United States Marine Corps
Command and Staff College
Marine Corps University
2076 South Street
Marine Corps Combat Development Command
Quantico, Virginia 22134-5068

MASTER OF MILITARY STUDIES

THE UNITED STATES MARINE CORPS' GROUND SAFETY PROGRAM: TRAIN HARD, TRAIN SAFE, TRAIN SMART

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF MILITARY STUDIES

AUTHOR: Major Daniel P. Monahan

Academic Year 2001-2002

Mentor: Dr. John W. Gordon
Approved: _____
Date: _____

Mentor: Colonel Craig S. Huddleston, USMC
Approved: _____
Date: _____

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1. REPORT DATE (DD-MM-YYYY)	2. REPORT TYPE	3. DATES COVERED (FROM - TO)
15-05-2002	Student research paper	xx-xx-2001 to xx-xx-2002

4. TITLE AND SUBTITLE
The United States Marine Corps' Ground Safety Program: Train Hard, Train Safe, Train Smart
Unclassified

5a. CONTRACT NUMBER
5b. GRANT NUMBER
5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Monahan, Daniel P. ;

5d. PROJECT NUMBER
5e. TASK NUMBER
5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME AND ADDRESS
USMC Command and Staff College
Marine Corps University, MCCDC
2076 South Street
Quantico, VA22134-5068

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME AND ADDRESS
USMC Command and Staff College
Marine Corps University
2076 South Street, MCCDC
Quantico, VA22134-5068

10. SPONSOR/MONITOR'S ACRONYM(S)
11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
APUBLIC RELEASE
,

13. SUPPLEMENTARY NOTES

14. ABSTRACT
See report.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE	Public Release	44	EM114, (blank) lfenster@dtic.mil
Unclassified	Unclassified	Unclassified			19b. TELEPHONE NUMBER International Area Code Area Code Telephone Number 703767-9007 DSN 427-9007

REPORT DOCUMENTATION PAGE

FORM APPROVED - - - OMB NO. 0704-0188

1. AGENCY USE ONLY (*LEAVE BLANK)*	2. REPORT DATE 15 MAY 2002	3. REPORT TYPE AND DATES COVERED ***STUDENT RESEARCH PAPER***

4. TITLE AND SUBTITLE THE UNITED STATES MARINE CORPS' GROUND SAFETY PROGRAM: TRAIN HARD, TRAIN SAFE, TRAIN SMART	5. FUNDING NUMBERS ***N/A***
6. AUTHOR(S) MAJOR DANIEL P. MONAHAN, USMC	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) ***USMC COMMAND AND STAFF COLLEGE*** ***2076 SOUTH STREET, MCCDC, QUANTICO, VA 22134-5068***	8. PERFORMING ORGANIZATION REPORT NUMBER ***NONE***
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) ***SAME AS #7.***	10. SPONSORING/MONITORING AGENCY REPORT NUMBER: ***NONE***
11. SUPPLEMENTARY NOTES ***NONE***	
12A. DISTRIBUTION/AVAILABILITY STATEMENT ***NO RESTRICTIONS***	12B. DISTRIBUTION CODE ***N/A***

abstract Although an aggressive Safety Campaign Plan has been initiated throughout the Marine Corps by the current Commandant, and significant improvements have been experienced in many areas, the Class-A rate for operational ground mishaps grew steadily in fiscal year 2001. The Operational Risk Management (ORM) process has been implemented through all operational and supporting establishments in an attempt to better mange risk in both on and off-duty situations. Utilizing the Operational Risk Management process for the conduct of live-fire training has been helpful in identifying hazards associated with this activity. However, a failure to understand the science of weapon and ordnance safety characteristics will render the hazard identification step in ORM ineffective for live-fire training. An in-depth understanding of the policies and procedures for the conduct of live-fire training must realized in order to adequately identify potential hazards and to implement controls to minimize those hazards. The science of conducting live-fire training can be found in the Army Regulation (AR) 385-64 / Marine Corps Order (MCO) 3570.1A titled *Range Safety*. An active awareness of this *Range Safety* order coupled with ORM will enable units to train as they intend to fight and fight as they were trained.

14. SUBJECT TERMS (KEY WORDS ON WHICH TO PERFORM SEARCH) LIVE-FIRE TRAINING, GROUND SAFETY, AR 385, MCO 3570.1A, OPERATIONAL RISK MANAGEMENT, SAFETY DANGER ZONES	15. NUMBER OF PAGES: 39
	16. PRICE CODE: N/A

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE:	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	***UNCLASSIFIED***	***UNCLASSIFIED***	

Table of Contents

DISCLAIMER

THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENTAL AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FOREGOING STATEMENT.

EXECUTIVE SUMMARY

Title: THE UNITED STATES MARINE CORPS' GROUND SAFETY PROGRAM: TRAIN HARD, TRAIN SAFE, WIN THE FIGHT.

Author: Major Daniel P. Monahan, U.S. Marine Corps

Thesis: This essay examines the requirement for the Marine Corps to formally develop an institutionalized safety education program for the conduct of live-fire ground training.

Discussion: Over the past five fiscal years (FY97-01), the United States Marine Corps experienced 142 Class-A mishaps. These 142 mishaps, resulted in the loss of 146 Marine lives at a total cost to the United States Government of over 1 billion dollars. Although an aggressive Safety Campaign Plan has been initiated throughout the Marine Corps by the current Commandant, and significant improvements have been experienced in many areas, the Class-A rate for operational ground mishaps grew steadily in fiscal year 2001. The Operational Risk Management (ORM) process has been implemented through all operational and supporting establishments in an attempt to better mange risk in both on and off-duty situations. Utilizing the Operational Risk Management process for the conduct of live-fire training has been helpful in identifying hazards associated with this activity. However, a failure to understand the science of weapon and ordnance safety characteristics will render the hazard identification step in ORM ineffective for live-fire training. An in-depth understanding of the policies and procedures for the conduct of live-fire training must realized in order to adequately identify potential hazards and to implement controls to minimize those hazards. The science of conducting live-fire training can be found in the Army Regulation (AR) 385-64 / Marine Corps Order (MCO) 3570.1A titled *Range Safety.* An active awareness of this *Range Safety* order coupled with ORM will enable units to train as they intend to fight and fight as they were trained. After researching the issues, below are recommendations to resolve the problems.

Conclusion:

1. The Marine Corps needs to continue to foster a command climate that emphasizes safety across all levels and activities. Commanders must be held responsible for developing and implementing effective safety programs throughout their units.
2. The Marine Corps needs to aggressively educate all leaders and trainers in the policies and applications of AR 385-64 / MCO 3570.1A *Range Safety.* An in-depth working knowledge of *Range Safety* will decrease live-fire training mishaps and further enhance the Marine Corps' warfighting capabilities.
3. The *Operational Risk Management* order (MCO 3500.27) needs to re-written to become more detailed, more in-depth, and more "user friendly" in order to make the process more effective, and easily used and understood at the lowest possible levels.

METHODOLOGY

This paper reviews the requirement for the United States Marine Corps to formally develop a more robust institutionalized safety education program for the conduct of live-fire ground training. Chapter one is the introduction and contains safety background information. The second chapter examines current ground safety initiatives in the Marine Corps and provides an analysis of mishap statistics. Also contained in this chapter is a summation of the current Commandant's Safety Campaign Plan. The third chapter highlights the importance of the Army/USMC order for *Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat,* and illustrates the scope of the neglect this document receives at all levels. The fourth chapter explains the Operational Risk Management process and how it is integrated for training, real world operations, and off-duty activities. The fifth chapter identifies what junior leaders and trainers need to know in order to be effective in the area of safety while conducting live fire evolutions. The conclusion focuses on recommendations to improve the perceived inadequacies in the current ground safety education level of junior leaders and trainers.

Chapter 1
Introduction/Background

Every activity is obliged to improve its safety record where it can. Those who insist on ignoring the smaller problems about which something can be done, pointing to the larger problems about which nothing can be done yet, are mostly evading the issue. Most safety measures adopted deal with small portions of the total hazard. Over years, the steady improvement that results is significant. If each step is discouraged because it doesn't solve the whole problem then nothing is accomplished.

