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THE EVALUATION OF SMALL ARMS EFFECTIVENESS CRITERIA

VOLUME II: APPENDIXES

May 1975

Sponsored by:

Defense Advanced Research Projects Agency

ARPA Order No. 2760

INTREC, INC.
Santa Monica, California 90401

THE EVALUATION OF SMALL ARMS EFFECTIVENESS CRITERIA

VOLUME II: APPENDIXES

May 1975

This research was supported by the Defense Advanced Research Projects Agency of the Department of Defense and was monitored by the US Army Missile Command under Contract Number DAAH01-74-C-0649, effective 5 April 1974.

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CONTENTS: VOLUME II

List of Tables iii

List of Figures iv

Appendix

A. BIBLIOGRAPHY A-1

B. REVIEW OF SMALL ARMS LETHALITY TESTING B-1

C. ENGINEERING TEST FORMAT C-1

D. RANGES AT WHICH SMALL ARMS TARGETS ARE ENGAGED D-1

E. HOW SOLDIERS FIRE SMALL ARMS IN COMBAT--ANALYSIS OF COMBAT FILMS E-1

F. FURTHER DATA ON CDEC AND IB TESTING RANGES AND NEW RANGE EQUIPMENT AVAILABLE F-1

G. SAMPLE DECISION MEMORANDA FROM THE CDEC-SAWS PROJECT G-1

TABLES: VOLUME II

D-1 Range Intervals for Detecting Infantry Targets Reported from the Korean War D-5

D-2 Estimated Maximum Useful Small Arms Ranges in the Korean War D-14

E-1 Incidence of Body Positions in Filmed Small Arms Firing Sequences E-4

E-2 Incidence of the Use of Support for Rifles, Carbines, and BARs from the Shoulder E-6

E-3 Incidence of Firers' Body Exposure Level with Sighting Method and Selected Body Positions E-7

E-4 Incidence of the Use of Cover and Concealment by Small Arms Firers E-9

E-5 Incidence of Clearly Pointed Fire by Weapon Type in Various Terrains E-11

F-1 Small Arms Tests Recently Conducted on IB Ranges F-2

F-2 Number and Types of Targets on IB Test Ranges F-3

F-3 Estimated Cost of Procuring IB Defense Ranges F-11

F-4 Small Arms Experiments Recently Conducted at CDEC F-13

F-5 Personnel Directly Assigned to CDEC Ranges When in Operation F-25

F-6 Procurement Costs of CDEC Range Components F-27

F-7 Comparison of Current IB and CDEC Ranges in Target Instrumentation and Capacity to Handle Test Firers F-28

F-8 Companies Producing Equipment for Smal[illegible]s Testing and Training F-39

FIGURES: VOLUME II

D-1 Frequency distribution of maximum lines of sight ranges from 153 defense positions in the Ardennes Campaign, World War II D-3

D-2 Frequency distribution of ranges to rifle squad targets in the CDEC-SAWS experiment D-5

D-3 Frequency distribution of ranges to machine gun squad targets in the CDEC-SAWS experiment D-6

D-4 Percent of rifle ammunition expended versus range in World War II and the Korean War D-10

D-5 Frequency distribution of ranges in small arms firings estimated from World War II, Korean War, and Vietnam War combat films D-11

D-6 Frequency distribution of ranges in small arms firings estimated from Vietnam War combat films D-12

D-7 Frequency distribution of ranges in small arms firings in World War II in Europe D-13

D-8 Frequency distribution of ranges in small arms firings estimated by the British Army for combat in Korea D-15

D-9 Frequency distribution of ranges at which small arms casualties were incurred in New Georgia and Burma in World War II D-17

D-10 Frequency distribution of ranges at which U.S. rifle casualties were incurred in the Vietnam War D-19

E-1 Incidence of pointed and aimed fire at different exposure levels E-8

E-2 Frequency distribution of first-round fire times E-13

E-3 Frequency distribution of first-round firing times for aimed and pointed fire E-14

E-4 Frequency distribution of sizes of M16 and BAR bursts of automatic fire E-16

E-5 Percent of times each range bracket was chosen E-19

E-6 Percent of estimated target range per 50-meter intervals E-20

E-7 Percent of estimated target range per 50-meter intervals for aimed and pointed fire E-21

E-8 Standing positions showing typical high elbow position (M1 and M16) and low elbow position (M14) E-24

E-9 Typical kneeling positions (M1 and M16) and typical prone position (M16) E-25

E-10 Men firing weapons from other than shoulder position E-27

E-11 Man firing M16 from other than shoulder position E-28

F-1 Layout of IB attack range F-8

F-2 Layout of IB quick-fire range F-9

F-3 Layout of IB day and night defense range F-10

F-4 Weapon-signature simulator F-15

F-5 Target components in armored target box F-17

F-6 Portable round counter for the M16 rifle F-19

F-7 Layout of Alpha Range, HLMR F-23

F-8 Layout of Bravo Range, HLMR F-24

Appendix A

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Appendix B

REVIEW OF SMALL ARMS LETHALITY TESTING

INTRODUCTION

This appendix includes the following:

- o Review of existing wound ballistics combat results and test data.
- o Analysis of certain combat and test data.
- o Comparison of data with currently used lethality models.
- o Conclusions concerning testing and lethality differences among standard bullets.

A basic understanding of the mechanisms of wounding by bullets has been pursued by surgeons and medical researchers for over a century. The "explosive" wound damage effects of bullets were first noted by Huzier in 1848 in Paris. The hydrodynamic nature of the extensive internal damage or "explosive" cavity caused by high-velocity bullets was first recognized by a Swiss researcher, Kocher, in 1874. By the turn of the century, bullet flattening and shock wave transmission had been eliminated as mechanisms; in 1898, Stevenson had, from surgical observation, correctly defined the major damage mechanism as the cavity in the wake of the bullet caused by the outward momentum imparted to tissue fluids.

The 1928 "Pig Board" firings and wound autopsies established what had already been suspected: that bullet velocity, tumbling, and energy loss were closely related to wound damage and that bullet caliber was not. World War II research by Harvey and others at Princeton treated the quantitative physics of wounding as a branch of underwater ballistics, having established by ultra-high-speed photography and X-rays that bullet cavities in water show behavior analogous to that of bullet temporary or "explosive" cavities in tissues.*

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*For a more detailed history of wound ballistics, see U.S. Army, Office of the Surgeon General, Wound Ballistics, edited by James C. Beyer (Washington, 1962). For the physics of wounding, see Chapter III.

Despite the advances in understanding the fundamental physics of wounding that were achieved in World War II, little or no research was undertaken to directly compare the wounding effectiveness of bullets of various shapes, velocities, and sizes (though some work was done on fragment sizes). The Pig Board tests remain the last scientifically credible experimental comparison of bullets of varying caliber.

Little progress has been made since World War II in the basic understanding of the mechanisms of wounding. Most attention in the area has focused on "optimizing" fragmentation, improving body armor, and devising and applying computer models for predicting incapacitation by various fragments and bullets. These models have, in fact, considerably less scientific validity than the World War II work; as a result, they have introduced much confusion and erroneous quantification into the evaluation of small arms wounding effectiveness--as will be seen.

THE TREND TOWARD SMALLER CALIBERS

Since the Civil War, whenever the question of introducing a smaller caliber cartridge has arisen, military developers and users have expressed concern that the smaller caliber may have insufficient "stopping power" and may be unlikely to "do the job." These objections were raised when the large (circa .40 to .60 caliber) and subsonic balls of the Civil War era were being replaced by 7.9- to 6.5-mm cartridges (about 2000 to 2800 fps) toward the end of the 19th century. Similar objections were raised again in the 1920s, when the .276 caliber was proposed (and defeated). The insufficient "stopping power" issue was heard again in the 1960s, when the 3200 fps 5.56 mm was proposed as a replacement for the 2800 fps 7.62 mm. In each case after adoption, surgical observation of combat casualties indicated that, if anything, the smaller-caliber, higher-velocity bullet created greater wound damage than its predecessor.

WOUND DAMAGE MECHANISMS

Based on the World War II wound ballistics research, it appears that most of the damage caused by a bullet owes to the violent expansion and construction of the large temporary cavity formed in the wake of high-velocity projectiles of any shape. This temporary cavity can fracture bones and rupture organs at significant distances from the bullet path. The diameter of the damage zone is apparently directly related to the diameter of the temporary cavity. The diameter of the temporary cavity at any point is proportional to the square root of the space rate of projectile energy loss at that point, or, equivalently, to the energy of the projectile times the retardation coefficient at that point. Thus, the diameter of the temporary cavity can vary widely--even for spherical projectiles--as tissues of varying resistance are encountered.*

Bullets, which are stabilized by the slight excess of gyroscopic spin forces over drag forces in air, become suddenly unstable upon entering the medium of tissue, which is 800 times denser than air. How fast they tumble in homogeneous tissue depends almost entirely on their transverse rotational moment of inertia and their yaw angle at impact. Thus, small bullets striking at moderate yaw angles of a few degrees will tumble much faster than highly stable, massive, point-on bullets of the type designed for minimum long-range dispersion. Yaws as fast as 90° in 3 inches have been observed. However, all high-velocity spitzer bullets will experience some tumbling due to tipping by external clothing or equipment and by internal inhomogeneities.

The significance of tumbling is that bullet retardation increases roughly as the square of yaw. Thus, a bullet at right angles to its path experiences approximately 50 times the retardation--and therefore produces a wound cavity diameter 50 times as large--as the same bullet point-on.** Thus, rapid tumbling before bullet exit is the most significant determinant of wound cavity size for bullets of comparable velocity, and it dominates such factors as bullet mass. Rapid tumbling, high-damage bullets are achieved by obtaining some yaw at impact, low rotational moment of inertia around the transverse axis, and high velocities. In other words, the most

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*For a more detailed discussion, see U.S. Army, Office of the Surgeon General, Wound Ballistics, Chapter III.

**Ibid., Chapter II.

lethal bullets will be fast and small* and should have the least possible stability consistent with acceptable dispersion.**

It is important to note that the above physical insights, although sufficient to guide bullet design and comparisons of qualitative wounding effectiveness, are not in any sense sufficient to provide quantitative predictions of serious casualty production or incapacitation. That is because the location of the temporary wound cavity relative to vital organs exerts an even more powerful (and unquantified) effect than the size of the cavity.

As a result of the most recent controversy, the 5.56-mm versus the 7.62-mm bullet, a number of research efforts were mounted, but they produced fragments of data that shed little new light and, in fact, often contradict each other. Reports and studies citing these data have, over the last ten or twelve years, created the general impression that significant differences in lethality exist between the 5.56-mm and 7.62-mm bullets. The validity of such a conclusion is an important matter and should therefore survive any fair and objective challenge. The remainder of this appendix examines the evidence for and against the existence of significant lethality differences in current standard rifle bullets.

TYPES OF EMPIRICAL BULLET LETHALITY DATA

There is little direct combat evidence of important variations in lethality among the standard rifle bullets in use since World War I. Comparable samples of casualties caused by several different kinds of bullets under similar exposure and range frequency conditions are rarely present in one country's force. Furthermore, little effort has been devoted to collecting detailed bullet wound data in any country. The data that are available are discussed below.

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*Bullets that are too fast and too small will not penetrate grass, brush, outer clothing, and equipment adequately because they will explode into tiny fragments upon contact. The limits of how small and how fast bullets can be made and still remain useful are not known.

**In light of this, the AMC decision to increase the twist of the M16 from 1 in 14 inches to 1 in 12 inches to increase the stability of the bullet under extreme arctic conditions (thereby achieving a just-noticeable decrease in dispersion at -60°F) has decreased the weapon's overall effectiveness. Fortunately, the bullet is still more than adequately lethal.

Because direct casualty evidence is in short supply, weapon developers have turned to substitute evidence. This usually involves estimating or inferring human incapacitation from bullet performance in some substitute material. (Cadavers cannot be used for valid lethality tests because they present far different mechanical properties to bullets than do live bodies.) Two types of substitutes have been used: animals and blocks of firm gelatin (which has penetrability properties similar though not identical to human muscle tissue). It is obvious that these substitutes are not the same as human bodies. Thus, lethality predictions made from tests using them must be applied with caution. It is therefore useful to consider how much direct evidence of bullet lethality in humans is available before discussing the use of substitutes.

COMBAT EVIDENCE OF BULLET LETHALITY

Usable data on the severity of wounds produced by rifle and machine gun bullets are not available for all casualties recorded by the U.S. Army, in part because the wounding agent (bullet, fragment, etc.) identified by surgeons or recorded in grave registrations is often in question, and in part because the circumstances of each casualty incident are not recorded. However, several samples of detailed small arms casualty data were deliberately collected during World War II, and they provide insights into bullet lethality. The most detailed data come from two samples, one of 213 bullet casualties in the New Georgia and Burma campaigns and the other of 59 bullet casualties in the Bougainville campaign.*

In these two samples the portion of rifle casualties who were killed or hospitalized (at any level above an aid station) was about 82 percent; for machine gun casualties it was about 92 percent. Even first-echelon hospitalization for bullet wounds required an average of 15 to 17 days. Of the total of men hit by rifle bullets, about 26 percent died and 41 percent had wounds so serious that they were evacuated to rear echelons or

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*U.S. Army, Office of the Surgeon General, Wound Ballistics, pp. 264-266 and p. 433, respectively.

the United States; for machine gun casualties, about 45 percent died and 40 percent required evacuation to rear echelons or the United States. The vast majority of small arms casualties were hit by the 6.5-mm Japanese rifle bullet, a moderate-velocity (2400 fps) bullet observed by military surgeons to cause especially grave wounds.* The relatively large wound damage effects of the 6.5-mm bullet apparently owed to its thin rear jacket design, which caused (intentionally or unintentionally) both high yaw (e.g., low stability) and separation of bullet from jacket on impact.

No detailed casualty surveys of adequate sample size covering both wounded and killed casualties resulting from specific, known engagements are available for other small arms and other theaters. Surgical observations exist on the relative severity of wounds from other types of bullets; of some interest is the observation that, as expected, wounds from pistol bullets (800 to 1200 fps) are significantly less severe than high-velocity rifle bullet wounds, and .30 caliber carbine wounds (1975 fps) are more like pistol wounds than rifle wounds.**

None of the available casualty surveys give any direct data concerning incapacitation, and time to incapacitation, of the casualty cases. Despite this, current computer lethality models attempt to predict incapacitation effectiveness (according to allegedly precise criteria of time and function--attack or defense) rather than to predict casualty production, say, the level of hospitalization required. Thus, these models are predicting quantities that have never been measured and probably never will be.

CONTROLLED TESTS USING SUBSTITUTE TARGETS

Of the two types of substitute targets, live animals are recognized to better simulate the human body, but gelatin blocks are far easier and less expensive to use.

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*Ibid., pp. 19, 96.

**Ibid., p. 94.

The object of experiments with substitute materials is to predict the seriousness (or the incapacitating effects) of wounds produced in men, so it is important to know how well these experiments help to predict wound severity. Certainly, if one is to have confidence in such predictions the tests must produce data that allow calculating the effect of:

- o Expected distributions of hit locations on the body and of directions of bullet travel within the body (and thus of the bullet's opportunity to cause damage to internal organs most likely to incapacitate).
- o Bullet penetration of clothing and equipment covering the body at the hit location, both in terms of the energy loss outside the body and the induced tumbling.
- o Bullet penetration of various internal tissues and bones that affects the tumbling and energy transfer of the bullet as it traverses the body.
- o Bullet striking velocity and yaw at impact, which depend on the range from the weapon to the target.

If bullet lethalities are to be compared on the basis of the "typical" hits on a soldier in combat, then it is essential that "typical" hits represent the expected distribution of locations and directions. The location of hits has been extensively studied in combat casualty surveys during the Civil War, World War I, World War II, in Korea and, to some extent, Vietnam. Direction of bullet travel through the body is rarely recorded; there exist essentially no usable distributions of directions of bullet paths relative to the body. The plausible assumption, used in most computer lethality models, that hits are random and proportional to the size of the body component's presented area has been demonstrated to be false. Almost all casualty surveys show a significantly higher than predicted percent of hits on the head and significantly lower than expected hits on the abdomen and legs.* In the absence of a combat-verified distribution of hit locations and directions for bullets, it seems unlikely that models for predicting lethality can have much validity.

A soldier engaged in front-line combat is always covered with layers of clothing and items of equipment (cartridge belt, suspenders, ammunition pouches, canteen, first aid kit, etc.); he is likely to be wearing a steel helmet and perhaps an armored vest. These items must be penetrated by a bullet before it penetrates his body. They add protection insofar as they decrease the bullet's energy and sometimes deflect it. However, they can significantly increase bullet damage by increasing its yaw angle and accelerating the tumbling process. (These effects of clothing and equipment have never been tested or included in current lethality modeling.) Similarly, after bullets begin to penetrate the body they may encounter bone and tough membrane, which can either protect vital organs or can accelerate tumbling.

Comparing animal targets and gelatin targets, it appears that most of the important internal and external effects on bullet lethality could be tested using animals, though such tests cannot lead to accurate quantitative prediction of human incapacitation. Test animals can be oriented toward the weapon and shielded by armor plate so as to achieve reproducible hit locations and bullet path angles relative to the body. They can be covered by clothing and equipment to provide data on the effects of these elements on bullet performance. Their bone structures and internal organs are not similar enough to man's to provide lethality quantification, but they can approximate the principal internal effects on bullet behavior. Bullet yaw before impact can be measured in order to control the effect of this critical variable. However, few of these aspects have been adequately represented in animal tests since World War II, as discussed below.

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*The presented areas used for prediction are almost always those of the full standing figure. As the casualty data show, this is hardly the average posture or exposure in combat; men are more likely to be crouching or prone and half exposed or in foxholes. The uniformly random hit distribution for bullets is further distorted by the effects of aiming, which are probably significant at close ranges.

Gelatin blocks, on the other hand, have little in common with the human body. They represent homogeneous muscle tissue only approximately (e.g., with about 22 percent lower drag coefficient and considerably different temporary cavity volumes and pulsations), but they do not represent any other component of the body. At most, gelatin block tests can be used to determine relative distance to tumble as an indicator of relative wound damage.* The blocks can be covered with appropriate clothing and equipment, and their surfaces can be oriented at angles to the bullet's path to determine the effects of covering materials and obliquity on distance to tumble. Except for one laboratory test under unrepresentative ballistic conditions,** gelatin tests have included only normal impact angles on "nude" gelatin.

RESULTS OF ANIMAL TESTS

The animal test data that this study has identified include one test using pigs and several tests using rabbits, cats, and goats. Only one of the latter involved the use of bullets and collected adequate data. The outstanding result of these tests was the seriousness of the wounds produced by all the bullets used, ranging from 5.56 mm to .30 caliber.

The pig tests were conducted by the U.S. Army in 1928 in support of a board appointed to recommend a cartridge for a new semiautomatic rifle.*** (The board has since become known as the "Pig Board.") Bullets of similar shape ranging from .256 to .30 caliber were fired, at muzzle velocities of 2700 fps, at anesthetized pigs located 300, 600, and 1000 yards away. Hit

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*Since distance to tumble is extremely sensitive to bullet yaw at impact, to be valid such tests must use large sample sizes of completely representative weapons and ammunition fired at many increments of range (since yaw is somewhat random from round to round and can vary rapidly with range). Few, if any, gelatin block tests meet these criteria of validity; a common failing is to simulate long-range impacts by using down-loaded cartridges at short range, which gives invalid yaw results.

**Ballistic Research Laboratories, Ballistic Limits of Tissue and Clothing, by J. Sperrazza and W. Kokinakis, BRL TN 1645, AD 813-139 (Aberdeen Proving Ground, MD, January 1967).

***U.S. War Department, Pig Board, Report of the Board of Officers Appointed by Paragraph 31, Special Orders 154, War Department, 2 July 1928 (Washington, September 21, 1928).

locations and directions were controlled; armor plate with a small aperture at the desired impact location was placed in front of each pig. The residual velocities and yaw of exiting bullets (almost all rounds completely penetrated the pigs) were measured in many cases. Wounds were examined and measured through autopsy.

