Capturing Insights to Reduce Future Warfighter Fatalities

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Until recently, there has been a widely-held belief that if an infantryman survives the first few combat encounters or firefights of a deployment, the Soldier is likely to survive the full tour of duty. Though it has been discussed anecdotally that military units tend to suffer higher casualty rates in their first engagements with the enemy, the "first five firefights" belief has not been validated. In this study, we examined the "first five firefights" concept to evaluate if Soldiers have an increased chance of becoming a fatality during their early days of deployment. By gathering and analyzing Soldier fatality data, conducting interviews with Soldiers, and evaluating human performance models of common fatality scenarios, we found the "first five" concept to be untrue. Rather, we identified that Soldiers are particularly vulnerable to becoming a fatality within the first three months of deployment. Soldiers also experience a period of increased vulnerability at mid-deployment and again near the end of the deployment. These vulnerabilities, explored through interviews with Soldiers, have implications for changes in training, tactics, techniques, and procedures in today's military.

INTRODUCTION

Even with the advent of elements such as immersion training, advanced weapons, and battlefield situational awareness technologies, heavy casualties can still persist in modern combat situations. In February 2009 HF Designworks, Inc. and Alion Science and Technology were awarded a Defense Advanced Research Projects Agency (DARPA) Phase I Small Business Innovative Research (SBIR) contract entitled "Capturing Insights from Firefights to Improve Training." One goal of the research was to evaluate the concept that if an infantryman survives the first few firefights of the deployment, the Soldier is likely to survive the full tour of duty. Another goal was to determine the feasibility of exposing Soldiers to these lessons/factors in training so that they effectively experience their "first five firefights" before going into combat. In addition, if the "first five firefights" concept was found to be untrue, the study sought to determine the most likely times within a Soldier's tour of duty for becoming a combat-related fatality, and to identify methods for reducing those fatalities. The results of our research demonstrate that the first three months of a deployment are a more reliable gauge of Soldier survivability than the widely held "first five firefights" theory. These results have implications for several aspects of modern training, as well as the tactics, techniques, and procedures (TTPs) used by today's military.

PRACTICE INNOVATION

Literature Review

Our research approach was to gather a variety of data to evaluate the validity of the "first few firefights" belief and identify the factors that contribute to an increased likelihood of Soldier combat survival. The process began with a comprehensive literature review to identify if the "first five firefights" truly had bearing on whether a Soldier would survive his/her tour of duty. We also attempted to find evidence for other particularly vulnerable times in a Soldier's tour of duty, based on a limited amount of "first account" information which suggests that in past conflicts (e.g., Vietnam) a notable amount of Soldiers would be critically wounded not only in their first few firefights, but in the final few weeks of their tour as well (Redden, 2008). The literature review also included an

analysis of information from other fields such as police and firefighter accident/fatality data to identify if early (e.g., insufficient experience or training) or late (e.g., fatigue, complacency) effects contribute to human error or risk taking behavior that could result in increased fatalities. The literature review included identification of factors such as risk-taking behavior, tolerance of uncertainty, training, knowledge of the enemy, and other potential influential effects on survivability. These factors have the potential to affect Soldier survivability in a number of ways. For example, there is a possibility that survivability is affected by a Soldier's intuitive interpretation of a combat situation. This might be an innate capability to sense danger with "the hairs on the back of the neck," or it might be a matter of recognition-primed decision making (Ross, Klein, Thunholm, Schmitt, & Baxter, 2004). Training is an especially crucial factor, as proper training counters unrealistic expectations of combat so that the Soldier is not overwhelmed by the sights, sounds, smells and feelings of isolation and fear when they occur during combat (Spiszer, 1999).

Relevant information was also found in a 2001 Defense Science Board task force report which reviewed studies of pilots' survivability rates in combat and found high casualty rates in the initial half-dozen combat events but much better chances of survival and success for those who survived through those initial battles (Braddock & Chatham, 2001). The literature review also included other fields, such as Human Reliability Analysis (HRA), where it has been found that human errors are more likely to occur when a novice first begins practicing the newly-acquired skills (Reason, 1990). An analysis of these other fields, however, revealed that this type of data was not comparable to Soldier fatality data due to the characteristics of modern combat, such as the sporadic nature of Soldier firefights and Improvised Explosive Device (IED) attacks. Despite this finding, the literature review assisted in guiding and focusing our approach towards assessing the "first five firefights" concept and evaluating the factors contributing to Soldier survivability.

