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STRESS INDUCEMENT:
THE SILENT COMBAT MULTIPLIER

A Monograph
by
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USMC



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First Term AY 91-92

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92-32402



92 12 18 092

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 19/12/91		3. REPORT TYPE AND DATES COVERED MONOGRAPH	
4. TITLE AND SUBTITLE STRESS INDUCEMENT: THE SILENT COMBAT MULTIPLIER				5. FUNDING NUMBERS	
6. AUTHOR(S) MAJOR MICHAEL P. MARLETTO, USMC					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) SCHOOL OF ADVANCED MILITARY STUDIES ATTN: ATZL-SWV FORT LEAVENWORTH, KANSAS 66027-6900 COM (913) 684-3437 AUTOVON 552-3437				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES					
12a. DISTRIBUTION/AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED				12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) SEE ATTACHED					
14. SUBJECT TERMS STRESS PSYCHOLOGICAL ASPECTS OF COMBAT DEFEAT MORAL EFFECT COMBAT MULTIPLIERS				15. NUMBER OF PAGES 59	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT UNLIMITED		

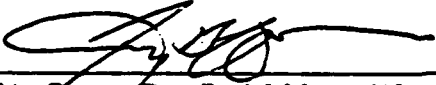
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MONOGRAPH APPROVAL

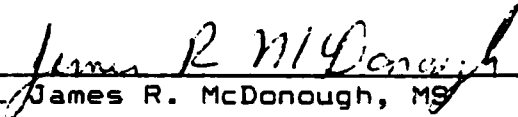
Major Michael P. Marletto

Title of Monograph: Stress Inducement: The Silent
Combat Multiplier

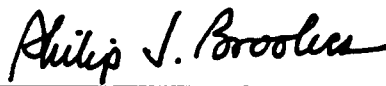
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Accepted this 81st day of December 1991

ABSTRACT

STRESS INDUCEMENT: THE SILENT COMBAT MULTIPLIER by Major Michael P. Marletto, USMC, 59 pages.

This monograph examines the ability of a commander to gain a tactical advantage by taking actions which increase enemy stress levels. The psychological dimensions of the modern battlefield are examined to determine if factors exist which can be exploited during staff planning.

The monograph explores the growth of psychological casualties which have accompanied the increased lethality of modern weaponry. The psychological impact of weapons systems, maneuver, functional dispersion, and continuous operations are examined.

The monograph concludes that actions can be taken by commanders which will hasten the moral breakdown of an enemy force. The universal conditions of stress which exist on the battlefield and effect every soldier can be magnified if the psychological aspects of fire and maneuver are considered during planning.

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INTRODUCTION

THE PHYSICAL AND MORAL DOMAINS OF WAR

War is characterized by an interaction of physical and moral forces (1). The physical characteristics of war are readily seen, understood, and measured. Weapons systems, force ratios, personnel and materiel losses, terrain lost or gained, and prisoners and materiel captured are all tangible evidence of the physical domain of war. The moral domain is less tangible. Moral forces such as fear, courage, morale, leadership, and resolve defy quantification. Despite this, moral forces exert a greater influence on the outcome of war than physical forces. Napoleon went as far as to assign the ratio of three to one for the relative importance of moral to physical force (2). The difficulty in measuring the moral aspects of war makes it tempting to ignore them. Nevertheless, any warfighting doctrine that neglects the moral factors of war ignores the greater part of the nature of war (3).

In his landmark work, On War, Carl von Clausewitz theorized that fighting is the central military act and that the object of fighting is the destruction or defeat of the enemy force. Clausewitz went on to explain that the defeat of the enemy could be accomplished by "death, injury, or any other means (4)." Clausewitz clearly recognized that means other than solely the physical destruction of battle could produce victory. The

specter of combat which yielded death and injury also induced psychological casualties among the enemy which could break the enemy's moral strength.

Clausewitz saw the loss of morale as the decisive factor in the engagement (5). Once the morale of a force was broken, the resulting loss of order and cohesion would create conditions which would make effective resistance impossible. The physical destruction that Clausewitz saw as the enduring legacy of battle followed the moral victory. The victory was not measured in solely moral or physical terms, but as a sum of both factors (6).

If we accept Clausewitz's equation of victory, the relationship of the physical and moral factors of war on today's battlefield must be determined to ensure the most efficient use of resources. Does Napoleon's three to one ratio still exist? Most contemporary theorists and operational analysts focus on the materiel destruction of the enemy at the expense of the moral aspects of war. Loss of will is often measured by the number of casualties inflicted or the amount of terrain occupied. This ignores the relationship which exists between the physical and moral factors. The physical destruction of war serves only as a means to achieve the psychological aim of making the enemy believe he is weaker and thus surrender (7).

This relationship of the moral and physical domains

makes the battlefield an environment which must be focused in human terms. While physical factors can effect the outcome of battle, only human terms can decide it. Thus, the focus must not be solely on the destruction of equipment, but on the people that operate it. Physical force creates fear in the enemy, which in turn raises his stress level. Ultimately, the enemy's will to resist is a reflection of his ability to cope with the stress of the battlefield. Moral defeat occurs when the level of stress exceeds the soldiers' ability to overcome it. Unless stress can be placed on the enemy, there is no hope of utilizing the moral aspects of war and therefore affecting his will to resist (8).

Along with affecting the enemy's will to resist, battlefield stress also affects the enemy's perception of what is occurring. The physical reality of the battlefield becomes secondary to the perception of the battlefield that exists in the enemy's mind. These perceptions, not physical reality, can determine the outcome of battle. Ideally, people maintain a balance between reality and perceptions. However, if this balance is disrupted, it becomes increasingly difficult for the human mind to cope (9). The goal of focusing and exploiting the human dimension of the battlefield lies in the mental and physical exhaustion of the enemy. This paper will answer the question, "Can stress be used

as a combat multiplier to speed the moral breakdown of an enemy tactical unit?" Assuming this occurs, the enemy's ability to effectively reason and act will be gradually lost. He will feel overwhelmed and a sort of collective paralysis can result (10). At this point, the decisive defeat envisioned by Clausewitz will be ensured.

To answer the basic question posed, i.e. can a commander take actions to speed the morale breakdown of the enemy, the phenomenon of the "empty battlefield" proposed by James Schneider, the resident theorist of the School for Advanced Military Studies, will be examined (11). It will be shown that the "empty battlefield's" factors of increased lethality, dispersion, and sequential operations produce conditions which lead to increasing amounts of battlefield stress and psychological casualties. These factors will be used as the criteria to examine their stress producing effects on the essential combat components of fire and maneuver. It will be further shown that these same factors, when properly considered during planning, can be used as a combat multiplier.