Reanalysis of Pig Board Results

Examination of the wound-by-wound data in the pig test report reveals some clear lethality results that do not appear to be generally understood today; no newer or more valid data exist to refute them. Of a total of 106 wounds, 86 percent were described (based on the autopsy results) as producing severe damage. The remaining 14 percent were from shots that penetrated only skin, fat, and muscle; 80 percent of these hit the thighs, back, and shoulders. Most of these shots hit near the edges of the pig's silhouette.

The reanalysis confirmed the original report's findings of some differences among wounds from the different caliber bullets, with the smallest bullets producing the greatest damage at ranges of 300 and 600 yards. However, the larger bullets also produced severe damage at these ranges. The only detectable reduction in severity of damage at 1000 yards relative to damage at the shorter ranges was in wounds in the hams (thighs), some of which were probably not immediately incapacitating.

The amounts of bullet energy transferred to the pigs were measured in some of the shots, primarily those fired at 600 and 1000 yards. Foot-pounds of energy transferred ranged from 12 to over 1100, but over 60 percent of the bullets deposited less than 300 foot-pounds of energy (each) in the pigs' bodies. Contrary to the assumptions of most predictive models, total energy* deposited in the non-serious wounds had about the

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*The physics of wound damage (i.e., the diameter of the temporary cavity) is concerned with the instantaneous space rate of energy loss, not the total energy loss. As mentioned above, the diameter of the temporary cavity is proportional to the projectile energy times the retardation coefficient at the point in the body where the cavity diameter is measured. The diameter of the cavity varies radically along the wound track, depending mostly on instantaneous bullet yaw angle and tissue resistance at each point.

same distribution as in the serious wounds. The only apparent differ-erence in the amounts of energy deposited by the .256, .276, and .30 caliber rounds was that only the .30 caliber bullet deposited more than 700 foot-pounds. Energy transfer was somewhat a function of the hit location, with hits in the head, chest, and abdomen accounting for the great preponderance of energy deposits larger than 200 foot-pounds. Average total energy transfer was greater at 600 than at 1000 yards, reflecting the greater kinetic energy remaining in the bullets at the shorter range. However, as stated above, this did not appear to affect the percent of serious wounds produced.

It appears that most of the tested combinations of bullet size, range (and thus bullet velocity), and hit location and direction are above any minimum threshold for serious wounds. Of these factors only hit location and direction significantly influenced the seriousness of the wounds inflicted by these bullets.

Reanalysis of Goat Tests

Wound ballistic tests were conducted on goats in 1964;* they were less precisely controlled than the pig tests. The weapons used were the 5.56-mm M16 rifle (1 in 12 twist); the 7.62-mm M14 rifle; and the Soviet 7.62-mm AK 47 rifle (representing considerably lower bullet mass and velocity than the M14). The locations of hits and directions of bullet paths relative to the goats were not controlled, but most bullets hit the goats' torsos rather than their extremities, and apparently from the side. The wounds were examined by autopsy. Of a total of 182 hits, 45 percent put the goat on the ground--dead or unable to stand--within five minutes (usually in a few seconds). In another 43 percent of the hits the goats were either sacrificed before five minutes elapsed or the time to their collapse was not recorded; however, the descriptions of the wounds (in-cluding diagrams of the wound tracks) indicate that they were serious.

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*Edgewood Arsenal, Chemical Research and Development Laboratories, Wound-Ballistics Assessment of M-14, AR-15 and Soviet AK Rifles (U), by Arthur J. Dziemian and Alfred G. Oliver, CRDLR 3204, AD 366-278 (Edgewood Arsenal, MD, March 1964), Confidential/NOFORN.

Many of this latter group of wounds produced large cavities in the goats' gastrointestinal systems. Thus, 85 percent of all wounds were apparently serious ones. The remaining 15 percent of the hits caused skin, fat, and muscle damage that would not necessarily be severe. Given the high variability induced by uncontrolled hit locations, all of the bullet types tested produced similar proportions of serious wounds at all ranges; differences in their lethalities cannot be inferred from the data.

GELATIN TESTS AND PREDICTIVE MODELS BASED ON THEM

Gelatin blocks are the most widely used target substitutes for human bodies in lethality testing because the tests are inexpensive and a detailed photographic record can be obtained of the projectile's track through the gelatin. The results of these tests are not, however, reliable indicators of lethality.* In addition to the unrepresentative homogeneity of the gelatin target, the permanent cavity in gelatin is only a record of tumbling; it does not represent the size of the temporary cavity in tissue, which is the basic damage mechanism in human bodies.

Attempts have been made to compensate for the artificiality of gelatin block results. In current computer models for predicting incapacitation, the projectile's total energy loss in 15 cm of gelatin is calculated from equations fitted to the previously described gelatin block firings and then translated into estimated wounding effects of such incapacitation "scores"** as a function of gelatin energy loss in each area of the body hit. The overall result is averaged, using the assumption of uniformly random horizontal hits or a standing nude man (with helmet) to arrive at

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*A detailed discussion of the technical aspects of the use of gelatin data to predict lethality is contained in U.S. Army, Small Arms Weapon Systems Analysis--a Review and Evaluation (Washington, June 1967).

**These "scores" are intended to be percent reductions in soldier "capability" for each area of the body, arrived at by a panel of medical doctors using subjective judgments. Separate "scores" versus energy loss, by area of the body, were established for the various incapacitation criteria such as the "5-minute defense" criterion and the "30-second attack" criterion. Defenders and attackers are both assumed to be full standing figures.

an average incapacitation "score" (often incorrectly used as an incapacitation probability). It is claimed that the basic incapacitation "score" judgments were based on the kinds of wounds that were observed in goats hit with spheres or cubes at various total energy loss levels. Even if goat wounds could be validly translated into human wounds, the shape of the wound track and temporary cavity made by spheres and cubes is quite different from that made by bullets, since bullet tumbling carries great variations in cavity diameter. Further, the goat tests provided too small a sample size to determine the chances that hits on given areas of the goat's body would fracture bones, rupture intestines, or damage vital organs and veins.

The results of these incapacitation models have been calculated a number of times over the past fourteen years for the current standard small arms projectiles--the M80, 7.62 mm NATO; the Soviet AK47, 7.62 mm (39-mm cartridge); and the M193, 5.56 mm. The numbers always decrease substantially as range increases from 100 to 500 meters. The more recent calculations* show the 5.56-mm and 7.62-mm bullets as achieving essentially equal average incapacitation "scores" at 100 meters (i.e., about .85 to .90 incapacitation), but as range increases to 500 meters the 7.62 mm decreases slowly to .77 incapacitation, while the 5.56 mm bullet drops to a .50-.55 "score."

These prediction differences are the direct results of calculated, not tested, differences in bullet energy loss to gelatin blocks during the first 15 cm of penetration. These calculated energy losses decrease smoothly** from 1400 foot-pounds at 10 meters' range to 150 foot-pounds at 500 meters' range for the M80, 7.62-mm bullet, and from 700 to 57 foot-pounds over the same ranges for the M193, 5.56-mm bullet. If there were a valid basis for relating the energy loss in 15 centimeters of gelatin to wound severity and incapacitation, the above energy losses should approximate

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*Edgewood Arsenal, Chemical Research and Development Laboratories, Wound-Ballistics Assessment of M-14, AR-15 and Soviet AK Rifles (U), by Arthur J. Dziemian and Alfred G. Oliver, CRDLR 3204, AD 366-278 (Edgewood Arsenal, MD, March 1964), Confidential/NOFORN.

**Valid test values of energy loss would show some increases with range at certain range intervals, due to increasing bullet yaw over these intervals.

those of the Pig Board tests. In fact, at 600 yards the measured losses in .30 caliber bullet energy due to travel through the pigs' bodies were more than four times larger than the calculated gelatin energy loss for the 7.62 mm (which has about the same size bullet and 100 fps more muzzle velocity than the Pig Board .30 caliber). The mean energy transfer in pigs at 600 yards for the .256 caliber bullet (2700 fps muzzle velocity) was 413 foot-pounds, and for the .276 and .30 caliber bullets (same velocity) it was 611 foot-pounds; median energy transfer values were 452 and 534 foot-pounds, respectively.

Clearly, gelatin block data and computer translations thereof cannot provide valid estimates of relative or absolute bullet lethality. The pig tests may imply lower wound severity than might be expected in actual combat. No clothing or equipment covered the pigs, so there were none of the added tipping effects on the bullets--increasing the wounding effect--that such materials could impart.*

CONCLUSIONS

There is evidence from both combat data for the 6.5-mm Japanese bullet and animal tests for high-velocity (i.e., above 2400 fps) bullets ranging from 5.56 mm to 7.62 mm that approximately 85 percent of the wounds resulting from hits by such bullets will be serious, that is, will require hospitalization rather than care at battalion aid stations. What percent of these serious casualties will be effectively incapacitated under any time criterion is unknown and unprovable. The performances of these bullets are more than adequately lethal and appear to be well above some as yet unidentified threshold of lethality. Differences in the size

*Tests conducted with thin metal tipping plates showed that causing 7.62-mm bullets to tip before striking a body produced what were described as "gross wounds." Ballistic Research Laboratories, Comparative Effectiveness Evaluation of the M14 and Other Rifle Concepts (U), by Robert E. Carn, Joseph Sperrazza, and Ronald L. Simmons, Technical Note 1482, AD 359-241 (Aberdeen Proving Ground, MD, December 1962), Confidential.

of the temporary cavity and the wound track caused by these bullets may exist, though the variability of the available data and the dominant importance of wound track location make it impossible to produce reliable evidence of significant differences.

On the basis of the surgical observations above, it appears that lower-velocity bullets (300 to 1200 fps), such as are used in pistols and submachine guns, produce considerably less severe wound damage.

Gelatin block tests, if sufficiently carefully conducted, can provide reliable measurements of relative distance to tumble, a useful qualitative indicator of relative lethality. Currently available gelatin block tests do not generally meet the criteria for reliable measurements.

It is apparent that predictions of bullet energy loss in gelatin, and current computer models that predict average incapacitation "scores" from these energy losses, are based upon tenuous assumptions and do not agree, in absolute or relative magnitude, with animal test results or combat experience data. Few animal tests of bullet lethality exist; none since the 1928 Pig Board have reached the same level of scientific validity.

These conclusions imply that if small arms projectiles are to be used that differ markedly in velocity or shape from current standard rifle and machine gun bullets, new animal testing will probably be necessary. Such tests should use the Pig Board procedures as a pattern, together with the other considerations mentioned in this appendix.

Appendix C

ENGINEERING TEST FORMAT

This appendix provides a typical example of the content of a small arms engineering test. The test cited is a standard engineering test for lightweight automatic rifles, and its procedures have remained approximately the same for the last twenty years.* Because of their stability of content, such tests provide a source of data for engineering comparisons of weapons developed at different times.

The instrumentation needed to conduct engineering tests is not extensive. If diagnostic tests are done to investigate or amplify basic engineering tests results, as sometimes occurs, instrumentation is needed for making detailed measurements of component pressures, loads, and motions (e.g., chamber pressures, buffer forces, and bolt accelerations). This instrumentation is the same as that used in small arms engineering design testing; it is not as extensive as the test equipment needed for other types of weapons in development.

The sample engineering test format presented in the annex to this appendix is taken directly from a 1960 Development and Proof Services test of the AR-15 rifle.** Since then, the engineering and testing of the lightweight automatic rifle have changed very little if at all.

It should be noted that absolute thresholds of acceptable performance are rarely specified for each of the 11 test procedures. In particular, no thresholds are usually set for assembly/disassembly, accuracy, flash, or

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*The test cited is not significantly different from tests that the Springfield Armory and Development and Proof Services, Aberdeen Proving Ground, were administering in the early 1950s. Springfield Armory, Synopsis of the Results of Tests of the U.S. Rifle, Caliber .30 Lightweight, T47, for the Period Covering 1 Jul 51 - 30 Jan 52, by S. D. Caloccia, SA-MR11-2500 (Springfield, MA, April 7, 1952).

**Development and Proof Services, A Test of Rifle, Caliber .223, AR-15, by L. F. Moore, DPS-96, AD 245-705L (Aberdeen Proving Ground, November 1960).

cook-off. At most, performance in these tests is subjectively (but rarely explicitly) compared with that of previous rifles. Furthermore, few if any rifles--including those later standardized--pass all the extreme condition endurance tests.

ANNEX TO APPENDIX C

ENGINEERING TEST FORMAT FOR A STANDARD LIGHT AUTOMATIC RIFLE TEST

TEST I: EXAMINATION

a. The rifle will be disassembled and an examination made of all parts.

b. The number and names of all parts and the types of springs will be recorded.

c. The weight of the complete rifle, component parts and accessories will be recorded.

d. The length of the rifle and other pertinent dimensions will be recorded. Dimensions recorded will include barrel length, sight radius, line of sight above bore, and stock dimensions.

e. The average trigger pull will be determined.

f. The rifle will be photographed in various conditions of disassembly.

TEST II: DISASSEMBLY AND ASSEMBLY

The time, and the number and type of tools required for each of the following operations will be recorded:

a. To disassemble the rifle completely.

b. To assemble the rifle after complete disassembly.

c. To dismount the operating parts and magazine mechanism (field strip).

d. To assemble the operating parts and magazine mechanism.

TEST III: ACCURACY

a. Four ten-round targets will be fired at a range of 100 yards from a machine rest or from a bench rest by an expert rifleman.

b. A test will be conducted to investigate the accuracy that can be obtained when the rifle is fired under various conditions similar to those encountered in combat. Three riflemen will each fire the following course at 100 yards with the test rifle:

(1) With sights properly adjusted and with a fouled bore,* one 10-round target will be fired from a bench rest.

(2) The rifle will be disassembled (field stripped), cleaned, oiled, and reassembled.

(3) Starting with a cold and oiled bore, one 10-round target will be fired from a bench rest.

(4) One 10-round target will be fired from the prone position using a sling.

(5) One hundred rounds will be fired as rapidly as possible.

(6) Immediately after firing the 100 rounds, one 10-round target will be fired from a bench rest.

(7) Another 10-round target will be fired immediately from the prone position using a sling.

c. Three riflemen will each fire 10 three-round bursts at a range of 25 yards from the standing position. The course will be repeated from the prone position. A suitable control rifle may be used.

d. Three individuals will fire as many aimed shots as possible in a one-minute period with each semiautomatic and automatic fire. The course will be fired three times per individual and the hits recorded on the E** target at 100 yards.

e. Six individuals will fire a standard qualification course with the rifle.

TEST IV: ENDURANCE

The rifle will be fired 6000 rounds for endurance, firing alternately 100 rounds semiautomatically and 100 rounds automatically. The rifle will be cooled after each 100 rounds. The entire mechanism may be disassembled, cleaned, and oiled after each 600 rounds. All malfunctions, breakages, and replacement of parts will be recorded. The instrumental velocity will be measured on 20 rounds, before and after the endurance test. Accuracy will be checked before and after the test. In the endurance test, 100 rounds will be fired semiautomatically and 100 rounds will be fired automatically under each of the following conditions:

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*How the bore is fouled is not specified.

**The "E" target is a silhouette target corresponding to a kneeling man. U.S. Army, U.S. Rifle Caliber .30, M1, FM 23-5, (Washington, May 1965).

a. With the rifle held loosely in the hands.

b. With the rifle held right side up.

c. With the rifle held left side up.

d. With the rifle held loosely in the hands at an elevation of 80 degrees.

e. With the rifle held in a normal manner at an elevation of 80 degrees.

f. With the rifle held loosely in the hands at a depression of 80 degrees.

g. With the rifle held in a normal manner at a depression of 80 degrees.

TEST V: FLASH

The cumulative flash from 20 rounds fired semiautomatically in a completely dark range will be recorded photographically by means of a 4- by 5-inch camera using a lens opening of f/2.5 and a film having a Weston rating of 100. The camera will be placed at a right angle to the muzzle at a distance of 4.5 feet.

TEST VI: UNLUBRICATED

The rifle will be cleaned in solvent and left in an unlubricated condition. One hundred rounds will then be fired alternating between semiautomatic and automatic fire.

TEST VII: EXTREME COLD

The rifle will be cleaned, lightly oiled, and placed with a loaded magazine in a cold room maintained at -65°F, for a 12-hour period prior to firing. After this period an attempt will be made to fire 20 rounds (or the capacity of the magazine) semiautomatically. If satisfactory functioning is obtained, a similar number of rounds will be fired automatically after an additional two hours.

TEST VIII: DUST

The rifle will be cleaned, lightly oiled. It will be fully loaded and the safety will be placed in the "ON" position. The rifle will then be placed in the dust box and exposed to the dust for one minute top side up and for one minute upside down. The dust mixture, which is made by mixing nine pounds of Grace 0 Albany sand with one pound of clean silica core sand which passed 100 percent through a 30-mesh sieve, 80 percent through a 50-mesh, and 3.4 percent through a 100-mesh, will be poured at a rate of five pounds per minute through the pourhole while the blower is turned at a handle speed of 60 revolutions per minute. The shooter will attempt to clean the rifle by wiping with his bare hands and by blowing sharply on the congested areas of the action. An attempt will be made to fire 20 rounds (or the capacity of the magazine).

TEST IX: MUD

The rifle will be cleaned, lightly oiled, and the muzzle taped to exclude the mud from the bore. The rifle will be immersed completely in the mud for a period of 15 seconds. The mud mixture is made in the proportion of ten pounds of red clay and two pounds of clean river sand to eight quarts of water. The sand is approximately the same grading as that used in the dust test. The shooter will remove the tape from the muzzle and attempt to clean the rifle by wiping with his bare hands and by blowing on the congested areas of the action. An attempt will be made to fire 20 rounds (or the capacity of the magazine).

TEST X: RAIN

The rifle will be cleaned, lubricated, and subjected to spray directed over the entire rifle by means of a 1/2-inch pipe having 0.059-inch holes spaced 1/2 inch apart. The pipe will be positioned three feet above the rifle. The following procedure will be used:

a. The rifle, in a horizontal position, will be exposed to the spray for five minutes with the bolt retracted and for five minutes with the bolt closed. The rifle will be loaded when the bolt is closed. After this time the gun will be fired 100 rounds semiautomatically.

b. The procedure in "a" will be repeated, except that the gun will be fired automatically.

c. The procedure in "a" will be repeated, except that the rifle will be exposed to the spray with muzzle up. The rifle will be fired 100 rounds semiautomatically in a horizontal position. Before firing, the muzzle of the rifle will be depressed to permit water accumulating in the bore to run out.

d. The procedure in "c" will be repeated except that the gun will be fired automatically.

e. The procedure in "c" will be repeated except that the rifle will be exposed to the spray with muzzle down.

f. The procedure in "e" will be repeated.

TEST XI: COOK-OFF

The rifle will be subjected to a test to determine the minimum number of rounds which may be fired before sufficient heating of the chamber occurs to result in a premature explosion of the cartridge. The firing will be conducted as rapidly as possible employing preloaded magazines. An attempt will be made to bracket the cook-off point in number of rounds fired.

Appendix D

RANGES AT WHICH SMALL ARMS TARGETS ARE ENGAGED

INTRODUCTION

This appendix briefly reviews the available information on the ranges at which small arms are used in combat. Target range frequency--the frequency of use versus range--is important for both the design and testing of small arms.

For testing purposes, the effectiveness of weapons cannot be usefully compared or evaluated without a realistic estimate of the ranges at which they are likely to be fired. For design purposes, requirements emphasize ranges that are too long. The design will be forced toward a heavier weapon and heavier ammunition of higher recoil, which can result in lower lethality, lower sustainability, and lower target effects against personnel targets at the ranges actually encountered in combat.

The question addressed here is what ranges are "normal" in small arms combat and what ranges occur too infrequently to be of interest.

