

Figure 1 illustrates the relationships among previous firefight experience, survival rate, and mission outcome ratings. The figure shows that mission outcome improves dramatically during units' fourth firefight (i.e., three previous firefights in the figure), while survival rate improves during the fifth engagement (i.e., four previous firefights). All subsets of the data (e.g., US, US and Allies, Afghanistan, Iraq, SOF, Non-SOF) produced similar results, with both measures trending upward with combat experience after the third and fourth firefights. The subsequent dips in these measures might be explained by the assignment of increasingly difficult missions to experienced units or by complacency.



The number of accounts with sufficient detail to evaluate the effect of prior casualties on a unit's later survival rates or combat effectiveness was small. However, several of these few narratives suggest that prior firefight experience involving casualties may be associated with increased proficiency and higher survival rates. Future research should investigate this possible relationship between the severity of early firefight experience and later measures of effectiveness and survivability.

OPERATIONAL VARIABLES

Seven operational variables also were rated using the five-point scale. The variables and selected average values within the database are listed in Table 4.

TABLE 4
OPERATIONAL VARIABLES AND AVERAGE RATINGS

	Within-Unit Comm.	**Outside Comm.**	**Physical Condition** (fatigue, thirst, hunger, health)	**Mental Condition** (emotions, morale, fear, etc.)	**Intelligence** (enemy, terrain, civilians, etc.)	**Personal Preparation**	**Unit Training**
All 208 Firefights 3.52 Avg	3.39	3.24	3.87	4.01	2.49	4.00	3.65
US & Allies in Afghanistan 29 FFs, 3.56 Avg	3.52	3.24	4.12	4.14	2.45	3.97	3.52
US & Allies in Iraq 116 FFs, 3.60 Avg	3.46	2.96	4.10	4.28	2.40	4.28	3.75
Soviets in Afghanistan 43 FFs, 3.00 Avg	3.07	3.05	3.07	3.00	2.63	3.09	3.09

The average of all operational variable ratings for 208 firefights was 3.52, with a median rating of 3.0 (41 percent of ratings). Physical/mental condition and personal preparation ratings had median values of four. In only eight cases did assessment of the textual accounts warrant less than nominal ratings (values of 1 or 2) of these variables, likely reflecting genuinely high standards of fitness and individual training as well as the narrators' personal regard for the combatants. The communications and unit-training ratings had medians of 3.0. The quality of intelligence was notably low with a median rating of 2. Only rarely did the narrators comment positively on the contributions of operational or tactical intelligence, while many commented negatively.

Special Operations units had averaged operational-variable ratings of 3.85 and non-Special Operations units 3.35. Smaller units had marginally higher averaged ratings than larger, while US and Allied units had significantly higher averaged ratings than did Soviet units. Averaged operational-variable ratings for units in engagements with western-force casualties did not show a significant difference from those without, nor did the averaged ratings of US and Allied units show significant differences between the Asian theatres of operations.

Relationships among the operational-variable ratings, previous firefight experience, mission accomplishment ratings, and survival rates were closely examined. All of the operational-variable rankings displayed generally rising trends when plotted against previous-firefight experience. Except for the intelligence-quality ranking, they exhibited pronounced downward inflections to minima at the one or two previous-firefight level of experience. When partitioned by the number of previous firefights, both the rating of intelligence quality and the average of all seven operational-variable ratings within each subset showed some correlation with outcome ratings that generally increased in significance with increased previous-firefight experience. No strong associations between the operational-variable ratings and survival rates were found.

Returning Fire, Pech Valley, Afghanistan
November 2009

BATTLE AND ENVIRONMENTAL VARIABLES

Records in the firefight database include fields for encoding battle variables: hostile activity, weapons used, friendly mission and battle activities, initiating action and time, duration, environmental variables, civilian presence/human terrain consequences and the tactical effects of rules-of-engagement. Detailed analysis of these factors was limited to the 145 entries for US and allied forces' engagements in Iraq and Afghanistan (i.e., excluding the Soviet firefights and those by US forces in Vietnam).

Rarely were the narrators of firefight accounts critical of rules-of-engagement (ROE) and then only because of apparently conflicting emphasis by senior commanders. Only infrequently did the authors quote dialogue of participants reproachful of these ROEs. However, when confronted with shoot/no-shoot predicaments, individuals and small units described in the narratives adopted moderate interpretations, choosing to minimize collateral casualties and damage at some possibly increased risk to their personal safety. The general lack of specific commentary on rules-of-engagement in the accounts combined with numerous references to the presence, or possible presence, of civilians seems to indicate that the rules are well internalized and simply regarded as the way we fight, regardless of any tactical advantage they may give our opponents.

It is troublingly that only a few of the accounts mentioned explicit human terrain cultivation and exploitation in connection with tactical actions. The scarcity of reference seems mostly due to a generalized disconnect between formal intelligence processes and small unit activities during early operations in Iraq and Afghanistan. Firefights from this period are more prevalent in the database than later encounters fought with more sophisticated anti-insurgency methods and better linguist/interpreter support.

Hostile staged attacks or ambushes were the most common initiating activity, starting 115 of the 145 firefights since 2001 in the database. They were noted in 84percent of the 98 engagements with friendly casualties and in 70 percent of the 47 firefights without own-force casualties. Only about a third of these were classified as surprise encounters, mostly occurring during movement-to-contact and search and clear operations that composed 47 percent and 38 percent respectively of the firefights with own force casualties and 38 percent and 30 percent of those without friendly casualties; 446 of the 982 casualties were associated with movement-to-contact or search and clear operations. Only five encounters with insurgents in transit and two ambushes by US and Allied forces were noted as resulting in firefights. One sixth of the accounts involved units responding to firefights in progress as reinforcements or quick-response forces.

US or Allied forces assaulted enemy positions in 44 percent of the firefights with friendly casualties and in 49 percent of the firefights without casualties. It is notable that only 38 percent of the assaults were conducted by units classified as having three or fewer previous firefights while the remaining 62 percent were by more experienced units. The less experienced units were involved in 47 percent of the encounters and sustained 68 percent of the 982 friendly-force casualties, which might also be related to the duration of their engagements; the average firefight duration for units in their fourth or earlier battle was over six and a half hours with a median of two hours. In contrast, units in their fifth or later firefights averaged less than three and a half hours with a median duration of only 60 minutes. However, it should be noted that variance in firefight duration was substantial.

The time of firefight initiation had little analytic value other than to illustrate insurgent forces aversion to fighting at night, although engagements initiated during darkness were slightly less likely to result in own-force casualties than those started in daylight hours. Perhaps more relevant to training issues was a comparison of the battlefield terrains with the corresponding shares of casualties; 63 percent of the engagements by US and Allied forces in Iraq and Afghanistan included in the database were fought in urban settings and accounted for 50 percent of the casualties. The six percent of engagements in suburban areas resulted in four percent of the casualties, and in rural terrain 22 percent of the fights produced 17 percent of the casualties. The most notable result of this particular analysis is that the nine percent of fire-

fights conducted in mountainous terrain produced thirty percent of the casualties. While many of the early engagements in Afghanistan and Northern Iraq were contested by large and relatively inexperienced forces in mountainous terrain, their disproportionate share of casualties is as troubling as our forces' prowess in urban combat is heartening.

Enemy weaponry noted in the database varies little among the firefights with and without own-force casualties and only slightly between the Iraq and Afghan theatres. No clear associations among survival ratios or mission outcomes and weapons encountered were noted. Small arms and rocket propelled grenades were the mainstays of opposition weaponry, respectively present in about 92 percent and 74 percent of all firefights. Heavy weapons, generally machine guns, were used in 53 percent of the encounters, more so in Iraq (57 percent) than in Afghanistan (38 percent). Mortar fire was encountered in about 29 percent of the firefights with little difference between theatres or other partitions of the data set. Sniper fire was reported in 58 of the 145 accounts, in 41 percent of the Iraq firefights and 34 percent of those in Afghanistan. Opposition sniping was noted in 42 percent of firefights with own-force casualties but in only 36 percent of those without casualties, accentuating the need for effective counter-sniping when it is encountered.

CASUALTY AND SURVIVAL FACTORS

The encoding process included identifying the factors that contributed to casualties during the 134 firefights in the database in which own-force personnel were killed and/or wounded, and identifying factors that contributed to survival during all 208 engagements. Brief descriptions were entered in text fields appended to the records. More than one factor could be assigned, but only explicit or clearly contributing factors were listed. For this reason, no casualty factors were recorded for 12 of the 134 firefights with casualties, and no clear survival factors could be identified for four of the 208 cases. Simple tallies were made to assemble the data presented in the following tables.

Table 5 lists the numbers of factors recorded in the database by theater of operation and shows totals of 163 casualty factors and 413 survival factors. Tables 6 and 7 list the casualty and survival factors, respectively, also by theater, in descending order of total frequency; values are expressed as the percentage of the total number of factors in a category.

TABLE 5
CASUALTY AND SURVIVAL FACTORS FROM THE DATABASE OF 208 FIREFIGHT ACCOUNTS

Category	US Vietnam	US & Allies Afghanistan	Soviets Afghanistan	US & Allies Iraq	Total
Own Force Casualty Factors	20	25	19	99	163
Own Force Survival Factors	36	76	70	231	413

Table 6 lists the 25 casualty factors identified during the review of firefight accounts and shows the most frequently-assigned factors to be Enemy fire superiority, Poor use of cover or concealment, and Lack of situational awareness; these three factors account for 57 percent of casualty factor assignments. Other notable but less frequent factors include Poor own-force tactics, Insufficient armor (primarily unarmored Humvees), and Friendly fire. Each of these three factors contributed to casualties in nine or ten separate engagements, representing approximately six percent each of the total number of casualty factors recorded and seven percent of the 134 firefights with casualties. The percentages seem small, but refer to the total number of casualties in the database, not the number of engagements with casualties. That is, a factor listed in seven percent of firefights is estimated to have contributed to approximately 133 of the 1,901 casualties in the database, one-third of which (approximately 46) would have been KIA. Even a factor that appears only once in the database, such as Lack of water, is estimated to be a contributing factor to 14 casualties among the 1,901 total (i.e., a frequency of one is a little more than seven-tenths of a percent of the 134 firefights with casualties in the database; .0075 x 1,901 = 14.25 casualties).

Table 7 lists the 25 survival factors identified during the review of firefight accounts and shows the most frequently-assigned factors to be Fire superiority/suppressing fire, Cover/concealment, and Fire and maneuver; these factors were listed for 77, 73, and 68 of the engagements, respectively, and together account for 53 percent of survival factor assignments. Other notable but less frequent factors include Body armor (i.e., personal protective gear), Armored vehicles (in support of infantry), Surprise, and Poor enemy marksmanship. For example, Body armor was listed as having contributed to individual survival during 27 of the 208 engagements in the database and Poor enemy marksmanship was an explicit factor in 19 firefights.