THE THEORY OF THE EMPTY BATTLEFIELD

In 1987, James J. Schneider theorized in his article "The Theory of the Empty Battlefield" that while weapons lethality had increased on the battlefield, casualty rates declined, ultimately as a result of

declining moral cohesion among fighting forces. He attempted to explain this paradox of declining relative casualties in the face of increased weapons lethality. Drawing upon the work of military historian Trevor Dupuy, Schneider showed that as weapons became more effective (App. A, Figure 1), the density of the battlefield decreased (App. A, Figure 2). Schneider theorized that while technological advances in range and accuracy of firearms had made them more lethal, there had been corresponding advances which enhanced the survivability of the individual soldier. Breech-loading rifles, smokeless gunpowder, and magazine-fed weapons are all examples of the technological innovations that allowed soldiers to maintain the rates of fire of massed formations while dispersed in protected firing positions (12).

While dispersion increased survivability, it also lessened the moral support inherently available to the individual soldier in a massed formation by reducing the physical proximity of individual soldiers to one another. Schneider postulated that without this group support, soldiers were unable to sustain themselves psychologically and pursue a fight to its ultimate conclusion. Thus, units would reach moral culmination prior to experiencing the physical attrition previously associated with defeat (13).

As a result of the inability to gain victory

through sheer physical attrition in a single engagement, 19th century commanders sought to string together successive engagements to inflict enough physical damage upon the enemy to break his moral will and thereby force his capitulation. Therefore, while the daily casualty rates of armies have continued to shrink, the number, intensity, and duration of battles has led to the large total casualty counts of modern war.

SIGNIFICANCE OF THE STUDY

If Schneider's theory of declining casualties is accepted, then the relative importance of the moral aspects of warfare must be thoroughly examined. If victory is the sum of physical and moral strength as Clausewitz postulates, then a decrease in physical force must be accompanied by an equal increase in moral strength to maintain the sum, victory. This paper will show that this phenomenon has in fact taken place, and today's tactical commander must be cognizant of this new way of viewing combat.

THE PSYCHOLOGY OF THE BATTLEFIELD

Before focusing on the influence of the "empty battlefield" on combat stress, we need to examine the psychological aspects of combat as they relate to human performance. To do this, the phenomenon and history of combat reactions will be discussed before moving on to the specific conditions of mental pressure which exist on the "empty battlefield."

COMBAT STRESS REACTIONS

Simply stated, stress is the body's response to a demand. Any event or situation which produces an emotional or physical demand or threat to the body can create stress. Emotional threats may be fear, conflict, or pressure. Physical threats, on the other hand, can be caused by the environment, disease, or injury (14).

The amount of stress produced within an individual is the direct result of the individual's perception of a given threat. An external event which an individual perceives as threatening produces stress, regardless of the actual threat the event represents. Thus, while the appearance of an aircraft may not in itself be stressful, it may produce a stressful reaction in a soldier who is anxious about air attack (15).

Combat stress is the sum of internal stress reactions to battlefield conditions experienced by a soldier. Collectively they result in reduced performance. Combat stress reactions also produce observable reactions of soldiers to the stress of combat. In fact, combat stress reactions become the visible means of measuring the internal stress at work on the individual soldier (16). Severe combat stress reactions have been known to render a soldier completely combat ineffective despite the absence of any physical injuries.

Without some type of release or relief, sustained combat stress will eventually produce psychiatric casualties through battle fatigue/exhaustion. In addition to producing psychiatric casualties, stress also impairs the combat performance of functioning soldiers which in turn leads to ineffective unit performance. Stress produces inadequate, inappropriate, or negligent behavior in soldiers or their leaders which contributes to soldiers becoming killed, injured, missing, or physically ill (17).

Researchers have also found a link between stress and soldier's attempts at escape from the battlefield. As stress levels are increased, the incidents of medical exits (e.g. disease, non-battle injury) from the battlefield also increase. All possible means of escaping the battlefield are stress related. For example, the incidence of malaria, frostbite, diarrhea, and other diseases is more related to the number of combat days a soldier is exposed to than the amount of overall time he spends in the field (18).

Regardless of the source or inducement, stress responses follow a three stage sequence (19). The first stage is the alarm reaction, which lasts seconds to hours depending on the situation. During this stage, the body prepares for danger and extreme physical activity. Physical activities may be done very well, but fine motor coordination and judgement are likely to

be impaired. During this stage the individual makes the choice to "fight or flight."

The alarm reaction is followed by the resistance stage. In this stage psychological defenses are mobilized by the body to control fear and arousal. Performance usually remains normal and may even increase.

The final phase is the exhaustion stage. During this stage the body and mind fight a losing battle to conquer continuous or high stress. The physical and psychological resistance of the body and the mind is consumed faster than it can be replenished. Alarm and arousal return and performance becomes highly erratic or in extreme cases shuts down completely.

While each soldier has a different reaction to the stress of combat, ranging from panic and flight to heroism, the simple fact remains that every soldier is exposed to it. This fact makes stress the only universal weapon on the battlefield. Soldiers can entrench to protect themselves from direct fire weapons, seek overhead cover for protection from artillery fragmentation, and camouflage themselves to protect themselves from enemy observation. Today's sophisticated technology even offers thermal decoys to confuse hi-tech thermal sights. Yet despite these advances, no protection has been found to completely shield all soldiers from the moral effects of combat.

What are the tactical ramifications of the universal impact of stress and can it be exploited? It appears that the commander who can best safeguard his own forces from stress, while at the same time taking steps to increase its effects on the enemy, will gain a significant tactical advantage. The methods which commanders can use to defend against the effects of stress are well documented. Later sections of this paper will deal with the steps commanders can take to increase stress on the enemy.

HISTORICAL OVERVIEW

The idea that men can be mentally as well as physically wounded during combat is not new. In ancient Greece it was not uncommon for members of the phalanx to become disoriented by the shock of close combat to such a degree that they lost their senses and hallucinated (20). During the Seven Years War, a Prussian officer described how during the 1758 battle of Zorndorf Russian artillerymen "crouched under their pieces and let themselves be massacred." A British battery commander at Waterloo described men who "fled not bodily to be sure, but spiritually, because their senses seem to have left them." (21) The Sino-Japanese War of 1894-95 produced reports of "traumatic delirium" among wounded Japanese troops from the concussion of large shells. Early in this century, a British surgeon speculated that artillery fire might be responsible for the mental

disorientation found in some Boer War patients. Despite the gathering body of evidence indicating the existence of powerful psychological factors at work on the battlefield, it made little impression on medical or military thought until a decade later (22).

The psychological consequences of battle on the human mind were brought home with dramatic effect in World War I. While the technological advances in weaponry and the resulting physical slaughter were anticipated by the Polish banker Jean Bloch and others, the corresponding mental casualties came as a surprise to all. In November 1914, Dr. Albert Wilson wrote in the "British Medical Journal" that psychologists should expect few patients during the war and the psychiatric casualties that did occur could easily be treated with alcohol (23). Events would soon prove the doctors wrong.

The ability of the warring nations to deliver unprecedented quantities of shell fire quickly took its toll on the minds of frontline soldiers. In the first year of the war, more shells were fired at the Battle of Neuve-Chapelle alone than were fired during the entire Boer War (24). The results of these intense artillery bombardments produced what has been termed as a "mass epidemic of mental disorders" among front line soldiers (25). During the first year of the war, the British army reported nineteen hundred cases of nervous

breakdown. In 1915, this number had grown to twenty thousand or nine percent of total battle casualties. By wars end, over eighty thousand frontline troops had been treated for various mental disorders (26).