-Unknown NASA Scientist

One of the most critical steps in achieving an effective safety program is to establish a command climate that permeates safety throughout the organization. It must be made clear that standards are to be adhered to and that supervisors will enforce those standards. This philosophy has to clearly emanate from the highest echelon; certainly the Marine Corps' current Commandant, General James L. Jones, has instituted various initiatives through his 2000 Safety Campaign Plan that have the Marine Corps headed in the right direction to becoming a safer organization. However, there are some areas of safety, most notably live-fire training, that are being neglected and need more command attention. This paper will examine the requirement for the United States Marine Corps to develop a more robust institutionalized safety education program for the conduct of live-fire ground training.

Marine Corps Doctrinal Publication (MCDP)-1 *Warfighting* states, "The purpose of all training is to develop forces that can win in combat" and that "training is the key to combat effectiveness and therefore is the main effort of a peacetime military."[1] The Marine Corps continually trains to develop and maintain combat-ready Marines and units

[1] Marine Corps Doctrinal Publication (MCDP) 1, *Warfighting* (Washington, DC: Headquarters, U.S. Marine Corps, 20 June 1997) 59.

that can perform assigned tasks to specific standards. Combat-ready units are manned with motivated, disciplined, and proficient Marines. They are led by tactically and technically proficient leaders and are conditioned through physically tough and mentally demanding training that ranges from individual battle drills to joint combined-arms exercises.[2] Training must be demanding, it must be realistic, and it must be safe.

Safe training does not necessarily equate to a training evolution where a Marine does not get killed or injured. Safe training is conducted by following an established set of guidelines, standards and regulations. The problem in the Marine Corps is that most Marine leaders and trainers do not understand which guidelines are applicable and, therefore, which to follow. Individual Training Standards (ITS), Mission Performance Standards (MPS), Range Regulations, and policies on Operational Risk Management may all be exactly adhered to while conducting training. That said, the failure to properly follow Marine Corps Order (MCO) P3570.1A (*Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat*), may produce disastrous results. As the Commandant stated, "Nothing is so critical as to place the life of a Marine at risk in a training situation."[3]

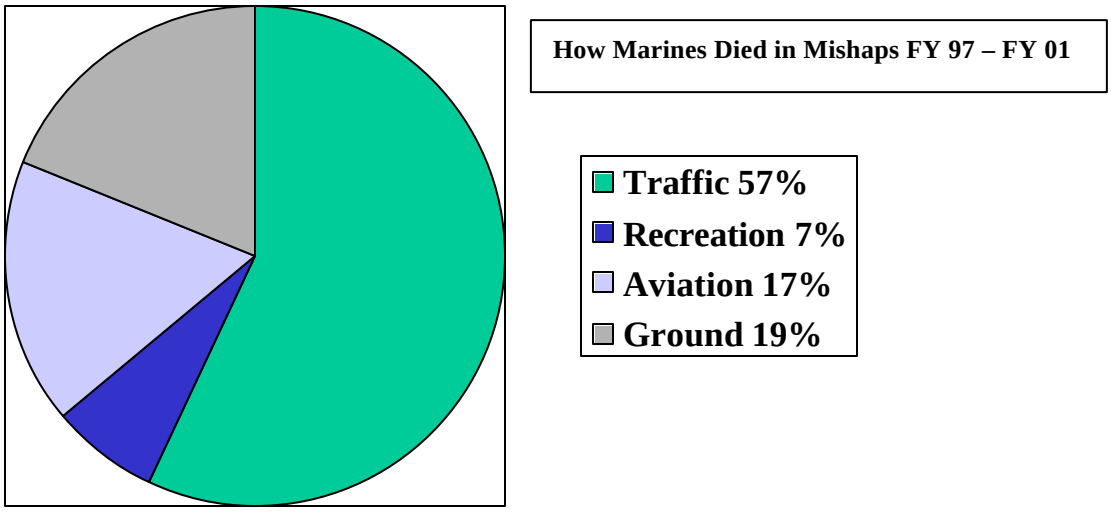
[2] Marine Corps Reference Publication (MCRP) 3-0A, *Unit Training Management Guide,* (Washington, DC, Headquarters, U.S. Marine Corps), 1-1.
[3] Commandant of the Marine Corps (CMC), *Safety Campaign Plan*, (Washington, DC, Headquarters, U.S. Marine Corps), cover page.

Chapter 2
Safety in the Marine Corps

The Commandant of the Marine Corps is responsible for issuing safety instructions which are necessary or appropriate in connection with matters under his technical direction. Commanders are responsible for compliance with prescribed safety instructions and with the elimination or control of all hazards within their commands. Safety precautions and procedures are to be made readily available to all personnel and drilled in their applicable portions. Where safety instructions are inconsistent or incomplete, necessary safety instructions will be issued and higher authority notified.

-Marine Corps Manual. Paragraph 1202, 3 May 1999

Statistics. Historically, the Marine Corps leads all of the other services in mishap and fatality rates. From fiscal year (FY) 1997 to FY 2001 there were 422 mishap fatalities in the Marine Corps. These mishaps occurred both on and off-duty. The pie chart[4] below illustrates the activity by percentage of how the mishap(s) occurred:



[4] Navy Safety Center Statistics Department, *How People Died In Mishaps,* : http://www.safetycenter.navy.mil/statistics/ images/marinetables.jpg.html

The following data chart[5] depicts the type of mishap, broken down further by category and the associated costs for the mishap throughout the same five-year span:

Marine Corps Mishaps FY97-01

Operational	Class A Mishaps	Marine Military Fatalities	Navy Military Fatalities	Federal Civilian Fatalities	Other Fatalities	Cost
Aviation	54	67	4	1	20	$1,234,269,667
Industrial	3	2	0	0	0	$6,932,812
GMV-Commercial	10	7	0	1	5	$4,313,260
GMV-Tactical	25	24	0	0	5	$17,751,709
Training	41	37	0	0	0	$15,253,053
Other Operational	9	9	0	0	0	$10,609,104
Total Operational	**142**	**146**	**4**	**2**	**30**	**$1,289,129,605**

Off-Duty	Mishap Fatalities	Cost
Private Motorized Vehicle	247	$52,109,377
Other Off-Duty	29	$13,749,081
Total Off-Duty	**276**	**$65,858,458**

Aside from the loss of precious Marine lives and the detrimental impact the loss has on the unit, mishaps in the Marine Corps cost the United States taxpayer a tremendous amount of money. During the five-year period illustrated above, over $1.3 billion dollars were expended due to Class-A mishaps and fatality mishaps in the Marine Corps. A Class-A mishap is one resulting in a fatality, permanent total disability, or total

[5] Navy Safety Center Statistics Department, *How People Died In Mishaps,* : http://www.safetycenter.navy.mil/statistics/ images/marinetables.jpg.html

reportable damage costs of $1 million or more[6].

Medical separations resulting from training mishaps, and operational injuries resulting in physical disability create a huge drain in personnel and resources. From the manpower perspective, it is estimated that due to on and off-duty injuries and fatalities each year (approximately 2000+ annually), the Marine Corps loses the equivalent of a Marine Expeditionary Unit.[7] It is obvious that decisive action must be taken in order to combat the mishap phenomenon in the Marine Corps.