Note: Luck (good and bad) was listed as a contributing factor to both casualties and survival. However, only a few of the firefights in which this factor emerged were so encoded. We were obligated to acknowledge luck, but chose to limit its representation to avoid trivialization of the analysis.[16]

TABLE 6
CASUALTY FACTORS FROM THE DATABASE OF 208 FIREFIGHT ACCOUNTS

Own Force Casualty Factors	US Vietnam	US & Allies Afghanistan	Soviets Afghanistan	US & Allies Iraq	Total
Enemy fire/fire superiority	35%	8%	16%	30%	26%
Poor cover/concealment	10%	24%	16%	18%	18%
Lack of situational awareness/Complacency	5%	12%	21%	13%	13%
Poor own force tactics	0%	0%	11%	8%	6%
Insufficient armor (on Humvees & LAVs)	0%	0%	5%	9%	6%
Friendly Fire	0%	12%	11%	4%	6%
Ambush	5%	8%	0%	3%	4%
IED	0%	8%	5%	2%	3%
Good enemy position/skill	0%	0%	0%	5%	3%
Hot LZ/Helo crash	5%	0%	11%	0%	2%
Bad luck/lucky shot	0%	0%	0%	3%	2%
Poor defensive position	10%	0%	0%	0%	1%
Poor Intel	10%	0%	0%	0%	1%
Lack of combined arms assets	0%	0%	0%	2%	1%
No body armor	0%	8%	0%	0%	1%
VBIED	5%	4%	0%	0%	1%
Claymore/Mine	10%	0%	0%	0%	1%
Poor command & control	0%	4%	0%	0%	1%
Poor operational security	0%	0%	5%	0%	1%
Faulty weapon	5%	0%	0%	0%	1%
Hand to hand	0%	4%	0%	0%	1%
Lack of water	0%	0%	0%	1%	1%
Lack of mine-clearing equipment & training	0%	4%	0%	0%	1%
Sniper	0%	4%	0%	0%	1%
Enemy use of NVGs	0%	0%	0%	1%	1%
	100%	100%	100%	100%	100%

[16] "A running man shoots a burst into a moving Humvee. Why do some miss? Why do some hit? Why a flesh wound and not a femoral artery? Aim and skill have nothing to do with it. The difference between life and death out here is seconds and millimeters – the sacred geometry of chance." (*One Bullet Away*, p. 281)

TABLE 7
SURVIVAL FACTORS FROM THE DATABASE OF 208 FIREFIGHT ACCOUNTS

Own Force Survival Factors	US Vietnam	US & Allies Afghanistan	Soviets Afghanistan	US & Allies Iraq	Total
Fire superiority/Suppressing fire	6%	16%	19%	22%	19%
Cover /concealment	25%	22%	23%	13%	18%
Fire & Maneuver	25%	20%	7%	17%	16%
Body armor	0%	5%	0%	10%	7%
Armor	3%	7%	7%	6%	6%
Surprise	22%	1%	13%	0%	5%
Poor enemy marksmanship	0%	3%	0%	7%	5%
Supporting fires (including air support)	8%	9%	9%	0%	4%
Poor enemy organization	0%	3%	3%	5%	4%
First Aid	0%	5%	0%	3%	3%
Good leadership	0%	1%	1%	2%	1%
Teamwork	3%	0%	0%	2%	1%
Heavy weapons	0%	3%	0%	1%	1%
Fast MEDEVAC	0%	0%	0%	2%	1%
NVGs	0%	1%	0%	1%	1%
Dispersion	0%	0%	1%	1%	1%
Situational Awareness	0%	0%	0%	2%	1%
Good tactics	0%	0%	1%	1%	1%
Good defensive position	0%	0%	4%	0%	1%
Audacity	0%	0%	3%	0%	1%
Fire discipline	8%	0%	0%	0%	1%
Marksmanship	0%	1%	0%	0%	0%
Quick Reaction Force	0%	0%	3%	0%	0%
Sacrifice by comrade	0%	0%	1%	0%	0%
Luck	0%	0%	0%	1%	0%
	100%	100%	100%	100%	100%

Squad Automatic Weapons (SAWs)
Helmand Province, Afghanistan, July 2009

LESSONS LEARNED

Table 8 lists the lessons that were derived from the 208 firefight accounts in the database. Only lessons that were explicitly identified by authors of the accounts were recorded.

TABLE 8
LESSONS LEARNED FROM THE DATABASE OF 208 FIREFIGHT ACCOUNTS

Explicit Lessons Learned	Number of Reports
Use recon, route, & flanking security.	9
Develop a plan (a plan can negate an enemy advantage).	8
Return fire promptly & keep shooting.	8
Recon before entering (anything).	7
Remain vigilant at all times; complacency kills.	7
Use speed & surprise.	7
Use cover & concealment (and know the difference).	7
Competency & initiative can be decisive factors (e.g., marksmanship, planning).	6
Take quick action on perishable intel.	5
Tracer rounds reveal your position.	5
Keep moving (it is harder to hit a moving target).	5
Training & rehearsal are critical (e.g., fire & maneuver, battle drills).	5
Lax operational security can be disastrous.	5
Use deception to confuse the enemy.	5
Disperse the force.	4
Dig for defense.	3
Plan routes carefully; avoid reusing routes.	3
Take initiative, decisive action.	3
Pin enemy when contacted, and then maneuver quickly.	3
Use armor & air assets.	2
Adapt to changing conditions.	2
The enemy uses terrain skillfully.	2
Use flanking force.	1
Use blocking force.	1
Blocking forces must provide their own defense.	1
Do not isolate small forces.	1
Use combined arms assets.	1
Use artillery.	1
Use very heavy fires to soften an occupied LZ.	1
Never quit.	1
Avoid mud.	1
Do not trust bozos.	1
Trust your support (air).	1
Bring your own fire support.	1
Carry and use grenades.	1
Lead with grenades.	1
Extra medical training saves lives.	1
Casualty handling is difficult with MRAPS.	1
Good radios are a must.	1
Bring equipment and water.	1
Heavy loads slow movement.	1
Monitor chokepoints.	1
Unarmored vehicles are vulnerable on patrol.	1
Do not hand clear buildings when demo & D9s are available.	1
Reclear buildings when exposed ("destroyed" buildings can still harbor the enemy).	1
Bounding overwatches work; slow air/arty calls do not.	1
Encirclement & massive firepower are not entirely adequate.	1
Combine conventional forces' firepower & SOF intel with planning, speed & initiative.	1
Newbie fires often are ineffective and can be dangerous.	1
Police your trash; be prudent.	1
Do not pick up souvenirs.	1
	140

The most-frequently reported lessons learned during the 208 firefights in our database address the importance of maintaining situational awareness; the admonitions concerning reconnaissance, remaining alert, and complacency all relate to the criticality of this factor to individual survival and mission success. Other salient lessons address the requirement to use cover and concealment effectively and the advantages of responding promptly with suppressing and well-aimed fire and movement. Learning the value of mission planning, deception, and the element of surprise also are among the most frequently-mentioned lessons reported in the firefight accounts. The importance of training and rehearsal is the most notable of the lessons because it was mentioned in five of the accounts and, more important, training and rehearsal are prerequisites to implementing *all* of the most frequently recommended skills and abilities.

Most of the lessons listed in the table were reported only once in the 208 firefight accounts and 73 percent of the lessons were reported in fewer than five accounts. These less-frequently mentioned and one-time lessons primarily concern specific tactical issues (e.g., Blocking forces must provide their own defense) and general advice (e.g., Avoid mud). All 51 of the lessons listed are sufficiently noteworthy to have been stated explicitly in at least one of the 208 written accounts that compose the firefight database.

EXAMPLES FROM THE FIREFIGHT ACCOUNTS

Passages from firefight accounts included in the database are reproduced below and inserted as footnotes, where appropriate, to illustrate some of the lessons learned and key survival factors identified by the analysis.

Situational Awareness

> We learned a lesson on this operation: we were just too complacent. It's been so quiet in and around the city that we let our guard down. We walked right by where those guys were hiding…In this game you have to always be on the alert. You can take nothing for granted, and you have to be professional at all times. (*Sheriff of Ramadi*, p. 218)

> At one point, one of Sarwar's men stooped to reload in front of a small six-inch opening in a mud wall and was shot in the stomach by a Taliban soldier. The man looked up in surprise and went tumbling down the wall into the fort. (*Horse Soldiers* p. 332)

> One of our guys decided to reload. He was supposed to get down, switch magazines, and stand up when his gun was back in action. For some reason, he froze and decided to do it right there, and he got shot. (*Heroes Among Us,* p. 226)

> Convoy driving requires a tremendous amount of mental concentration. Every vehicle is suspect. How do you know? There are combat indicators, yes, but how do you really know? A forty-kilometer drive can exhaust you, mentally. You must be ready at all times, ready for the unexpected. (*Outside the Wire*, p. 253-254)

Training

> He [Colbert] confesses to me that he had absolutely no feeling going through the city. He almost seems disturbed by this. "It was just like training," he says. "I just loaded and fired my weapon from muscle memory. I wasn't even aware what my hands were doing." (*Generation Kill,* p. 143)

> Killing and destroying had not yet become routine. Reconnaissance units train to collect information and report it back to combat commanders, who generally oversee most of the destruction. So when the trucks drove over the hill, the teams fell back on their training: instead of firing, they reported what they saw. I listened to meticulous descriptions of the trucks on the radio and wondered why no one at the front was shooting. (*One Bullet Away,* p. 196)

Everything you do in combat has to be second nature. You do not have time to stop and think about what's next in the process. You can't pull out a book and look up the answer or ask a buddy what to do next. The one second that you stop to think about what's going on could cost someone their life. In the heat of battle, that one split-second decision could cost a life or save a life. (*Heroes Among Us,* p. 178)

In our world, basic tasks have to be repeatedly rehearsed in conditions mimicking predicted combat scenarios as faithfully as possible. For example, you can never be sure which small detail might mean the difference between exiting a vehicle caught in an enemy ambush kill zone in two seconds or in ten. That kind of time differential can be fatal. Where is the door handle on the seven-ton truck? Do you have to pull it up or down to get out? … Once all the little questions have been answered, those answers must be practiced again and again until they become muscle memory… I became amazed at how much my men would tolerate if someone just took the time to explain the why of it all to them. (*Joker One,* p. 71)

As a company commander, I couldn't have dreamed of anything better than this, taking my unit into combat. It was the Super Bowl, and I wanted to be there. I had a young organization but we were well trained. After numerous training exercises at Fort Stewart and a solid National Training Center rotation at Fort Irwin, California, we could make a plan, prepare for combat, and execute the plan almost instantly if we had to. When you throw in the confidence that comes with that training, it's easy to get excited about doing your job. Of course, there's apprehension too. (*Heroes Among Us,* p. 111)

SEALs train incessantly for this kind of confrontation – up-close shooting, engaging multiple targets, shifting from their primary weapon, a rifle or submachine gun, to their secondary weapon, a pistol sidearm. They drill in these shooting situations in different scenarios and situations, shifting from primary to secondary and back, over and over. "I didn't have time to think about it," Chief Dale told me. "My primary [weapon] was gone before I got a round off. The rest was instinct and training. I knew I had to get to my pistol and there it was, in my hand and I was shooting." (*Sheriff of Ramadi,* p. 183-4)

Man, first time I got shot at, I didn't even know how to respond. It was like it wasn't real. I kept thinking, they're firing at me? They're firing at me? It was crazy. I had to remind myself what to do, even though we've practiced it a hundred times. Poking your head around some cover to return fire is the scariest fucking thing in the world, you know? (*Blood Makes the Grass Grow Green*, p. 199)

His Marines had spent months training for legitimate target identification. They didn't want to fire on unarmed civilians, so they had been taught to zero in on hands to look for signs of weapons. (*Ambush Alley,* p. 109-10)

The best way to keep men alive on the battlefield is to instill in [each one] a decisive mind that can quickly separate the crucial from the irrelevant, synthesize the output, and use this intelligence to create little bubbles of order in the all-out chaos that is war. (*Joker One,* p. 44)