Initially, the medical profession labeled these psychological reactions "shell shock." They attributed the cause of these stress casualties to the concussion and gases of high explosive artillery shells. It soon became apparent that this diagnosis alone could not adequately explain the phenomenon which was occurring. Medical circles realized that the problem required a more complex explanation. As medical research intensified, valuable insights were gained on the magnitude of the problem, its diagnosis, and treatment. Doctors now concentrated on diagnosing the psychological effects of the battlefield in more conventional terms, such as neurosis (27). More aware of stress effects than their World War I predecessors, continuing post-war studies led 1938 British planners to expect the next war to produce three mental for every physical casualty (28). But what of the American experience in World War I?

As a result of its late entry into the war, America had not suffered as many immediate (vice post-traumatic) psychiatric casualties as the British. Unfortunately, by the outbreak of World War II most of what the British had learned from World War I was forgotten or ignored by

American authorities. American medical officials believed that psychiatric casualties were a function of "character flaws" (e.g. those lacking moral fiber or courage) and therefore focused on screening out "mentally unfit" individuals during the induction process. As a result, 1.6 million of the 5.2 million American men screened for military duty during the first year of World War II were classified as unfit for military service for various "mental deficiencies." (29)

The fallacy that combat reactions could be defined as a factor of predetermined personality types was exploded on the battlefields of World War II. Despite the rigorous pre-induction psychological screening, psychiatric casualty rates soared. During the first year of the war, the American army lost more men to combat reactions than it could replace (30).

The dimension of the problem the Army faced was dramatically brought home at Kasserine Pass, where thirty four percent of all casualties were psychiatric. Unfortunately, the problem continued to be widespread throughout the duration of the conflict. In the South Pacific, the 43rd Infantry Division reported forty percent of its forty-four hundred casualties as resulting from psychiatric causes. The 1st Armored Division reported that psychiatric cases accounted for fifty-four percent of its casualties during one forty four day period of fighting along the Gothic Line in

Italy. On Okinawa, the 6th Marine Division reported over twelve hundred psychiatric casualties (forty eight percent) during one ten day period of battle. By war's end, approximately twenty-three percent of all casualties were determined to have been the result of psychiatric causes (31).

Studies after both World Wars I and II reached similar conclusions about the cumulative effect of combat on the human mind. The inescapable reality of battle was that given time, ninety eight percent of all soldiers would become victims of the stress of combat (32). These studies focused on combat exposure as a function of time "in line" vice "under fire."

World War I researchers had believed that soldiers reached peak efficiency after three months of combat. After three months a rapid decline in efficiency began. After six months most soldiers were mentally incapable of continuing combat (33).

After World War II, American researchers postulated that a soldier reached maximum battlefield efficiency after approximately twenty-one days of combat and then began to decline in efficiency until a vegetative state was reached after sixty days (34). In contrast, the British estimated that a rifleman could last for about four hundred days in combat. The longer period of combat efficiency for British soldiers was the result of a more liberal rotation policy which relieved frontline

troops for a four day rest after twelve days in action. American troops, meanwhile, were generally kept in the line twenty to thirty days, and on occasion as long as eighty days (35).

The Korean and Vietnam Wars failed to produce significant numbers of immediate psychiatric casualties for two reasons. First, medical authorities had benefited from the lessons of World War II and were better prepared to handle psychiatric casualties. Secondly, both wars were also relatively less intense (in terms of conventional combat) than World War II and soldiers benefited from shorter combat tours (36).

The body of knowledge produced from World War II studies remained the foundation of psychiatric diagnosis until the events of the 1973 Yom Kippur War caused a re-evaluation of existing ideas. During the 1973 War, the Israelis encountered significant numbers of psychiatric casualties for the first time, after three wars in less than two decades. Twenty three percent of Israel's 1973 War casualties were reported to be from psychiatric causes (37).

The significance of the Israeli experience is found in the large number of psychiatric casualties encountered in the first two days of combat. Sixty percent of the Israeli's first fifteen hundred casualties were found to be suffering from purely psychiatric trauma (i.e. no physical injuries). When

the Israelis attempted to analyze the factors which caused their numerous psychiatric casualties during the Yom Kippur War, they determined that the primary cause of stress casualties was the intensity of combat vice its duration. When they plotted the incidence of psychiatric casualties against the intensity of combat, they discovered that battle stress casualties were highest during the first hours and days of the war. Following this early surge, stress casualties dropped off until about two weeks later when the Israelis conducted their crossing of the Suez Canal (38). Clearly, the classic pattern of combat exhaustion following thirty days of combat did not apply. Since soldiers had not been in combat long enough to have reached combat exhaustion, the term combat reaction was coined to describe their condition (39).

Alarmed by the number of psychiatric casualties it had suffered, the Israeli Defense Forces (IDF) and Israel's medical community took vigorous actions to study the causes of battle stress reactions and develop measures to prevent and treat it. As a result of this effort, the Israelis developed an integrated system of prevention and treatment which was put to the test in Lebanon during the 1982 invasion. Despite conditions which appeared favorable to the Israelis (thorough preparation, a one front war with only a portion of the IDF engaged), the IDF still suffered over an eighteen

percent psychiatric casualty ratio (40).

Although the psychiatric casualty rate for the IDF was lower in 1982 than 1973, the significant number of casualties suffered in light of the extensive preventive preparations raised new debates in the medical community. On one hand, it was argued that the extensive education and anticipation of great numbers of stress casualties led to the tendency to overdiagnose cases of combat stress reaction. Although no empirical evidence supports it, it was suggested that an institutional acceptance of the problem of battlefield stress had led to the classification of normal anxiety reactions as psychiatric casualties. The opposing view held that the unexpectedly high psychiatric casualty rates were a response to the increasing mental demands of the modern battlefield (41).

So what conclusions can be drawn from this historical analysis? First, psychiatric casualties have and will continue to be an inseparable part of warfare. Despite the recognition of the problem in both the military and medical communities, the rates of soldiers evacuated from the battlefield as a result of the mental stress of combat have not significantly declined. Awareness, prevention, and treatment efforts have only been successful in returning psychological casualties to units after treatment. They have not succeeded in significantly decreasing the immediate effects of

stress. While the phenomenon of the "empty battlefield" has succeeded in lowering physical casualties, the incidence of psychological casualties continues to rise (App. A, Figure 3). The rate of psychological breakdown has been found to be linked to the intensity of combat, not mere duration. The evidence of increased psychiatric casualties rates at the outset of modern combat demonstrated during the 1973 Yom Kippur War may suggest that technological advances in battlefield lethality may be at the point predicted by Ardant du Picq, where man's reserve of courage is used up in minutes (42).