The available quantitative data on small arms targets consist of fragmentary estimates of ranges and exposure times. These data do not define the frequency of target existence, detection, engagement, and exposure time as a function of range, tactical situation, terrain, and light; they merely reduce the degree of uncertainty about these matters. Some data on combat target range frequency are available for the following four types of targets:

- o Targets in line of sight to a firer, though concealed or partially concealed.
- o Targets in line of sight that are detected and recognized as targets (whether accurately located or not).
- o Recognized or acquired targets that are fired upon, i.e., engaged.
- o Engaged targets that are hit.

The available data for each of these types are discussed below.

MAXIMUM RANGES AT WHICH TARGETS ARE IN LINE OF SIGHT

Two sets of data are available that provide estimates of line of sight ranges to small arms targets. Both indicate upper-bound or maximum ranges at which lines of sight to targets may exist, but neither indicates how often targets will actually be in line of sight at any range within these maximum ranges (or how often the targets will be detected).

The first set is drawn from a study of World War II combat actions in the Ardennes campaign, December 1944. It gives the maximum ranges that could be seen along approaches to 153 company-level U.S. and German defensive positions (determined by personal reconnaissance of each defensive position).* Thus, these data present the approximate ranges beyond which line of sight could not have existed--the actual lines of sight from firers to targets in these battles would necessarily have been shorter. Figure D-1 shows a frequency distribution of these ranges. When a position was attacked at night, the line-of-sight range was assumed to be reduced to less than 100 meters. That assumption partially accounts for the high incidence of short ranges in a terrain with much open area (the sample covered all terrain in the Ardennes campaign, only a small portion of which was heavily forested).

The other data set is the results of an analysis of combat and terrain data by combat-experienced analysts.** The analysis was

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*RMC Research Corporation, Research Study on Predictive War Game Factors; Final Report, by James K. Cockrell and Donn Carter, prepared for SHAPE Technical Centre, Contract C.72-03 (Bethesda, MD, March 1974).

**Stanford Research Institute, Considerations Affecting the Doctrine of Small Arms Employment Rifle and Automatic Rifle Usage as a Function of Range (U), by George M. Gividen, prepared for U.S. Army Combat Developments Command Experimentation Center (Ft. Ord, CA, February 1965), Confidential.

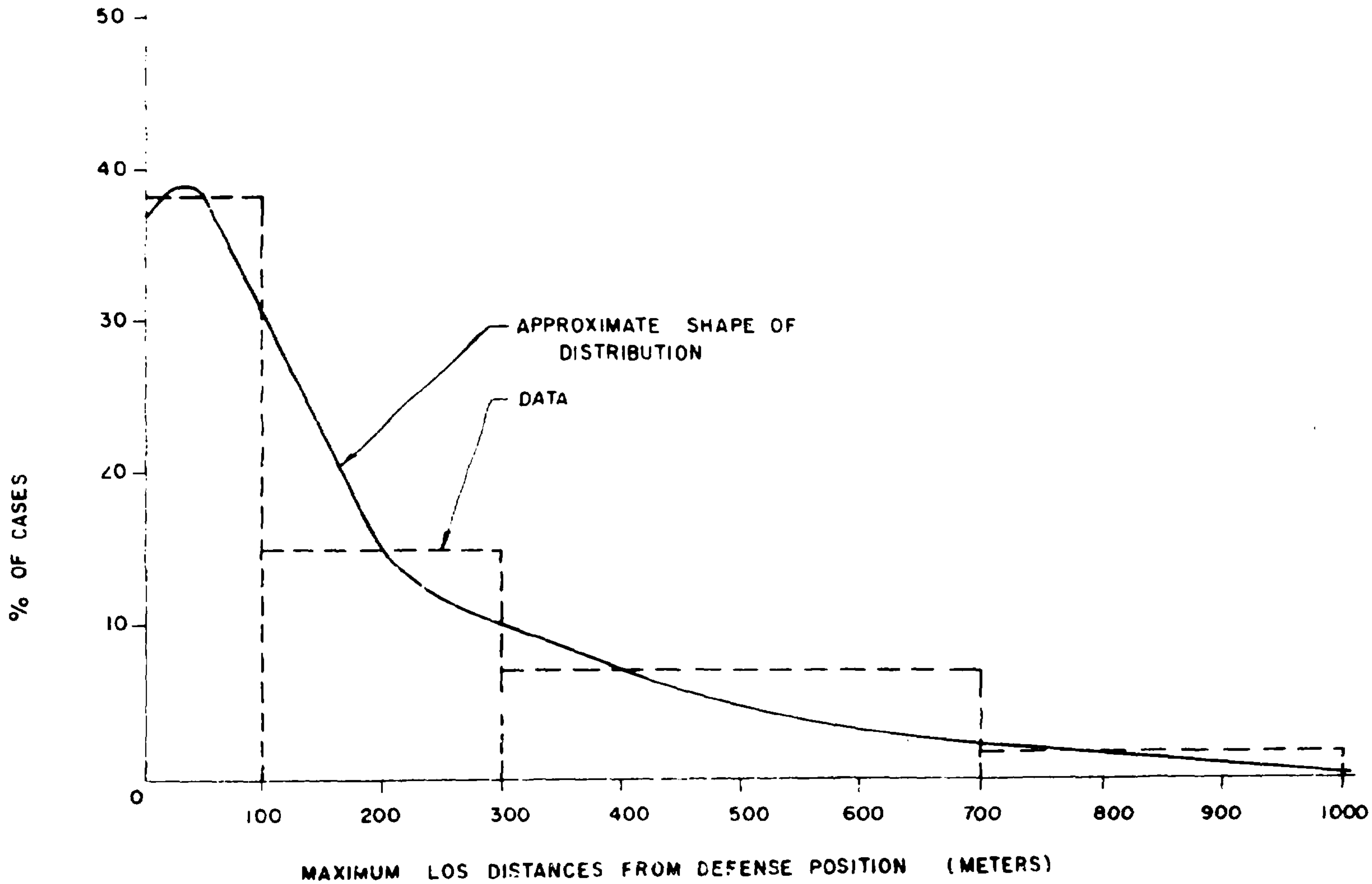

Figure D-1. Frequency distribution of maximum lines of sight ranges from 153 defense positions in the Ardennes Campaign, World War II.

conducted by the experimentation team at the U.S. Army Combat Developments Command Experimentation Center, which planned and conducted the Small Arms Weapon Systems experiment in 1965-1966.* The team reviewed and compared available sources on small infantry unit combat experience and doctrine, and then translated their findings into sets of target arrays, on actual terrain, that were thought to represent typical firer-target dispositions in each of four typical kinds of infantry engagements (assault, advance and encounter, fire support of assault, and prepared defense). The frequency distribution of line-of-sight ranges to these targets for each type of engagement are illustrative, though they do not constitute definitive combat target range frequencies. They can be considered high or upper-bound estimates because the terrain was selected to bias the supporting fire positions toward ranges somewhat longer than typical combat ranges. That was done to test fully the range-accuracy capabilities of each of the candidate small arms tested in the experiment. The frequency distributions of range to targets are shown in Figures D-2 (rifle squad targets) and D-3 (machine gun squad targets).

RANGES AT WHICH PERSONNEL TARGETS ARE DETECTED AND RECOGNIZED

Absence of Measurement

Very little even quasi-quantitative data are available on the ranges at which personnel targets are detected and recognized, probably because the interacting factors affecting detection vary so widely; they include level and angle of light, vegetation, camouflage, and target exposure time and movement. It is obvious that a man walking erect in an open, grassy meadow in the daytime will be seen by almost all observers at considerable range and that a stationary man who is partially concealed in foliage at night may not be seen at even a few meters. Regrettably, the effects of the variations between such extremes have rarely been measured.

*U.S. Army Combat Developments Command, Experimentation Command, Small Arms Weapon Systems (SAWS), Part 1: Main Text, CDCEC 65-4 (Ft. Ord, CA, 10 May 1966); U.S. Army Combat Developments Command, Experimentation Command, Small Arms Weapon Systems (SAWS), Part 2: Annexes, CDCEC 65-4 (Ft. Ord, CA, 10 May 1966).

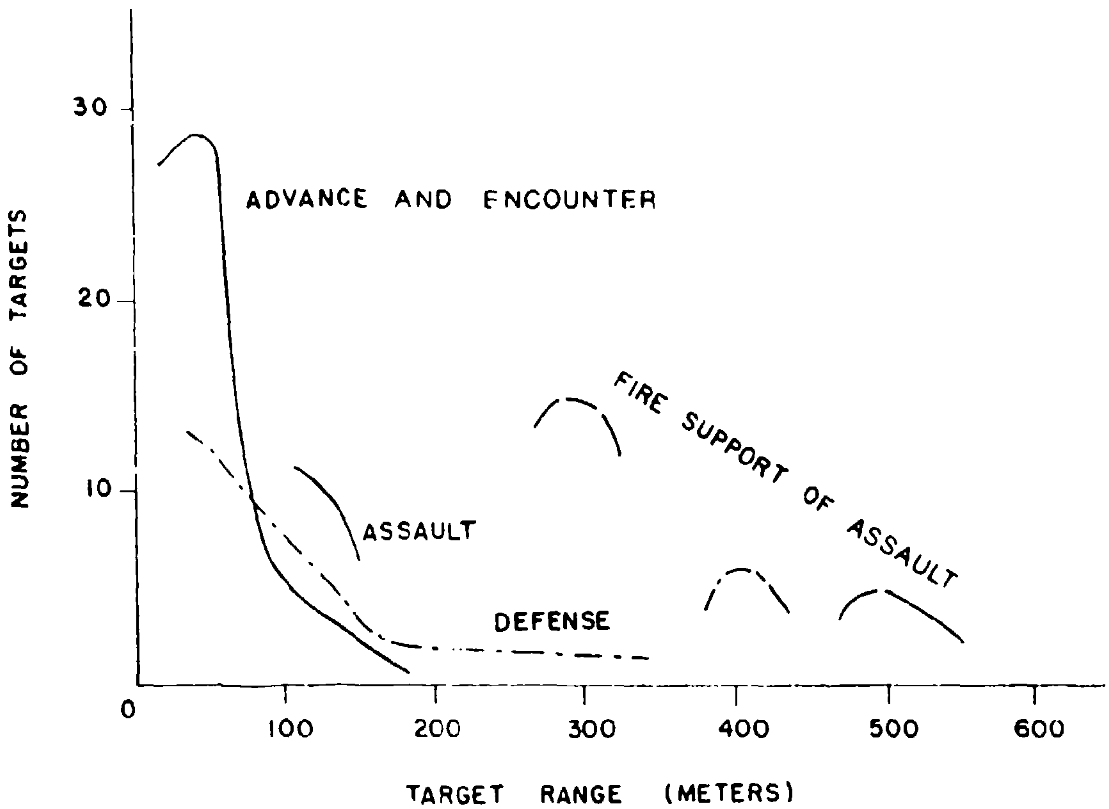

Figure D-2. Frequency distribution of ranges to rifle squad targets in the CDEC-SAWS experiment.

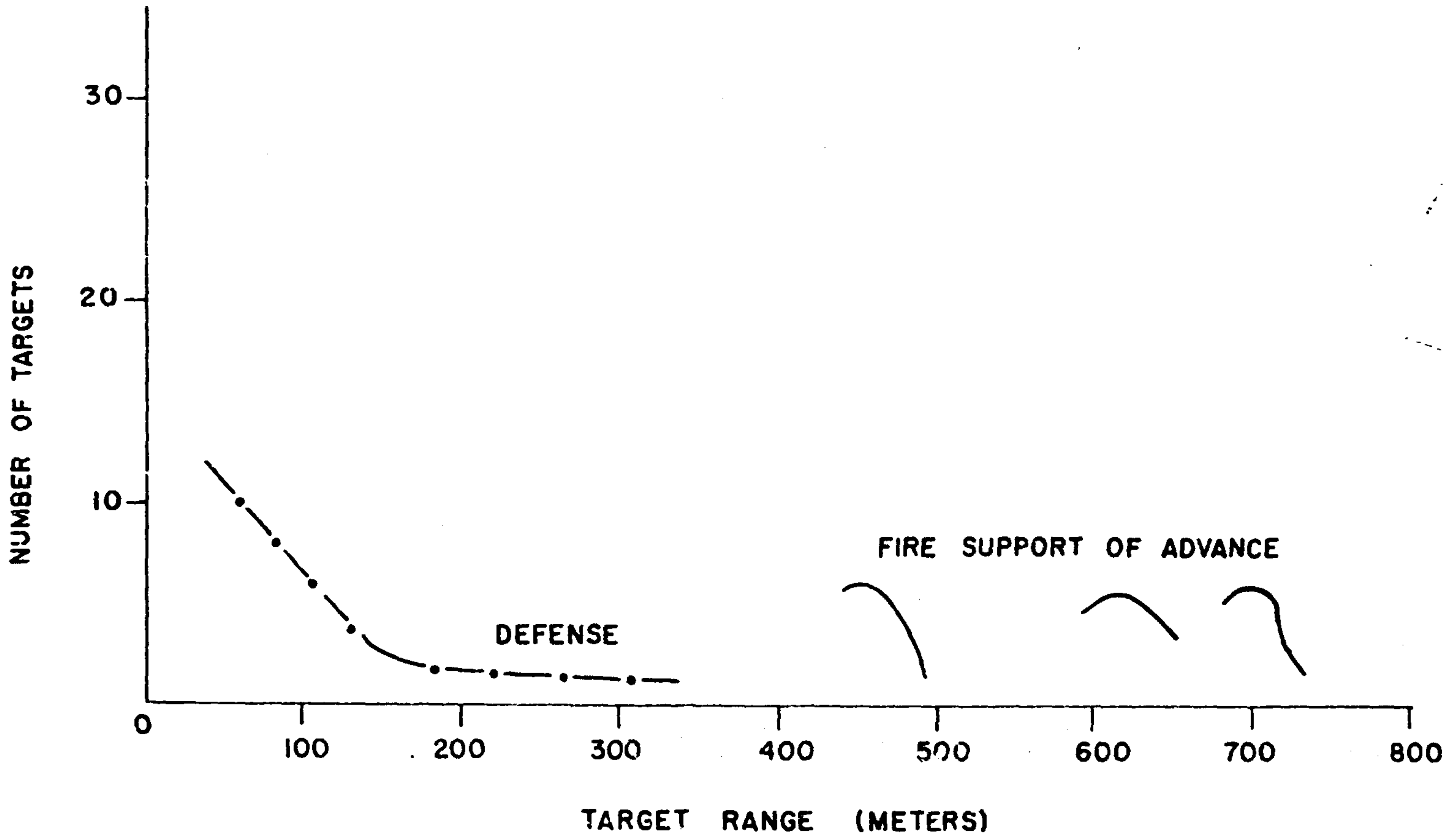

Figure D-3. Frequency distribution of ranges to machine gun squad targets in the CDEC-SAWS experiment.

One of the few experiments on this subject only confirmed the obvious conclusion that moving, standing personnel are readily detectable up to 300 meters (the longest range tested) unless concealed by vegetation; the experiment found no consistent effects of motion.*

CDEC-SAWS Target Detection Evidence

Detection of stationary personnel in defensive positions is certainly much more difficult, and the CDEC-SAWS experiment provided some useful insights into this question. Targets that were silhouettes of soldiers' heads and shoulders were quickly raised at various ranges (to represent a man rising up in a foxhole), and colocated devices simulated the flash, smoke, and sound of small arms and the dust kicked up by muzzle gases.

Most of the CDEC-SAWS targets were partially concealed in a realistic manner. It was found that neither the targets nor the general locations of arrays containing them could be detected at ranges of about 500 meters or more, even when the weapon simulations were made more perceptible than was considered representative of combat conditions. The areas in which these target arrays were located had to be pointed out to test subjects to enable them to place fire on the arrays. Even when the targets were placed at 250-350 meters, the low percentages that were hit by the nearly 1000 test subjects provided evidence that their exact locations were difficult to detect.

Night Target Detections

The ranges at which targets can be detected for small arms fire in night combat vary greatly, exceeding daytime ranges at one extreme (e.g., machine gun muzzle flash on a clear night) and approaching point-blank range at the other (e.g., stealthy approach in woods on an overcast night). Observations and interviews with soldiers recently exposed to combat in the Korean War produced estimates of approximate infantry target-detection

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*Human Resources Research Organization, Target Detection and Range Estimation, by James A. Caviness, Jeffery L. Maxey, and James H. McPherson, Technical Report 72-34, AD 753-600 (Alexandria, VA, November 1972).

ranges comparing day and night conditions.* The combat infantrymen's judgments of the range intervals within which most targets were detected are listed in Table D-1.

Table D-1

RANGE INTERVALS FOR DETECTING INFANTRY
TARGETS REPORTED FROM THE KOREAN WAR

Range (meters)	Condition
15-200	All cases
15-150	Attacking targets
50-200	Day only
15-50	Night only
15-30	Night or cut-up terrain

RANGES AT WHICH PERSONNEL TARGETS ARE FIRED UPON

The ranges at which small arms fire is directed at personnel may be somewhat shorter than those at which targets are detected and recognized. Fire will sometimes be withheld to permit targets to close to shorter ranges, to increase the chance that they will be hit before they take cover, or for other reasons. Two kinds of quantitative data are available about the distributions of firing ranges in combat: questionnaires and combat films.

Range Estimates from Questionnaires

One type of firing range data is the result of surveys of combat-experienced personnel made some time after the experiences occurred. Two such surveys made by the Johns Hopkins University Operations Research

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*Johns Hopkins University, Operations Research Office, Commentary on Infantry Operations and Weapons Usage in Korea; Winter of 1950-51, by S. L. A. Marshall, ORO-R-13, AD 000-342 (Chevy Chase, MD, October 1952).

Office contain responses about percentages of rifle fire expended at various ranges. (The basis of ammunition expenditure is likely to skew the underlying distribution of range, though the direction of bias is unknown.) One survey dealt only with daytime firing in the Korean War; the other dealt with firing under all visibility conditions in World War II (Europe and the Pacific) and the Korean War.*

Figure D-4 shows the results of the surveys. As might be expected, firing during daytime in the Korean War showed a rather high incidence of targets at 150-300 meters.

Range Estimates from Combat Films

The second type of combat data consists of estimates of firing ranges derived from films of rifle, carbine, automatic rifle, and light machine gun firings in World War II and the Korean and Vietnam wars. Estimates could be made of firer-to-target range in 780 of a total of 1429 samples of combat movie film sequences of small arms firings (see Appendix E for detailed descriptions). It appears from the overall film content that many short-range conditions typical of intense combat--such as final assaults or defenses against them--are rare. Figure D-5 shows the frequency distribution of firing ranges in the total sample, which contains 138 film sequences of firings in World War II in Europe, 211 sequences in World War II in the Pacific, 65 sequences in the Korean War, and 364 sequences in the Vietnam War. Figure D-6 shows the frequency distribution of filmed firings of rifles and M60 machine guns in Vietnam combat, and Figure D-7 shows the frequency distribution of firings of rifles, BARs, and carbines in World War II in Europe.

From observations and postbattle interviews of Korean War infantrymen have come general statements about firing ranges that support the data

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*Respectively, Johns Hopkins University, Operations Research Office, Use of Infantry Weapons and Equipment in Korea, by G. N. Donovan, Technical Memorandum ORO-T-18(FEC), ATI 169-243 (Chevy Chase, MD, 13 May 1952), and Johns Hopkins University, Operations Research Office, Tactics Division, SALVO I: Rifle Field Experiment, by Leon Feldman et al., Technical Memorandum ORO-T-378, AD 304-321 (Bethesda, MD, June 1959).