The thing that really paid off for me was having done a lot of my hand-to-hand-combat training in gear. I fought a lot of guys with my full gear on. A lot of people will do combat training slick, without gear. But you gotta fight with your kit on to make it more realistic. (*Heroes Among Us,* p. 19)

For him, it's all too much stimulus to process. Riding shotgun in a vehicle with no roof or door or armor of any kind, seeing the wall of fire he is about to drive into, his mind goes blank. Muscle memory takes over. He hunches over his M-4 in what he calls the "gangsta curl" and begins shooting. (*Generation Kill,* p. 139)

The U.S. soldiers needed no order from their platoon leaders or me [a Canadian Army Colonel]; they immediately spread out into two squad lines and began to advance, firing all their weaponry into the enemy. The exchange of fire was about even, but the enemy's passed over our heads whilst ours found the mark. The swift action of the American infantrymen—a result of many hours of battle-drill training and the efficiency of the sergeants (all now four-year veterans with multiple tours in Afghanistan and Iraq)—was very effective. The enemy fire slackened. (*Outside the Wire*, p. 154)

Cover and Concealment

And then I notice Sergeant Riley and the others staring at me. Have I been shot? What the hell are they looking at me for? I check my body for bullet wound. I don't think I've been shot. But then I could have just been so excited at getting shot at that I didn't realize I'd been shot. And then I noticed that the cover I'm hiding behind is a haystack. A bullet rips through the haystack by my face, sending little bits of hay floating gently to the earth. I make another mental note to myself: next time hide behind something solid. (*Blood Makes the Grass Grow Green*, p. 204)

My safety was off, and I was ready to fire. But I didn't. None of us did. Orange tracers as big as beer bottles were zipping right over our heads, but we knew [the Iraqis] couldn't see our camouflaged bodies. If we fired back, it was sure to bring a hail of devastating fire directly into us. (*Never Fight Fair,* p. 318)

Remaining Calm

Our immediate reaction was to drop to the ground and start shooting. I was so tense at that moment that after the second shot, I realized I was firing into the dirt. I told myself, *Calm down, calm down*. I waited for the one guy to pop up and I shot him. I waited for the other guy to pop up and I shot him. At this point I was telling myself, *I'm good now. I can do this. I just have to remain calm*. (*Heroes Among Us,* p. 234)

We have a saying that calmness breeds calmness. He [the air force combat controller] just stayed calm because he didn't want the pilots to know the peril we were in, because then they'd amp up and make mistakes. (*Heroes Among Us,* p. 243)

I ran over to the first Humvee that arrived, expecting to see my familiar ETT soldiers. Instead, when I yanked open the door, a burly, unshaven Special Forces major stepped out. Surprised at this unexpected passenger, I inadvertently blurted out, "Who the hell are you?" "I'm Major White with Task Force Paladin. What's the situation here?" He coolly responded. "We've been surrounded and taking heavy fire for two hours." "Surrounded?" A look of amusement rose on his face. "I *love* being surrounded!" The QRF group, unofficially led by this Special Forces major, instantly changed the whole mood and morale of our ANA forces. (*Welcome to Afghanistan: Send More Ammo*, p.30)

Contrary to popular opinion, a person does not function better under an adrenalin rush. If anything, it causes rash thinking and unnecessarily snap decisions. Reflexes do not speed up; they just appear to. Keeping cool in combat allows for clear thinking and well-placed shots. The key to survival is making the enemy lose his cool and then exploiting the weaknesses that unfold as a consequence. (*Combat 101,* p. 4)

Equipment

They [the Marines] send up flares at the slightest hint of contact and bathe our neighborhood in brilliant white light. This is the last thing we want. We're fine operating in the dark; we all have night-vision goggles. But the Marines issue them only to their leadership. We own the night; the Marines rent it. (*House to House,* p. 199)

Yeah, we were fighting on a roof near the cemetery when an AK round must have caught my Kevlar at an angle. Look here, you can see the divot it made in the thing. Anyway, I fell over—must've been knocked out. I woke up and found my Marines dragging me off the roof, screaming that I had been killed. Man, were they surprised when I jumped up and told them I was okay. (*Joker One*, p. 177)

…most people don't go down when you shoot them with one of our little .223 bullets. (*Joker One,* p. 6)

We keep our first-aid kits on our left sides because, you can't waste time hunting for a Marine's tourniquet when he's spurting blood out of a severed artery. (*Joker One,* p. 43)

"One thing I learned as a sniper," he told me while riveting an ammo rack to a Humvee, "is that nothing in the world's as useless as ammo just out of reach." (*One Bullet Away,* p. 166)

We did what every infantryman in history has had to do in combat: We improvised. "Semper Gumby," as Chuck joked. Always Flexible. Problem: How do you put a machine gun on a Toyota? Solution: Strap it to the top of the cab with cargo ties. Problem: No armor. Solution: Drive faster. (*The Unforgiving Minute,* p. 230)

Important safety lesson: When picking up a newly fired enemy rocket warhead base, allow proper time for cooling or handle it with gloves. I filed that one away with other lessons learned the hard way. (*Joker One,* p. 4)

Initial Reaction to Combat

In my case, hearing and sight become almost disconnected. I see more muzzle flashes next to the vehicle but don't hear them. In the seat beside me, Trombley fires 300 rounds from his machine gun. Ordinarily, if someone were firing a machine gun that close to you, it would be deafening. His gun seems to whisper. (*Generation Kill,* p. 138)

My mouth felt dry and gummy. Everything seemed to pass in a blur. I thought of war stories that talked about hyperclarity in combat, seeing every blade of grass and feeling colors more intensely than ever before. But for me, whole city blocks faded into a gray fuzz. I feared I was processing information too slowly, seeing only one of every ten things I should. I felt shortchanged. I wanted hyperclarity, too. (*One Bullet Away,* p. 204)

We laughed. Combat slides emotion so far up the scale that amusing events become hilarious. Sometimes, in mid-firefight, I would see Marines laughing maniacally. (*One Bullet Away,* p. 206)

I never acquired a sixth sense in combat, but my original five became more finely tuned. We began to notice danger signs. (*One Bullet Away,* p. 212)

The first time [Garfield was shot at], all he could remember was being angry. And then he managed to focus simply on shooting his weapon. (*Horse Soldiers,* p. 321)

Replacements

He's new and he's green. The rest of us have had to work extra hard to keep Pulley from getting himself killed. His lack of experience is a burden we will all shoulder together. (*House to House,* p. 54)

He wanted to put Jones with his M16 in front as point man. His weapon was light, and he could react quickly. It sounded cruel, but they were taught to put the inexperienced and youngest at the front. If he was shot, those with more experience and bigger weapons would still have a chance. But a good point man could save lives. (*Ambush Alley,* p. 101)

Adrenaline Addiction

I saw in the platoon a glimmer of something I was starting to feel in myself: excitement. The adrenaline rush of combat and the heady thrill of being the law were addicting us. This was becoming a game. I was starting to look forward to missions and firefights the way I might savor pickup football or playing baseball. There was excitement, teamwork, common purpose, and the chance to demonstrate skill. I didn't have the luxury of much time for reflection, but I was aware enough to be concerned that I was starting to enjoy it. (*One Bullet Away,* p. 261)

The rush of battle is often a potent and lethal addiction, for war is a drug. (Chris Hedges, *War is a Force that Gives Us Meaning*, used as epigraph to the movie *The Hurt Locker.*)

Luck

Ski, to retrieve his cigarette lighter, drops down from the turret into the vehicle for an instant. And it's an instant that saves his life. Three simultaneous explosions, blended into one deafening blast of air and noise and shrapnel, rip apart an ANA vehicle not more than 10 meters away. Chunks of shrapnel screech through the airspace his head had occupied seconds earlier." (*Welcome to Afghanistan: Send More Ammo*, p. 59)

Calvin was busy spotting enemy positions when an AK round ripped through his flak vest. "They said it was luck, a quarter-of-an-inch and I would have been in a wheelchair. It came in through my flak vest and went along my back, underlining my Marine tattoo, ricocheted off my plate, and came out the other side of my vest. It was a tracer, so it actually cauterized the entire wound." (*We Were One*, p. 119)

USMC Sgt. W. Bee sustains minor injuries in firefight,
Helmand Province, Afghanistan, May 2008

OBSERVATIONS AND RECOMMENDATIONS OF SUBJECT MATTER EXPERTS (SMES)

Interview notes and written responses to the questions posted on the BCKS forums were reviewed and information extracted to compose a list of observations and recommendations for each of the four central research questions. Results of this task are presented below with annotations and explanation, where appropriate.

CASUALTY FACTORS

Twenty-one factors were described by SMEs as contributing to casualties during firefights. Lack of situational awareness was the most frequently mentioned factor, which includes failure to attend to one's immediate surroundings (e.g., the 5/25 meter scan drill that soldiers are taught to perform routinely) and to the general conditions and enemy tactics within the area of operation. One respondent stated that some form of complacency, even if only momentary, was involved in all casualties suffered by his unit. The casualty factors reported by SMEs are grouped by similarity in the five categories listed below.

Performance-Related Factors

- Lack of situational awareness (immediate area, 5/25, AOR, complacency)
- Nervous, confused and/or hesitant to respond to attack
- Reluctant to return fire and/or waiting to be ordered

Training-Related Factors

- Inadequate medical skills[17]
- Inadequate marksmanship
- Inadequate physical fitness
- Inadequate training in general
- Inadequate rehearsal of battle drills
- Inadequate training concerning TTPs
- Training only to the minimum standard

Aimed Fire in Helmand Province, Afghanistan, October 2009

Equipment/Administrative-Related Factors

- Running low on ammunition
- Large number of replacements in a unit
- Failure to wear personal protective gear
- Carrying heavy loads (slows maneuver/increases exposure)

Tactics/Procedures-Related Factors

- Failure to approach from all sides to cordon
- Remaining in vehicle after an IED attack (i.e., remaining a target, failing to pursue the enemy and discourage further attacks)

Enemy-Related Factors

- Enemy training
- Hit-and-run tactics
- Ambush/surprise attack
- Enemy communications

[17] [Our corpsman provided extra training and] "…put together blowout kits for the whole platoon. The kits contained the essentials to keep a wounded Marine alive–saline IV bag, battle dressings, and QuikClot... He'd also led the platoon in making tourniquets, to be worn loosely around the neck for easy access, and threatened to pummel any man caught without his. Doc's final contribution was not material but tactical. He stressed that the job of any Marine wounded in a firefight was to keep shooting until his team or the platoon was out of danger. Wounded men don't have the luxury of giving up the fight." (*One Bullet Away*, p. 269)

SURVIVAL FACTORS

SMEs mentioned 29 factors that they have personally observed to contribute to survival during firefights. Weapons proficiency and leadership skills were among the most frequently mentioned factors, followed by the benefits of training, rehearsal, and situational awareness (knowing the AOR, TTPs, etc.). The survival factors reported by SMEs are grouped by similarity in the five categories listed below.