THE IMPACT OF THE EMPTY BATTLEFIELD ON COMBAT STRESS

Combat stress has been found to be caused by varying combinations of threats to personal safety (both real and perceived): fear of failure; the horrible sights and experiences encountered on the battlefield; intense grief, rage, and guilt; and cumulative physical fatigue, sleep loss, and discomfort (43). Of these factors, World War II studies have consistently identified raw fear (i.e. threats to personal safety) as the critical ingredient in the psychological breakdown of soldiers on the battlefield. The danger of being killed or maimed may impose a strain so great that it causes men to break down (44). Despite the attempts to mitigate against the dangers of modern battle by dispersion, the increased lethality of weapons on the

"empty battlefield" has been the chief cause in the increase of stress related casualties.

In addition to the fear of death, pain, injury, and mutilation, there is also the anxiety of becoming fearful to the point of being totally unable to function (i.e. battle paralysis). The soldier is thus in conflict. Fear of death and injury promote flight, while fear of losing face among his peer group prompts standing in place (45). It is through this relationship that, despite the group dynamics present on the battlefield, war is ultimately reduced to an individual struggle (46).

PSYCHOLOGICAL DIMENSIONS OF FIRE/WEAPONS

Current U.S. doctrine clearly focuses on the materiel effect which weapons systems can produce on the battlefield. FM 6-20, Fire Support in the Airland Battle, classifies fire support sources as either lethal or nonlethal. Lethal effects are described as either destruction, neutralization, or suppression. Destruction is defined as fires which permanently put a target out of action. Neutralization fires are also defined as producing a materiel effect, but the target is only put out of action temporarily. Suppressive fires are designed to limit the ability of enemy personnel in the target area from performing their jobs. Suppressive fires are also described as causing confusion and apprehension in the enemy. The effects of

suppressive fire effects, however, are seen as producing effects only as long as the fires continue (47).

These definitions raise several questions in light of the evidence of significant casualties resulting from psychological factors. First, what, if any, moral effect is produced by destruction or neutralization fires? Second, do certain weapons or munitions produce a greater moral effect than others? Finally, how great and how long lasting are any moral effects produced by fires? This section will attempt to answer these questions by surveying historical data on the psychological effects of weaponry.

One of the earliest attempts to measure the psychological effect of weapons systems was conducted by John Dollard in his study of fear and courage among veterans of the Spanish Civil War's Abraham Lincoln Brigade. Dollard found that men's fear of enemy weapons did not necessarily correspond to their lethality. His subjects rated bomb shrapnel the most fearful, followed in order by trench mortars, artillery shells, bayonet and knife, expanding bullets, and grenades. The least feared weapons were machine guns, bullets, and tanks. Dollard postulated that weapons may produce fear because they are common and dangerous (e.g. artillery) or because it raises an irrational fear (e.g. aerial bombing). The failure of high casualty producing weapons, such as the machine gun, to produce a strong

fear reaction was explained by the postulation that its commonality on the battlefield made soldiers both familiar and capable of coping with it (48).

A study of American soldiers during World War II confirmed the belief that a weapon's psychological effect was not necessarily a reflection of its lethality. Researchers found that soldiers reported artillery (e.g., 88mm gun), dive bombers, mortars, horizontal bombers, and light machine guns as the most frightening weapons on the battlefield (49).

When asked to describe the factors which caused these particular weapons to be frightening, soldiers responses demonstrated both a lethal and moral appreciation of weapons effect. Artillery, mortars, and the light machine gun were feared because of their casualty producing (i.e. lethal) effect. Characteristics listed as making these weapons frightening included: accuracy, surprise, and rapid rates of fire (50).

The dive and horizontal bombers were reported as being frightening for the psychological effect they produced. The characteristics associated with these weapons included the "siren" and "terrible shrieking noise" of the dive bomber, and the feeling of helplessness which the horizontal bomber produced (51). Thus, of all the weapons factors mentioned as producing stress, noise is the only non-lethal effect. During

World War II, the Germans attempted to capitalize on the psychological effects of noise by adding a siren which produced a howling screech to the JU-87 Stuka dive bomber. This noise terrified British and French troops during the early stages of the war (52). Similarly, the screaming noise of German and Soviet multiple rocket launchers contributed toward making them some of the most terrifying weapons of the war.

Further study revealed that as troops became more experienced, their fears of particular weapons corresponded more closely with the weapon's real striking power versus psychological effect. Thus, prior to combat, inexperienced troops reported air attack as over twice as frightening as artillery attack. Once exposed to combat, however, this belief quickly changed. In fact, after approximately five days in combat, artillery was rated just as frightening as air attack. After approximately ten days in combat, the attitudes became reversed and artillery was rated twice as frightening as air attacks (52).

A British study which examined these results concluded that the long term moral effect of a weapon depends on its lethality. They concluded that it is possible for a newly introduced weapon to have a short "vogue" period during which it has an over-rated morale effect in relationship to its actual casualty producing capability (53). Thus, the Stuka dive bomber with its

screaming dive was considered extremely terrifying early in World War II despite the fact that it was slow moving, poorly armored, and carried a small bomb load. As the war progressed, the Stuka quickly lost its moral effect as its vulnerabilities and lack of relative lethality were recognized (54).

In addition to finding a correlation between the actual lethality of a weapon and its psychological effect, researchers have found that a weapon's accuracy also effects the amount of stress it produces. A study of 115 World War II patients diagnosed as suffering from blast concussion showed that 105 were suffering from acute anxiety due to exposure to a nearby explosion (55). One of the factors contributing to the 28th Infantry division's collapse during the November 1944 battle for Schmidt is thought to have been extremely accurate German artillery fire. These fires fell so close to individual foxholes of the defenders of the town of Vossenack, that the soldiers broke as a result of their belief that the enemy was attacking them personally (56). This relatively common phenomenon destroys the cohesion between the individual soldier and his peers by placing him in a position where he must make an individual decision, fight or flight. At Vossenack, the only means available for the individual soldier to alter the circumstances of the engagement was to flee (57).

In attempt to measure human reactions to fragmentation, a study was conducted to determine how much psychological effect was gained from a bombardment intended to neutralize a target. This study indicates that soldiers will be suppressed (i.e. unable to perform their mission) by rounds which impact within a distance of the rounds lethal area plus roughly forty percent (58). By applying this figure to standard 155mm and 8 inch high explosive ammunition, the expected suppression radius for a single round would be 70 and 112 meters respectively.

Another factor which effects the amount of psychological effect a weapon produces is the volume of fire placed on a target. After World War II, British researchers found that effects were produced on a target in the following order: suppression, moral, lethal, and materiel (59). In studying the moral effect of artillery bombardment, they concluded that approximately 0.1 pounds of artillery fire per square yard for four hours on an open position would cause an enemy unit to collapse from the psychological effect of the fire. By increasing the intensity of fire to 1.0 pounds per square yard, a morale collapse could be produced in fifteen minutes (60). An example of this principle was the artillery barrage fired on 23 March 1945 to support the crossing of the Rhine at Wesel. The German troops under the barrage surrendered without resistance

and were described as "whimpering" and "glad to be out of it." (61) Using the British figures, Figure 4 (App. A) indicates the volume of fire required from current U.S. artillery systems to achieve comparable results.

Soviet research has reached similar conclusions on the importance of the weight of fire versus duration. Soviet firing procedures in World War II emphasized the importance of shortening artillery preparations while increasing the density and number of rounds in the target area (62).