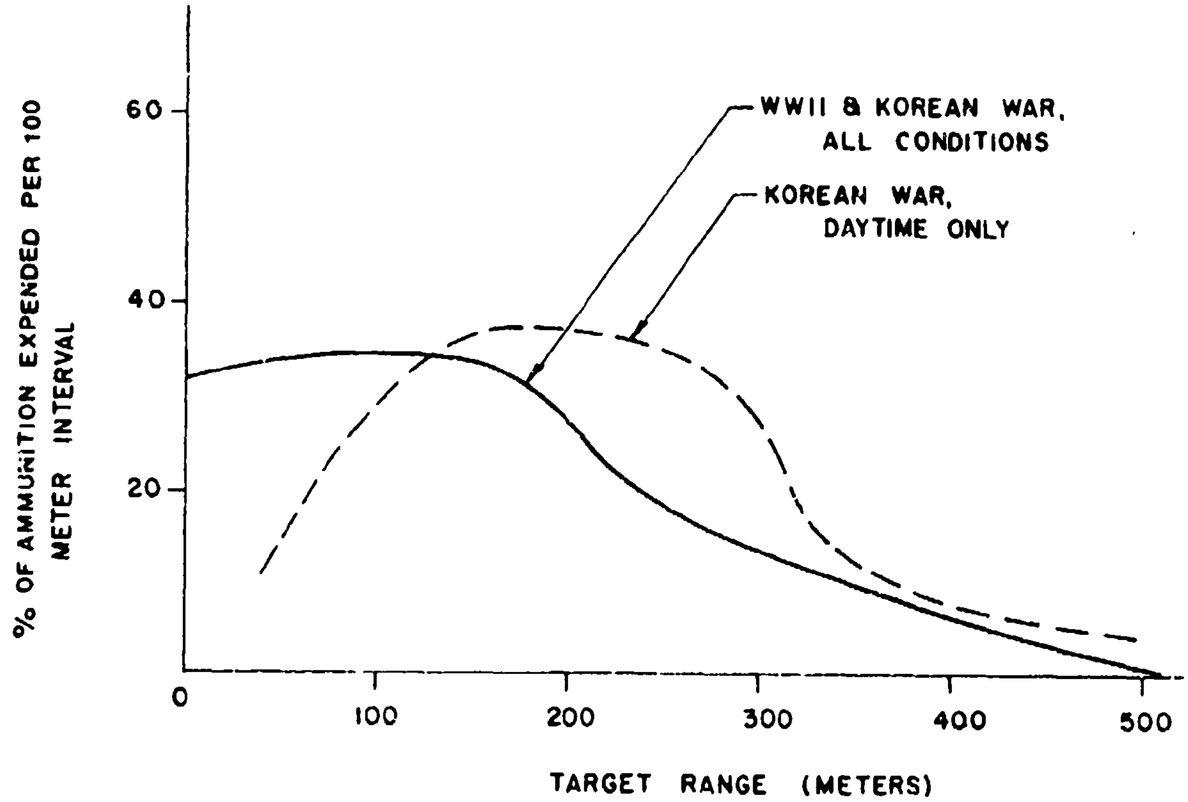

Figure D-4. Percent of rifle ammunition expended versus range in World War II and the Korean War.

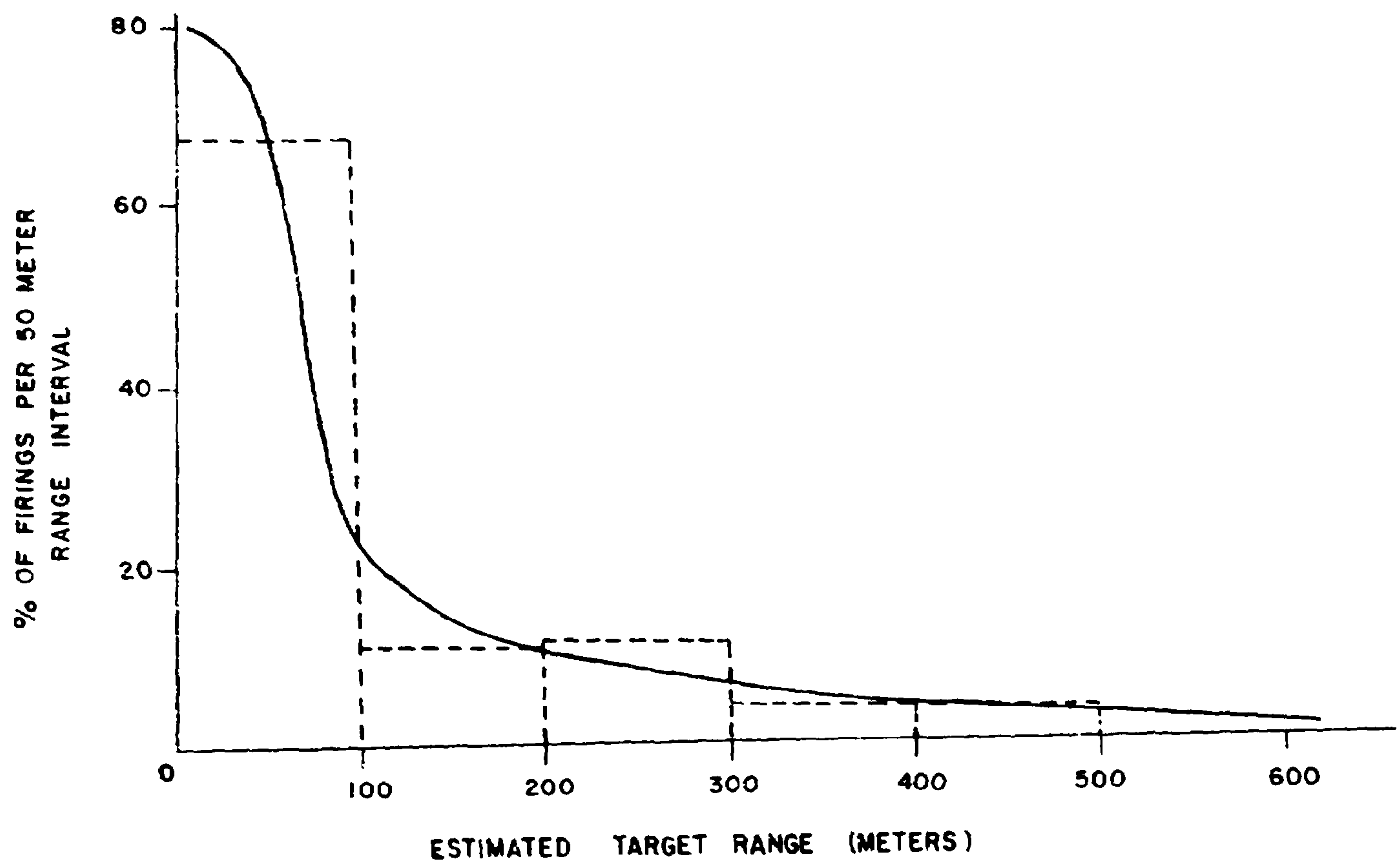

Figure D-5. Frequency distribution of ranges in small arms firings estimated from World War II, Korean War, and Vietnam War combat film.

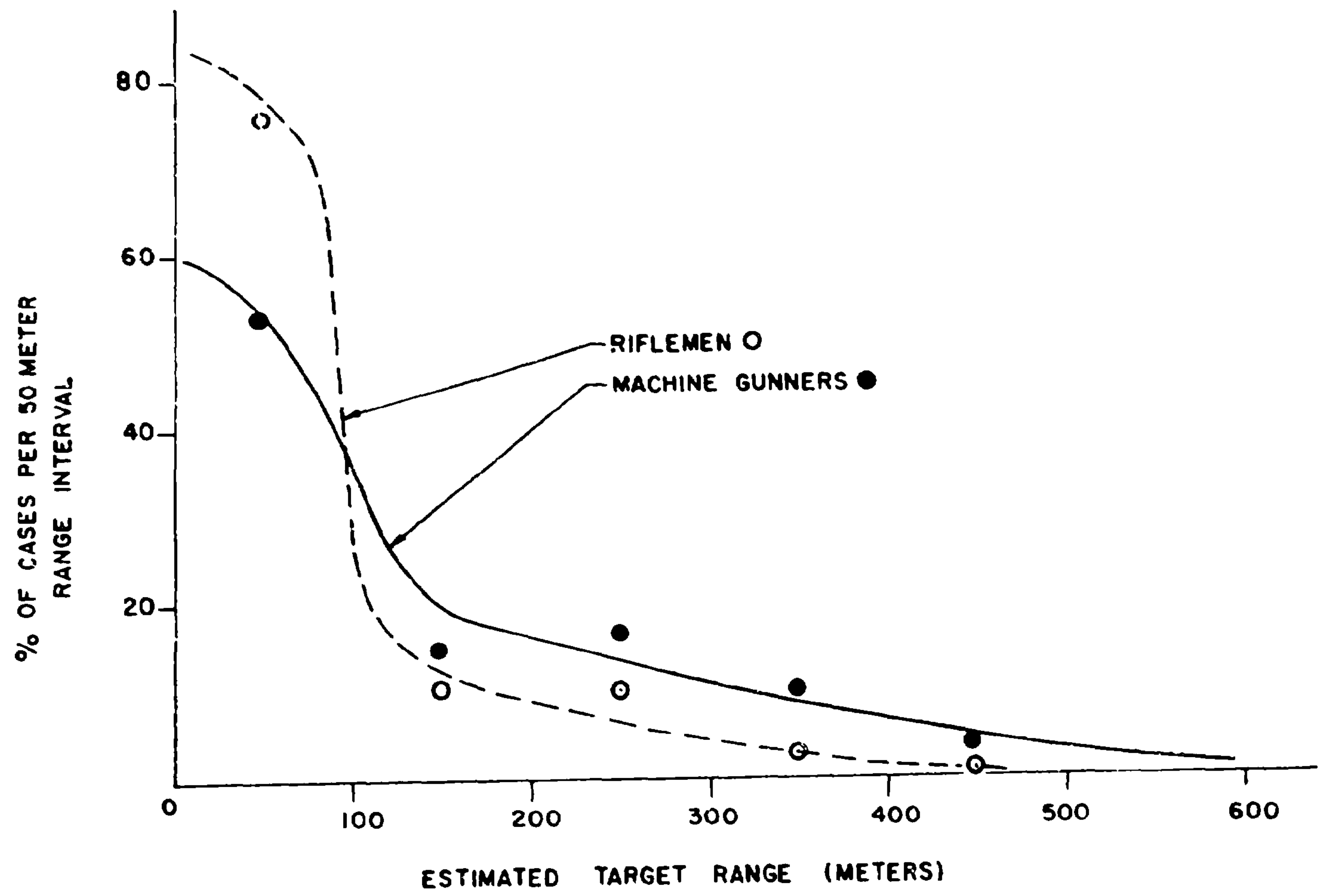

Figure D-6. Frequency distribution of ranges in small arms firings estimated from Vietnam War combat film.

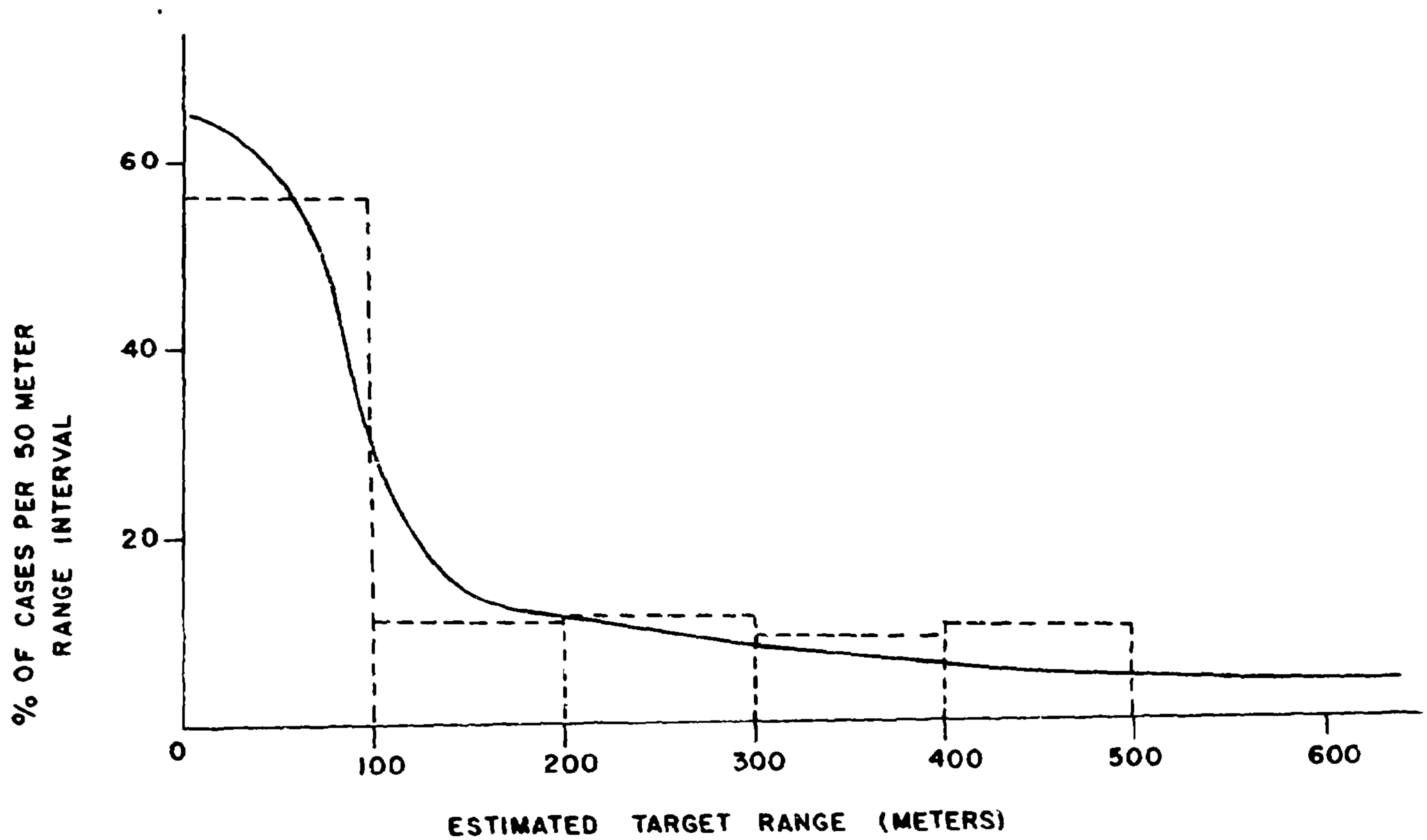

Figure D-7. Frequency distribution of ranges in small arms firings in World War II in Europe.

described above.* They indicate the ranges shown in Table D-2.

Table D-2

ESTIMATED MAXIMUM USEFUL SMALL ARMS RANGES
IN THE KOREAN WAR

Range (meters)	Condition
Up to 400	All rifle squad fire
About 300	"Normal" maximum for BAR fire
About 200	"Effective" range for small arms fire
About 150	Maximum for decisive small arms fire repulsion of attack
Up to 50	Usual range for engaging Chinese Communist attacking forces

A British Army study has concluded that the ranges at which British units fired in the Korean War and the ranges at which targets become available to small arms firers in tactical training exercises are consistent with each other.** The former is represented by the curve in Figure D-8. Although the trench warfare of World War I was certainly different from combat in World War II and later wars, a study of infantry actions in World War I determined that riflemen rarely fire at ranges greater than 400 yards.

RANGES AT WHICH SOLDIERS ARE WOUNDED OR KILLED BY BULLETS

Another type of combat data helpful in estimating ranges at which rifles and machine guns are used in combat is the frequency distribution

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*Johns Hopkins University, Operations Research Office, Commentary on Infantry Operations and Weapons Usage.

**Great Britain, Jungle Warfare School, Trial and Development Wing, Trial of Section 5.56mm Light Machine Guns, by M. W. Ward, JWS/TD/STO/2 (N.p., 8 July 1970).

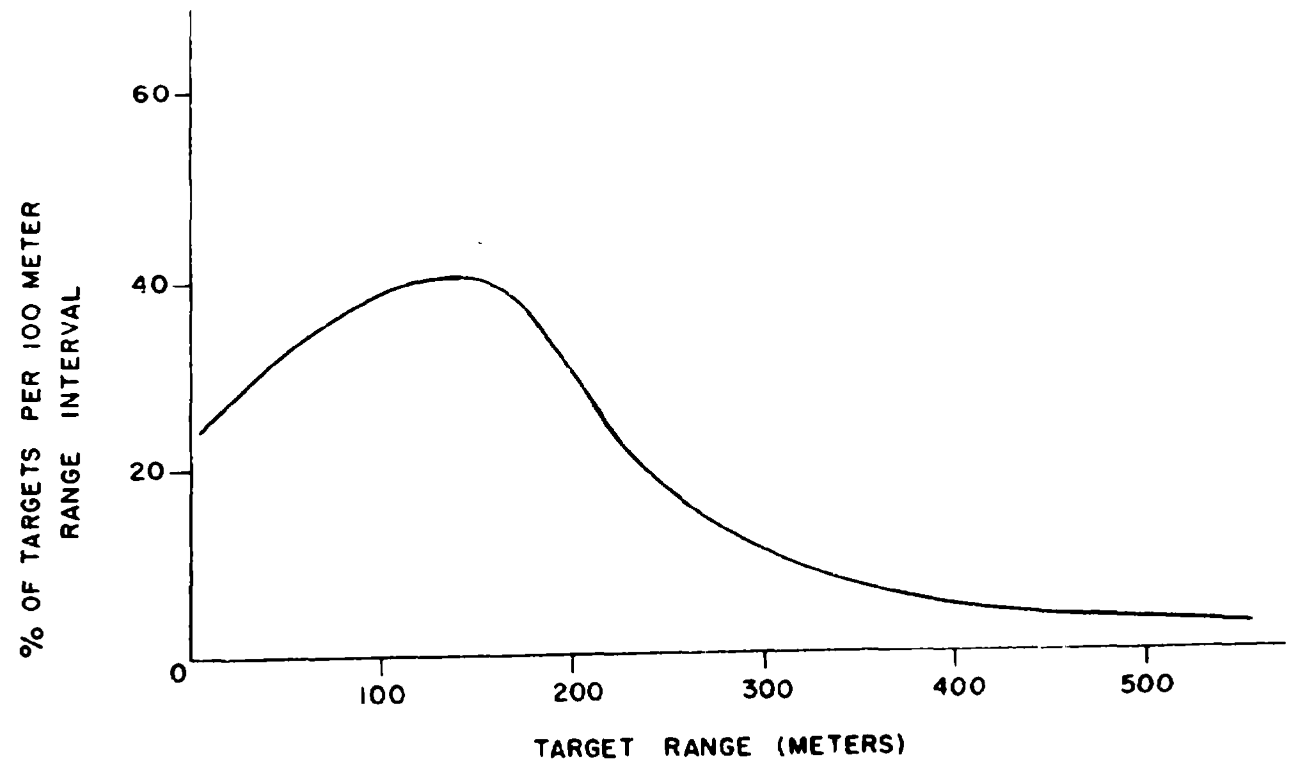

Figure D-8. Frequency distribution of ranges in small arms firings estimated by the British Army for combat in Korea.

of ranges at which bullet wounds are received. These ranges are necessarily shorter--probably significantly shorter--than a distribution of firing ranges. Data on this subject are not normally collected during combat, but a few samples exist.

Firing ranges at which casualties were hit were estimated on 208 of 219 casualties of small arms fire who were handled by one battalion medical aid station during campaigns in New Georgia Island and Burma in World War II. Of the 208 casualties (WIA and KIA), 93 were reportedly hit by rifle bullets and 115 by machine gun bullets; 68 percent of the rifle bullets and 65 percent of the machine gun bullets were estimated to have been fired from ranges of less than 75 yards (the range distribution of longer-range firings was not given). Figure D-9 shows the distribution of casualty ranges for these data, as calculated directly from the compiled incident descriptions.*

A similar sample was collected in the Bougainville campaign, in which there were 549 bullet casualties; range estimates could be made on 460 of these (339 from rifle fire and 121 from machine gun fire).** The range-limiting effect of jungle terrain appears to be more pronounced in this campaign, because 80 percent of the rifle bullet casualties and 86 percent of the machine gun casualties occurred at ranges of less than 75 yards.