Performance-Related Factors

- Sustained fire
- Marksmanship
- Fire superiority
- Well-placed fires
- Fire and maneuver
- Good reporting of status and position
- Good communications within the unit
- Good leadership (remaining calm, directing fires, keeping subordinates focused despite casualties, humor)

Mk-19 Grenade Launcher in Firefight
Nuristan, Afghanistan, August 2009

Training/Experience-Related Factors

- Proper training, in general
- Advanced medical training
- Training to higher than the minimum standards
- Cross training (equipment and weapons operation, medical training)
- Conducting battle drills and updating and redefining procedures as necessary
- Previous combat experience (firefights with casualties, in particular)

Knowledge-Related Factors

- Knowing your AOR
- Knowing enemy TTPs
- Knowing commander's intent
- Knowing your assets and their call signs
- Knowing your soldiers' or Marines' capabilities and limitations
- Confidence in your abilities
- Good intelligence

Tactics/Procedures-Related Factors

- Decisive action
- Tactical pause to redistribute fire
- Maintaining stand-off distance when out-gunned
- Dismounting after an attack to pursue the enemy
- Slower convoy speed (e.g., 20 mph) to detect IEDs and ambushes

Equipment-Related Factors

- Heavy weapons (i.e., .50 cal. and Mk 19-"the firefight ender," in particular, but also mortars and fires by armored vehicles can make a critical difference).
- Personal protective gear
- Rotary wing assets

SKILLS POSSESSED THAT CONTRIBUTED TO SURVIVAL DURING INITIAL FIREFIGHTS

The following 13 skills and abilities were mentioned by the SMEs as having contributed to survival during their initial combat experiences. All of the skills listed appear to have been acquired through formal military training, with the possible exception of "Aggressiveness," which was mentioned only once. The skill most frequently reported to have contributed to survival that was possessed prior to the SMEs' first firefight is the ability to respond immediately to an attack with actions that are appropriate for the circumstances, which usually is a situation-specific variation of seeking cover, returning fire, and maneuvering for advantage. SMEs and the authors of many of the accounts of initial firefights in our database expressed surprise over their seemingly reflexive responses to attacks and attribute their personal survival and the survival of others to the "muscle memory" that was conditioned by the repetitive performance of battle drills.[18]

- Immediate, reflexive response acquired through repetitive fire drills[19]
- Marksmanship[20]
- Weapons proficiency
- Quick reloading and clearing[21]
- Basic OODA skills[22]
- Reporting procedures
- Basic leadership skills
- Assigning and directing fires[23]
- Communicating within the team
- Visualizing the scene as if from above
- Using cover and concealment properly
- Expecting the noise (stress fire training)
- Aggressiveness[24]

Taking Cover in Helmand Province, Afghanistan, July 2009

[18] "A normal human survival reaction would be to curl up on the Humvee floorboards and close my eyes. This is precisely the reaction Marine Corps training is designed to overcome. And it worked. After the initial shock of the ambush, I felt calm and completely self-possessed… The first lesson every young infantry officer learns at Quantico is that your job when being shot at is to shoot back. 'Gain and maintain fire superiority' is how the Marine Corps describes it." (*One Bullet Away,* p. 215)

[19] "The first time we were in a firefight, we moved out just like we did when we trained. It just happened. We reacted instantly and everybody did what he had to do. This was the result of training, muscle memory, and knowing each other. We could communicate without saying a word, just by our actions." (*Heroes Among Us,* p. 242)

[20] "Soldier, you are either a marksman or a target." (*The Unforgiving Minute,* p. 199)

[21] One respondent wrote, "I always felt most vulnerable when I was changing magazines; the ability to do it quickly and accurately really matters; same with clearing jams/malfunctions; get the weapon up and operating quickly."

[22] The OODA loop (for observe, orient, decide, act).

[23] A difference between Army and Marine Corps doctrine emerged from the interview data in the form of recommendations concerning the role of small unit leaders during firefights. A Marine lieutenant reported that he adopted a "fighting leader" approach, leading from the front and firing his own weapon. In contrast, an Army NCO was adamant that the proper role of the team leader is to direct the fire of his troops, not to get wrapped up in the shooting himself or feel obligated to be a shooter when he should be on the radio; the team is the leader's weapon. Both of these approaches have merit and they are not mutually exclusive. That is, the lieutenant reported and communicated, as required by the circumstances, and coordinated his men's maneuver and fires, directly and through squad leaders. And, many accounts of Army firefights in our database include descriptions of leaders firing their weapons in addition to performing their coordination tasks. It is, in practice, a matter of emphasis, but that emphasis reflects fundamental differences in approach.

[24] "We had to show [the Iraqi soldiers] that the way to handle incoming fire was to react aggressively–fire and maneuver. If we were with them, they would do this–most of the time." (*Sheriff of Ramadi,* p. 100)

LESSONS LEARNED DURING INITIAL FIREFIGHTS THAT CONTRIBUTED TO SURVIVAL

The SMEs mentioned 24 separate lessons learned during their first few firefights that contributed to their survival and the survival of others during subsequent engagements. None of the lessons was reported more than once, which suggests that each person's introduction to combat is unique and that the list of lessons will grow with each additional interview of a firefight veteran. The lessons reported by the SMEs are grouped by similarity in the three categories listed below.

Performance-Related Lessons

- Distribute fire.
- Carry plenty of ammunition.
- Remove tracers from magazines.
- The fight is not only in front of you; watch for flanking maneuvers.
- Well-aimed double-shots on target are more effective than spraying rounds.
- Be aware of comrades' states of mind.
- Remain calm, despite the noise and gunfire.
- Remain alert; constantly assess what is happening around you.
- Have a plan, even though it probably will change.
- Communication among maneuver units is critical.

Firefight in Kunar Province, Afghanistan, May 2009 (Note "I Love NY" boxer shorts)

Knowledge-Related Lessons

- Do not follow trails.
- Stop the bleeding first.
- I can still function when wounded.
- Watch for patterns in enemy behavior.
- Rehearse battle drills until responses are automatic.
- Learn from experience and the experiences of others.
- Apply lessons learned and knowledge of enemy TTPs.
- The enemy learns from your behavior, so do not be predictable.
- Leaders are responsible for conveying enemy tactics to the S-2.
- Fake IEDs are used to lure patrols into ambushes, sniper attacks, and big IEDs.

Support-Related Lessons

- ISR platforms can be helpful; use them.[25]
- UAV footage of firefights can be instructive.
- Use CAS; do not send a man to do a bomb's job.[26]
- Fast-movers are not much help for CAS; A-10s and helicopters are better.

[25] Intelligence, Surveillance, and Reconnaissance (ISR) platforms range in size from the hand-launched Dragon Eye and Raven to the long-range Global Hawk Unmanned Air Vehicles (UAVs) and also include fixed towers, tethered aerostats, and piloted aircraft such as the Constant Hawk and U-2.

[26] Close Air Support (CAS) assets include high altitude bombers, such as the B-1 and B-52; helicopters, Cobras and Apaches, in particular; A-10s, which were designed specifically for CAS; AC-130 gunships, also designed for CAS but generally available only at night; Predator "drone" UAVs; and high-speed fighter/attack aircraft, such as Navy F/A-18 Hornets, British Tornados, and French Mirages.

SURVIVAL TIPS AND SUGGESTIONS

The following list of firefight survival tips was developed from SME comments, previous research, field experience, and an extensive review of the literature.

- Understand the difference between cover and concealment. Cover is an obstruction that blocks bullets (e.g., concrete wall, earthen embankment); concealment is something that blocks the shooter's view, but not bullets (e.g., bushes, smoke, haystack, or door).

- Upon the first indication of gunfire--either hearing it, seeing a shooter, or noticing rounds coming your way--immediately sprint for the nearest cover or concealment. Do not stop to determine the source of the gunfire unless it is coming from the only cover and concealment. The nearest cover might be only a wet gutter or a shallow ditch, but do not hesitate to take it until you can find more substantial protection. If you can find no cover at all within three seconds, sprint from where you are, drop to the ground and crawl to the closest cover. Dodge and weave as you make your way and keep the cover between you and the shooters.
- Shadows provide concealment; a shooter can lose his targets in a shadow even on a sunny day.
- Once behind cover, breathe deeply and then calmly assess the situation.
- Ask your comrades if they saw the source of the fire, speaking only as loudly as necessary. Do not scream. It attracts attention and wastes energy.
- Keep your head down! Look around the side of your cover or concealment instead of over it (e.g. around the side rather than over the hood or roof of a vehicle). If you peek around a corner, do so at ankle-to-knee-height.
- Attempt to answer these questions: From where is the gunfire coming? Are they single shots or machine gun fire? Are the bullets coming so near that it appears you are being targeted? Are you injured? Where is the next available cover or concealment? Your next action will be based on your assessment.
- Decide to return fire, move to another position, or remain in place based on what you calculate the danger to be to you and your comrades. If you are hurt, you believe the gunfire is not specifically targeting you, and/or the cover is ideal, you should stay where you are. But the situation will change, so remain alert and prepare to fire and move.
- Take heart if the shooters are firing long bursts of low-caliber automatic gun fire. Genuinely dangerous adversaries use precise shots, measured bursts, or heavier weapons. However, do not take chances or assume that the fire will be undisciplined. Even ricochets can kill.
- Stay away from windows. You could be shot from within the building or injured by breaking glass.
- Do not vault over walls. Place one arm over the wall and then ease yourself over the top, remaining as low as possible.
- Do not silhouette yourself (i.e., sitting or standing against a lighter background). A body silhouetted against the sky attracts attention and becomes an ideal target for snipers.

- If a shooter is targeting you and you cannot return fire (e.g., out of ammunition): 1) Peek around your cover at one end to plan a route and exit the cover at another location; 2) Time your evasive action or counter fire to coincide with the shooter’s magazine change.

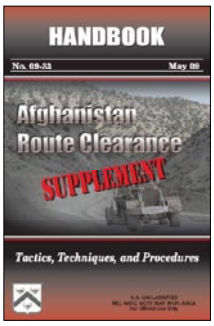
- If you are exposed, observe the shooter's trigger finger and move with explosive speed when you believe he is about to pull the trigger (you cannot move faster than a bullet, but you can move faster than a trigger finger). If the shooter is right handed and you are facing him, move to your left; if he is left-handed, move to your right. Similarly, when entering a room where a shooter might be present, always move to your left; 85 percent of males are right-handed and it is more difficult to track a target in the direction of the firing hand.
- Engage the closest threat first and work away from your position from left to right. Use the natural rise after each shot to transition to the next target. Aim at low center mass.
- Maneuver to the flank and coordinate your attack on the weakest element of the opposing force.
- After diving for cover, do not fire from the same place you landed. The enemy will be expecting that.
- When firing from behind cover, change firing positions to keep the enemy from aiming where you will appear. Remain unpredictable.
- Keep moving. It requires the enemy to devote attention to determining your motives; it is harder to hit a moving than a stationary target; and if you remain stationary too long the enemy might send someone to flank you.
- Scan the area to your front as well as the sides, rear and above. Remind yourself to avoid focusing attention exclusively in the direction of the perceived threat. Flanking maneuvers are effective because of this tendency for tunnel vision.
- Reload only behind full cover.

QUICK TIPS

- Shoot first.
- Get to cover.
- Keep moving.
- Do not stand up.
- Doors are not effective cover.
- When in doubt, grenade it out.
- Expect your backup to be late.
- Discretion is the better part of survival.
- Tracers and smoke grenades work both ways.
- The bigger the vehicle, the more attractive the target.
- It is physically impossible to carry too much ammunition.
- If you cannot remember, the claymore is pointed in your direction.
- Being brave is good. Being smart is better, and usually a lot less painful.
- Whether approaching a concealed passage or the gates of heaven, always check for booby traps.
- Develop and maintain a Combat Mindset composed of awareness, anticipation, concentration, and coolness. Dexterity and marksmanship are prerequisite to confidence, and confidence is prerequisite to self-control.[27]

[27] The elements of the Combat Mindset presented here are adapted from Jeff Cooper's, *To Ride, Shoot Straight, and Speak the Truth,* Paladin Press, Boulder, Colorado, 1998.