While larger weapons systems can put a correspondingly heavier weight of fire on a target, the amount of moral effect achieved is more by the amount of explosions in a target area than the weight of each projectile. Researchers found that captured German prisoners feared shelling by 40mm shells as much as by light and medium artillery (63). This finding appears to have been confirmed by psychological reactions to Improved Conventional Munitions (ICM) during both the Vietnam War and Operation Desert Storm. The 155mm and 8 inch anti-personnel/anti-materiel ICM rounds contain 88 and 180 submunition bomblets respectively. The Multiple Launch Rocket System (MLRS) can deliver 688 bomblets in each rocket. In Vietnam, prisoner interrogations conducted by the II Field Force Artillery and the 173rd Airborne Brigade indicated that North Vietnamese

soldiers feared ICM rounds more than any other (64). Likewise, reports from Operation Desert Storm indicate that the Iraqi's fear of the MLRS rocket earned it the title "steel rain." (65)

While U.S. doctrine considers suppressive effect to only last as long as fire continues on a target, the Soviets have recognized that a period of time will be required after a bombardment for a soldier to assess the situation and make combat decisions. Soviet attempts at quantifying the recovery time from the suppressive effects of fire have determined that the earliest expected recovery time for soldiers located in protective shelters five to ten meters from their fighting positions are: 0.75 minutes for an automatic rifleman, 1.0 - 1.2 minutes for an ATGM crew, and 2 - 3 minutes for a dug-in tank (66).

Soviet writers place great emphasis on the fact that the moral effect of an artillery barrage outweighs the materiel effect achieved. The effectiveness of an artillery preparation is measured, not on the amount of personnel and weapons systems destroyed but on the fact that the uninjured men in the defense lose their combat capability for a time and their weapons are therefore not in action. The Soviets seek to exploit this fact by carefully timing their preparatory fires with their rates of advance. Ideally, attacking forces will bring a defensive position under direct fire prior to the

defenders recovering from the morale effects of the preparation (67). This transfer of fires from the artillery to the attacker's direct fire weapons is termed "fire relay." (68)

In summary, the morale effect produced by a given weapon appears dependent on the following factors: its lethality, accuracy, rate of fire, and the noise it produces. Of these factors, the actual capability of a weapon to produce casualties (i.e. lethality) is most significant. A weapon may enjoy a vogue period where its psychological effect is greater than its actual lethality warrants. Accurately placed fires will produce a stress reaction in all personnel in the vicinity of the fires. While the moral effect produced will vary, for a given period of time all personnel will be unable to perform their duties. This implication is even more significant on today's hi-tech battlefield. Since cognitive functions suffer most under stress, it stands to reason that a soldier's ability to operate advanced high technology equipment (e.g. a digital communications terminal) will be degraded more than his ability to perform more mundane physical tasks such as operating a weapon.

The implications of the moral effect gained by the increased lethality of the "empty battlefield" can be exploited by the commander who focuses his planning on the stress producing characteristics of his weapons

systems. The technological advances in target acquisition and weapons lethality have progressed to the point where individual positions can be targeted and attacked with high volumes of destructive fire. Apart from the obvious physical damage which is produced, the moral effects of modern high technology weaponry has been significantly increased. Today, a commander may be able to produce a systematic moral breakdown of the enemy by attacking individual positions with precision guided munitions. Each battle may become a modern day Vossenack, where the enemy soldier feels he has been individually targeted for destruction.

The commander can take further advantage of the moral effect of fires by carefully timing fires with his scheme of maneuver. The accuracy and high volume of fire that modern weapons systems can deliver on a target will produce a temporary paralysis of enemy soldiers on and in close vicinity to the target area. By adopting the Soviet concept of the "fire relay," commanders can ensure that their forces close to direct fire engagement range while the enemy is still suffering the moral effects of the supporting or preparatory fires.

EFFECTS OF REDUCED CASUALTY RATES

Having looked at the moral effect of the essential combat component of fire, I will now turn to the moral element provided by its counterpart, maneuver. Today's operational research analysts tend to use the

destruction of the enemy force as the framework for analyzing combat. As a result, theories of combat tend to explain the casualty producing process (69). The measure of victory on the battlefield is often measured in the number of casualties (both friendly and enemy). The "empty battlefield" theory has demonstrated however, that casualty rates are decreasing. In light of this trend, the question must be asked, "Is the number of casualties inflicted on the enemy in fact the primary factor in defeating him?" This section will attempt to examine the relationship of casualties and maneuver to defeat.

A study of eighty defeats between 1941 and 1982 attempted to determine the factors that made a commander concede defeat. As part of the study, a survey was conducted among field grade combat arms officers to determine how many casualties a unit could accept before its commander felt it had been defeated. The survey results indicated that they felt a unit would recognize defeat when it had received fifty percent casualties. The analysis of actual battle casualties indicated the average attack was recognized as a failure when casualties had reached less than four percent of the attacking force. In the defense, the defense was abandoned at a median casualty total of less than eight percent of the defending force (70).

In addition to total casualties, casualty exchange

ratios (i.e. attacker to defender losses), casualty rates (i.e. percent casualties per hour), and final force ratios were examined. After examining all these factors, the study concluded that there was no significant relationship between the number of battle casualties and defeat. In fact, battles have been lost or won when casualties ranged from insignificant to overwhelming (71).

Since casualties did not appear to be the measure of defeat, an attempt was made to isolate what was. The most likely cause was identified in 52 of the 80 cases (Ann. A, Figure 5). The results indicated that principal condition associated with defeat in sixty-four percent of the cases was the use of maneuver (72). Firepower accounted for another twelve percent and the final twenty four percent were attributed to other reasons (e.g. no reserves left, truce or surrender, supply shortages, etc.).

The eighteenth century military adventurer, Maurice de Saxe was one of the first theorists to speculate on the moral effect of maneuver. Saxe advanced the theory that a sudden attack from an unexpected direction would cause a moral breakdown of the enemy (73).

Similarly, Saxe wrote of the advantage to be gained by controlling the expectations of soldiers on the battlefield. In the defense, he believed that if a commander placed all his troops in forward positions and

the positions were penetrated, a route would ensue because the expectation was to hold forward. The attacker thus gained moral ascendancy over the defender. The defender could reverse this situation by maintaining a force to the rear for a counterattack. The counterattack force was told that the enemy would be allowed to penetrate prior to launching their own attack. Since the penetration was expected, the moral advantage normally gained by the attacker was neutralized. The counterattack would then achieve moral ascendancy over the attacker since it would be launched at the moment the attacker believed victory was in his grasp (74).

Conventional thinking prescribes an enveloping maneuver as a means of the attacker gaining an advantage over the defender by causing him to fight in a direction from which he is less prepared. Coming from this unexpected direction, the enemies full fighting power cannot be brought to bear due to improper weapon and obstacle orientation (75). The effectiveness of the envelopment may in fact be the result of moral forces. The impact of maneuver on the enemy may be based on his mental apprehension of what may happen next and not what is happening to him now. The fear of what may happen creates a unbearable mental pressure on the defender to reposition, reorient, or run (76).