Firing range data on one sample of surviving casualties from the Turkish Brigade in the Korean War suggest a type of terrain very different from that of the preceding samples.*** Of the 257 bullet wounds sustained, 149 were reportedly from rifles, 59 from machine guns, 28 from pistols or submachine guns, and 21 from unidentified weapons. No distribution of ranges is available, but the soldiers themselves estimated an average wounding range of 112 meters for rifle bullet wounds and 71 meters for machine gun bullets. As in the data from the Pacific theater

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*U.S. Army, Office of the Surgeon General, <u>Wound Ballistics</u>, edited by James C. Beyer (Washington, 1962), p. 272.

**Ibid., p. 421.

***Ibid., p. 716.

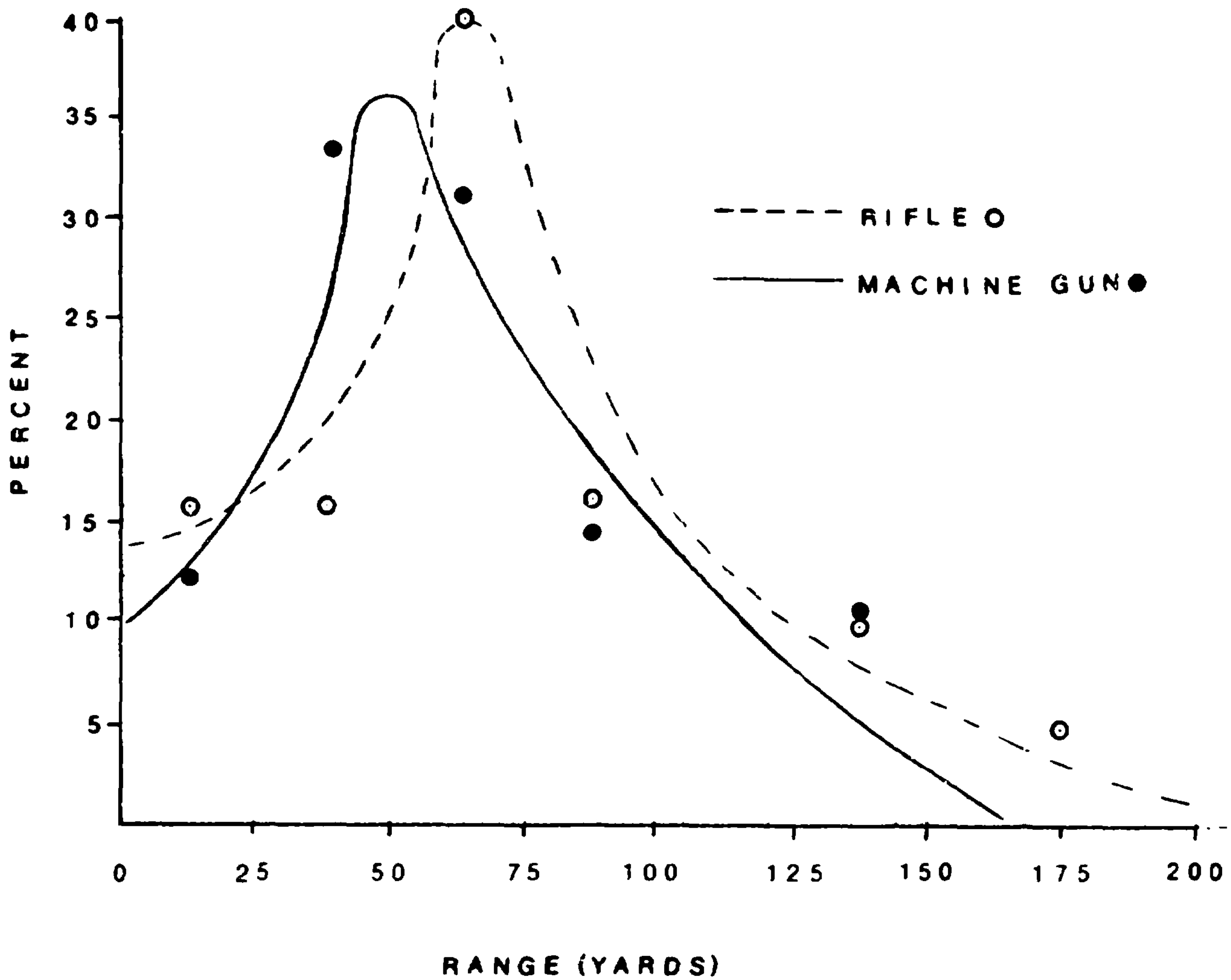

Figure D-9. Frequency distribution of ranges at which small arms casualties were incurred in New Georgia and Burma in World War II.

in World War II, machine guns had casualty-producing ranges consistently shorter than those of rifles.

A much larger sample of bullet casualty ranges is available from the Vietnam War, from surveys made by the U.S. Army Wound Data and Munitions Effectiveness Team in 1967.* Of 4980 casualty cases considered, range data are available on 991 rifle fire wounds. The distribution of these ranges is shown in Figure D-10; note that the average range is 73 meters, compared with the Turkish Brigade average of 71 meters for machine guns and 112 meters for rifle bullets.

The apparently longer average casualty ranges in Korea may owe partially to the longer lines of sight on the Korean terrain, but they may also reflect a bias in the Turkish soldiers' estimations. Their range figures were apparently not checked by other estimates, as were most of the data in the other samples.

ASSESSMENT

The data presented above do not permit precise identification of the target range frequencies for small arms. Considering the variety of sources, however, the data are quite consistent in showing that the bulk of small arms combat takes place at under 100 meters, and a negligible percent of firings or casualties takes place beyond 300 meters.

There is little evidence that machine guns fire at significantly greater ranges than do rifles; machine gun-inflicted casualties consistently occur at ranges shorter than rifle-inflicted casualties. This probably reflects (1) a high percentage of machine-gun use in defensive or unplanned attacks, and (2) the frequent difficulty of finding positions from which long-range fire support can be delivered, coupled with uncertainty about the defender's location and the difficulty of coordinating such fire with the attacker's movement.

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*U.S. Army, Materiel Systems Analysis Agency, Comparison of Predicted and Observed Wound Ballistics Estimates for Rifle Bullets (U), by Robert E. Carn et al., Technical Report 28 (Aberdeen Proving Ground, MD, November 1970), Confidential.

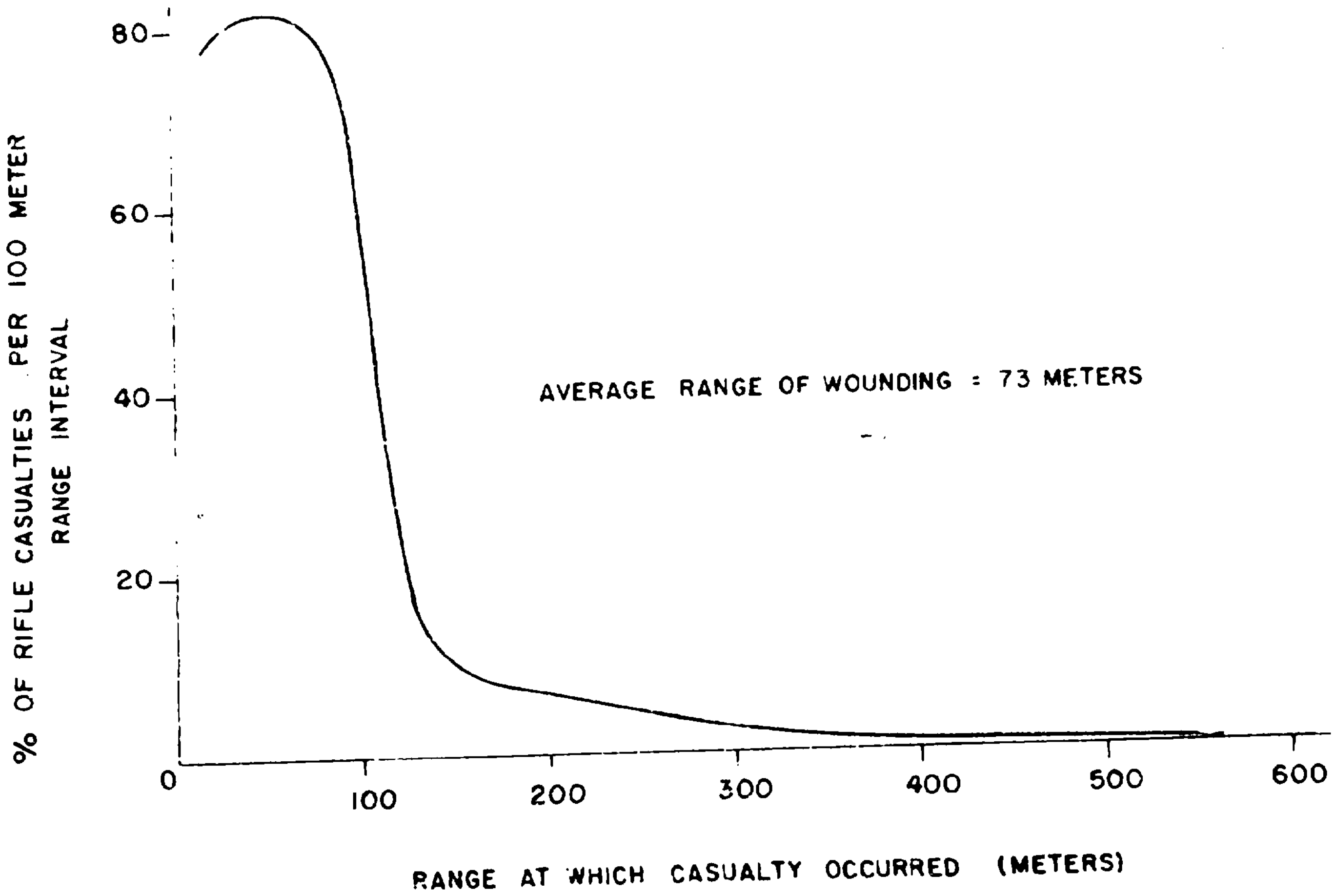

Figure D-10. Frequency distribution of ranges at which U.S. rifle casualties were incurred in the Vietnam War.

Appendix E

HOW SOLDIERS FIRE SMALL ARMS IN COMBAT--
ANALYSIS OF COMBAT FILMS

This appendix presents the results of an examination of combat films of small arms firing in World War II, Korea, and Vietnam. The examination was undertaken to derive insights regarding combat firings that might be of use in testing small arms. The appendix has eight sections: the reasons for using combat photography, the usefulness of the data collected from it, body positions, body exposure, aiming techniques, firing speed, target range, and a comparison of the body positions actually taken by the firers with those they had been taught in training. The data collected are presented in an annex to this appendix.

WHY COMBAT PHOTOGRAPHY WAS USED

Chapter III noted the importance of simulating the combat context in small arms operational tests. Actual combat is two-sided, so the firers on each side are also targets for the other side. The danger from return fire cannot be simulated in testing, although other aspects of two-sided firing situations can be simulated. Realistic testing will attempt to ensure that firer conduct in small arms tests will be like that in combat, but little data for comparing the two has been available.

A type of data that may be potentially useful in judging the impact of actual combat on firers--and the extent to which combat firing differs from test firing--is combat photography. An extensive amount of infantry combat film is available in Army and Marine Corps archives. On the other hand, film data have severe limitations that must be recognized.

USEFULNESS OF DATA FROM COMBAT FILMS

The utility of combat photography as a data source for improving the realism of small arms effectiveness testing hinges on three negative aspects of the combat photography mission. First, the combat photographer is not permitted to impede or compromise the combat action being filmed, so his pictures are real, not staged.* Second, combat photographers are not expected to take unreasonable risks in becoming casualties. It is likely, therefore, that they get a considerably smaller than representative sample of film footage in combat situations that place them in great danger, such as final assaults on well-defended enemy positions or defenses against very strong attacks. However, from examination of the films they took and the fact that many of them became casualties, it is clear that combat photographers operated in many sharply contested infantry actions. Third, the inherent limitations of the film medium (limited field of view, light dependence, lack of depth perception) and the frequent failure of cameramen to photograph target areas restrict the type and amount of information that combat films contain.

Another set of limitations is not specific to combat photography; it is the inherent weakness of any sample of descriptions of individual actions in combat. They lack extensive details about the individual and the engagement--details such as his skills, the level and content of his training, the combat circumstances of enemy and friendly tactics, and so forth. It becomes almost impossible to assess whether a certain individual action reflects good or poor training, effective or ineffective technique, fatigue or alertness.

However, even though combat film is a limited source of information on combat behavior, it may contain some useful information on firing positions, firing time factors, aiming techniques, and possibly target ranges. As regards the combat films examined for this study, little information was available on the circumstances of each photographed firing; and the representativeness of the sample of firings recorded on the film cannot be established in any quantitative way. With the foregoing limitations in mind, the following sections discuss observations derived from combat films that bear on small arms effectiveness testing.

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*Careful scrutiny of each "combat" film identified a few reenactments or staged events. No data were collected from these films.

CONTENT OF THE FILM DATA

To collect information about small arms firings from combat film for this study, all the film footage contained in the U.S. Army Motion Picture Depository at Tobyhanna, Pennsylvania, and in the U.S. Marine Corps Motion Picture Archives at Quantico, Virginia, was viewed. Over 800 reels of film were found to contain potentially useful small arms firing sequences, and the 61,000 feet of film in these reels were searched. In them, 1429 usable firing sequences were discovered. Each was screened by trained and combat-experienced observers, who reduced the desired data from each sequence into a format suitable for computer processing.

The readily derived information from combat films that is of potential relevance to small arms testing is firer posture, body exposure during firing, sighting techniques (aiming or pointing), rate of fire and burst size, and target ranges. The films were searched for a number of other data items of potential interest, but it was discovered that they could not be collected from the films or were insignificant.

Detailed descriptions of each element of information that was collected appear in the annex to this appendix. It also describes the procedures used to classify or measure each element and gives a complete listing of the data collected for each firing sequence.

OBSERVATIONS ON BODY POSITIONS

The body positions from which soldiers fire small arms may be influenced by a number of factors. They include the combat mission, whether or not the soldiers are moving or stationary, what cover and concealment are available, how the terrain and vegetation affect their opportunity to see and point at the target area, the apparent danger presented by enemy fire of all types, what weapon they are using, and their firing doctrine.

It was not possible to collect information on all these factors from the films, so the proportions of times that soldiers fired from standing, kneeling, prone, foxhole, or other positions cannot be related to all the factors that presumably influenced the selection of those positions.

Table E-1 shows the frequency of occurrence of each position. In the possibly biased film sample, a strong preference is shown for standing (weapon at shoulder or underarm) and kneeling positions. The standing or kneeling position was used about 65 to 80 percent of the time with every weapon, including the heavy BAR and M60 automatic weapons. The M60, however, was fired almost twice as often from the prone position as the other weapons--about 30 percent of the M60 firings were prone. The prone, sitting, and squatting positions combined comprised 26 to 28 percent of the positions taken with the heavier rifles and the BAR, but only 18 to 20 percent of those taken with the lighter and shorter carbine and M16 rifle.

Table E-1

INCIDENCE OF BODY POSITIONS IN FILMED SMALL ARMS FIRING SEQUENCES (%)

Position	Incidence of Position						
	All Weapons	M1	M14	M16	Carbine	BAR	M60 Machine Gun
Weapon at shoulder:							
Prone	16	17	12	10	8	16	29
Sitting	10	11	14	8	9	9	6
Squatting	1	1	2	2	1	1	0
Kneeling	28	28	40	31	24	25	24
Standing[a]	32	36	19	32	46	37	14
Weapon not at shoulder:							
Standing or crouching	13	7	13	17	12	12	27
Total (%)	100	100	100	100	100	100	100
Total number of cases	1429	531	133	319	89	180	177

[a] Includes less than 1 percent crouching.

Although the low incidence of prone firing (about 15 percent or less for rifles) may be due partly to a possible bias of the sample against the most intense combat situations, the films themselves show why the prone position is so little used. In many film sequences, the firers would drop to the prone position upon receiving fire, and then would have to rise to a kneeling or sitting position to return fire, simply in order to see over the vegetation or cover directly in front of them. The films show clearly that there are few places where a firer can see much from a prone position.

Examination of the incidence of body positions in each of the various wars and theaters in which the weapons were used showed that they differed little from the overall incidence. However, when the body positions used by Army soldiers and Marines were compared, it is apparent that Marines fired the M1 and M14 rifles more often from the kneeling than from the standing position. The M14 sample shown in Table E-1 is primarily from Marine firings, which explains the higher percentage of the kneeling position in the M14 firings.

Sighting Methods versus Body Position

Sighting methods* were affected by the type of body positions used. When the weapon was placed at the shoulder in a standing position, the sights were clearly not used over twice as much (7 percent of all standing position firings) as when the other shoulder-fired positions were used (3 percent of all prone, kneeling, etc., firings).

Type of Support Used

Another aspect of body position is the use of support for the weapon. Prone-position firing is always supported by the elbows resting on the ground, so it is not discussed further. The kneeling, sitting, and squatting positions usually involve resting one or both elbows on legs or knees. That was not considered in the data reduction as firm support; only when films showed firers resting their elbows or the weapon itself on a solid surface was it termed "support." Table E-2 shows that the incidence of use of support by firers of rifles, carbines, and the BAR in the shoulder-fired positions was about 20 to 28 percent, with 2/3 of the supported

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*Sighting methods were not clearly distinguishable as aiming or pointing. The film allowed only a small proportion of the firing to be definitely identified as not using the sights; the aiming category probably includes a sizable proportion of pointing fire.

firings resting the weapon directly on the supporting surface. Only six of these firings were clearly pointed rather than aimed. There were only four cases of firing from a weapon's bipod for support (although they were available for many of the M16's and BARs), so they did not constitute 1 percent of any position and do not show up in the table.

Table E-2

INCIDENCE OF THE USE OF SUPPORT FOR RIFLES, CARBINES, AND BARs FIRED FROM THE SHOULDER

Body Position	Size of Sample	Type of Support on Solid Surface (%)			
		Elbow	Weapon Itself	No Firm Support	Total
Standing	428	9	19	72	100
Kneeling	365	5	15	80	100
Sitting or Squatting	144	13	13	74	100
All Positions	937	8	17	75	100

OBSERVATIONS ON FIRER BODY EXPOSURE

Data were collected from each filmed firing sequence on the amount of each firer's body that was exposed in the direction toward which he was firing. These exposures were categorized as "full," "half," or "minimum." These terms mean that for each firing position (standing, prone, etc.), the full amount of a firer's body that could be exposed in that firing position was exposed, or that about half that amount was exposed, or that only a small fraction was exposed (generally little more than the head). Thus, a man in the prone position would be called "fully exposed" if no part of his body was obscured from enemy vision, even though his silhouette would be quite small. If he were lying in grass his exposure could be reduced to "half" or even "minimum" if he were partly behind a wall or foliage, etc.

The data show how often the firers attempted to remain partially or almost entirely concealed from the direction of the target areas. Table E-3 and Figure E-1 show the incidence of each exposure level (all firing positions combined) and the proportion of each that were clearly pointed or not. Clearly pointed fire was very strongly related to the degree of exposure: its use increased by half as exposure changed from minimum to full.