CMC Safety Campaign Plan. General James L. Jones has made safety one of his top priorities since his tour began in the spring of 2000. This commitment toward a safer, more efficient and effective Corps needed to occur due to the staggering mishaps statistics over the past ten years. The Marine Corps had a safety program in place (MCO 5100.29 *Marine Corps Safety Program*) prior to General Jones's tenure, which provided safety policy, assigned responsibilities and established instructions for the administration of the safety program. However, the mishap trends, both on and off-duty continued, and the merit of an effective safety program can be easily measured or determined by the statistics. This is not to propose that previous Marine Commandants did not have a genuine concern for the welfare and safety of their Marines. On paper and in theory, the previous *Marine Corps Safety Program* should have been effective. MCO 5100.29 stated that:

a. All levels of command shall establish and maintain aggressive force protection (occupational safety and health (OSH) and operational safety)

[6] Marine Corps Order (MCO) 5102.1A, *Ground Safety Mishap Reporting*, (Headquarters, U.S. marine Corps, Washington, DC, 1 October 98) , 5.

programs to enhance warfighting capability by preventing mishaps and reducing personnel and material losses.[8]

b. Force protection, including hazard awareness and risk management, shall be fundamental elements in doctrine, training, material acquisition, supply and combat operations.[9]

c. Force protection considerations shall be integrated into appropriate orders, training and indoctrination programs, technical and tactical publications, checklists and standard operating procedures. [10]

In the summer of 2000, General Jones issued his United States Marine Corps Safety Campaign Plan. General Jones stated, "Non-combat casualties diminish our readiness, our cohesion and our camaraderie. Our Corps needs a cultural change and this change must be profound."[11] He placed the main emphasis on the leadership of the Corps to institute this change. He established the Executive Safety Board (ESB), which is made up of commanding generals from operational commands, major bases and supporting organizations.[12] Their mission is "to provide safety policy and guidance for our Corps."[13] Numerous initiatives were introduced in the Campaign Plan to include that the executive officer or deputy commander within each command is now held responsible for the execution of safety policy and that mandatory comments will be required on their fitness

---

[7] Commandant of the Marine Corps (CMC), *Safety Campaign Plan*, (Washington, DC, Headquarters, U.S. Marine Corps)
[8] Marine Corps Order (MCO) 5100.29, *Marine Corps Safety Program*, (Washington, DC, Headquarters, U.S. Marine Corps, 6 September 1994), 1.
[9] MCO 5100.29, *Marine Corps Safety Program,* 1.
[10] MCO 5100.29, *Marine Corps Safety Program,* 1.
[11] CMC 2000 USMC *Safety Campaign Plan*, .2.
[12] CMC 2000 USMC *Safety Campaign Plan,* 2.
[13] CMC 2000 USMC *Safety Campaign Plan,* 2.

reports concerning fulfillment of safety duties. Also, within seven days of any Class–A mishap, all commanding officers will brief their commanding generals on the circumstances surrounding the mishap and the steps taken to prevent recurrences. Another mandate for better integrating operations and safety was the institutionalization of Operational Risk Management (ORM). Incorporated throughout the Marine Corps, ORM was to be taught and reinforced at all formal schools. The process was also to be adhered to in all activities, both on and off-duty.

As a result of the Commandant's aggressive approach towards safety through his Campaign Plan, the Marine Corps made significant improvements in reducing aviation Class-A mishaps and Private Motor Vehicle (PMV) fatality rates. However, operational ground Class-A mishaps rose considerably during the past year (FY 01). The following chart[14] details the last five years of on-duty mishaps:

Marine Corps Operational Class A Mishap Rate FY 97-01

	Aviation Mishaps	Ground Mishaps	Total Mishaps	Rate per 100,000 military personnel per year
FY 97	12	15	27	15.53
FY 98	12	13	25	14.44
FY 99	15	17	32	18.54
FY 00	10	13	23	13.27
FY 01	5	30	35	20.19
FY 97-01	**54**	**88**	**142**	**16.39**

In the Commandant's 2002 Safety Campaign Plan, he stated the following with regards to ground mishaps: "In fact, we failed to meet the goal of a 25% reduction in

Class A and B (*Class B mishap is one resulting in a permanent partial disability; hospitalization of three or more personnel; or total reportable damage costs of $200,000 or more, but less than $1 million*)[15] mishaps. Ground Class-A mishaps occurred almost twice as frequently in FY01 than they did in FY99 and FY01 resulted in more Marine fatalities than any of the past ten years. This is unacceptable and must change."[16] The plan also outlined that the goal for FY02 through FY06 remains a 5% reduction of the number of ground Class-A and B mishaps per year.[17] However, in order to remain on track through FY06, a 30% reduction is needed for FY02. This is based on the Marine Corps' failure to attain a 25% reduction during FY01 plus the 5% per year reduction from FY02 through FY 06. He further charged, "Leaders at all levels must remain engaged in ORM. Greater attention must be paid to our on duty activities. Safety cannot be separated from our operational tasks and failing to control or mitigate risks tempts fate, and inexcusably places the lives of our Marines at risk."[18] To do so requires a working knowledge of the basic order governing the conduct of live-fire training.

---

[14] Navy Safety Center Statistics Department, *How People Died In Mishaps,* : http://www.safetycenter.navy.mil/statistics/ images/marinetables.jpg.html
[15] MCO 5102.1A, *Ground Safety Mishap Reporting*, 9.
[16] Commandant of the Marine Corps (CMC), *2002 Safety Campaign Plan*, (Washington, DC, Headquarters, U.S. Marine Corps, January, 2002), 6.
[17] CMC, *2002 Safety Campaign Plan* , 6.
[18] CMC, *2002 Safety Campaign Plan*,, 7.

Chapter 3

AR 385-63 / MCO P357

It is true I must run great risk; no gallant action was ever accomplished without great danger.

-John Paul Jones

Army Regulation (AR) 385-63 or Marine Corps Order (MCO) P3570.1A is officially titled *Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat*. It provides standards and procedures for the safe firing of ammunition, demolitions, lasers, guided missiles, and rockets for training, target practice, and to the extent practicable, combat.[19]

Background. The proponent for this publication is the Commander, U.S Army Training and Doctrine Command (TRADOC), through the Director of Army Safety (DASAF) under the Office Chief of Staff Army (OCSA).[20] The Marine Corps essentially affixes a cover letter on this Army Regulation and labels it a Marine Corps order. The date this document was signed (although minor changes and updates have been periodically made) was 15 October 1983. A draft revision of the new order (AR 385-63 / MCO P3570.2A) has been distributed and has been available to both Army and Marine operating forces since October 2000. The new AR-385-63 / MCO 3570.2A is now titled *Range Safety.*

The AR385-63 / MCO 3570.1A applies to all Marine Corps commands active and reserve. The only exception would be if the standards and/or procedures conflict with

[19] U. S. Army, Army Regulation (AR) 385-63 Draft, *Range Safety*, (TRADOC, Fort Monroe, VA, 1 October 2000), ii.
[20] AR 385-63, *Range Safety*, ii.

Department of the Navy; Headquarters, Marine Corps (HQMC), or Commanding General, Marine Corps Combat Development Command (MCCDC), orders[21].

MCO P3570.1A is one of the most important documents available to any individual or unit that conducts live-fire operations. Unfortunately, it is one of the most neglected.

Organizational Neglect. Marine Corps Reference Publication (MCRP) 3-0B dated 25 November 1996, *How to Conduct Training,* is a publication that has been prepared primarily for trainers (officers, staff NCOs and NCOs) at the company level and lower throughout the operating forces.[22] It provides guidance on how to conduct Marine Corps training. A drawback of this publication is that it fails to mention anything about the importance of safety in a training environment. Appendix H of the publication contains over sixty examples of supporting training documents (Marine Corps orders) that are used throughout the Marine Corps to effectively facilitate training. MCO P3570.1A is not one of the documents mentioned in the appendix.

A companion publication, MCRP 3-0A *Unit Training Management Guide*, dated 25 November 1996, assists unit commanders and their staffs in the preparation of unit training programs. It reflects the methodology and techniques developed over the years to improve the Marine Corps' overall training effort. This publication states "the history of battle, a commander's experience, and the wisdom of military philosophers all confirm the direct correlation between training and victory in war."[23] The better trained a force is, the better it will perform in battle. Marines base their future success on the battlefield on

[21] AR 385-63, *Range Safety*, 1-1.
[22] Marine Corps Reference Publication (MCRP) 3-0B, *How to Conduct Training,* (Washington, DC, Headquarters, U.S. Marine Corps, 25 November 1996), Foreword.

the philosophy that "successful combat units train as they intend to fight and fight as they were trained."[24] The *Unit Training Management Guide* details the Commander's (battalion/squadron) responsibilities for overseeing/managing training. Of those very heavy responsibilities, the importance of safety in managing training is not even mentioned. In the myriad of Marine Corps orders and publications referenced in MCRP 3-0A (*Unit Training Management Guide*) that support training, MCO P3570.1A is not referred to; ironically, the *Marine Corps Casualty Procedures Manual* may be found.