In the article titled, "Moral Disruption by

Maneuver," Captain Kevin B. Smith proposed the theory that this reaction was the result of units in linear battle establishing a sensitive unit boundary around their positions. If approached from an expected direction, the sensitivity of the boundary is low because the attack from that direction is expected. If approached from an unexpected direction (e.g. flank or rear), the unit becomes more sensitive to the enemy's movement and the actions of adjacent units (77).

Smith named the sensitive boundary the Unit Moral Envelope (UME). The size of the UME is not fixed, for a unit's morale and physical state will impact on its size. Thus, a unit's UME will fluctuate over time (78).

The process of moral disruption by maneuver is caused by doubt, fear, or crowd psychology. It is not a function of weapons or material effect. This maneuver induced disruption process flows through several steps. First, an undisclosed movement by an attacker on the enemy's rear or flank causes an unexpected appearance of a poorly defined enemy in the defenders UME. This incursion into the UME forces the defender to take action. Normally, the unit will move away from the enemy and toward a more secure location where it can attempt to restore its UME. In a majority of cases, the unit will move towards its lines of communication because this is seen as the most secure area.

As the defender moves, the attacker seeks to

exploit the situation by the application (or threat) of force sufficient to cause the first defenders to break or run. This may be accomplished by artillery, smoke, jamming, multiple routes, or a rapid surge of direct fire. Following the detection of the initial disintegration, the attacker seeks to "push" the fleeing defenders with a continual threat to generate mob action. A continued pursuit is necessary to prevent the defender from reaching a position of perceived safety where it can reestablish its UME. Finally, the pursuit must be sustained to a decision prior to the attacker reaching his culminating point (79).

Smith caveats his theory with the following points. Moral disruption by maneuver requires some degree of surprise and will be most successful on inexperienced enemy forces trained in linear tactics. Additionally, during a meeting engagement, both forces may end up violating the others UME. The unit with the larger (i.e. weaker) UME will usually break first. In this case, disruption may be so successful that large numbers of prisoners may impede the attacking force. Finally, due to the inherent complexity of modern war, many operations hover on the brink of disruption without any enemy interference (80).

The idea that maneuver can produce a moral effect on the enemy is not new. Napoleon was a practitioner of the concept with his famous "manoeuvre sur les

derrieres." Through this maneuver, he sought to gain a position along the enemy's line of communication in order to cut off their lines of retreat and demoralize him (81). During the Jena Campaign, Napoleon wrote of how the Prussian commander had "lost his head" when his lines to Berlin and Dresden were cut (82). More recently, the moral effect of maneuver was demonstrated when Grenadian forces surrendered to U.S. Marines without a fight during Operation Urgent Fury. When the Marines suddenly attacked from unexpected directions, the Grenadians were paralyzed. In the words of their operations officer, "You appeared so swiftly and in so many places where we didn't expect you that it was clear that resistance was hopeless, so I recommended to my superiors that we lay down our arms and go into hiding." (83) In summary, a surprise maneuver from an unexpected direction or against the enemy's lines of communication or retreat has historically produced a moral advantage for the attacker.

The decline in casualty rates on the "empty battlefield" suggests that today's commander must look to means other than attrition to gain a tactical victory. Despite the emphasis by operational analysts on measuring defeat in terms of casualties inflicted, the moral effect of maneuver produces the majority of tactical decisions. When choosing his form of maneuver, a commander can maximize the stress he places on the

enemy by executing the form which will produce the greatest surprise. This can be accomplished by an attack from the least likely direction, or a maneuver that threatens the enemy's lines of retreat and communications.

PSYCHOLOGICAL EFFECTS OF DISPERSION

As brought out earlier, the increased lethality of weapons has forced soldiers to disperse on the battlefield in order to survive. The effects of dispersion and the corresponding need for increased moral cohesion among dispersed troops to compensate for its negative effects has long been a concern to commanders. Schneider described how the difficulty in maintaining moral cohesion had effected an army's ability to face the lethal effects of the "empty battlefield". Consequently, the focus of Army leadership has been toward the development of cohesive fighting units on the battlefield. Studies, such as Colonel William Henderson's Cohesion and S.L.A. Marshall's Men Against Fire, have focused on how to best create and maintain cohesive units (84).

Despite these efforts, the dispersion of battlefield functions on the "empty battlefield" has produced conditions which can be exploited by commanders. The increase in size and complexity of modern armies has created a multitude of specialized logistics and maintenance troops to support the

frontline soldier. The movement of these support functions/roles out of direct contact with the enemy has created new opportunities for psychological attack. Israeli studies of the 1973 War found that the incidence of psychiatric casualties varied in correlation with a soldier's role on the battlefield. Combat reactions were highest among the armored units which had bore the brunt of the intense fighting. Following armor units, artillery and infantry formations suffered the highest incidence of stress casualties. Experiencing the least combat, combat service support units suffered the lowest number of psychiatric casualties (85).

When these casualty figures are examined in relative terms (App. A, Figure 6), it becomes apparent that the combat support and combat service support suffered a disproportionately higher percentage of psychiatric casualties. While suffering only ten and a half percent of the physical casualties, support forces accounted for thirty percent of the psychological casualties. This indicates that those least likely to be exposed to combat are the most likely to be effected by its stress (86).

The vulnerability of support troops to the pressure of combat can be utilized offensively on enemy support forces to increase their stress levels. The "empty battlefield" has been dispersed in function as well as

in area. High technology weaponry has created a demand for support troops to supply and maintain frontline combat forces. These support forces are highly vulnerable to the psychological effects of modern weaponry. By directing an attack (by fire, maneuver, or special operating forces) against these "psychologically soft" targets, a commander can gain a greater moral effect for his effort than directing the same amount of effort at frontline forces.

PSYCHOLOGICAL EFFECTS OF CONTINUOUS OPERATIONS

As previously discussed, in concert with other factors the decline in casualty rates as a result of the "empty battlefield" has made it necessary for commanders to conduct sequential operations to achieve victory. As a result of this and contemporary technological advances which permit effective observation and movement at night, in poor weather, and in periods of low visibility, soldiers must be prepared to conduct continuous combat operations at high intensity levels for extended periods. A soldier's ability to effectively function in this environment will be dependant on obtaining sufficient sleep.

Sleep loss is one of the most significant sources of stress and is a primary contributor to performance impairment (87). The main effect of sleep deprivation is psychological rather than physiological. During prolonged periods of sleep deprivation, mental ability

and mood deteriorate even though physical fitness does not. Mental tasks which are difficult or require concentration deteriorate the most when sleep is deprived. As with the effects of fire (see page 27), complex mental tasks, such as operating sophisticated communications equipment and a leaders decision making ability, will be among the first functions effected. Simple, well-learned tasks such as weapons handling, however, suffer little (88). But how long can soldiers go without sleep before they exhibit characteristics of fatigue?