Table E-3

INCIDENCE OF FIRERS' BODY EXPOSURE LEVEL WITH SIGHTING METHOD AND SELECTED BODY POSITIONS

	Body Exposure Level							
	Full		Half		Minimum		Total	
Item	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Sighting method:								
Clearly pointed fire	146	(25)	56	(21)	38	(7)	242	(17)
Aimed or pointed fire	439	(75)	214	(79)	536	(93)	1187	(83)
Total	585	(41)	270	(20)	574	(39)	1429	(100)
Body position:								
Prone	66	(29)	22	(10)	136	(61)	224	
Standing	221	(50)	63	(14)	158	(36)	442	
Not to shoulder	126	(66)	42	(22)	23	(12)	191	

The incidence of each exposure level does not vary greatly across the different types of terrain or among the different weapon types, except that the firers of M60 machine guns (all in Vietnam) were fully exposed about 1/3 less often (27 percent of the time) and minimally exposed about 1/3 more often (51 percent) than were the firers of other weapons. The possible underrepresentation of intense combat in the film sample may cause these estimates of fully exposed firing frequency to be somewhat high.

Data were also collected on the proportion of partially exposed firers who were behind physical cover and who were behind nonprotective concealment only (grass, brush, etc.). Overall, about 40 percent of the firings

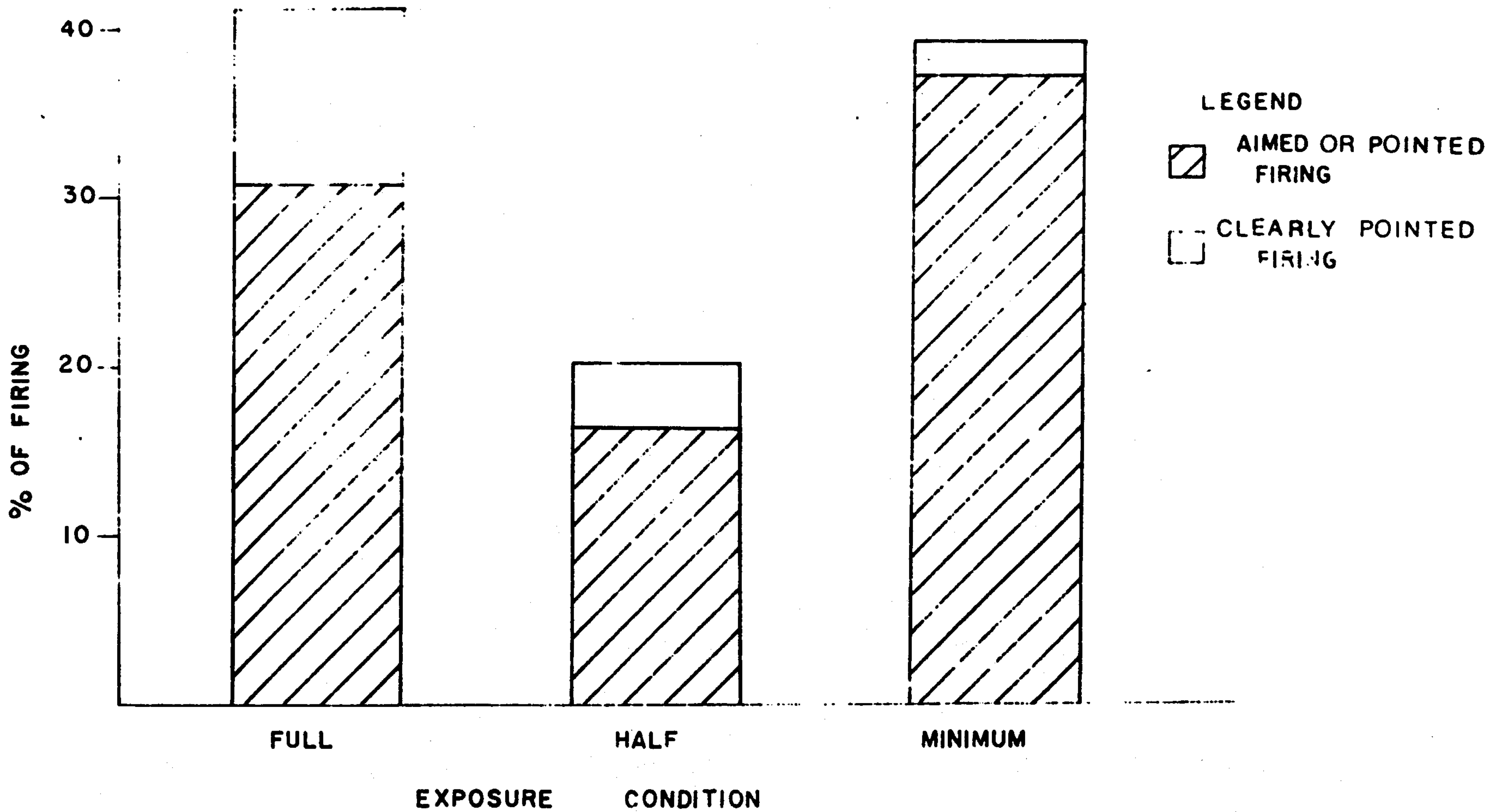

Figure E-1. Incidence of pointed and aimed fire at different exposure levels.

were fully exposed, and 40 percent were behind cover. Table E-4 shows the relative use of cover and concealment in different combat areas. The somewhat decreased frequency of fully exposed firings in Korea and Vietnam is noticeable; it may be due to changes in training rather than terrain since it happens in two theaters of rather different terrain. The only clear differences in the proportions among the different weapon types are those deriving from these theater differences (M14's, M16's, and M60's appeared only in Vietnam and the other weapons only in the other theaters).

Table E-4

INCIDENCE OF THE USE OF COVER AND CONCEALMENT
BY SMALL ARMS FIRERS

Item	Use of Cover and Concealment in Various Theaters (%)					Size of Sample
	Europe (WWII)	South Pacific (WWII)	Korea	Vietnam	All	
Cover	45	42	42	38	41	580
Concealment	8	13	20	24	18	264
Neither	47	45	38	38	41	585
Total	100	100	100	100	100	1429

OBSERVATIONS ON AIMING TECHNIQUES

All the weapons included in this data sample had conventional peep sights. In aimed fire, soldiers are taught to align the top of the front sight post or blade both on the target and in the center of the ring formed by the rear ring or "peep" sight. That takes time, so soldiers use pointed fire when they need to fire very quickly; it involves looking over, not through, the sights and "pointing" along the barrel. Examination of the film did not show the degree to which a soldier whose position apparently allowed him to look through his sights actually aligned them. It did, however, permit identification of cases in which the firer could not have used his sights. There were 242 such cases; in 191 of them the weapon was fired from a hip or underarm position, and in 51 of them the weapon was at the shoulder but the firer's head was clearly above the axis of the sights. These cases were called "clearly pointed" fire; all others were called "aimed or pointed" fire.

If different weapon types are not "clearly pointed" and "aimed or pointed" with the same frequencies, it is possible that the difference is due to a difference in weapon characteristics. Characteristics that might produce such differences are the size or weight of the weapon, which affects its "feel" or handiness, and whether muzzle impulse is low enough to produce usable bursts of automatic fire that could offset the decreased accuracy of pointed fire.

When data on the incidence of aiming and pointing were examined, it was clear (from the M1, carbine, and BAR results in Europe and the Pacific) that the type of terrain in which the weapon was being used strongly influenced the soldier's selection of sighting method. Table E-5 illustrates the effect of terrain and of weapon types. It shows that shorter weapons and automatic-firing weapons were more often clearly pointed than were longer and semiautomatic weapons. This was especially true in terrain providing shorter firing ranges. The M60 machine gun's very high incidence of clearly pointed fire may be explained by the fact that in films of Vietnam fighting it appeared most often in advancing offensive operations and was often carried slung from the shoulder in a waist-high firing position. It should not be concluded from the table that the M16 is actually pointed less often than the M60--it is clearly pointed less often only because most M60 pointed firings are likely to be clearly pointed firings from the waist.

To the extent that the film sample is biased away from intense combat, the actual frequencies of pointed fire are probably higher than those shown here.

Table E-5

INCIDENCE OF CLEARLY POINTED FIRE BY WEAPON TYPE
IN VARIOUS TERRAINS

Weapon Type	Size of Sample (Total Number of Firings)	Clearly Pointed Firings (%)		
		Shorter-Range Terrain		Longer-Range Terrain
		South Pacific (WWII)	Vietnam	Europe (WWII) + Korea
Long, semiautomatic rifle:				
M1	531	12	--	7
M14	133	--	14	--
Short, semiautomatic (carbine)	89	22	--	10
Long, automatic:				
BAR	180	22	--	4
M60 machine gun	177	--	36	--
Short, automatic:				
M16 rifle	319	--	22	--
All weapons	1429	15	24	7

OBSERVATIONS ON FIRING SPEED

The amount of time firers take to aim or point their weapons at the target and to fire the first round (or burst) is of interest because it reflects the resolution of the conflicting pressures of need for accuracy (which motivates deliberate aiming) and need for speed (to beat the enemy's fire or reduce one's exposure). These times were measured from the moment that the weapon was placed in firing position (usually at the shoulder) to the moment of first trigger pull. The raw data are accurate to less than 0.1 seconds but have been aggregated in 0.5-second intervals in Figure E-2. A smoothed curve has been added to show more clearly the approximate shape of the distribution of first-round firing times.

Figure E-3 shows the actual firing time distribution for clearly pointed fire and an estimated distribution for aimed fire that attempts to statistically remove the effect of the pointing fire cases that were indistinguishable photographically from aimed fire.* The very short firing times for pointed fire (52 percent at less than .2 seconds) presumably reflects firer-inferred demands for extreme speed and go hand in hand with the firer's decision to point rather than aim. The median difference between clearly pointed and estimated aimed fire is about 1.2 seconds. The estimated distribution of aimed fire shows at least half the firings to be less than 1.4 seconds, considerably shorter than the generally accepted minimums of 1.5 to 2 seconds for aiming. This may reflect either a violation of the statistical assumptions underlying the estimating methods or a large proportion of firings somewhere between pointing and aiming.

It is interesting to compare the means of the distributions of firing times shown in Figure E-3 with the means of similar times measured in previous small arms tests. Mean times to first trigger pull (timed

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*The estimated frequency distribution for aimed fire was calculated by (1) assuming that the aimed or pointed fire distribution was a weighted mixture of two distributions: the "pure" aimed fire distribution (unknown) and the "pure" pointed fire distribution (assumed equal to the actual clearly pointed fire distribution), (2) estimating the proportion, k, of "pure" pointed fire in the aimed or pointed sample, assuming that all the aimed or pointed firings at .2 seconds or less were, in fact, "pure" pointed firings, (3) applying the defining equation for mixtures of frequency distributions,

$$f_{\text{aim or point}} = kf_{\text{point}} + (1-k)\, f_{\text{aim}},$$

to "subtract out" the frequency distribution of "pure" pointed fire. Using that equation and the previous assumptions, the proportion, k, was calculated as the percent of all aimed or pointed firings that had firing times less than .2 seconds, divided by the percent of all clearly pointed firings that had firing times less than .2 seconds. Thus, the estimated proportion of "pure" pointed fire in the aimed or pointed sample was .17, or 17 percent.

from initial target appearance[*]) are reported from the SALVO II experiment[**] and two experiments conducted at Fort Benning, the Quick-Fire Experiment and the Defense Experiment.[***] The SALVO and Quick-Fire times are almost identical, with average times to first trigger pull of 2.74 and 2.72 seconds, respectively. In the Defense Experiment, however, the average time to first trigger pull was 4 seconds at about 100 meters. In contrast, clearly pointed average times from the combat films are about 0.6 seconds, while aimed or pointed average firing times are about 1.6 seconds.

The reasons for the large differences between the mean values from the combat firings and those from the various tests appear to rest in firer motivation. Although the subjects in the SALVO and Quick-Fire experiments were instructed to fire quickly so as to get maximum hits, it appears th. the experiments far from reproduced the time pressures of combat. The firers in the Defense Experiment were told to aim accurately so as to

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[*] In the SALVO II and Defense experiments, the firers knew about where almost all the targets would appear; thus, time from target appearance to trigger pull would be slower than time from weapon positioning to trigger pull by only about .2 to .3 seconds.

[**] Johns Hopkins University, Operations Research Office, Tactics Division, <u>SALVO II: Rifle Field Experiment</u>, by Leon Feldman et al., Technical Memorandum ORO-T-397, AD 325-385 (Bethesda, MD, May 1961).

[***] Respectively, Litton Systems, Inc., Mellonics Systems Development Division, <u>Infantry Weapons Test Methodology Study Quick-Fire Experiment I; Final Report</u>, by Ronald D. Klein, Contract DAEA 18-68-C-0004, prepared for United States Army Infantry Board, USAIB Project 3091, AD 914-686L (Ft. Benning, GA, 27 June 1969), and U.S. Army Infantry Board, <u>Defense Experiment I</u>, TECOM Project 8-5-0070-01 (Ft. Benning, GA, 25 November 1971).

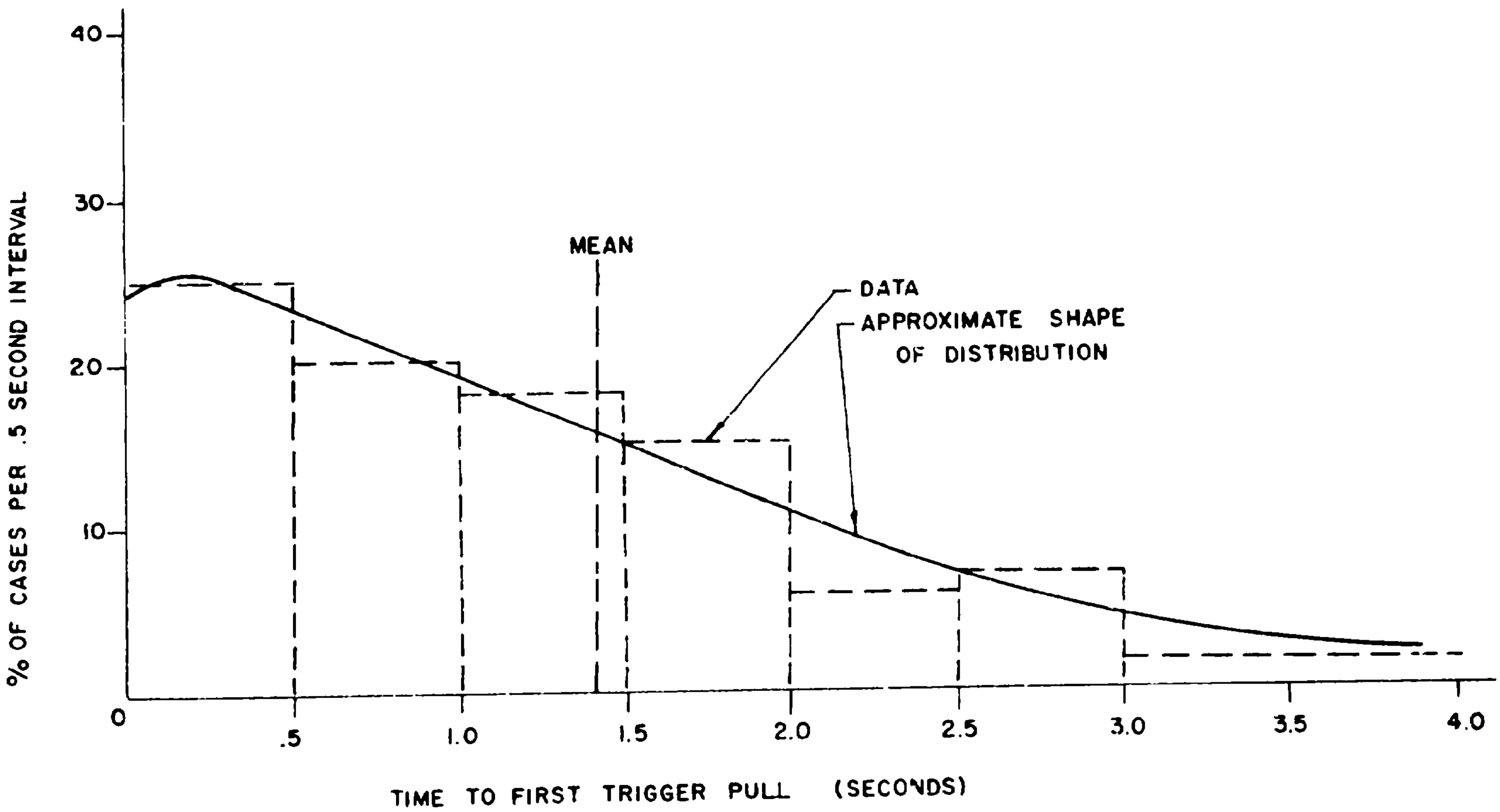

Figure E-2. Frequency distribution of first-round fire times.

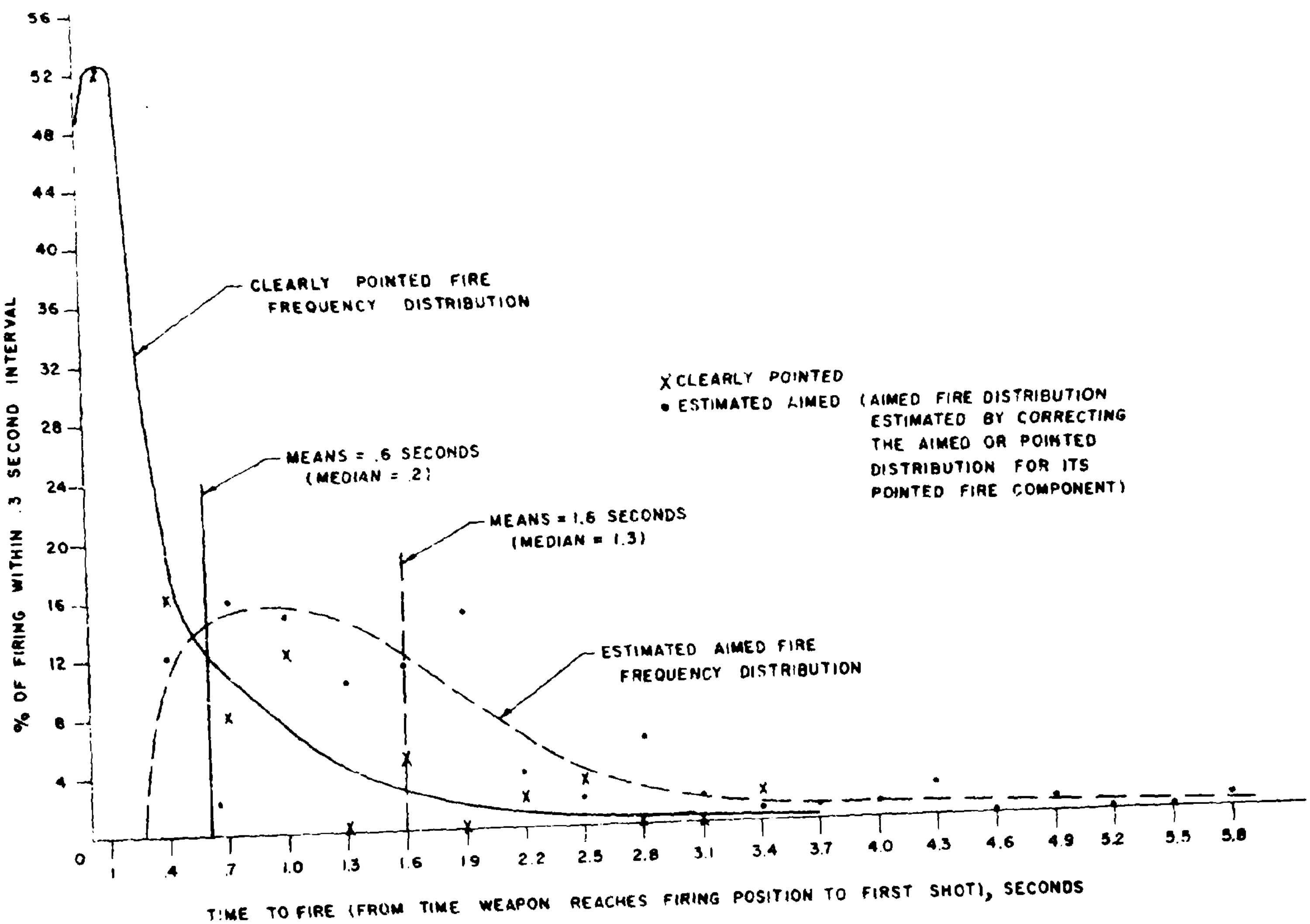

Figure E-3. Frequency distribution of first-round firing times for aimed and pointed fire.

maximize first-round hit probability and to expose themselves as little as possible while firing; as a consequence they took twice as long to fire as did firers in the other experiments and seven times as long as did those using clearly pointed fire in combat.