LESSONS LEARNED RESOURCES



Lessons learned documents are produced in a variety of formats and range in size from brief, issue-specific memoranda, such as the CALL Tip #78 and excerpt from a 10th Mountain Division bulletin, presented below, to lengthy accounts of a unit's entire tour of duty, such as the 343-page PowerPoint presentation (in PDF) prepared by the 2nd Brigade Combat Team, 2nd Infantry Division, which provides lessons learned in all categories of operations in meticulous detail; an excerpt concerning battle drills is inserted following the 10th Mountain example. CALL has produced many informative lessons learned documents, such as the soldiers' guide to surviving the first 100 days, mentioned previously, and the timely *Afghanistan Route Clearance Handbook.* The Marine Corps Center for Lessons Learned, located in Quantico, Virginia, has taken a more personal approach with publication of *Company Commanders' Observations*, which is a compilation of lessons and advice from ground and logistics combat element company commanders who served in Iraq from 2004 through 2007. Excerpts are provided as the final examples in this section.

Combat Training Centers TIPS for Success - #78

The following information was extracted from reports compiled at the Center for Army Lessons Learned from recent rotations at the National Training Center, Joint Readiness Training Center, Joint Multinational Readiness Center, and the Battle Command Training Program.

Observation: Units fail to maintain 360-degree security and suffer unnecessary casualties as a result.

Discussion: Units operating in urban areas fail to plan and supervise their security posture. Soldiers operating in urban areas are easily distracted and fail to maintain 360-degree security.

- Soldiers often focus their attention inward rather than maintaining observation on their assigned sector of fire.
- Units often fail to develop a direct fire plan and assign sectors of fire during troop-leading procedures. As a result, units have unknown gaps in their observation plan and the enemy forces are able to exploit these gaps.

Recommendations: Units need to focus on the basics of direct fire planning. While 95 percent of the time contact does not occur, units need to develop observation plans to ensure that they have 360-degree security.

- Junior leaders must enforce Soldier discipline to ensure that all areas are under observation.
- Unit must maintain adequate security to prevent the opportunity for the enemy sniper to conduct multiple engagements without receiving return fire from coalition forces.

References:

- Asymmetric Warfare Group, *Countersniper Pocket Guide*, November 2006.[28]
- CALL Newsletter No. 06-16, *Tactical Marksmanship and Sniper/Countersniper Operations.*

Subject: August 2008 Tactics, Techniques, and Procedures Observations (Excerpt from 10th Mountain Div. memo)

1. **Observation:** Elements of the 10th Mountain Division conduct patrols in various parts of MND-C and have recorded critical lessons to support operations.
2. **Discussion:** 5 and 25 Meter Checks: Lately, it appears that the 5 and 25 meter checks are the focus of patrols during movement. Use these checks at the halt. All patrol members are to conduct their 5 and 25 meter checks of their immediate vicinity prior to and during dismount. During movement, all members have assigned specific sectors of fire and area of observation. Individual attentiveness to assigned sectors is imperative to maintaining security for the patrol. All members should be attuned to their environment, look and scan for fields of fire, choke points, surveillance positions, possible triggerman locations (cover and concealment with an obstacle between IED and triggerman) and key terrain. Think as the enemy. Put yourself in his shoes and ask yourself, "Where would I be to conduct an attack or to conduct surveillance?"

   Honesty Traces: Valuable data is lost if AARs/Debriefs are not conducted for returning patrols. Returning patrols should utilize an "Honesty Trace" debriefing forum that incorporates the capabilities of CPOF, ARC or Falcon-View to capture and archive the actual patrol route, time, composition of patrol, actions on any objectives, and movement techniques including speed, distance and lanes. This data capture will allow follow on patrols to review the details of previous patrols to prevent pattern setting.

[28] The Asymmetric Warfare Group, located at Fort Meade, Maryland, serves as a repository and training resource for information concerning procedures and tactics that might otherwise be lost through retirement, attrition, or rotation.

- **Issue: React To Contact (Excerpts from 2nd BCT, 2nd ID After Action Review)**

- **Discussion:** The enemy will pick the moment and location to open fire. Our actions in an ambush situation were no different than what is outline in FM 7-8 task 7-3/4-1112 where the platoon disengages the element in the kill zone or forces the enemy to withdraw. Usually the best reaction was to return fire and deploy forces to the area of suspicion. Keep in mind the threat of a complex or baited ambush involving a squad sized element hitting you from more than one angle. Typically the bait involves one guy with an AK who opens up in order to draw you into a kill zone. These kill zones involve either IED's or a PKC/RPG point ambush, which are initiated as the maneuver elements move in pursuit of initial threat (AK gunner). As well considering the ominous sniper threat; react to contact was the only action in zone that was totally doctrinal.
- **Recommendation:** An adopted tactic of ours was that if a sole AK gunner opened fire on one of our elements then we would take a roundabout way to him capture and/or kill him. If it was PKC gunner or greater who mounted an attack, charge straight at him. Snipers are a threat that must be dealt with thru Intel gathering and targeted raids. Identifying a sniper after the shot has been taken is virtually impossible in an urban environment. If stationary pop smoke literally and reposition. There isn't much a platoon can do about a sniper; the operative word is "helplessness." IED's should be handled like this; if it doesn't disable a vehicle or personnel get the receiver portion of the IED if possible and keep moving.

- **Issue: Reaction to an attack on the platoon before the enemy withdraws**
- **Discussion:** The enemy uses hit and run tactics. The enemy will engage by SAF or RPG fire and then break contact by rounding a corner, loading into an automobile and disappearing into traffic.
- **Recommendation:** Platoon develops an instant SOP that requires little to no thought. Truck engaged immediately assaults the threat. Trucks to the flank move one block and toward the threat to limit enemy movement.

Marine Corps *Company Commanders' Observations* (Excerpts from the 56-page document)

Captain Nakoniecz's Must Hit List

1. Live fire situation-based training.
2. Learning the Iraqis' language.
3. Development of a company playbook.
4. Weekly company level tactical decision games.
5. Studying the area before you get there. Not just leaders, all Marines.
6. Combat conditioning.
7. Study enemy TTP's and discuss ways to avoid / defeat them.
8. ROE training and discussions: Instilling a mindset that it is cowardly to kill innocents but enforcing the absolute need to protect your fellow Marines and yourself.

Marksmanship was substandard. Marines did more suppressing than engaging. The Marine Corps has placed too much of a focus on close range shooting -- more emphasis needs to be placed on engagements between 100-300 meters. - **Captain Robert Lynch**

Our marksmanship training program and philosophy is 180 degrees out from what is required to fight in a city. Run repeated live-fire ranges stressing firing from posts, firing from vehicles, getting out of trucks and moving to a building, then engaging from inside or the roof, etc. There are 10,000 SigActs that read "Marine observed three military aged males planting IED 200 m in front of him. Marine engaged with 30x5.56. Males egressed to the east." Assume that your Marines cannot shoot any weapon proficiently. If you do and you force them to prove you're wrong by hitting actual targets that provide feedback, you will have finally trained them to shoot. Once you get to that point, re-confirm [battle sight zero (BZO)] 30 days later with live fire. If you eyesight BZO or laser bore-sight BZO, you will soon be reading those SigActs again. - **Major Rory Quinn**

SECTION 4: IMPLICATIONS

T.E. Lawrence believed that some individuals do, indeed, possess an intangible skill that contributes to mission success and individual survival in combat. In an article published in the 14th Edition of the *Encyclopedia Britannica* (1929), titled, "Science of Guerrilla Warfare," he wrote,

> Nine-tenths of tactics are certain and taught in books: but the irrational tenth is like the kingfisher flashing across the pond and that is the test of generals. It can only be ensured by instinct, sharpened by thought, practicing the stroke so often that at the crisis it is as natural as a reflex.

The split-second decisions in the fog of war described by many of the authors in our database and Lawrence of Arabia's kingfisher refer to what is, essentially, the same personal quality that provides advantage in all life-threatening circumstances: prompt, calm, and deliberate action under stressful conditions, which has been an essential quality of leadership and revered performance throughout history. It is a central element of US military tradition and frequently is cited in our most honorific descriptions of valor.[29]

There might be a single skill, knowledge, or cognitive ability that enables survival under quickly changing and perilous circumstances, such as combat. The current research did not find the ephemeral kingfisher, but instead identified a set of instrumental behaviors that can be practiced, "so often that at the crisis it is as natural as a reflex." The authors of the firefight accounts and the combat veterans who contributed to this study agree that proper training and rehearsal of these behaviors are the keys to survival.

The ability to respond quickly to attack has provided selective advantage through millions of years of hominid evolution. However, there are characteristics of modern warfare that are substantively different from the threats that shaped human capabilities. We believe there are at least two factors present in modern warfare for which there has been insufficient time to adapt evolutionarily. These are the speed of fired projectiles and the noise of mechanized and explosive battle.

Human sensory-motor capabilities were shaped by a world filled with threats that move at relatively slow speeds. As a result, humans are capable of outrunning (or outsmarting) most animal predators and of dodging clubs or other weapons wielded by competing humans. But the time between the appearance of these threats and the moment when a potentially mortal wound could be inflicted is usually measured in seconds, or longer. In contrast, the interval between a trigger pull and (possible) sudden death is measured in fractions of a second. Humans have evolved to dodge a blow, but not a bullet. Other mechanisms must be brought to bear to counter modern weapons in order to survive firefights. The behaviors are susceptible to influence through training, primarily by learning to avoid becoming a target and, once targeted, to remain one for as little time as possible.

Noise is the other characteristic of modern combat for which humans have not fully adapted. Noise is a well-documented environmental stressor that can damage sensory organs and contributes predictably to human error; it is for these reasons that considerable effort is devoted to minimizing the sources and mitigating the effects of noise in industrial settings, and it is why ear plugs and other protective devices are worn at shooting ranges. The sudden onset of battle can be deafening, disorienting, and distracting, all of which can impair performance, resulting in delayed reactions, improper responses, inaccurate fire, and other errors.

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[29] Among the more than 3,400 Medal of Honor Citations is one that describes a firefight that occurred on 14 March 1969 near *Nha Trang* Bay, Vietnam. Navy Lieutenant, Junior Grade, Joseph Kerrey led a SEAL platoon up a sheer cliff taller than a 30-story building in an attempt to capture high value targets. The SEALs were ambushed and the lieutenant was severely wounded when a grenade exploded at his feet. The citation records for posterity that, "Although he was bleeding profusely, he displayed outstanding courage and presence of mind in immediately directing his element's fire into the heart of the enemy camp… and although immobilized by his multiple wounds, he continued to maintain calm, superlative control as he ordered his team to secure and defend an extraction site."

Three common psychological biases seem to be particularly exacerbated by these stressors. Initial impressions or perceptions are often given undue import in prioritizing and evaluating subsequent observations. Particularly noteworthy and recent events can assume excessive significance in appraisal of present circumstances. Likewise, extreme stress frequently provokes reliance on stereotypical beliefs and interpretations, also prejudicing useful comprehension and decision-making (these biases have been characterized as anchoring, availing and attributing in studies of diagnostic error). Beyond sensory barrage, the anxieties sustaining these problematic reckonings are promoted by related distortions of temporal perception (too slow, too fast) and sensations of isolation related to difficulty or lack of communication.