Training safety problems in the Marine Corps may be highlighted by some common examples:

The Blank-Fire Mentality. A Raid Force Commander, an experienced Captain, is briefing his ground scheme of maneuver during a confirmation brief to the MEU Commander during a Special Operations Capable (SOC) certification exercise. The Raid Force Commander has a simple, yet detailed plan, with the actions of an assault force, a security force and a support force all referenced on his schematic. This particular raid will be conducted at night with the support force providing fire from six M240G machine guns on the west side of the target building. On a predetermined signal, the support force will cease firing and the assault element will rush in and destroy the target from the south. For the exercise, the raid force will be using blank ammunition with blank firing adaptors (BFAs). Would the Raid Force Commander feel confident with the same scheme of maneuver if the MEU Commander directed that live rounds be used vice blanks to conduct this particular raid? Did he apply any applications from the AR 385 / MCO 3570.1A concerning Surface Danger Zones (SDZ) or required angles of separation

[23] MCRP 3-0B, *How To Conduct Training*, 1-1.
[24] MCRP 3-0A, *Unit Training Management Guide*, 1-1.

between flanking fire and assaulting troops throughout his planning? Did the MEU commander, the BLT commander or any staff officer verify the battlefield geometry of this raid? Or since the raid force was not utilizing live ammunition and only blanks, the battlefield geometry around the target building was deemed not important? This is the blank-fire mentality that must be overcome at all levels in order for the Marine Corps to become more proficient on the battlefield.

The Marine Corps must train the way it intends to fight. One of the most effective methods of training is a force-on-force, free play exercise. These exercises must obviously be conducted with blank ammunition or with the new Special Effects Small Arms Marking Systems (SESAMS). When conducting a blank exercise, it is unfortunately all too common for participants to take on a lethargic mentality in regards to safety issues and their particular weapon system. Since participants are firing blanks and the blank ammunition cannot cause injury, schemes of maneuver are often tactically unrealistic. The result is that fratricide opportunities are rampant during the exercise, but are normally overlooked because "no one ever actually gets shot." This "blank warfare mentality" must cease. Instead, leaders must attempt to play out the exercise as if live ammunition was being utilized. If the Marine Corps desires to train as it intends to fight, <u>all training</u>, whether using blanks, firing live rounds, or a tactical decision game (TDG) on a sand table, must be governed by the same set of regulations, and the same mentality, as if conducting a real-world operation in a combat environment. These regulations are found in the AR-385-63 / MCO 3570.1A.

Another example of a lack of knowledge of the AR 385 is to casually query any squared-away Lance Corporal M203 gunner in an infantry unit about the range or some

of the characteristics of his weapon system. He most likely can recite that the maximum effective range for an area target is 350 meters for High Explosive (HE) ammunition. It is doubtful, however, that he can recite that the minimum safe distance to engage a target with a HE round (due to hazardous fragmentation) is 165 meters.[25] The shocking assumption is that squad leader and platoon commander probably cannot give the minimum engagement distance for that weapon system either.

In AR 385, weapon ranges and capabilities are well established. These capabilities and characteristics are a matter of science and are well documented throughout the publication. It therefore becomes a matter of geometry to arrange the firing fans (SDZs) on the terrain so as to be on the side of safety. The AR-385 details this procedure by very complete and clear diagrams, which are easy to apply in either a training or crisis situation. The more difficult and exacting task is the task of supervision. Leaders up and down the chain of command must be able to actively supervise their plan to insure that it is executed properly, safely, and satisfies the accomplishment of the mission. To better aid in the supervision of a plan or evolution, a leader must possess the ability to identify potential hazards associated with their plan prior to the plan being executed. The Marine Corps' process for identifying hazards and vulnerabilities is called Operational Risk Management, and will be explained in detail throughout the next chapter.

[25] AR 385-63, *Range Safety*,*7-5*.

Chapter 4

OPERATIONAL RISK MANAGEMENT

A risk is a chance you take; if it fails, you can recover. A gamble is a chance taken; if a gamble fails, recovery is impossible.

-Field Marshal Erwin Rommel

Operational Risk Management is a decision making tool used at all levels to increase operational effectiveness by anticipating hazards and reducing the potential for loss, thereby increasing the probability of a successful mission. It is a five-step process of dealing with risk associated within military operations, which includes risk assessment, risk decision-making and implementation of effective risk controls.[26] The ultimate goal of Operational Risk Management is to enhance operational capability at all levels while minimizing risk.

Background. The United States Army originally introduced the risk management process into training in the late 1980's.[27] Risk management was originally perceived by the Army as solely a safety officer function. By the early 1990's, the Army established a goal to integrate risk management into all Army processes and activities and into every individual's behavior, both on and off duty[28]. In September 1996, both the Marine Corps and Navy agreed to pursue a common approach toward Operational Risk Management and produced a mutual OPNAVINST/MCO in April of 1997[29]. Although an official Marine Corps Order (MCO 3500.27), Operational Risk Management was not

[26] Marine Corps Order (MCO) 3500.27A, Operational Risk Management (ORM), (Washington, DC, Headquarters, U.S. Marine Corps, 26 September 2000), 2.
[27] U.S. Army, Field Manual (FM) 100-14, *Risk Management*, (Washington, DC, Department of the Army, 23 April 1998), iii.
[28] FM 100-14, *Risk Management*, iii.

fully implemented and properly adhered to by the Marine Corps in the conduct of operations. The typical inbred response in the Marine Corps to ORM was to say "no, that's an Army thing" and "we will continue to make decisions based on the way we have always done things." But this fostered a negative attitude towards this new process. When the order originally came out, there was not a mechanism in place to educate Marine leaders on the fundamentals and principles of the risk management process. Many cultural changes had to be overcome for Operational Risk Management to be accepted by Marines. Indeed, it was not until June 2000 that the Commandant's Executive Safety Board published various initiatives directing that proper action be taken[30]. One of the various initiatives of the Safety Board's directed that all Marines be provided training in how to identify hazards, assess risks and implement controls to reduce risk to an acceptable level. This training, to be (and currently) implemented at all formal Marine Corps schools, from the Recruit Training Depots on to Top Level Schools, is the process of Operational Risk Management.

Operational Risk Management Principles. Operational Risk Management incorporates the following basic four principles:

1. Accept risk when benefits outweigh the cost. The goal of Operational Risk Management is not to eliminate risk, but to manage the risk so that the mission can be accomplished with the minimal amount of loss.

2. Accept no unnecessary risk. Take only risks that are necessary to accomplish the mission. Leaders compare and balance risks against mission expectations and accept risks only if the benefits outweigh the potential costs or losses.

---

[29] Commandant of the Marine Corps Message, ALMAR 210/97 dated July 1997.
[30] Headquarters, U.S. Marine Corps, *Executive Safety Board Meeting* Minutes, June 2000

3. Anticipate and manage risk by planning. Risks are more easily controlled when they are identified early in the planning process.

4. Make risk decisions at the right level. Risk management decisions are made by the leader directly responsible for the operation. Prudence, experience, judgment, intuition and situational awareness of leaders directly involved in the planning and execution of the mission are the critical elements in making effective risk management decisions.[31]

Operational Risk Management Levels. The Operational Risk Management process exists on three levels. The Commander or leader selects which level, based upon the mission, the situation, the time available, the proficiency of personnel and the assets available. The three levels are as follows:

1. **Time-Critical**. An "on the run" mental or oral review of the situation using the five-step processes without recording the information on paper. This level is employed by experienced personnel to consider risk while making decisions in a time-compressed situation. It is the normal level Operational Risk Management used during the execution phase of training or operations as well as in planning during crisis response scenarios.[32]

2. **Deliberate**. A complete application of the five-step process in planning an operation or evaluating procedures. It uses primarily experience and brainstorming to identify hazards and develop controls, and is therefore most effective when accomplished in a group setting[33].

3. **In-Depth**. The Deliberate process with a more thorough risk assessment involving research of available data, use of diagram and analysis tools, formal testing or

[31] MCO 3500.27A, *Operational Risk Management*, 10.
[32] MCO 3500.27A, *Operational Risk Management*, 9.

long term tracking of the hazards associated with the operation to identify and access the hazards. It is used to more thoroughly study the hazards and their associated risk in a complex operation or system, or one in which the hazards are not well understood.[34]

Operational Risk Management Process. The below figure illustrates the flow of the Operational Risk Management process.

The five-step process is:

1. Identify Hazards. Create an outline or chart of the major steps of the operation (operational analysis). Next, conduct a Preliminary Hazard Analysis by listing all of the hazards associated with each step in the operational analysis along with possible causes for these hazards.