Another key result of our literature review was the finding that the nature of modern combat suggests the "first five firefights" concept is no longer valid. IEDs are now the main cause of Soldier fatalities, not firefights or combat encounters. Thus, we realized that time into tour of duty might be a more valid measure.

Fatality Databases

The second phase of the study was to find a military database that contained both Soldier deployment dates and their accompanying fatality dates (when a fatality occurred). We intended to leverage this database to investigate the legitimacy of the "first five" concept by analyzing the number of firefights in which each fatality had participated. After contacting over three-dozen military agencies and following-up on several promising leads, we ultimately realized that a database such as the one we were looking for did not exist and we would need to develop our own databases. In addition, we discovered that there are no statistics kept on the number of firefights in which a Soldier participates. We also could not discover a commonly-accepted definition of a firefight, further complicating an investigation of the "first five" concept. Given this lack of data, we developed two fatality databases (one of United States combat related fatality data and one of United Kingdom combat related fatality data), comprised of approximately 2000 casualties from both Iraq and Afghanistan. The databases were created by a combination of multiple online compilations, casualty and war-watch websites, press releases, obituaries/tribute pages, and government websites. Typically, each Soldier's data was compiled from at least two sources, though oftentimes three or more sources went into the creation of each database entry. For a typical entry, we utilized a Department of Defense (DoD) press release for the Soldier's age, unit, and rank. We extracted additional information from hometown newspapers, articles, and other news sites. Data were collected from 01 January 2007 to 01 September 2009. Once the data were collected, we coded both databases in a consistent manner to support data analysis. Further, our spreadsheet format provides easy access to particular category inquiries (such as viewing only IED fatalities or viewing all casualties of a certain age or rank).

Soldier Interviews

In addition to collecting and evaluating fatality data, we administered individual Soldier surveys/interviews and conducted a focus group discussion with Soldiers who had recently served in Iraq and Afghanistan. We developed a questionnaire to investigate Soldier beliefs regarding vulnerable periods in their tour (or tours) of duty, and their experiences and opinions pertaining to factors that contribute to Soldier fatalities. Further, we asked questions to identify what Soldiers believe can and should be done to improve Soldier survivability. Participants were obtained via posted announcements on several Army websites including Army Knowledge Online (AKO). We also contacted military bases, Army and Marine recruiters, veterans' hospitals, and identified Soldiers through professional and personal contacts. In the end, we were able to conduct one-on-one interviews or collect questionnaire data from 18 Army Soldiers and Marines. In addition, we held a focus group discussion with seven recent combat veterans. The focus group venue allowed Soldiers to discuss their beliefs on what improvements should be made to training, TTPs, equipment, and how these could be implemented to improve the likelihood of Soldiers surviving their tour of duty.

Human Performance Modeling

Finally, our evaluation of the "first five" concept and the crucial factors contributing to Soldier survivability included human performance modeling using the Integrated Performance Modeling Environment (IPME) tool developed by Alion's Micro Analysis & Design (MA&D) Operation. IPME allows analysts to build computational models of scenarios that include human decisions and actions and are designed to help assess warfighter performance. IPME provides a realistic representation of humans in complex environments, and allowed us to recreate common scenarios in which Soldiers become fatalities.

We included human performance modeling as part of our research to investigate the impact of various performance shaping factors (e.g., training, fatigue, experience, and environmental conditions) on the likelihood that the Soldier would survive. By systematically varying these factors and running the model multiple times, we collected extensive data on Soldier fatalities.