Many of the narratives suggest the notion that success in minimizing perceptual and cognitive biases by combatants with extensive firefight experience seems distinctly related to their sharing of tactical perceptions in a timely, deliberate and non-distracting manner. They don't just talk a good fight, they talk *while* they fight, sharing information while actively and mutually suppressing maladaptive anxieties common to all combatants regardless of prior experience. More than promoting a common situational perspective, a good "backcourt" or "infield chatter" reduces anxiety and promotes individual situational awareness. Like any other martial skill, pertinent communication is only habituated by repetition and stress in training, drills, rehearsals, and more expensively, in battle. While it is prominent in command and junior leadership education, development of this skill should be emphasized earlier in individual and initial-unit training, particularly in mixed-reality scenarios.

We believe that current methods for desensitizing troops to the noise and chaos of combat could be improved by simulation and repetitive drilling in controlled environments. Live fire exercises and small unit training under realistic conditions, as conducted at the NTCs and in training lanes at posts and bases, help prepare soldiers and Marines for the physical and mental stressors of combat. High-fidelity field exercises are effective, but involve risks and require considerable time and resources to plan, implement, and evaluate. However, our research suggests that multiple exposures to high-fidelity training would be necessary to enhance the likelihood of surviving one's first few actual firefights.

The advent of programmable simulators offers the possibility of desensitizing soldiers and Marines to the noise and confusion of battle and training them how to respond to a variety of firefight conditions in the same manner that pilots and astronauts are trained to respond to in-flight problems without actually jeopardizing personnel or equipment. Simulators such as the USMC Infantry Immersion Trainer and the "stress fire" facilities that use paintball guns are appropriate for training police and military personnel for close-quarter combat and clearing buildings, but not for firefight training, in general. Several of the accounts included in our database involved dismounted urban operations, especially the descriptions of Marine actions in Fallujah. However, Fallujah was a costly exception, rather than the rule. The engagement distance in most military firefights is 100 to 200 meters, which exceeds paintball range and the capabilities of current computer-driven systems to simulate realistically. Our recommendations will address these and other implications of study results.

USMC Infantry Immersion Trainer in the "Tomato Factory" at Camp Pendleton

SUMMARY OF STUDY RESULTS

The objectives of the current study have been to, 1) test the hypothesis that surviving one's first few firefights is correlated with long-term survival in combat; and 2) identify factors with training implications that contribute to casualties and survival. Experience has been the primary variable of interest in the study in order to address the first objective.

EXPERIENCE

We reported previously that substantial evidence emerged from the analysis to support the study's primary hypothesis: survival rates were found to improve following units' fourth firefight and mission outcomes begin to improve following the third engagement; survival rates and mission outcome ratings varied independently. Additional analyses were conducted to further inform the conclusions presented here. This inquiry focused exclusively on the 145 cases involving US and Coalition forces in Iraq and Afghanistan and verified a substantial decline in own force casualties after a unit experiences its fourth firefight. The data presented in Table 9 show that units that have experienced zero to three firefights represent 47 percent of the 145 firefights in the analysis (the sum of the numbers of engagements) and 68 percent of the casualties. However, the difference between the cumulative numbers of firefights and casualties begins to narrow following this level of experience. That is, units with four or fewer previous firefights account for 57 percent of the total number, but only 72 percent of the casualties. Thus, the fifth firefight appears to be the level of experience beyond which survival rates improve. The implication of this result is that at least four high-fidelity simulated firefight experiences that incorporate the noise and chaos of battle and the survival factors identified by the research are necessary to help prepare soldiers and Marines for combat.

TABLE 9
CASUALTIES AND PREVIOUS FIREFIGHT EXPERIENCE
US AND ALLIED FORCES, IRAQ AND AFGHANISTAN

145 Firefights; 98 with Own-Force Casualties	Cumulative % of Firefights	Cumulative % of Firefights w/ Casualties	Number of Casualties (982 total)	Percentage of Total Own Force Casualties	Cumulative Percentage of Own Force Casualties
No Previous Firefights (26 Engagements)	18%	12%	88	9%	9%
One Previous Firefight (16 Engagements)	29%	26%	183	19%	28%
Two Previous Firefights (11 Engagements)	37%	36%	73	7%	35%
Three Previous Firefights (15 Engagements)	47%	46%	326	33%	68%
Four Previous Firefights (15 Engagements)	57%	53%	34	3%	72%
5-7 Previous Firefights (16 Engagements)	68%	66%	45	5%	76%
8-10 Previous Firefights (13 Engagements)	77%	79%	123	13%	89%
11-14 Previous Firefights (12 Engagements)	86%	86%	60	6%	95%
15-19 Previous Firefights (9 Engagements)	92%	92%	20	2%	97%
20 or more Previous Firefights (12 Engagements)	100%	100%	30	3%	100%

Note: Even when a particularly violent encounter between Northern Alliance forces with SOF assistance and the Taliban near Cobaki in October 2001 is excluded, units with three or fewer previous engagements accounted for 60% of own-force casualties.

FACTORS AND LESSONS

This study has used content analysis of written accounts of firefights and information provided by highly-experienced veterans to identify the factors that contribute to casualties and survival during combat. We derived lists of casualty factors, survival factors, and lessons learned from the database of 208 firefight accounts; from interviews and correspondence with subject matter experts, we developed lists of casualty factors, survival factors, skills possessed that contributed to surviving initial firefights, and skills learned during initial firefights that contributed to surviving subsequent engagements. The results of these research tasks were presented in the previous section of this report and are summarized in Table 10.

TABLE 10
SUMMARY OF STUDY RESULTS

Top Casualty Factors	
Database of 208 Firefights	**SME Interviews**
Enemy fire/Fire superiority	Poor Situational Awareness
Poor cover/Concealment	Slow to respond/Fire
Poor Situational Awareness	Inadequate weapons training
Poor tactics	Inadequate medical training
Insufficient armor	Inadequate TTP training
Friendly Fire	Inadequate drills and tactics training
Top Survival Factors	
Database of 208 Firefights	**SME Interviews**
Fire superiority	Fire superiority/Sustained fires
Cover/Concealment	Marksmanship
Fire & Maneuver	Training/Cross training
Body armor	Knowledge of AO
Armor	Leadership
Surprise	Tactics
Top Lessons Learned	
Database of 208 Firefights	**SME Interviews**
Recon routes/Recon everything	Fire superiority/Sustained fires
Develop a plan	Remain calm
Return fire promptly	Remain alert/Complacency kills
Remain vigilant/Complacency kills	Learn from experience
Speed and surprise work	Use surprise/Avoid predictability
Use cover and concealment	Use assets
Skills Possessed by SMEs that Contributed to Survival During Initial Firefights	
Reflexive response	Marksmanship
Basic OODA skills	Weapons proficiency
Reporting procedures	Quick reloading and clearing
Basic leadership skills	Assigning and directing fires
Communicating within the team	Using cover and concealment properly
Aggressiveness	Expected the noise and chaos of battle

Thirteen of the 48 items listed in Table 10 concern weapons and another, the Survival Factor "Training/Cross training," refers primarily to cross-training on heavy weapons. Eight of the items concern the importance of maintaining situational awareness, of the immediate surroundings, a route, and enemy TTPs in the Area of Operations. Seven of the items concern tactics, including the Casualty Factor "Inadequate drills and tactics training," and the benefits of surprise, in particular. Four of the items concern the importance of using cover and concealment properly and another four concern leadership. These five categories of factors and lessons account for 77 percent of the 48 items listed in the table. The remaining 11 items concern specific skills, personal qualities, equipment, and friendly fire.

The analytical procedure described here has been to assign the data to categories based on similarities, and then to count the numbers of cases in each category. Thus, SME comments and 208 narrative accounts of firefights were reduced to four categories: Casualty Factors, Survival Factors, Lessons Learned, and Skills already possessed that contributed to survival. The items were counted and further categorized by similarity to construct the summary table of top factors and lessons. The items listed in the table were then counted to derive the key contributors to firefight survival, which are listed in order of salience below.

- Weapons Proficiency
- Situational Awareness
- Tactics and Drills
- Cover and Concealment
- Leadership/Communications

It is the job of investigators to describe the research and analytical methods used and to reduce results to a few understandable key points, as we have done here. This process is necessary, but the inevitable over-simplification can obscure the details that give meaning to the results. Those details are present in the 190 survival and casualty factors and lessons learned derived from the database of firefight accounts, and in the 87 factors, skills, and lessons described by the subject matter experts. It is these details that can inform the development of enhanced training to prepare soldiers and Marines for combat.

DARPA has not informed us of the actual system(s) to which the results of this research will be applied. Although DARPA's original solicitation mentioned that study results would be incorporated in mixed-reality training, conventional field training and battle drills also could benefit from addressing the survival factors and SME recommendations that have been identified and will be further evaluated during the proposed Phase II research. For example, training scenarios developed during Phase II could be incorporated in the USMC's Mojave Viper and the US Army's Brigade Combat Team exercises conducted at the National Training Centers (NTCs). "Local-level" training conducted at the 55 military installations that currently prepare personnel for deployments also could incorporate the scenarios we propose to develop based on study results. In other words, the full range of training methods could benefit from data-driven recommendations derived from the current research.

CONCLUSIONS

We found evidence of only one other study concerning the factors that contribute to survival and casualties during combat since S.L.A. Marshall interviewed troops at the end of WWII and during the Korean War. The CALL survey, mentioned in the introduction to this report, asked returning soldiers about the causes of casualties during their first 100 days after deployment. Responses covered a broad range of issues and the resulting handbook provides guidance concerning negligent discharges and other accidents, enemy TTPs, snipers, PTSD, small arms fire, cultural awareness, intelligence, and of course, IEDs. Milton Hileman, the handbook's author, reported that the primary lesson of the study concerns the importance of maintaining situational awareness:

> Overall, the soldiers said they need to stay alert and stay attuned to the environment in order to survive. Avoiding complacency was a reoccurring theme… Soldiers said that complacency in one way or another contributed to every casualty they saw. It was little things like not following [standard operating procedures], not having all of your kit when you went out the gate on a mission, leaders not doing their pre-combat inspections, and leaders not being adaptive in the way they plan their missions.[30]

[30] Senior Military Analyst, Milton Hileman quoted in, "New Army Handbooks Focus on First 100 Days of Combat," by Seaman William Selby for the Armed Forces Press Service, 2 May 2008.

In contrast to the CALL survey, the current study focused exclusively on the factors that contribute to casualties and survival during firefights. However, like the CALL researchers, we hoped to discover insights that could be used to improve survival in a combat environment. Both studies have produced information that can enhance training and operational performance, and eventually save lives, but both studies have concluded that, "the biggest surprise is that there are no surprises."[31]

The five categories of survival and casualty factors identified during the current study are well-known to experienced soldiers and Marines, as they were to their predecessors in the ranks during prior eras. No previously-undetected skill or ability was revealed, but our methods have allowed us to 1) determine the criticality of the first four engagements statistically, 2) identify specific examples of the skills and behaviors that contribute to casualties and survival, and 3) quantify the relative salience of the factors and place them in order of priority. A few words of explanation concerning these familiar military concepts and the implications of study results are provided below.