Soldiers deprived of sleep show a reduced efficiency after twenty-four hours. Forty-eight hours without sleep severely restricts efficiency. After seventy-two hours, soldiers become militarily ineffective and may suffer from hallucinations. Nevertheless, by ensuring that soldiers sleep four hours per day, commanders can ensure their people will remain operational for nine to fourteen days, albeit, with a reduced efficiency (89). The lack of sleep, therefore, can be a stress inducing weapon.

Any actions that a commander can take to deprive enemy forces of sleep will seriously degrade their long term effectiveness. In order to be deprived rest, the enemy must be given no respite. The enemy must be presented a continual threat which demands vigilance. Continuous offensive action, raids, aggressive

patrolling, noise makers, snipers, and harassing fires can all be used to rob the enemy of sleep. An enemy deprived of sleep may suffer little in his ability to operate his weapons systems (unless they contain high technology equipment such as radar), but his ability to make rapid and correct tactical decisions will be seriously degraded. Once the enemy's "sleep debt" has been pushed to the point where performance is degraded and his reactions slow, his reduced effectiveness can be exploited by fire and maneuver.

CONCLUSIONS

James Schneider's theory of the "empty battlefield" is characterized by the conditions of intense lethality, dispersion, and sequential operations. While these conditions have resulted in decreasing physical casualty rates, they have created an increase in psychological casualties. An examination of each of these conditions indicates that opportunities exist for a commander to take actions directed at increasing the battlefield stress levels of opposing forces in order to hasten their moral breakdown. The universal conditions of stress which exist on the battlefield and effect every soldier can be magnified if the psychological implications of fire and maneuver are considered during planning.

A historical analysis of the psychological conditions of the battlefield has shown that psychiatric

casualties have and will continue to be an inseparable part of warfare. Despite the recognition of the problem in both the military and medical communities, the rates of soldiers evacuated from the battlefield as a result of the mental stress of combat has continued to grow. Awareness, prevention, and treatment efforts have only been successful in returning psychological casualties to units after treatment, not preventing them.

This high rate of psychological breakdown has been found to be linked to the intensity of combat, not mere duration. The 1973 Yom Kippur War produced evidence of increased psychiatric casualties rates at the outset of modern combat. This suggests that technological advances in battlefield lethality may have reached the point predicted by Ardant du Picq where, man's reserve of courage is used up in minutes.

This same modern weapon's technology has been shown to produce a morale effect based on the following factors: lethality, accuracy, rate of fire, and the sheer noise of modern battle. Of these factors, the actual capability of a weapon to produce casualties (i.e. lethality) is most significant. A weapon may enjoy a vogue period where its psychological effect is greater than its actual lethality warrants, but long term morale effect is based on the its ability to inflict physical damage. In addition to lethality, weapons accuracy has been shown to be a factor in stress

inducement.

Accurately placed fires will produce a stress reaction in all personnel in the immediate vicinity of the fires. While the moral effect produced will vary, for a given period of time all personnel will be unable to perform their duties. This implication is even more significant on today's hi-tech battlefield, where sophisticated equipment demands increased cognitive skills. Since these cognitive functions have been shown to suffer most under stress, it stands to reason that a soldier's ability to operate advanced high technology equipment will be degraded more than his ability to perform more mundane physical tasks such as operating a simple weapon.

The implications of the moral effect gained by the increased lethality of the "empty battlefield" can be exploited by the commander who focuses his planning on the stress producing characteristics of his weapons systems. The technological advances in target acquisition and weapons lethality have progressed to the point where individual positions can be targeted and attacked with high volumes of destructive fire. Apart from the obvious physical damage which is produced, the moral effects of modern high technology weaponry has been significantly increased. Today, a commander may be able to produce a systematic moral breakdown of the enemy by attacking individual positions with precision

guided munitions. This action can create a situation where the enemy soldier feels he has been individually targeted for destruction and therefore forces him to make a "fight or flight" decision. Commonly, the soldier will choose the flight option, if he thinks that he is helpless to stop the fires.

In addition to capitalizing on the moral effects of fire, a commander can gain a moral advantage by complementing his fires with maneuver. This decline in casualty rates on the "empty battlefield" suggests that today's commander must look to means other than attrition to gain a tactical victory. Despite the emphasis by operational analysts on measuring defeat in terms of casualties inflicted, the moral effect of maneuver produces the majority of tactical decisions. When choosing his form of maneuver, a commander can maximize the stress he places on the enemy by executing the form which will produce the greatest surprise. This can be accomplished by an attack from the unlikeliest direction, or a maneuver that threatens the enemy's lines of retreat and communications.

Further more, the "empty battlefield" has resulted in a functional dispersion of the battlefield which can be morally exploited. Support troops have been shown to be more vulnerable to the pressures of combat than combat arms personnel. This can be utilized offensively by focusing stress inducing fires and maneuvers on enemy

support forces to hasten their psychological breakdown.

The functional dispersion of the "empty battlefield" has also been accompanied by a temporal expansion. The requirement for sequential operations to defeat the enemy, when combined with high technology, has produced a requirement for the ability to conduct continuous operations. This requirement has placed additional stress on soldiers by disrupting their normal sleep cycles. Sleep loss has been shown to be a primary source of stress. Any actions that a commander can take to deprive enemy forces of sleep will seriously degrade their long term effectiveness. Continuous offensive action, raids, aggressive patrolling, noise makers, snipers, and harassing fires can all be used to deprive the enemy of sleep. An enemy robbed of sleep will react in much the same manner as when he is under heavy fire. His ability to make rapid, correct tactical decisions and operate sophisticated weaponry will be seriously degraded. Once the enemy's "sleep debt" has been pushed to the point where performance is degraded and his reactions slowed, his reduced effectiveness can be exploited by fire and maneuver.

Despite the opportunities available for the inducement of stress on the battlefield, a commander must never lose sight of the fact that the moral and physical domains of combat are inseparably linked. Moral effect is only gained through the use, or threat

of use, of physical force. Over emphasis on the moral aspects of war can lead to the carnages of World War I. Conversely, ignorance of the moral ramifications of physical force can lead to a needless waste of men and materiel in attempts to inflict excessive physical destruction on a morally defeated enemy. Commanders are best served by remembering Clausewitz's simple equation of victory being the sum of physical and moral forces.