In all three experiments the firers were in position to fire before the targets were raised (and before time measurement began), and they roughly knew where to expect the targets to appear. In fact, in the Defense Experiment the firers had seen each group of four or five targets just before the same targets were exposed individually for them to engage. Thus, there is little reason to believe that the test firers were put at a time disadvantage to the combat firers (even though the experiment times are measured from target exposure, not from weapon in position). The combat firers had presumably already inferred or acquired a target before bringing the weapon to their shoulder. The shorter combat firing times probably reflect two factors: a stronger incentive to fire quickly, together with a greater willingness to aim less accurately, and the presence of few clearly defined targets to aim at.

It appears that the people who plan and conduct small arms tests can use measurements of test subjects' firing time (compared with the above combat firing times) to help assess whether the test subjects' training is achieving combat-like rapidity of fire. If the film sample had included a higher proportion of intense combat, the firing time distribution would likely have been even shorter than that shown.

Another aspect of firing speed is the number of rounds that are fired in each burst of automatic fire. Since the introduction of the M16 rifle, it has been alleged that its automatic fire capability produced excessively long bursts of fire in Vietnam and thus a great waste of ammunition (because during long bursts the muzzle may climb so high that most rounds pass high over the target).

Of the 319 M16 firings contained in the film data sample, 22 percent were automatic fire. The incidence of automatic fire was higher among Army soldiers (32 percent) than among Marines (11 percent). The number of rounds fired in each burst were counted and averaged for each firing sequence. (The sizes of the bursts used by a single man in a single firing sequence were checked and found not to vary much.) The frequency of occurrence of bursts of various sizes is shown in Figure E-4.

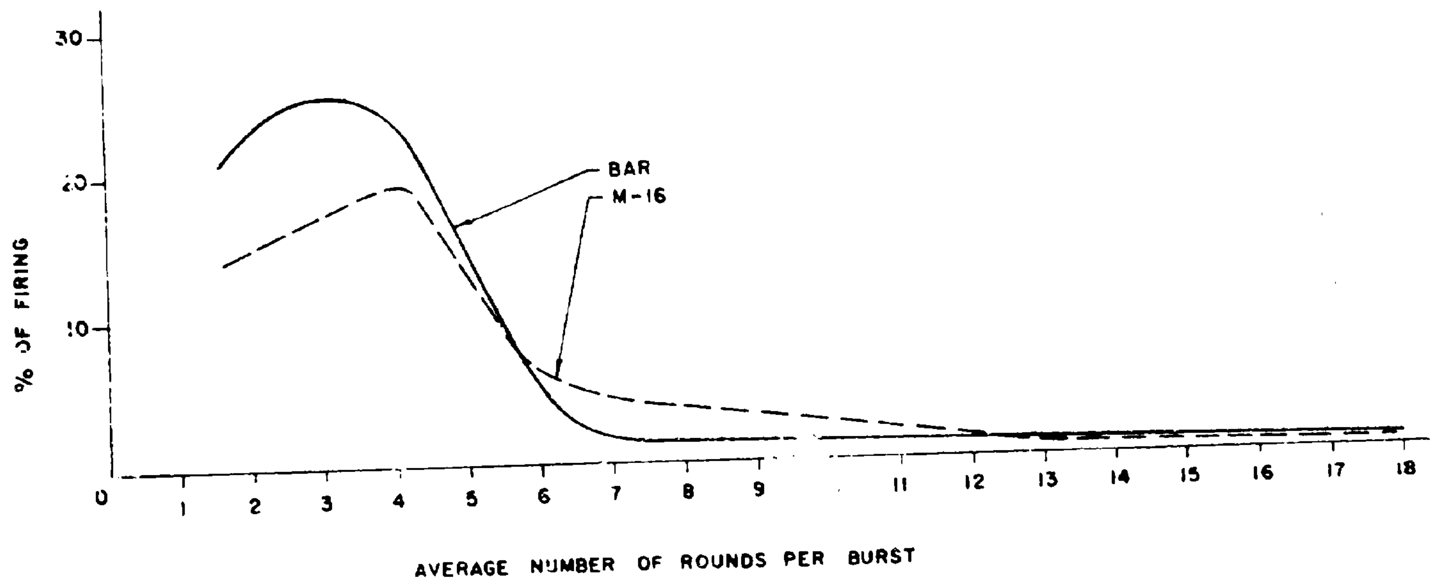

Figure E-4. Frequency distribution of sizes of M16 and BAR bursts of automatic fire.

The data show that firers used bursts longer than five rounds in only a small percentage of the 69 M16 automatic firings seen on film; about 60 percent of the firings are between two and four rounds. This is true even though many of these firers had not received any formal training in automatic fire techniques and there was no standard Army or Marine technique for such fire. The sizes of bursts shown in the figure cannot be considered optimum just because they were used in combat; as is discussed in Chapter IV, the CDEC-SAWS experiment discovered that two-round bursts are more effective than longer ones, when target effects and sustainability are weighed. Figure E-4 also shows the burst sizes used by BAR firers in World War II and Korea. These firers had been trained in 2- to 3-round burst and single-shot techniques, and it is apparent that they used slightly shorter bursts than the M16 firers; the BAR firers also had a much slower rate of fire.

OBSERVATIONS ON TARGET RANGE

The distribution of ranges from small arms firers to targets is generally known from various data sources, as described in Appendix D. In collecting information from combat film firing sequences, estimates were made of approximate ranges, and these are useful for comparison with range data from other sources to indicate how well the ranges in the filmed firing sequences agree with the known combat range distributions.

In 777 of the 1429 sequences, some estimate of range to target could be made. In many of these the estimate had to be rough, but in others it could be more precise.* An estimating procedure was devised that allowed the data collectors to produce consistent estimates of ranges, based on the variety of views of target areas that were found in the filmed sample. This procedure presented the collectors with a choice of range intervals of varying sizes (e.g., 100-300 meters and 75-450 meters) so that they could appropriately express the degree of uncertainty with which they could make any

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*Information on camera focal length was not available, so the method of calculating distances to visible objects of known size from their dimensions in the picture could not be used.

particular estimate. The raw range data are shown in Figure E-5; each bar is the width of one of the range intervals that were available for choice. The bar's height indicates the percent of times that the collectors chose that bracket. A more useful form of presentation is in Figure E-6; the overlaps of bars have been accounted for by assuming that the actual ranges to all the targets within each estimated interval were distributed uniformly and then totaling the inferred frequencies in the overlapping areas. (The distribution of actual ranges within an interval is probably not uniform, and there are likely to be fewer actual ranges falling near the extremes of the intervals than near their centers.) The smoothed curve (shown as a solid line in Figure E-6) presents a usable approximation of the range frequency for the sample of filmed firing sequences. This curve agrees quite well with the target range frequencies from very different sources shown in Appendix D. To the extent that the film sample does not include a representative sample of assaults, the target range frequencies here represent a high estimate of ranges used in small arms combat.

Since the 777 cases in which range estimates could be made constitute little more than half the total set of filmed small arms firing sequences, it is of interest to see whether this subset represents an unbiased sample of the full set. Examination revealed that weapon types were represented in about the same proportions in the subset as in the complete set, that combat theaters were represented in the proper proportions, and that the incidence of clearly pointed versus aimed or pointed weapon sighting was similar to the full set. On the other hand, Marine firings were under-represented in the subset, apparently because Army photographers were more likely than Marine photographers to include views in the direction the firer was aiming.

The difference between target range frequencies for clearly pointed fire and aimed or pointed fire is of interest. Both distributions are shown in Figure E-7 as smoothed curves derived in the same way as the distribution in Figure E-6. The distributions differ only slightly, with clearly pointed firing ranges averaging only about 10 meters shorter than the aimed or pointed ranges.

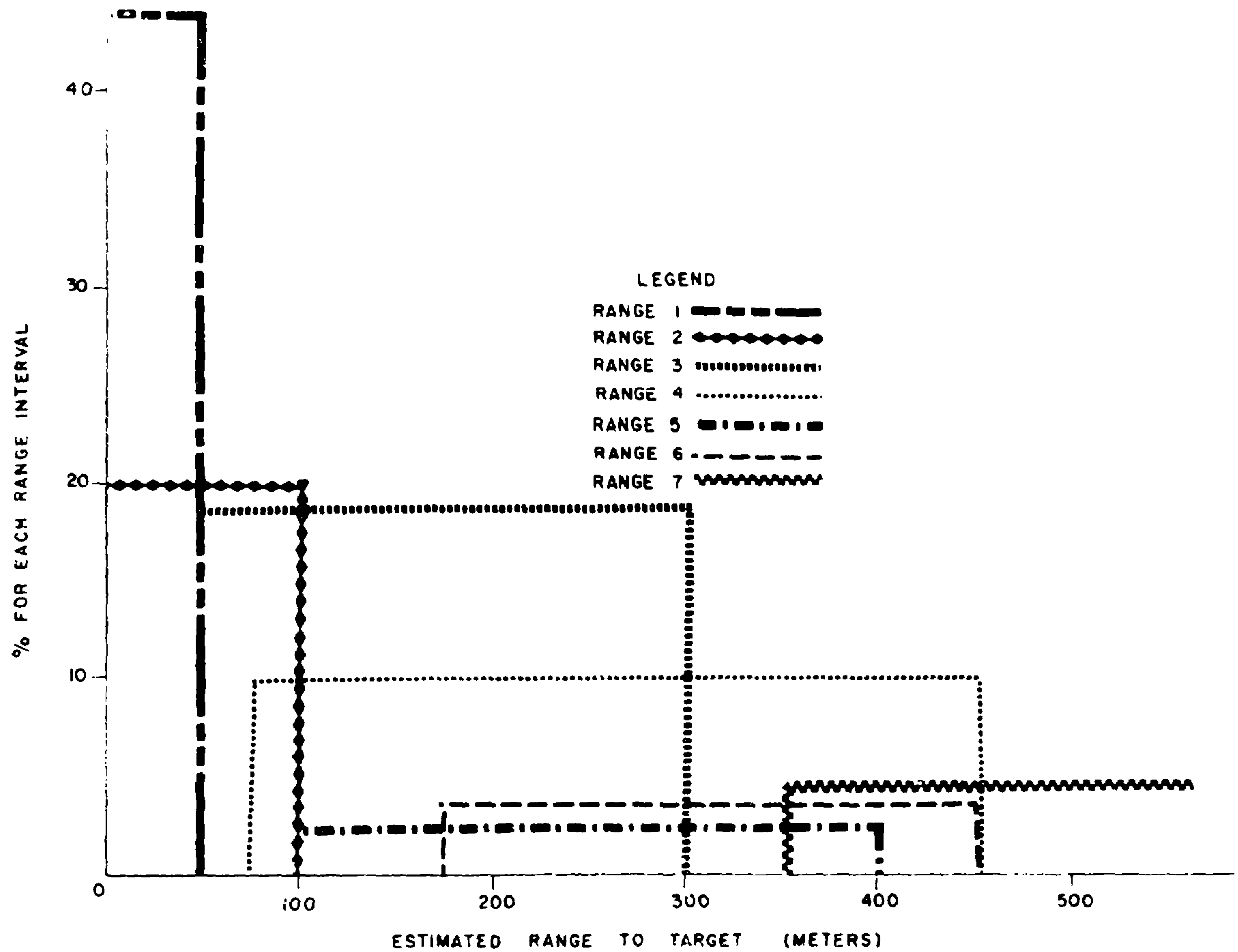

Figure E-5. Percent of times each range bracket was chosen.

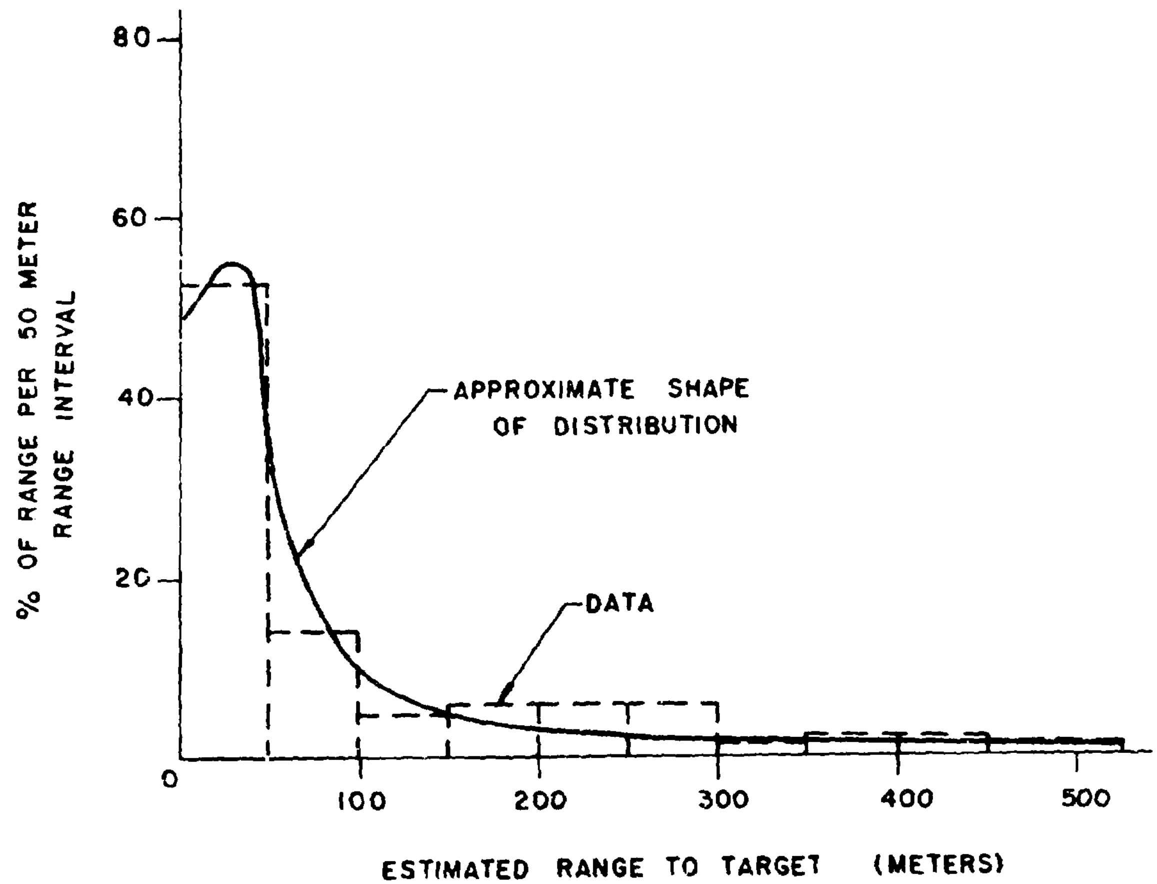

Figure E-6. Percent of estimated target range per 50-meter intervals.

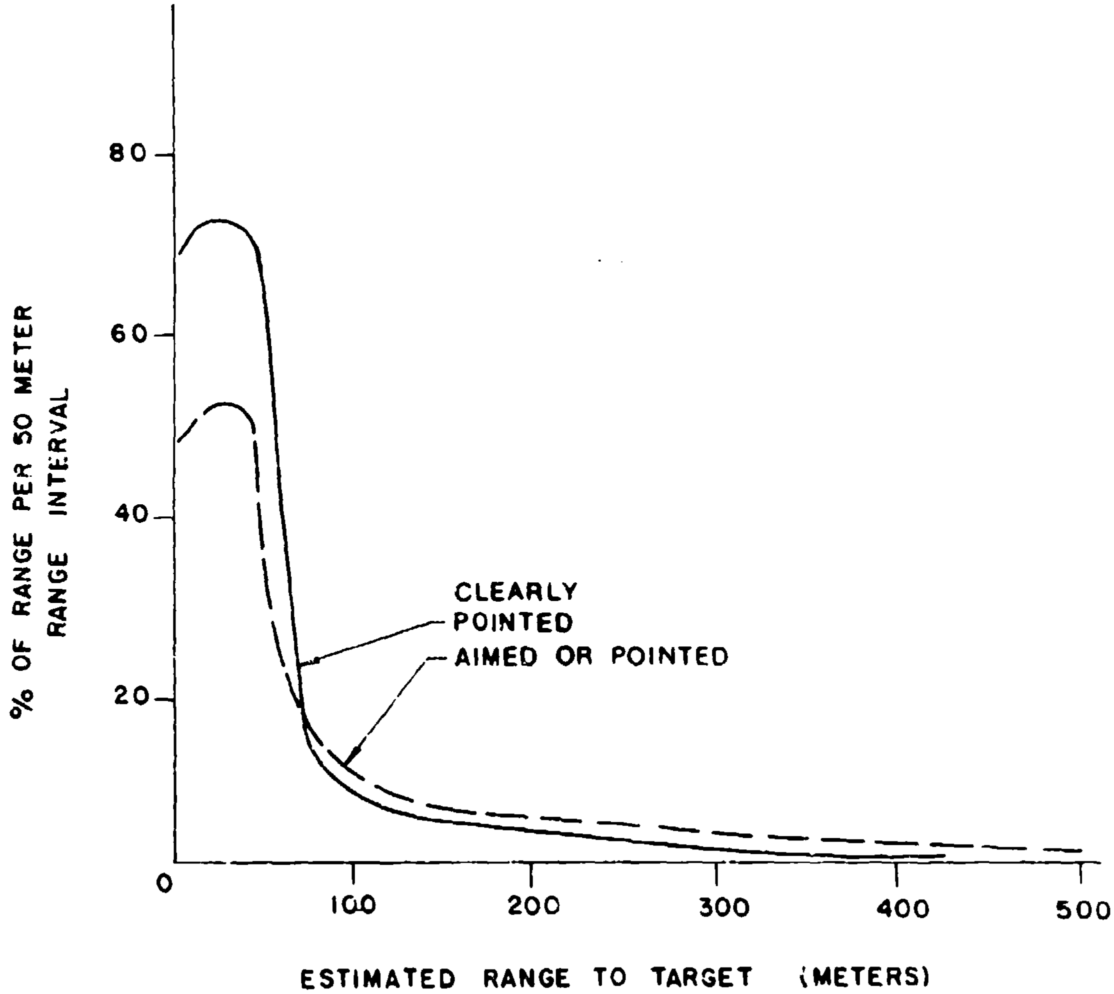

Figure E-7. Percent estimated target range per 50-meter intervals aimed and pointed fire.

COMPARISON OF FIRING POSITIONS TAUGHT IN TRAINING WITH THOSE TAKEN IN COMBAT

The films were also used to investigate the possibility that combat firers use firing positions that deviate significantly from the standard positions taught in U.S. infantry training. This was done by compiling the film sequences for each class of firing position (prone, standing, etc.), selecting representative samples, obtaining artists' drawings of the samples, and comparing these with the drawings of the standard firing positions contained in official training manuals. The BAR and M60 machine gun were excluded to simplify the comparison.

Selection of Firing Sequence Samples

The first step was to eliminate from further consideration the firing sequences that were not representative enough for the intended comparison. The criteria for elimination were as follows:

- o The firer's position had to be clearly visible (preferably from his right side).
- o The majority of the firer's body had to be within the camera's field of view.
- o The weapon being fired could not be supported (e.g., rested on a wall, etc.). It was believed that there were too few pictures of any one type of supported position to indicate a trend.
- o Films of firers located on steep slopes or pointing their weapons up or down at sharp angles would not be used.