WEAPONS PROFICIENCY

The paramount importance of weapons proficiency (accounting for 29 percent of the items listed in Table 10) is understandable when the subject is military firefights, which by definition involve the use of weapons. However, the emphases identified by the analysis on marksmanship, clearing and reloading procedures and cross-training on heavy weapons are noteworthy. Also, we found that the recent tendency to focus almost exclusively on close-quarter combat skills, especially in computer-aided training, ignores the realities of the current theaters of operation where the combatants are usually separated by at least 100 meters or by greater distances and often with substantial elevation differentials in Afghanistan. Furthermore, the discovery that the nine percent of firefights in our database conducted in mountainous terrain generated 30 percent of total casualties implies that a data-driven approach to training would reverse the relative emphases currently placed on urban combat procedures and increase the effort to improve marksmanship and weapons proficiency at greater ranges and in varied terrain.[32]

SITUATIONAL AWARENESS

The extraordinary importance of constant vigilance that was identified by both the CALL survey and the current study also should be expected. Our word "alert" is derived from the Latin for tending a watchtower, a fundamentally military function, and Homer's *Odyssey*, one of history's earliest narratives is primarily about the importance of remaining alert and the perils of complacency. Situational awareness is the antithesis of surprise, which is the leading tactical factor that contributes to survival and to casualties. Until recently, "situational awareness" was a term familiar only to law enforcement, the military, and pilots. However, it is increasingly recognized as a skill that conveys advantage in all complex endeavors, but is not possessed in equal measure by everyone. The military training scenarios that we propose to develop based on study results will emphasize the requirement to remain alert and maintain situational awareness of immediate surroundings, up-to-date enemy TTPs, and the cultural terrain in an area of operations.

[31] AFR interview with Colonel Steven Mains and Mr. Milton Hileman, Center for Army Lessons Learned.

[32] "Essex picked out what he thought was the leader of the Taliban assault, a man in a flowing white robe, who was running from left to right trying to flank their position. Essex started shooting at the guy [even though] his M-4 rifle was accurate to a little over 550 yards and the target was still 800 yards away. Essex elevated the barrel and tried lobbing his shots. As he was looking through his scope, the Taliban soldier turned and looked directly at Essex [who] was struck by the confused, nearly comical look on his face as the man dropped suddenly to the ground and started rolling down the hill." (*Horse Soldiers,* p. 219)

TACTICS AND BATTLE DRILLS

Recurrent rehearsal of tactics and battle drills, in particular, is the standard approach to military, pre-deployment training. The efficacy of repetitive rehearsal to conditioning reflex-like responses is recognized by the services, which attempt to make every soldier and Marine textbook examples of situation-specific muscle memory. The importance of battle drills is well-known and the many descriptions of life-saving effects contained in the firefight accounts in our database would be gratifying to those responsible for developing and conducting the training. However, some of the SMEs who contributed to our study reported that they and/or others were not fully prepared for combat when they deployed; others were adamant that training only to the minimum standard is insufficient. The CALL researchers found that only 70 percent of soldiers who responded to the survey in 2007 considered themselves to be adequately trained for combat. The clear implication is that improved pre-deployment training could increase firefight survival rates substantially.

High-Fidelity Training at the NTC, Fort Irwin, California

COVER AND CONCEALMENT

The distinction between and proper uses of cover and concealment have been primary subjects of military education throughout history. Like the Eskimos' many words for snow, the many technical terms for describing different forms of cover and concealment reflect the importance of the concept to practitioners of the military arts. Foxhole, trench, bunker, reverse slope, military crest, defilade, and ranger grave are among the examples of cover intended to protect soldiers from enemy fire. All military personnel are taught to "take cover" when under attack and to return fire in a manner that minimizes exposure to "incoming" rounds.[33] Cover and concealment are to soldiers and Marines what addition and subtraction are to mathematicians. For this reason, the only related surprise in the results of the current study is that cover and concealment did not emerge as the most salient survival factor. It is also for this reason that we were startled to find a memorandum from Iraq in the CALL archives dated January 2009 that advocates contractor-provided training in a "North Hollywood Shootout" style to prepare soldiers for firefights. The style refers to the two men armed with assault rifles and wearing body armor who attempted to rob a Bank of America branch in the San Fernando Valley of Los Angeles in January 1997. The robbers stood boldly in the street in tactical poses shielded by their protective gear and superior firepower and forced the police, who were armed only with side arms, to take cover. The event resulted in the Los Angeles Police Department assigning AR-15s to patrol officers, but it was hardly a demonstration of an effective tactic, as both robbers were killed during the firefight, one by a shot to the head and the other bled out from a leg wound while the emergency medical personnel attended to wounded officers and civilians. It is true that body armor saves lives and that many of the adversaries in Iraq have been spectacularly poor marksmen. However, it defies logic and several hundred years of military experience to encourage soldiers to expose themselves to enemy fire protected only by body armor and gloves.[34]

Taking Cover in Wardak Province, Afghanistan, May 2009

[33] "The big rounds started knocking bucket-size divots out of the hill [so Diller] ordered everyone to take cover behind the scattered, tall boulders along the path. And then in groups of two and three the Afghans and Americans began leapfrogging up the hill from boulder to boulder. It took ten minutes for everyone to make it to the top. Diller was last; he was carrying the 80-pound satellite radio in a pack and couldn't move quickly." (*Horse Soldiers*, p. 225)

[34] It is not the mythical "bullet with your name on it," but the ones marked To Whom It May Concern that should be feared.

LEADERSHIP/COMMUNICATIONS

More pages have been written about leadership than any other aspect of the military profession. From Sun Tsu's *Art of War* to the present, leadership has been the quintessential military topic. In addition to abstract notions of the personal qualities necessary for military leadership, each generation of aspiring leaders must contend with the material conditions imposed on them to discover if they are suited for the job. The work of platoon leaders in peacetime is similar to that of many junior-level managers in that they are concerned about the welfare of their subordinates, but usually in the way that restaurant managers are concerned about employees showing up for work. Everything changes when combat is imminent. The pressures to coordinate inventories, training, leave schedules, and other bureaucratic matters are replaced by a single concern: to bring all of the team home when the deployment is over. Several of the contributors to our database wrote about the burden of small unit command, but it was the young lieutenants from Dartmouth, Princeton, and the US Military Academy who most eloquently described their awesome responsibilities and campaigns of personal discovery. All were changed by their experiences.

The experiences comprised by the firefight database and the recommendations of subject matter experts can be combined to describe the skills and personal qualities needed to lead small units effectively in combat. First, the leader must communicate well with his team and foster communications among its members. This includes communication that encourages comradeship, for it is well-known that soldiers fight primarily for each other, rather than to achieve a military or political objective; it also includes communication *during* firefights to share information that contributes to situational awareness and tactical advantage, and to provide encouragement. Second, it is the leader's job to shield subordinates from distraction, in general, and to keep them focused during firefights, in particular, especially when taking casualties. Third, the leader must maintain emotional control to obtain the confidence of subordinates; calm, deliberate, decision-making under stressful conditions is a characteristic of esteemed leadership in all fields, but is critical during combat. Fourth, the leader should have either previous firefight experience or demonstrated competence in relevant tasks, maintaining situational awareness, in particular.

Each of these four leadership qualities represents many individual skills and behaviors. A few passages from firefight accounts in our database and comments by subject matter experts are presented below to illustrate some of the leadership issues.

> A leader or any soldier for that matter can't simply say, "I'm trained, so all I have to do is react." Even with an operation order in hand, it is essential to constantly survey the terrain in order to use it for survival. He must be aware of weather factors. He must be aware of the support that is available. He must be observant in order to know the enemy's strength and capabilities. He must be able to estimate the enemy's size and position by observing the direction and volume of fire. As an OC in the field on training exercises, I would often test for situational awareness. If I said, "Here is your situation, what are you going to do?" the leader would always confidently regurgitate an acronym or numbered sequence that he had memorized. But if I asked, "What is your situation?" I would get a confused response most of the time, or even a blank look with no response.
>
> A leader who has either been under fire before or who has taken the training to heart will perform far better than a leader who has not been engaged and/or has not trained to high standards. The latter is a leadership failure in two parts: (a) On the part of the FLL on the line, because they ignore the training or train only to minimum standards; and (b) On the part of the senior leadership because they allow acceptance of training to the minimum standard. Soldiers deserve leaders who train to higher standards.
>
> 1SG Hollis G. Franks (IN Ret.)

Calm down, slow down and take the time to actually assess what is going on around you. In the heat of the moment a leader must be able to pick up on changes in the guys around him. You can tell if someone is experiencing extreme stress by a change in the pitch in their voice, as it usually gets a few octaves higher. SFC John M. Case

The single best thinking and decision-making tool a leader has is to consistently conduct reality checks by asking a profoundly simple question: "What's your recommendation?" I asked Ali Mohamed; I asked the Afghan general; I asked the warlord; I asked Kris; I asked Speedy; I asked Goody; I asked Slab, and what I got in return was pure, unadulterated tacit knowledge—knowing how to obtain desired end states, knowing what to do in order to obtain them, and knowing when and where to actually act on them. The power of the question goes beyond just the context-rich tacit knowledge it reveals; it also has a potent intrinsic effect on the responders. It lets them know that you respect their input, and as a leader, you respect the primacy of the guy on the ground!

COL Pete Blaber (Ret.) in *The Mission, the Men, and Me,* p. 297

Years of training had shaped the way I interpreted my environment. Every door and crooked tree was a potential ambush. I peered at shadows in expectation of trouble and searched for cover that my men and I could use to protect us. Military officers plan for the worst and hope for the best. *Stay alert and stay alive*. This attitude was well suited for a battlefield or training exercise. Gardez was neither. I wasn't prepared to walk through a village that was neither "friendly" nor "enemy." This was the frustration of Gardez in microcosm: how to stay focused on protecting my men while simultaneously engaging the local population. One pundit called this "armed social work."

CAPT Craig Mullaney in *The Unforgiving Minute,* p. 236

An Army Bradley roared by on the main road, guns chattering. A moment later a Humvee pulled up, and seconds later Major Andrew Milburn, sent from Quantico, Virginia, to analyze "lessons learned," was kneeling next to [Master Sergeant Andreas] Elesky. "Want an assistant?" Milburn said. "Bring your own grenades?" Elesky asked. "Six, plus fresh batteries and strobes to fix our pos," Milburn said. "In case we want to call in something a bit heavier." Back at MEF headquarters, the word had gotten out that the advisers were understaffed. To lend a hand, staff officers from the MEF had slipped forward. Out on the lines, no one questioned majors who simply appeared and quietly obeyed the directions of sergeants. Bing West in *No True Glory*, p. 276

I found that instinct took over in firefights, and fear was replaced by the countless small tasks of living, leading, and fighting. CAPT Nathaniel Fick in *One Bullet Away,* p. 226

I stopped moving and tried to slow my breathing. It was my first firefight; I didn't want to sound frantic or panicked on the radio, since how you sound when you call in during your first enemy contact can come to define how you're viewed by those above and below you for the rest of your tour. CAPT Donovan Campbell in *Joker One,* p. 124

You'll never know until you're there [in combat]. What you know for certain is that it will be chaotic and loud, and you'll be ready to piss in your boots. You'll be more scared of letting down your men than anything the enemy's gonna do to you. And then you'll lead from instinct and judgment. *That's the price of a salute*.

CAPT Craig Mullaney in *The Unforgiving Minute,* p. 69

FINAL NOTE

The current study has determined that, on average, mission outcome improves following units' third firefight and survival rate improves following units' fourth engagement. In addition, we identified 190 survival factors, casualty factors, and lessons learned from a database of 208 firefight accounts, and 87 factors, skills, and lessons from interviews and correspondence with subject matter experts. The factors and lessons were categorized and the items in each category counted. Further analysis reduced the results to the five categories of skills, knowledge, and behaviors presented in the preceding pages in order of their contribution to survival during firefights: Weapons Proficiency, Situational Awareness, Tactics and Drills, Cover and Concealment, and Leadership/Communications. Each of the categories is composed of many specific behaviors and skills, which have been described in varying detail in this report. Additional issues are discussed in Appendix B.