2. Assess Hazards. For each hazard identified, determine the associated degree of risk in terms of probability and severity. Hazard severity is the worst credible consequence, which can occur as a result of a hazard. Severity is defined by potential degree of injury, illness, property damage, loss of assets (time, money, personnel) or effect on mission. The four hazard severity categories are as follows:[35]

(1) Category I - The hazard may cause death, loss of facility/asset or result in grave damage to national interests.

(2) Category II - The hazard may cause severe: injury, illness, property damage, damage to national service or command interests or degradation to efficient use of assets.

---

[33] MCO 3500.27A, *Operational Risk Management*, 9.
[34] MCO 3500.27A, *Operational Risk Management*, 9.
[35] MCO 3500.27A, *Operational Risk Management*, 11.

(3) Category III - The hazard may cause minor: injury, illness, property damage, damage to national service or command interests or degradation to efficient use of assets.

(4) Category IV - The hazard presents a minimal threat to personnel safety or health, property, national, service or command interests or efficient use of assets.

Mishap probability is the probability that a hazard will result in a mishap or loss, based on an assessment of such factors as location exposure (cycles or hours of operation), affected populations, experience or previously established statistical information. The four mishap probability sub-categories are as follows:[36]

(1) Sub-category A – Likely to occur immediately or within a short period of time. Expected to occur frequently to an individual item or person or continuously to a fleet, inventory or group.

(2) Sub-category B - Probability will occur in time. Expected to occur several times to an individual item or person or frequently to a fleet, inventory or group.

(3) Sub-category C – May occur in time. Can reasonably be expected to occur some time to an individual item or person or several times to a fleet, inventory or group.

(4) Sub-category D – Unlikely to occur.

Hazard severity is described as an assessment of the worst credible consequence that can occur as a result of a hazard, defined by the *potential degree of loss or effect on the mission*. Loss probability is based on an assessment of factors such as location, environment, exposure time, affected populations, experience, or statistical data.

[36] MCO 3500.27A, *Operational Risk Management*,12.

Hazard severity and loss probability together make up a Risk Assessment Code (RAC). A less severe hazard that is more likely to happen may get a higher RAC, representing a *perception of greater overall risk*. The RACs are used to determine risk reduction priorities. A risk assessment matrix may be used to accomplish the second step in the process. This matrix will provide the risk assessment code (RAC), that is an expression of risk, which combines the elements of hazard severity and mishap probability. The risk assessment code is expressed as a single Arabic number that can be used to help determine hazard abatement priorities. The standard RAC matrix used by the Marine Corps is illustrated below:

LOSS PROBABILITY

HAZARD SEVERITY	**A**	**B**	**C**	**D**
I	1	1	2	3
II	1	2	3	4
III	2	3	4	5
IV	3	4	5	5

Hazard Severity Definitions:

I. Catastrophic
II. Severe
III. Minor
IV. Negligible

Loss Probability Definitions:

A. Likely to occur immediately or frequently.
B. Probability will occur or is suspected to occur several times.
C. May occur or can be reasonably expected to occur.
D. Unlikely to occur.

Risk Assessment Code Definitions:

1-Critical
2- Serious
3- Moderate
4- Minor
5- Negligible

3. Make Risk Decisions. Start with the most serious (or severe) risk and select controls that will reduce the risk to a minimum consistent with mission accomplishment. With selected controls in place, decide if the benefit of the operation outweighs the risk. If risk outweighs benefit or if assurance is required to implement controls, communicate with higher authority in the chain of command.

4. Implement Controls. The following measures are used to eliminate hazards or to reduce the degree of risk. These are listed by order of preference:[37]

(1) Administrative Controls – Controls that reduce risks through specific administrative actions, such as:

a. providing suitable warnings, markings, placards, signs and notices.
b. establishing written policies, programs, instructions and standard operating procedures (SOP).
c. training personnel to recognize hazards and take appropriate precautionary measures.
d. limiting the exposure to a hazard (either by reducing the number of personnel/assets or the length of time they are exposed).

(2) Engineering Controls – Controls that use engineering methods to reduce risks by design, material, selection or substitution when technically or economically feasible.

[37] MCO 3500.27A, Operational Risk Management, 8.

(3) Personal Protective Equipment – Serves as a barrier between personnel and a hazard. It should be used when other controls do not reduce the hazard to an acceptable level.

5. **Supervise**. Conduct follow-up evaluations on the controls to ensure they remain in place and have the desired effect. Monitor for changes that may require further Operational Risk Management. Take corrective action when necessary.

The objective of managing risk is not to remove all risk, but to eliminate unnecessary risk. Commanders conduct tough, realistic training, knowing that they may put lives and property at risk in the course of military operations. Nothing is worth the cost of a life as the result of taking unnecessary risk. If an action will result in an unacceptable risk, measures should be taken to mitigate it. If the risk cannot be mitigated to an acceptable level, the action should not be executed.

Leaders and individual Marines must have the skills, knowledge, and attitude to effectively manage risks inherent in all operations. Effective training helps Marines become proficient. It qualifies them technically and tactically, and as leaders, to accomplish the mission without unnecessary risk.

Chapter 5

What Effective Company Grade Leaders and Trainers Should Know

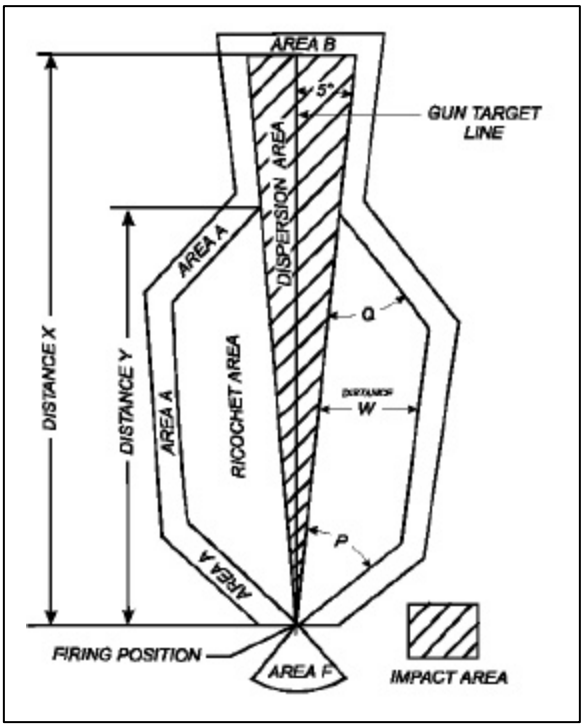
The AR 385 contains a wealth of information on the "science" of firing weapons and ammunition, as well as imposed restrictions based on test methods and computer simulation. Nearly all of the weapons and munitions organic to a Marine Infantry Battalion are detailed throughout the AR-385 and a majority of this information contained in the AR 385 cannot be found in weapon system technical manuals (TMs) or publications. One of the most fundamental, yet important concepts for leaders to understand is the model of the Surface Danger Zone (SDZ)[38]. The AR 385 definition of the SDZ is "the ground and airspace designated within the training complex (to include associated safety areas) for vertical and lateral containment of projectiles, fragments, debris, and components resulting from the firing, launching, or detonation of weapon systems to include explosives and demolitions." It must be noted that although the SDZ definition possesses a particular training "flavor," it has an important application for real world, combat situations as well.