We developed three scenarios, based on common causes (identified from our databases and interviews) of combat related fatalities. The scenarios were comprised of an IED detection scenario, a sniper attack on a patrol, and a sniper attack with baiting which reflected a change in US tactics. In developing these scenarios, we worked with our military Subject Matter Expert (a recently returned Marine Machine Gunner with combat experience in both Iraq and Afghanistan) to ensure that the tasks, responses, probabilities of responses occurring, and effects of performance shaping factors were realistic. The specific performance shaping factors we included in the models were based on data collected during Soldier interviews. The models evaluated the influence of various factors on Soldier survivability and allowed us to perform sensitivity analyses to identify which traits contribute most to survivability. Note that even though those interviewed were concerned with sniper fire, citing it as a large cause of combat related fatalities, our database findings show that over the last three years, fewer than 1% of all US and UK combat related fatalities have been the result of actual sniper fire.

FINDINGS

Analyses of our databases revealed several points during deployments in which Soldiers are more vulnerable to becoming a fatality. Almost 40% of fatalities occur in the first three months of deployment, and the most likely time Soldiers become fatalities is approximately two or three months into their deployment (Figure 1), lending some support to the initial belief that Soldiers who survive their first few (i.e., five) firefights (or early combat experiences) are likely to survive their combat tour.

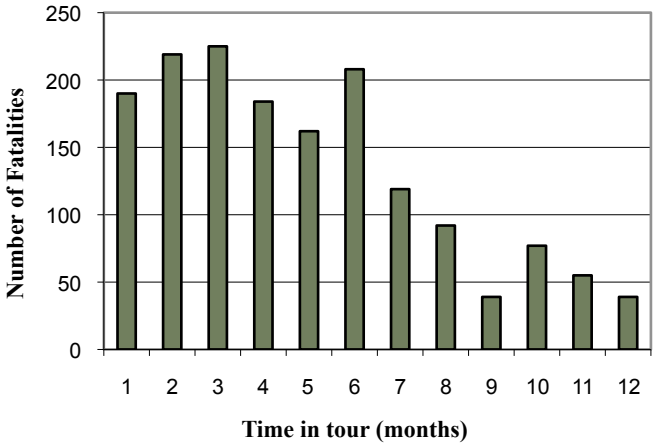

Figure 1. U.S. Military fatalities in Iraq and Afghanistan from Jan 2007 – Sept 2009 by time in tour (months)

Interviews with combat veterans revealed that likely factors for the increased likelihood of fatalities in the first three months are troop transition factors (such as old units rotating out and the new units "learning the ropes" as they rotate in, as well as loss of local intelligence when the old unit leaves), lack of familiarity with the enemy and environment, as well as insufficient experience. We also discovered that there is another increase in fatalities, though not as dramatic, at approximately the six-month mark of a tour for Army personnel (this is typically the half way point of a tour for the Army). This six-month spike was less pronounced for Marines, Navy and Air Force personnel, all of whom typically have shorter combat tours than Army personnel. There is also another spike in fatalities near the end of deployments. We determined through Soldier interviews that possible factors for the increased likelihood of fatalities in these later months are fatigue and complacency, likely stemming from frequent missions and patrols, overly consistent day-to-day procedures, and lack of in-theater training to maintain Soldier focus. Further, by this time in the tour, the enemy has had a chance to learn and adapt their attacks to Soldier routines.

Our databases also allowed us to determine the most common causes of death for U.S. and U.K. troops between 01 January 2007 and 01 September 2009. We learned that Improvised Explosive Devices (IEDs) and small-arms fire are the primary causes of fatalities. Fatalities were grouped into three general categories based on the nature of each casualty (Figure 2). Fatalities categorized as 'Hostile' (those that did not involve a direct firefight confrontation with enemy forces, such as IED, rocket, and mortar attacks/indirect fire) were the leading cause of fatalities. Fatalities categorized as 'Combat' (those that involve direct action with enemy forces, such as small-arms fire, sniper fire) were the second leading cause of fatalities. However as was stated earlier, less than 1% of all fatalities from 01 January 2007 – 01 September 2009 were sniper related. A third category, 'Non-combat/ Accident,' included all fatalities that were due to non-combat related causes (such as fatalities due to medical reasons or non-combat related vehicle accidents). Our US database also had 13 undetermined fatalities for which cause of death was either unknown or not released to the public.