The study is unique in its application of scientific methods and statistical analysis and the database structure developed for this purpose provides a conceptual framework for understanding the full range of armed engagements. Study results could be used immediately to develop enhanced training to help prepare soldiers and Marines for combat. Others have recognized the potential value of this research. In particular, a copy of our Phase I final report has been requested by the Commanding General of the National Simulation Center. Managers of the Center for Army Lessons Learned at Fort Leavenworth and training specialists at the Asymmetric Warfare Group at Fort Meade also have asked for study results as soon as possible.

The current study confirmed the importance of training and rehearsal of battle drills to surviving firefights. We also confirmed the earlier CALL survey's discovery that a large proportion of soldiers and Marines believe their preparation for combat to have been inadequate; 30 percent of respondents to the CALL survey and 36 percent of the SMEs who contributed to the current study reported that more and/or better training is needed. We interpret this information to mean that an opportunity exists to increase combat survival rates *substantially* by incorporating study results in properly-designed pre-deployment instruction and exercises, and then ensuring that all personnel receive the training prior to deployment. The effects of small percentages on large numbers of engagements were discussed previously; for example, a casualty factor with a frequency of only one percent is responsible for more than 400 US dead and wounded in Iraq and Afghanistan. For these reasons, training based on the data-driven methods and results reported here could reduce firefight casualty rates by 20 percent or more.

We propose to continue the research described in this report by developing computer-based and paper procedures that encourage small unit leaders to contribute to an on-going study of firefight survival by submitting simple, streamlined "after-action reports" to a growing database of combat experience. We plan to develop and implement the protocols with the assistance of two highly-respected Command Sergeants Major who participated in the current study and have offered to help during Phase II. We will review the after action reports, encode report content, and enter the data, descriptive information, and inferences using the database structure, categories, and scoring protocols developed during Phase I. Most important, we intend to prepare detailed scenarios to guide the development of mixed-reality and conventional military training to instruct personnel in the tactics, techniques, and procedures that study results indicate will improve the likelihood of surviving firefights.

POST SCRIPT

We were informed after the preparation of this report that our Phase II proposal was rejected by DARPA because the products of our research lacked "commercial application."

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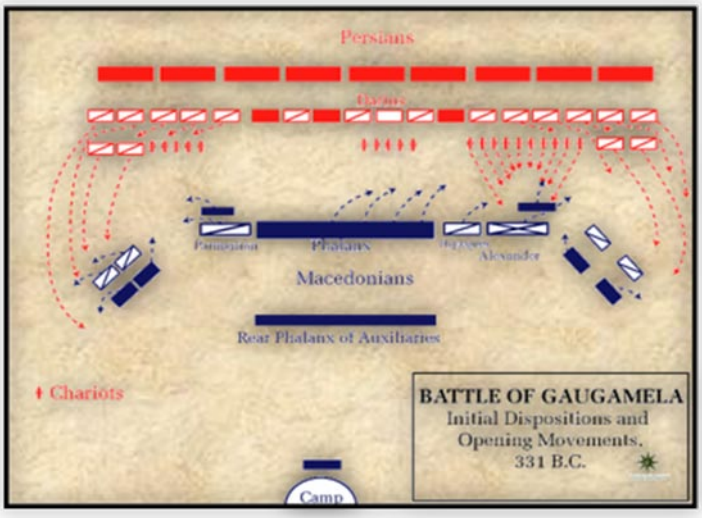
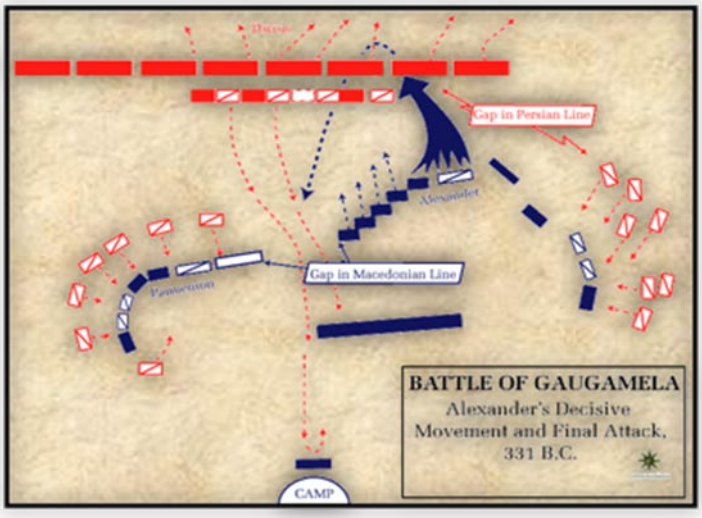
The Charge of the Persian Scythed Chariots at the Battle of Gaugamela
by Andre Castaigne

THE BATTLE OF GAUGAMELA, 1 OCTOBER 331 BCE



The Persians outnumbered Alexander's army 5:1 in cavalry and nearly 2:1 in total force when they met near what is now Mosul in northern Iraq. Alexander began by ordering his infantry to march in phalanx formation towards the center of the enemy line with wings echeloned to the rear at 45 degree angles to lure the Persian cavalry to attack.



Darius III took the bait and charged the Macedonian flanks. Alexander, wearing the leather and bronze *cuirasses* of his Companion Cavalry, then formed his units into a wedge and led them in a movement parallel to the Persian front lines, heading off of the battlefield that Darius had prepared for his scythed chariots. Darius ordered his cavalry to block Alexander's force, which included elite light infantry armed with slings, javelins, and short bows concealed behind the Macedonian horsemen. Alexander waited for the Persian line to open as it stretched in response to his parallel movement, and then wheeled his cavalry left into the gap while his infantry followed with well-aimed projectiles and javelins. The Persian line was penetrated. Darius and the most powerful army on the planet eventually broke and fled in disarray.

The Battle of Gaugamela illustrates the use of situational awareness, fire and maneuver, knowledge of enemy TTPs, innovative tactics, cover and concealment, combined arms, personal protective equipment, deception, surprise, marksmanship, decisive action, planning, calm decision-making under fire, competent leadership, experience, and training—the same factors that contribute to survival of modern warriors in combat.

APPENDIX A

SYMPTOMS OF POST TRAUMATIC STRESS DISORDER (PTSD)

Re-Experiencing the Traumatic Event

- Intrusive, upsetting memories of the event.
- Flashbacks (acting or feeling like the event is happening again).
- Nightmares (either of the traumatic event or of other events).
- Feelings of intense distress when reminded of the trauma.
- Intense physical reactions to reminders of the event (e.g. pounding heart, rapid breathing, nausea, muscle tension, sweating).

Avoidance and Emotional Numbing

- Avoiding activities, places, thoughts, or feelings that remind of the trauma.
- Inability to remember important aspects of the trauma.
- Loss of interest in activities and life in general.
- Feeling detached from others and emotionally numb.
- Sense of a limited future.

Increased Arousal

- Difficulty falling or staying asleep.
- Irritability or outbursts of anger.
- Difficulty concentrating.
- Hyper-vigilance.
- Feeling jumpy and easily startled.

Other Symptoms

- Anger and irritability.
- Guilt, shame, or self-blame.
- Substance abuse.
- Depression and hopelessness.
- Suicidal thoughts and feelings.
- Feeling alienated and alone.
- Feelings of mistrust and betrayal.
- Headaches, stomach problems, chest pain.

APPENDIX B

ADDITIONAL ISSUES

The current study focused on the factors that contribute to casualties and survival during firefights, particularly those factors amenable to training. Several other issues related to tactics, doctrine, the operational arts, and equipage that are relevant to combat performance were identified during the research. A few of these issues are discussed briefly, below.

- Considerations of tactical deception are almost entirely absent from the firefight accounts reviewed. Insurgent forces expend significant effort in observation and characterization of our units' activities. Actively promoting interpretive errors in their intelligence preparation of battlefields should be considered as fundamental as any other operational-security practice.
- The use of engineer troops in base construction and fortification was frequently mentioned in the accounts, as were their roles in ordnance disposal and route clearance, mostly in Iraq. It is notable that regular support of infantry operations by combat-engineers and Seabees in Afghanistan during the same period was not mentioned in the available narratives. The number of US and Allied engagements in Afghanistan analyzed was small, but the observation is troubling in light of Taliban tactics and these assets' value in developing and maintaining favorable human-terrain resources.
- Several of the accounts indicated that cross training of all personnel to a high level of competency on their unit's crew-served weapons would have increased their effectiveness and possibly averted casualties. Likewise, training and licensing of more drivers in tactical and support units would likely improve overall levels of vigilance in convoy and patrol operations by allowing more frequent relief from this fatiguing task.
- A substantial number of the firefight accounts described situations where hostile-fire indicators for use in tactical vehicles to indicate direction of incoming would have greatly augmented the situational awareness of motorized troops in movement and laager.
- Very loud horns or sirens in tactical vehicles would provide an additional communication asset during critical phases of combat for mounted forces (i.e., the modern equivalent of a bugle, audible in battle, to signal certain actions).
- The collateral casualties and damage, restricted human-terrain resources, and poor overall intelligence quality noted in many of the accounts studied were all largely related to limited/nonexistent local-language skills in tactical/operational units. Perhaps borrowing some of the techniques used in the Peace Corps' "in-country" immersive language training programs might enhance the DoD's efforts in this regard.
- The use of canines in tactical operations is not evident in the narratives (resident feral dogs were mentioned as defensive adjuncts in two accounts). The roles dogs played in the World Wars, Korean and Vietnamese conflicts have been supplanted largely by technological means with only limited success. Abandoning these versatile assets after several thousand years of use on battlefields seems premature at this time.
- In recent decades, doctrine in the operational arts has selectively borrowed aspects of Zero-Defect concepts from manufacturing management. The notion of Zero-Defect operations presents a difficult goal, perhaps too challenging an objective in the complexity of modern battlefields. More appropriate from a doctrinal viewpoint may be characteristic concepts developed in systems engineering and aviation-safety: defect management, amelioration and recovery. Not just good "Plan Bs," or even "Plan Cs," but data-driven and institutionalized practices and procedures akin to design-risk management and crew-resource management respectively in the operational and tactical arenas.

- Requiring knowledge of the commander's intent is a relatively recent military innovation that enables units to pursue mission objectives despite changing conditions or even calamity. The procedure began during the Vietnam War and eventually became doctrine; Commander's Intent is now a sub-paragraph in the five-paragraph Operations Order and soldiers must know the intent of commanders two levels up the chain. In the words of an SME, "Knowing why a mission is conducted allows a soldier to continue the fight if his commander goes down, rather than just coming to a halt and dying in place." Leaders should communicate their intentions clearly and re-enforce commander's intent requirements.
- The friendly fire incidents in our database primarily involved the Air Force; an AC-130 and two A-10 attacks were particularly destructive. Friendly fire accounted for six percent of the casualty factor reports in our database, which is consistent with the estimates of independent observers and about half of the historical rate of 10 to 14 percent in conflicts since WWII. The Army's official estimates are .78 percent and 1.24 percent for Iraq and Afghanistan, respectively, which are incredibly low.

Use of a Cover for Concealment