An example of a real-world application of a surface danger zone would be a unit operating near or in the vicinity of a lateral boundary. That unit is responsible not only for the surface area delineated by that control measure (unit boundary), but also for the effects of the fires that unit produces. A weak understanding of the basic SDZ model (A basic rifle platoon with a squad of 7.62mm machineguns attached has an SDZ extending out 4100 meters) could yield a potential fratricide incident with an adjacent unit, due to

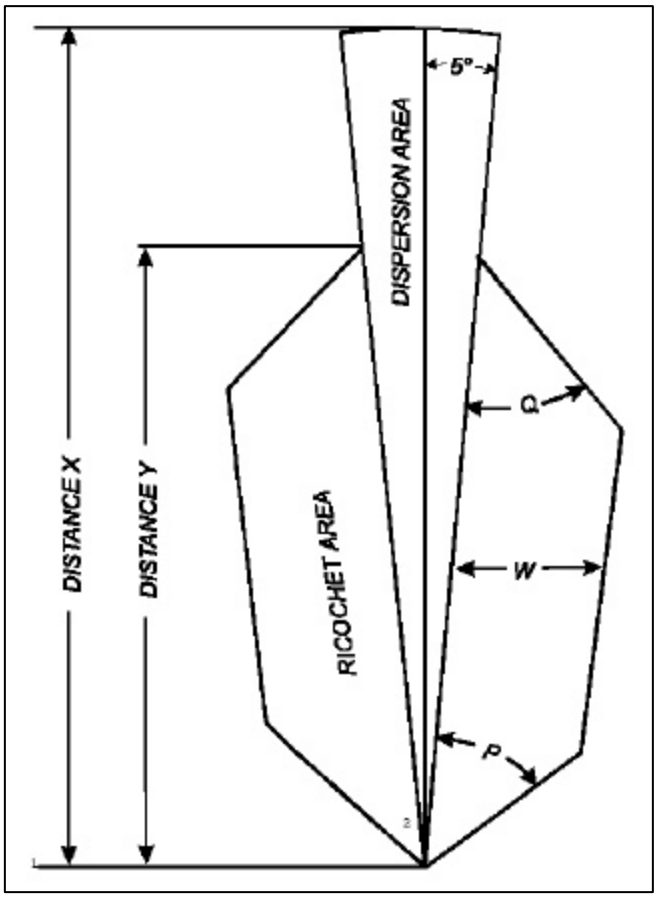
[38] AR 385-63, Range Safety, Appendix C-1.

the unit leader not thoroughly understanding his battle space geometry and effects his/her weapons can produce.

Figures (A) and (B) are examples[39] of direct fire SDZs and Table (1) highlights the various distances and angles for numerous weapon systems and munitions.



Direct Fire Surface Danger Zone with Explosive Projectiles
Figure (A)



Direct Fire Surface Danger Zone without Explosive Projectiles
Figure (B)

[39] AR 385-63, *Range Safety*, Appendix C-8.

Area A. The secondary danger area (buffer zone) that laterally parallels the impact area or ricochet area (depending on the weapon system). It contains fragments, debris, and components from frangible or explosive projectiles and warheads functioning on the left or right edge of the impact area.[40]

Area B. The secondary danger area (buffer zone) downrange on the far side of the impact area and area A. It contains fragments, debris, and components from frangible or exploding projectiles and warheads functioning on the far edge of the impact area.[41]

Area C. The secondary danger area (buffer zone) up range of the near side of the impact area and parallel to area B. It contains fragments, debris, and components from frangible or exploding projectiles and warheads functioning on the near edge of the impact area.[42]

Area D. The safe area between areas C and E used when firing ammunition certified for overhead fire of unprotected.personnel.[43]

Area E. The danger area between an indirect fire weapon system and area D. This area is endangered by muzzle blast, debris, overpressure, thermal effects, and hazardous impulse noise.[44]

Area F. The danger area to the rear of a weapon system which is endangered by backblast, debris, overpressure, thermal effects, and hazardous impulse noise.[45]

Dispersion Area. The area within a direct fire weapon system surface danger zone located between the gun target line and the ricochet area. This area accounts for human sighting error and weapon system accuracy characteristics (e.g., gun/cannon tube

[40] AR 385-63, *Range Safety*, Appendix C-1.
[41] AR 385-63, *Range Safety*, Appendix C-1.
[42] AR 385-63, *Range Safety*, Appendix C-1.
[43] AR 385-63, *Range Safety*, Appendix C-1.

wear, propellant temperature, etc.). Probable errors for indirect fire weapon system surface danger zones are similar in function to dispersion area.[46]

Gun Target Line. An imaginary line drawn between the firing position and target position. Also referred to as the missile target line or line of fire.[47]

Firing Position. The point or location at which a weapon system (excluding demolitions) is placed for firing. For demolitions, the firing position is the point or location at which the firing crew is located during demolition operations.[48]

CALIBER	IMPACT MEDIA	<-------METERS-------> DIST X	DIST Y	AREA W	VERT HAZ	<----DEGREES----> ANGLE P	ANGLE Q
12 Gage Slug	Earth/Water	1073	710	125	136	21.96	33.34
	Steel/Concrete	1073	830	287	197	56.91	40.17
.22 Cal Long Rifle, M24	Earth/Water	1400	1033	155	96	24.00	15.90
	Steel/Concrete	1400	1125	386	245	63.40	30.30
.38 Cal M41 Ball	Earth/Water	1806	1258	153	89	22.57	16.07
	Steel/Concrete	1806	1258	389	245	60.95	35.36
9mm M882, Ball	Earth/Water	1800	1077	158	93	23.10	15.80
	Steel/Concrete	1800	1211	399	253	61.10	30.40
.45 Cal, M1911 Pistol/SMG	Earth/Water	1690	1016	117	100	21.11	16.69
	Steel/Concrete	1690	1111	290	186	54.74	30.77
5.56mm, M193 Ball	Earth/Water	3100	2004	458	319	35.20	23.10
	Steel/Concrete	3100	1666	323	219	19.00	26.90
5.56mm, M196 Tracer	Earth/Water	3100	2066	514	355	35.10	26.80
	Steel/Concrete	3100	2023	243	243	19.20	22.80
5.56mm, M855 Ball	Earth/Water	3437	2029	462	325	34.20	22.40
	Steel/Concrete	3437	1810	334	229	18.80	25.20
5.56mm, M856 Tracer	Earth/Water	3089	1607	355	261	32.80	23.20
	Steel/Concrete	3089	1592	277	261	18.60	21.00
5.56mm, M862 Plastic	Earth/Water	250	165	24	16	15.40	20.00
	Steel/Concrete	250	136	5	4	3.30	7.30
7.62mm, M118 Special	Earth/Water	5288	4800	1545	752	43.81	38.73
	Steel/Concrete	5288	5137	990	490	20.17	41.29
7.62mm, M80 Ball	Earth/Water	4100	4073	1461	706	43.54	38.90
	Steel/Concrete	4100	4053	861	447	20.04	75.54
.50 Cal, M858 Ball, Plastic	Earth/Water	700	398	20	41	4.28	9.16
	Steel/Concrete	700	415	53	41	11.65	21.14
.50 Cal, M860 Tracer, Plastic	Earth/Water	700	398	20	41	4.28	9.16
	Steel/Concrete	700	415	53	41	11.65	21.14
.50 Cal M2 AP	Earth/Water	6100	5142	1659	904	40.80	69.60
	Steel/Concrete	6100	4300	718	462	16.30	33.10
.50 Cal M2 Ball	Earth/Water	6500	5211	1652	901	38.19	63.35
	Steel/Concrete	6500	4147	714	478	16.03	44.13
20mm, M220 TP-T	Earth	3940	3340	581	317	25.83	22.83
	Water	3940	3040	558	311	26.08	30.96
	Steel	3940	3290	804	513	36.66	47.76
	Concrete	3940	3260	765	447	34.33	34.09
20mm, M55A2 TP	Earth	4500	3780	733	357	25.74	33.20
	Water	4500	3500	737	350	26.16	36.66
	Steel	4500	3290	1025	585	38.14	36.82
	Concrete	4500	3260	969	509	34.12	37.78
30mm, M788 TP-T	Earth	4020	3116	636	311	24.93	40.37
	Water	4020	3252	730	298	25.19	28.65
	Steel	4020	3631	1023	524	36.78	33.18
	Concrete	4020	3600	874	451	30.66	35.59

[46] AR 385-63, *Range Safety*, Appendix C-1.
[47] AR 385-63, *Range Safety*, Appendix C-2.