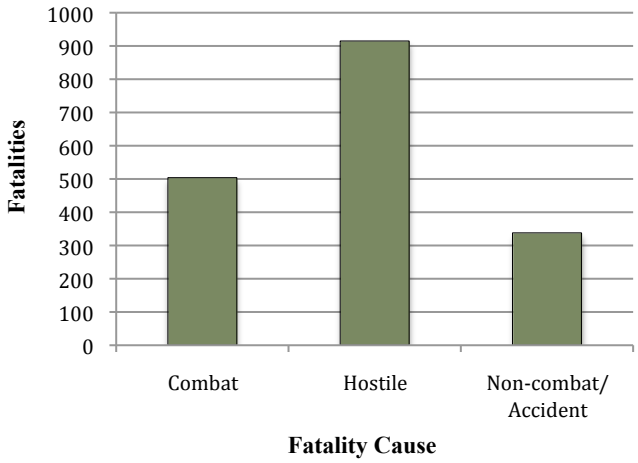

Figure 2. Cause of Fatalities (U.S. Military in Iraq and Afghanistan Jan 2007- Sept 2009)

Analyses of our databases also revealed that isolated attacks, rather than actual firefights or combat encounters, are the major causes of fatalities in current military operations. Perhaps the nature of warfare has changed since the "first five firefights" expression was coined. Except for very rare instances, we were unable to identify the number of firefights Soldiers had been involved in before becoming a fatality as they are rarely tracked. The nature of current warfare (where more Soldiers are killed in random encounters rather than battles) suggests that time and experience in the hostile environment (or months into tour of duty) are more relevant than the precise number of firefights.

In addition to our database findings, our modeling approach also offered significant insights

into selected conditions that affect Soldier fatalities. For example, we found that less experienced/less highly trained personnel were less likely to be killed in the sniper scenarios. At first, these findings appeared counterintuitive. Upon further investigation, and discussion with Soldier SMEs, we learned that the less experienced Soldiers might have been keeping themselves out of harm's way, whereas more experienced Soldiers may have been more aggressively seeking the sniper. These types of insights reveal another use of models beyond standard data collection: serving as a starting point for discussions and providing more insight into the mechanisms underlying human behavior.

DISCUSSION

For this study, we set out to determine the most likely times within a Soldier's tour of duty for becoming a combat related fatality and to determine the feasibility of exposing Soldiers to the factors leading to these fatalities in training prior to entering combat. The ultimate goal of this work has been to accurately identify the elements that will contribute to reduced future warfighter fatalities.

These findings have powerful implications for current training, as well as common tactics, techniques, and procedures currently in practice. We believe the findings about the critical periods in a tour of duty are of particular interest to the military. We further believe the findings from the numerous interviews and resulting recommendations would be of interest to the military, and could be implemented to save Soldiers' lives.

Our databases, interviews, and modeling and simulation findings indicate that training, information sharing, combat procedures, and complacency are significant problems that contribute to Soldier fatalities. Interviews with combat veterans have corroborated the significance of these deployment vulnerability patterns and offered a breadth of additional knowledge that is critical to identifying the factors leading to increased Soldier survivability. Focusing on the factors that create vulnerable periods in a deployment, and developing appropriate strategies such as improving troop transition periods, could reduce future fatalities. Even with current training methods, the Soldiers we interviewed expressed concern that training is not sufficiently current or realistic, and there is a strong need for just-in-time training and more up-to-date information to combat ever-changing enemy tactics. In addition, in-deployment training could help to reduce complacency and help maintain Soldier focus; two factors we identified that play an important role in the latter-half of a tour.

Altering these aspects of training and intelligence dissemination could have an enormous impact on current Soldier survivability, an implication that cannot be ignored, given the United States' current involvement in Iraq and Afghanistan. In addition, increasing the overall awareness of these vulnerable periods could be a potentially life-saving effort in itself. We believe these types of changes, if implemented in a timely and effective manner, have the potential to save the lives of both current and future warfighters.

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