APPENDIX A

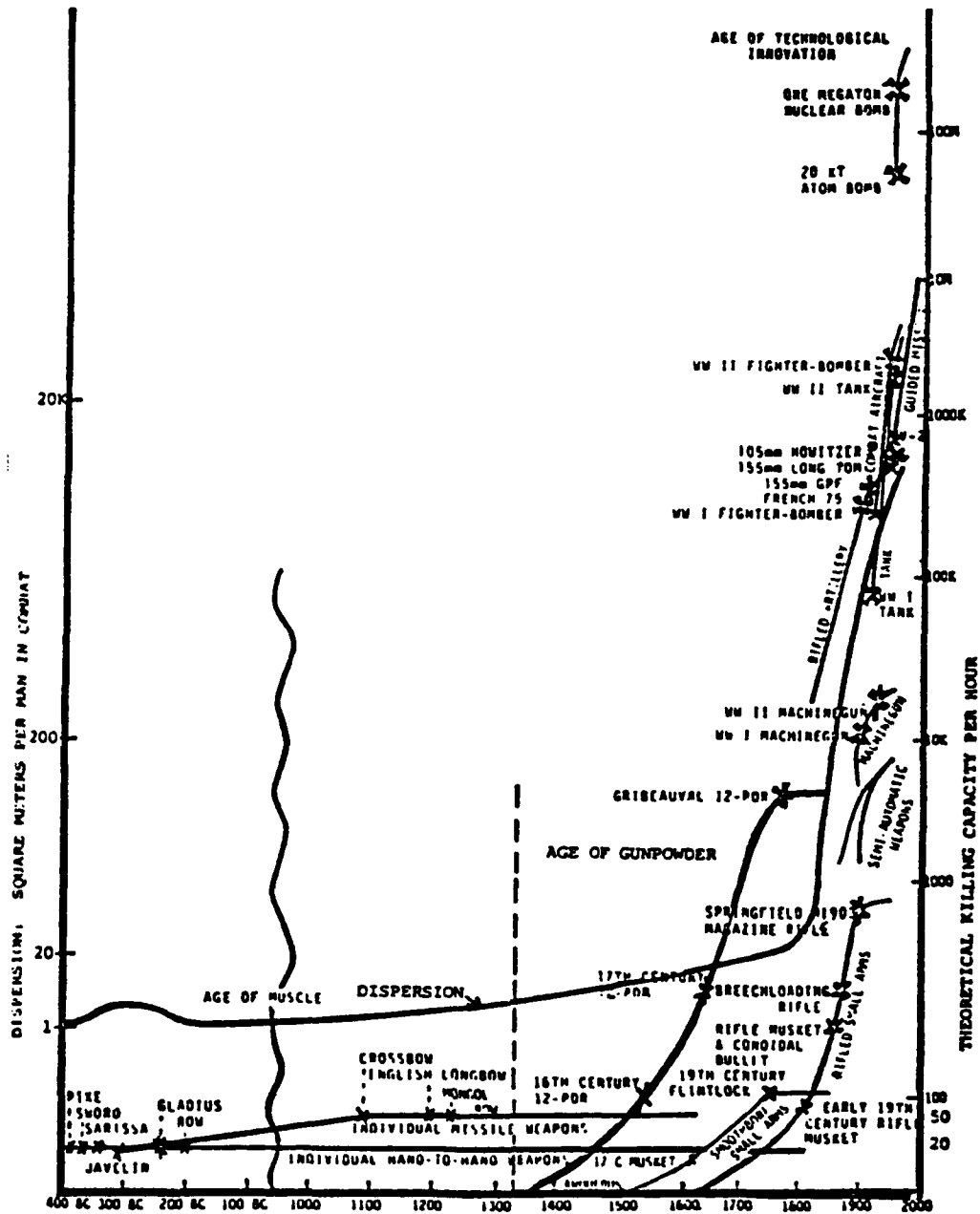


Figure 1
Increase of Weapon Lethality and
Dispersion Over History

(Trevor N. Dupuy, Numbers, Predictions and War: Using History to Evaluate and Predict the Outcome of Armed Conflict (Fairfax, VA: Hero Books, 1985), 7.)

Figure 2
Historical Army Dispersion Patterns

	Ancient Armies	Napole- onic Wars	American Civil War	WWI	WWII	1973
Area occupied by deployed force 100,000 strong (sq km)	1.00	20.12	25.75	247.5	3100	4000
Depth (km)	.15	2.5	3.0	12	60	67
Width (km)	6.67	8.00	8.33	20.83	50	60
Dispersion factor	1.0	20.0	25.0	250	3000	4000

(Trevor N. Dupuy, Numbers, Predictions and War: Using History to Evaluate and Predict the Outcome of Armed Conflict (Fairfax, VA: Hero Books, 1985), 28.)

Figure 3
Historical Examples of Battlefield Stress Rates
(unless otherwise specified, rates are percentage of WIA)

World War II

1. Okinawa for 10 days: 48%
2. Gothic Line for 44 days
 - 1st Armored Division: 54%
 - 91st Division: 34%
3. Early North Africa: Stress Casualties exceed theater replacements
4. France, D-Day for 60 days
 - Overall: 40%
 - 1st Army: 18%
 - Some infantry battalions had more stress casualties than wounded
5. South Pacific: Stress Casualties exceeded wounded
6. Total World War II: 23% of all evacuees were Battlefield Stress Casualties

Korea: 6% of evacuees were Battlefield Stress Casualties

Vietnam: Very low rates of "Immediate" Stress Casualties

1973 Yom Kippur War

1. Of Initial 1500 wounded: 60%
2. Overall: 30%

(Dale B. Flora, "Battlefield Stress: Causes, Cures, and Countermeasures," (Master of Military Art and Science Thesis, US Army Command and General Staff College, 1985), 30.)

Figure 4
Battalion Volleys of Current U.S. Cannon Systems
Required to Produce Moral Effect (a)

Density of Fire
for 100 meter radius target (b)

	0.1 lbs/sq meter	1.0 lbs/sq meter
105 mm	4 volleys (c)	40 volleys (c)
155 mm	2 volleys (d)	14 volleys (d)
203 mm	1 volley (e)	7 volleys (e)

- (a) Based on historical data, a density of fire of 0.1 lbs/sq meter will produce a moral collapse of a personnel target in four hours. A density of fire of 1.0 lbs/sq meter will produce a moral collapse in 15 minutes. (Military Operational Research Unit, Report No. 3, The Effects of Bombardment - The Present State of Knowledge. (Department of the Scientific Advisor to the Army Council, March 1946), 9.)
- (b) Standard target radius for current U.S. fire direction computers.
- (c) 24 gun battalion, standard shell weight 33.0 lbs.
- (d) 24 gun battalion, standard shell weight 95.0 lbs.
- (e) 24 gun battalion, standard shell weight 200.0 lbs.

Figure 5
Reasons for a Force Abandoning
An Attack or a Defense

Maneuver by Enemy	Percent
Envelopment, encirclement, penetration	33
Adjacent friendly unit withdrew	13
Enemy occupied key terrain	6
Enemy achieved surprise	8
Enemy reinforced	<u>4</u>
Total	64
Firepower by Enemy	
Casualties or equipment losses	10
Heavy artillery and air attacks by enemy	<u>2</u>
Total	12
Other Reasons	
No reserves left	12
Supply shortage	2
Truce or surrender	6
Change in weather	2
Orders to withdraw	<u>2</u>
Total	24

(Robert McQuie, "Battle Outcomes: Casualty Rates as a Measure of Defeat," Army 37 (November 1987): 34.)

Figure 6
Distribution of Israeli Psychiatric and Physical (Wounded)
Casualties by Military Assignment, 1973 Yom Kippur War

Assignment	Percent of Psychiatric Casualties	Percent of Physical Casualties
Combat	69.8	89.4
Combat Support	25.5	8.5
Combat Service Support	4.7	2.0

(Reuvan Gal, A Portrait of the Israeli Soldier (Westport, CT: Greenwood Press, 1986), 215.)

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