Surface Danger Zones for Direct Fire Weapons
Without Explosive Projectiles
Table (1)

Impact Area. The area within the surface danger zone used to contain fired, or launched ammunition and explosives, and the resulting fragments, debris, and components. Indirect fire weapon system impact areas include probable error for range and deflection. Direct fire weapon system impact areas encompass the total area from the firing point downrange to distance X and laterally between the ricochet area, but exclude areas A and B. Areas A and B are part of the total weapon system surface danger zone, but contain fragments, debris, and components of ammunition and explosives functioning on the near edge of the impact area.[49]

Ricochet Area. The area located to the left and right of the dispersion area in a direct fire weapon system surface danger zone. It contains projectiles which ricochet after making initial contact with the target or other impact medium. For direct fire weapon system surface danger zones having angles P and Q, it is also the area located to the left and right of the dispersion area and defined as area W.[50]

Probable error. A measure of the impact distribution in the dispersion pattern around the center of projectile impact that is dimensionally expressed in firing tables as one interval of the dispersion rectangle. Probable errors are only unique to indirect fire weapon systems.[51]

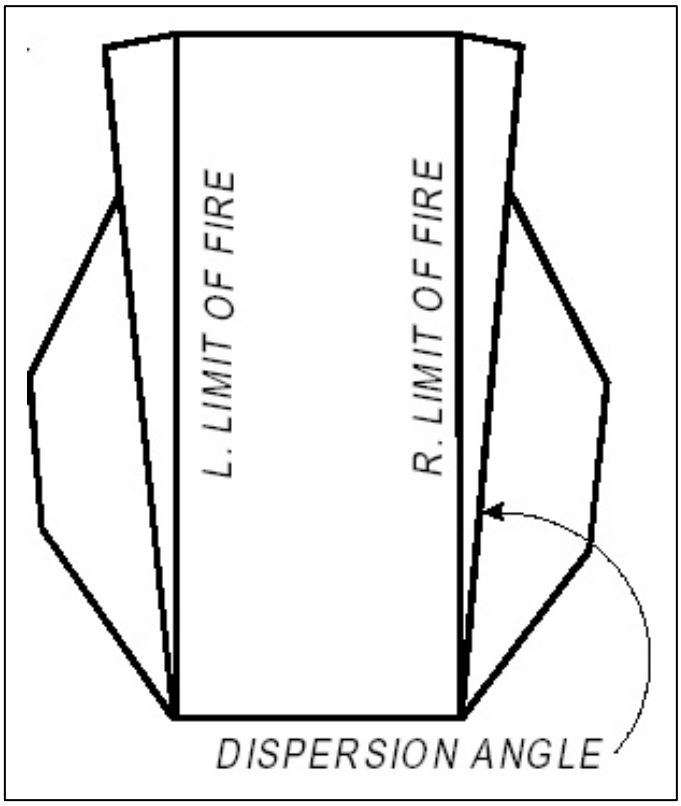
---

[48] AR 385-63, *Range Safety*, Appendix C-2.
[49] AR 385-63, *Range Safety*, Appendix C-2.
[50] AR 385-63, *Range Safety*, Appendix C-2.
[51] AR 385-63, *Range Safety*, Appendix C-2.

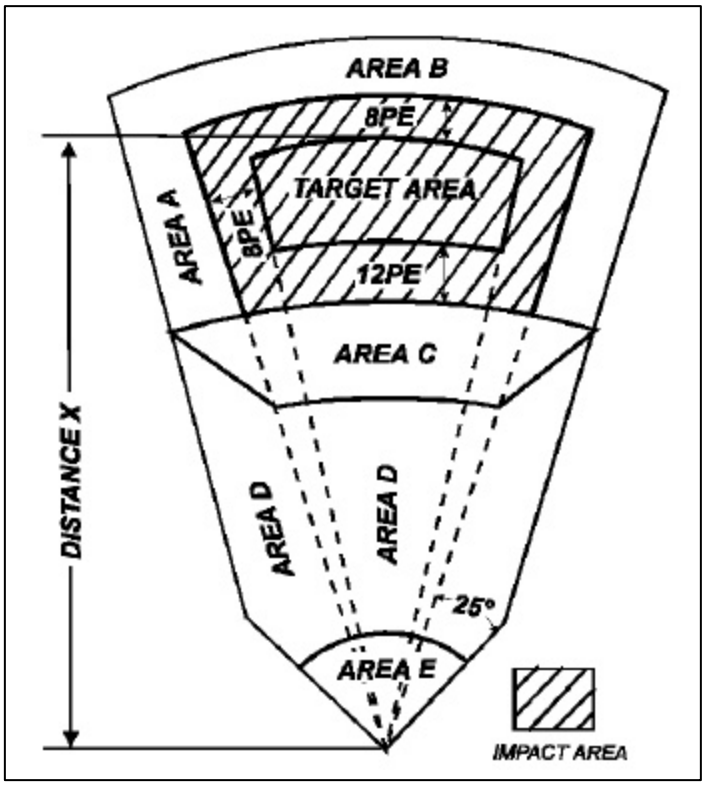
Target Area. The point or location within the surface danger zone where targets (static/moving, point/array) are emplaced for weapon system engagement. Target areas for direct and indirect fire weapon systems and demolition are defined below:[52]

(a) Direct fire weapon systems - the target area may be any point along the gun target line.
(b) Indirect fire weapon systems - the target area is located between areas A, B, and C.
(c) Demolitions - the target area is the point or location where explosive charges are emplaced.

Figure (C)[53] depicts an SDZ for multiple firing positions, firing similar type weapons and Figure (D[54]) shows an indirect fire (artillery/mortars) SDZ.



Multiple Firing Positions, Multiple Targets
Figure (C)



Indirect Fire SDZ
Figure (D)

[52] AR 385-63, *Range Safety*, Appendix C-2.
[53] AR 385-63, *Range Safety*, Appendix C-13.
[54] AR 385-63, *Range Safety*, Appendix C-9.

In the complex, fluid and chaotic environment of the modern day battlefield, the SDZ is not going to be uniform in design. Consider that a reinforced rifle company will have many unique attachments and fire support assets at its disposal, as well as a distinct scheme of maneuver. The scheme of maneuver calls for one unit fixing the enemy, while the other units maneuver to envelope, all under the cover of coordinated indirect fire. This SDZ of this particular battle space will be non-uniform and diverse. However, a basic visualization of each particular SDZ (one for each group of weapon systems and the position they encompass) will facilitate a basic SDZ "picture" for the company commander to verify that the chosen scheme of maneuver is relatively safe, and the possibility of fratricide has been minimized Figure (E)[55] on the following page, depicts a SDZ for indirect fire and direct fire weapons being utilized in a combined arms manner. The outside boundary line of the 3 SDZs reflects the entire SDZ for this particular evolution and gives a graphic visualization to the unit leader in order to enable him to understand the potential effects of the weapon systems at his disposal.

[55] AR 385-63, *Range Safety*, Appendix C-13.

Combined Arms SDZs for Multiple Firing Positions.

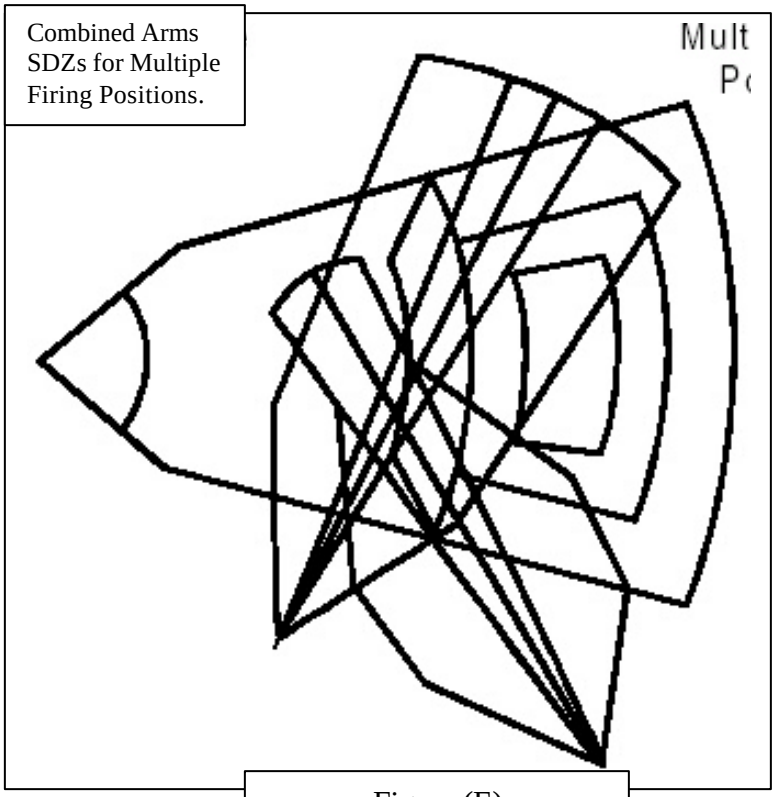


Figure (E)

There is much information to digest in the AR 385. But a basic working knowledge of SDZs and the particular chapter on Live Fire Exercises (Chapter 19) will greatly enhance the combat effectiveness of a unit and most importantly, greatly reduce the possibility of training casualties.

The following examples can be frequently observed in the operating forces.

"Position the 60 mm mortar section 400 meters directly behind 1st platoon with a direction of fire of…."

"I want the maneuver element to get as close as possible to the base of fire before we signal to shift or cease fire."

"I want everybody (M16A2s, M249s, M240Gs) shooting in the base of fire as the maneuver element flanks the objective."

"I have a hot position for the AT-4 approximately 10 meters from the road which gives him a great, close-in, flanking shot."

"To promote cross-training…on this next running of the live fire evolution, I want all M249 SAW gunners to switch weapons with somebody that has an M16A2."

Although the examples seem routine and executable, a leader who was knowledgeable in the AR 385 would never allow them to happen.

In preparation for conducting live-fire training, a unit leader should, at a minimum, carefully examine the applicable chapter(s) in the AR 385 that apply to the weapon systems being utilized, and the type of live-fire training being executed. In order for a unit to train hard and realistically, it must train smart. A comprehension of the information in AR 385 by company grade unit leaders will allow that unit to train smart, and ultimately fight smart and fight hard.

Chapter 6
Conclusion

The habit of gambling contrary to reasonable calculations is a military vice which, as the pages of history reveal, has ruined more armies than any other cause.

-B.H. Liddell Hart

The Commandant of the Marine Corps is committed to halting the accidental deaths and injuries within his organization. Safety and operations must intertwine in such a manner that risk management and safety are part of the planning and execution of all missions, exercises, and daily activities.[56] However, the Marine Corps cannot afford to become too cautious when it comes to the matter of safety. There is a fine line between a unit being safety cautious and being safety conscious. The Marine Corps needs to become more safety conscious. The Marine Corps can easily minimize or lower the numerous accidental deaths that occur throughout peacetime on an annual basis. To do this, the easy solution would be to stop conducting training. No flying, no road marches, no combined arms exercises, no rifle ranges. Low accident/mishap rates and minimal injury statistics do not necessarily equate to a good, proficient combat-ready organization. An infantry unit that never trains and continually remains in garrison may have an outstanding accident/mishap rate, however, that unit is most likely non-mission capable in any of its Mission Essential Task List (METL) requirements. In order to be capable, a unit must train to the establish standard(s). A good, proficient unit attempts to conduct all of its mission essential tasks, in the conditions that it would expect to endure in combat.

[56] CMC, *2000 Safety Campaign Plan*, 2.

Commanders and leaders must still be able to aggressively conduct effective, realistic training to properly prepare their units for combat However, they must be more safety conscious in the conduct of their training. Statistics show that 80 percent of all accidents are caused by human error, and supervision is the key to preventing human error. Leaders can reduce human error by establishing sound standards and consistently enforcing them. Failure to enforce a standard serves to establish a new, lower standard. The Marine Corps standard for the conduct of Range Safety is MCO 3570.2A (AR 385). This order sets the policies and procedures for firing ammunition for training, target practice and combat. This order must be understood and adhered to by all leaders. It must be enforced. There must be a concerted effort by the leadership of the Marine Corps to get this document in the hands of those executing training. This effort must be at the same level and authority as with the implementation of the Operational Risk Management process. Failure to properly understand contents of this document will lead to more unnecessary accidental deaths and injuries in training operations. If the Marine Corps subscribes to the "fight as you were trained" adage, we will have more accidental deaths and injuries in combat as well.

Safety in training is not only important, it is obligatory. But safety is not entirely insured by the adherence to the AR-385 and the Operational Risk Management process. Safety is a matter of keen judgment, sound analysis, and common sense. In order to have the capacity to properly judge, analyze and apply common sense toward training, one must first have a basic knowledge/understanding of the science of their trade.

BIBLIOGRAPHY

Books

Florio, A.E.,and G.T. Stafford. *Safety Education*. 3rd ed. New York: McGraw Hill, 1969.

Rigg, Robert B. *Realistic Combat Training and How to Conduct It.* Harrisburg, PA: Telegraph Press, 1955.

Seaton, Don Cash, and others. *Administration and Supervision of Safety Education*. New York: The MacMillian Company, 1969.

Magazines

Arthaud, Jason D. "M16-A2 Exploded." *Ground Warrior-The Marine Corps Ground Safety Magazine*, Winter 2001-2002, 4-7.

Berthelotte, Paul. "Those Targets Are Far Enough Away." *Ground Warrior-The Marine Corps Ground Safety Magazine*, Winter 1999-2000, 4-6.

Blaine, M.J. "ORM: It Works for the 3rd Regiment." *Ground Warrior-The Marine Corps Ground Safety Magazine*, January, 1998, 20-24.

Cleary, Joseph. "Rehearsal? No Thank You!" *Ground Warrior-The Marine Corps Ground Safety Magazine*, Winter 2000-2001, 14-15.

Cleary, Joseph. "Hmm...My Stationary Targets Went Down." *Ground Warrior-The Marine Corps Ground Safety Magazine*, Summer 2001, 10-11.

Rivinius, Keith. "The High Cost of MEU Training." *Ground Warrior-The Marine Corps Ground Safety Magazine*, Summer, 1999, 25.

Scarf, Michael. "Friendly Fire Isn't." *Ground Warrior-The Marine Corps Ground Safety Magazine*, Winter 1998, 2-3.

Smith, Rodney. "Lobbing Grenades: Don't Get Outwitted by Inanimate Objects." *Ground Warrior-The Marine Corps Ground Safety Magazine*, Summer, 2000, 12-13, 30.

Military Manuals

U.S. Army. Field Manual (FM) 100-14. *Risk Management*. Washington, DC: Department of the Army, 23 April 1998.

U.S. Marine Corps. Marine Corps Reference Publication (MCRP) 3-0A. *Unit Training Management Guide*. Washington, DC: Headquarters, United States Marine Corps, 25 November 1996.

U.S. Marine Corps. Marine Corps Reference Publication (MCRP) 3-0B. *How to Conduct Training*. Washington, DC: Headquarters, United States Marine Corps, 25 November 1996.

U.S. Marine Corps. *Company Commander's Handbook*. Washington, DC: Marine Corps Institute; Headquarters, United States Marine Corps, 31 March 1989.

U.S. Marine Corps. Marine Corps Doctrinal Publication (MCDP) 1. *Warfighting*. Washington, DC: Headquarters, United States Marine Corps, 20 June 1997.

Miltary Orders

U.S. Marine Corps. Marine Corps Order (MCO) 3500.27A. *Operational Risk Management (ORM)*. Washington, DC: Headquarters, United States Marine Corps, 26 September 2000.

U.S. Marine Corps. Marine Corps Order (MCO) 5100.29. *Marine Corps Safety Program*. Washington, DC: Headquarters, United States Marine Corps, 6 September 1994.

Military Brochures

U.S. Marine Corps. *United States Marine Corps Safety Campaign Plan*. Washington, DC: Headquarters, United States Marine Corps, August 2000.

U.S. Marine Corps. 2002 *Safety Campaign Plan*. Washington, DC: Headquarters, United States Marine Corps, January 2002.

U.S. Marine Corps. *Safety Forum 2000*. Washington, DC: Headquarters, United States Marine Corps, Safety Division, August 2000.

Pamphlets

U.S. Army. Training and Doctrine Command (TRADOC) Draft Pamphlet Army Regulation (AR) 385-63. *Range Safety.* Fort Monroe, VA: U.S. Army TRADOC, 1 October 2000.

U.S. Army. Training and Doctrine Command (TRADOC) Pamphlet Army Regulation (AR) 385-63. *Policies and Procedures for Firing Ammunition for Training, Target practice and Combat*. Fort Monroe, VA: U.S. Army TRADOC, 15 October 1983.

Electronic Citations

"Indicators of Safety Readiness." URL:http://www.hqmc.usmc.mil/safety.nsf/ff918d1fdad570a885256Aa004fer.html. Accessed 9 January 2002.

"How People Died in Mishaps." URL: http://www.safetycenter.navy.mil/statistics/images/marinetables.jpg.html. Accessed 18 December 2001.