When these criteria were applied, the sample of 1072 rifle and carbine firing sequences was reduced to a maximum of about 250 firings. From this group, 115 sequences were selected and prints were obtained. They were used for the following comparisons:

- o Comparison of filmed standing, kneeling, and prone positions (using the M1, M14, and M16 rifles and the carbine) with doctrinal positions.

- Comparison of standing and kneeling positions when the firer was wearing an armored vest (M14 and M16 rifles) with positions of firers not wearing vests.
- Comparison of firing positions when the butt of the weapon stock was not placed at the firer's shoulder (including both automatic and semiautomatic fire modes) with firing when the butt was at the shoulder.
- Comparison of positions in which the firer clearly pointed his weapon with positions in which he appeared to aim (including both semiautomatic and automatic M16 fire).

After review of these films about half were selected as being particularly useful for more detailed examination and comparison. The specific frame of each film showing the firer just before his weapon fired was then enlarged; a tracing of the firer's main outlines was made; and the details of his body position were drawn in by a medical illustrator. These drawings were used for final comparisons and analyses of position variations.

Results of Drawing Comparisons

The standing, kneeling, and prone positions that were used by combat firers fell well within the allowed variation of standard positions prescribed in the applicable Army field manuals.* None of the positions seen were awkward ones; on the contrary, most would have passed the rather exacting criteria of marksmanship trainers. Figure E-8 shows film-based drawings of standing positions with M1 and M16 rifles that are typical of the "preferred" high elbow position, and one of an M14 rifle typical of the "alternate" low elbow position. Figure E-9 shows drawings of typical kneeling positions with M1 and M16 rifles, and one of the prone position with an M16.

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*U.S. Army and U.S. Air Force, Carbine Caliber .30 M1, M1A1, M2, and M3, Field Manual 23-7 (Washington, January 1952); U.S. Army, M14 and M14A1 Rifles and Rifle Marksmanship, Field Manual 23-8 (Washington, April 1974); U.S. Army, M16A1 Rifle and Rifle Marksmanship, Field Manual 23-9 (Washington, June 1974); U.S. Army, Rifle Marksmanship, Field Manual 23-71 (Washington, December 1966).

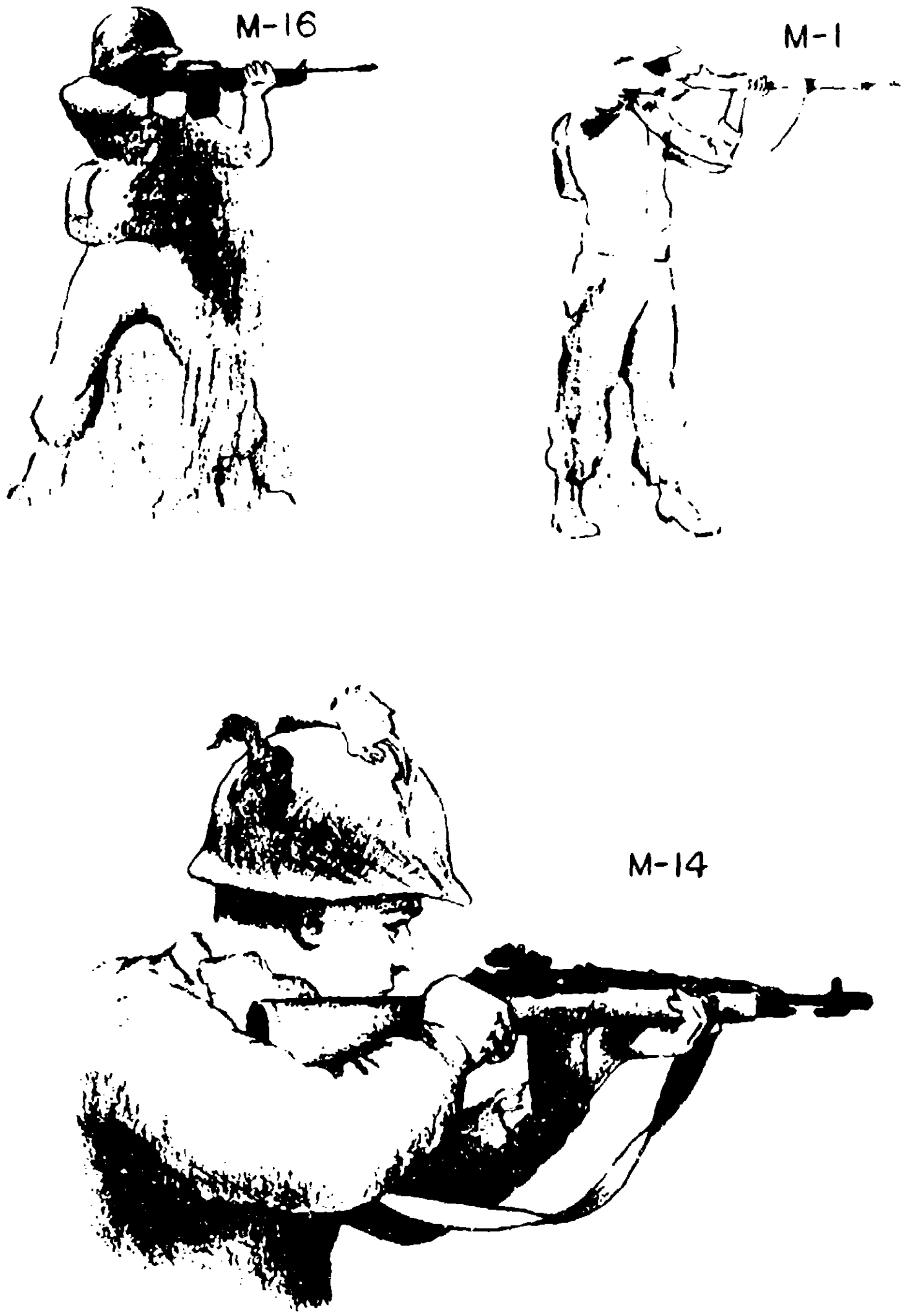

Figure E-8. Standing positions showing typical high elbow position (M1 and M16) and low elbow position (M14).

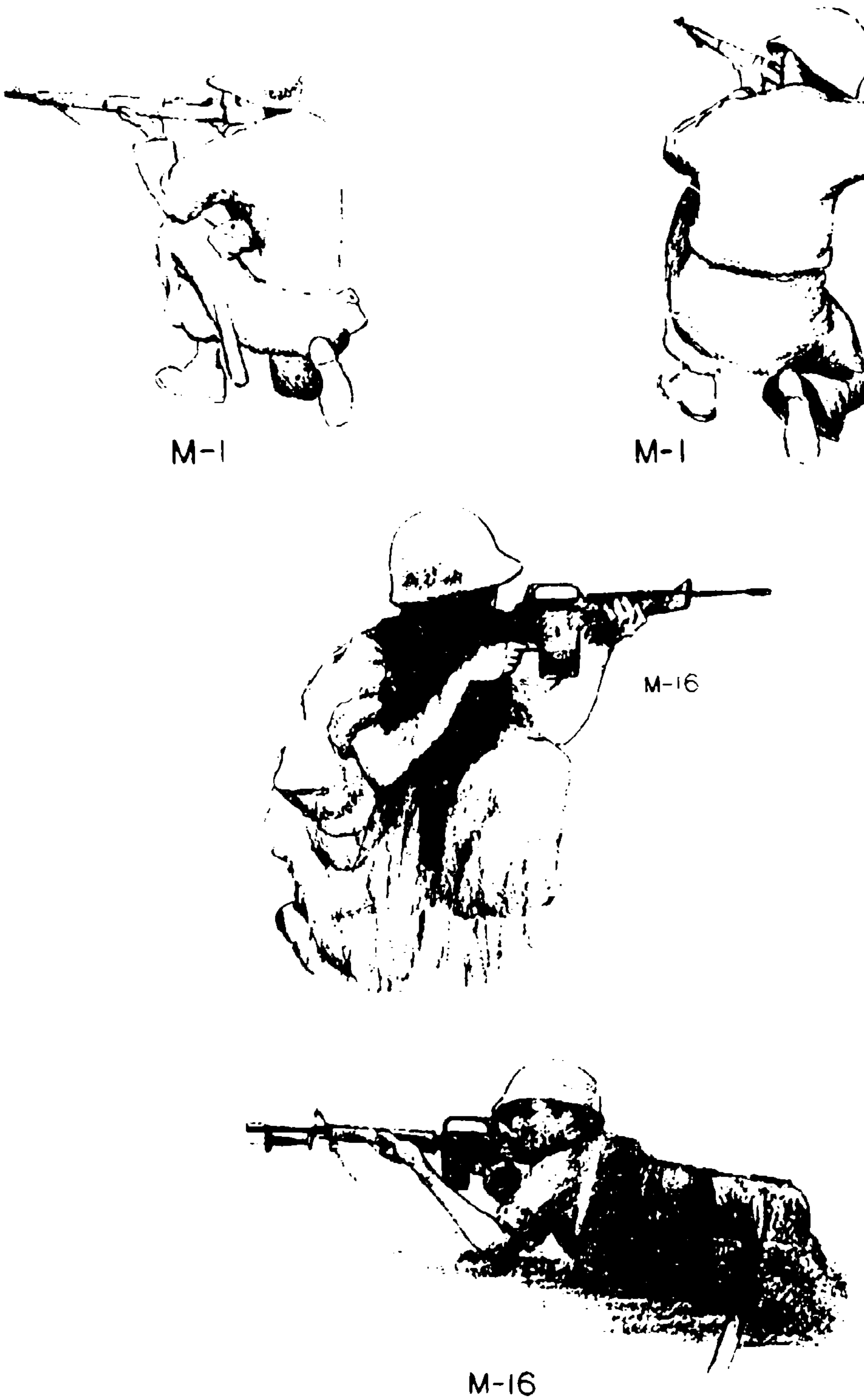

Figure E-9. Typical kneeling positions (M1 and M16) and typical prone position (M16).

When firings by men wearing armored vests were compared with similar non-vest firings using the same weapons and body positions, no difference was detectable. As far as could be seen, the vests did not affect the way the butt of the stock was placed against the firer's shoulder, change the position of his torso, or alter his normal elbow position. In all such pictures the right elbow was little if any lower than the shoulder (no prone positions were seen). Examination of the drawings of men firing weapons from her than the shoulder position revealed little variation. The rifle was mostly held above the waist but well below the armpit, with the right forearm approximately level and the wrist nearly straight, as shown in Figure E-10.

When the drawings of firers "pointing" their weapons (from shoulder positions) were compared with those in which they appeared to be looking through the sights, no difference in body position was seen, though of course the head position was different because "pointing" firings were detected by the head-up attitude of the firer (which causes him to look over the sights). Several M16 firers held the rifle butt a little lower on the shoulder during "pointing" firing. As shown in the example in Figure E-11, this increased the already substantial height above the sights of the firer's line of vision.

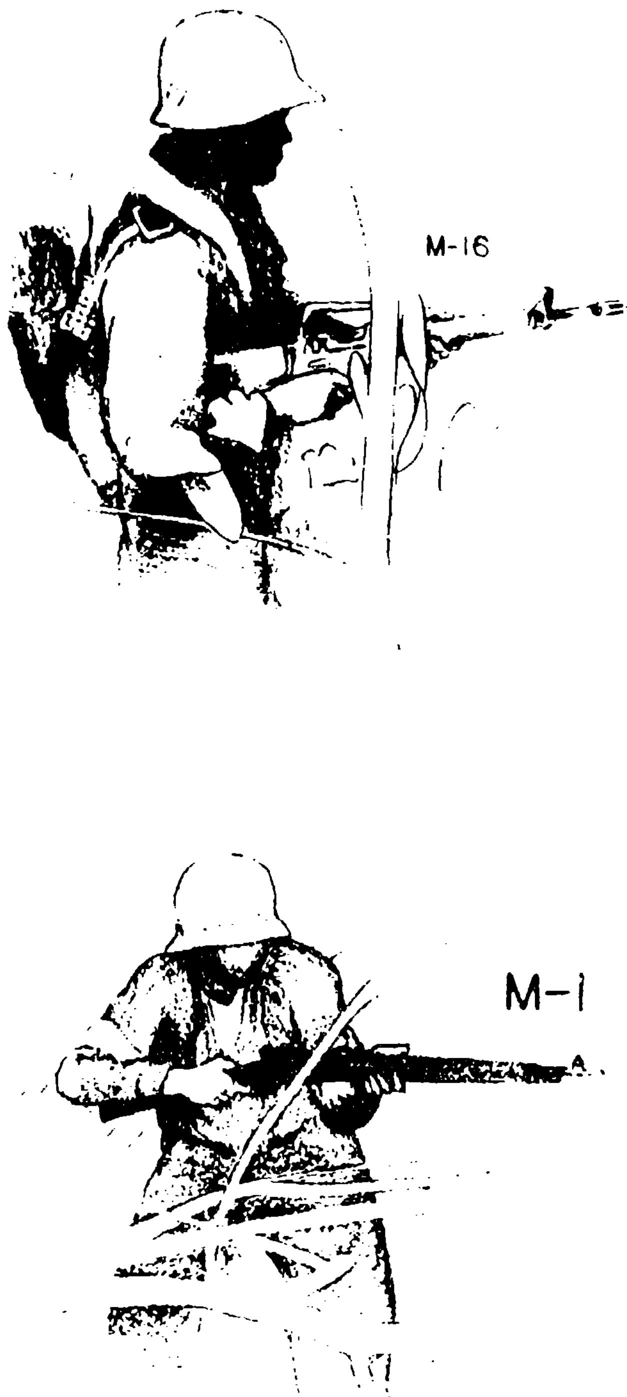

Figure E-10. Men firing weapons from other than shoulder position.

Figure E-11. Man firing M16 from other than shoulder position.

Annex to Appendix E

COMBAT FILM DATA OF SMALL ARMS FIRINGS

INTRODUCTION

This annex describes the procedures used to collect information about small arms firings from the combat films and fully lists the data that were collected.

The sources of film were the U.S. Army Motion Picture Depository and Records Center, Tobyhanna Depot, Tobyhanna, Pennsylvania, and the U.S. Marine Corps Motion Picture Archives, Quantico, Virginia. Both film repositories had similar facilities, and the collection techniques used were identical.

The specific objective was to record data that described the firer's actions (from the time he was first observed until he stopped firing or paused to reload), including his position, type of weapon, method and speed of aiming and firing, and available information about the target and the range to the target.

A tentative data collection format was developed, tested, and used to collect the following categories of information:

- o Where and when the firing sequence took place (i.e., World War II in Europe, or in the South Pacific, the Korean War, or Vietnam).
- o Activities of the firer, such as his firing position, weapon, method of aiming, and rate of fire.
- o An estimate of the range to the target area and target movement and size.
- o Assessment of the utility of the sequence for comparing firing positions with each other and with doctrinal positions (judging from film quality, camera angle, and the amount of the firer's body that could be seen).
- o Information identifying the firer's unit.

THE COLLECTION PROCESS

The research team conducted a search of all films at both film centers by examining the identification cards that briefly describe each film (e.g., "Marine infantry and tank attack in Korea," "M-1's and tank firing"). These cards are categorized by subject (e.g., M-1, tank) and are extensively cross-referenced. Initially, 84,000 film identification cards were examined to identify the film reels which contained small arms firing sequences. Over 800 reels of film, constituting 615,000 feet of combat footage, appeared to contain such firings. All 615,000 feet of film were examined, and a total of 1429 weapon firing sequences was collected.

Selection of firing sequences was made only from footage of actual combat; training films, staged shots, and reenactments were excluded.

Items of information collected during the combat film examination were recorded on data collection sheets, checked for completeness and validity, and then entered into a computer so that they could be sorted and listed in ways convenient for analysis.

DATA DESCRIPTORS

Below are described each of the data elements that were collected from the films. They are described in the order in which they appear in the computer printouts of the complete data (Figure 1, beginning p. E-57). The left-hand column presents the headings as they appear across the top of Figure 1 from left to right. The right-hand column describes these headings and explains the data codes.

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
LSN	This heading contains four columns which represent the "Line Sequence Number." Those lines in the data listing that are blank represent data items which were deleted because they were not usable. Thus there are 1464 line numbers but only 1429 data items.
O	Column "O" describes the "Type of Operation" (Attack, Defense, Undetermined) during the firing sequence. The code numbers below describe the items they represent: <u>Type of Operation</u> 1 - Attack 2 - Defense 3 - Undetermined When code number 1 - "Attack" appears in column "O" the term attack means that the firer seemed to be moving forward before and after the firing sequence or that the enemy was seen in prepared positions (foxholes, bunkers, etc.). Code number 2 - "Defense" appears when the firer was seen in a prepared position such as a foxhole or when enemy forces were seen advancing toward the firer.

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
POS FSP	This heading contains three columns that describe the firing position, what (if any) type of support was used for the firer's weapon, and the last stationary position the firer was in before assuming the firing position. The left hand ("F") column contains code numbers which represent seven different firing positions. The center ("S") column contains code numbers which represent five different types of support. The right hand ("P") column contains code numbers which represent seven different "pre-fire" positions. The code numbers below describe the items they represent:

Firing Position	Weapon Support	Prefire Position
1-Standing	1-Elbow	1-Standing
2-Kneeling	2-Magazine	2-Kneeling
3-Prone	3-Forward of Magazine	3-Prone
4-Sitting	4-Bipod	4-Sitting
5-Squatting	5-None	5-Squatting
6-Crouch		6-Crouch
7-Not to Shoulder		7-Other

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
(cont.) POS FSP	In the firing position column code number 7-"Not to Shoulder" indicates only that the rifle was not at the firer's shoulder (e.g., weapon held underarm or at waist or at hip). Code number 1 - "Elbow" in the center column was not entered when the use of the elbow as a support was a normal aspect of that position (e.g., left elbow placed on knee in the kneeling position or both elbows on the ground in the prone position). The right hand column describes the firer's last stationary position before he assumed his firing position.
AIM M	This heading contains three columns that describe the method of sighting the firer apparently used, any movement or lack of movement of the firer during the firing sequence, and the consistency of such movement. The left hand (M) column contains code numbers which represent six different methods of sighting. The center column (I) contains code numbers which represent five different

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION

(cont.)

AIM

M

types of movement. The right hand column (M) contains code numbers which represent three different types of consistency. The code numbers below describe the items they represent:

Sighting Method	Movement Between Trigger Pulls	Consistency of Movement
1-Aim	0-Not Applicable	0-No Change
2-Point*	1-No Change	1-Most of time/ always
3-Aim/Track	2-Raised Head	2-Some of the time
4-Aim/Traverse	3-Lowered Rifle	
5-Point/Track*	4-Other	
6-Point/Traverse*		

In the sighting method column the term "aim" means the firer appeared to be able to see through the sights of his weapon. The

*When code number 7 - "Not to Shoulder" appears in the firing position (F) column, one of three code numbers (2, 5, 6) appears in the sighting method column, because it would be impossible for the firer to use a clearly aimed method of fire from the "Not to Shoulder" position.

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
(cont.) AIM M	term "point" means the firer did not appear to have been able to see through the sights of his weapon. The term "track" means that the firer was moving his weapon smoothly in a horizontal direction as if tracking a moving target. The term "traverse" means the firer was moving his weapon in a horizontal direction but stopped for each trigger pull. In the "movement between trigger pulls" column the entry 0 - "Not Applicable" means that there was only one trigger pull. 1 - "No Change" appears when there was more than one trigger pull in which no movement of head or rifle between trigger pulls was observed. When 4 - "Other" appears in the center column, this describes more than one movement, usually meaning that both 2 - "Raised Head" and 3 - "Lowered Rifle" occurred. In the "consistency of movement" column 0 - "No Change" appears when there was only one trigger pull or when no change was entered in the previous column.

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION

W

A

This heading contains two columns that describe the type of weapon and mode of fire.

The left hand column (W) contains six code numbers which represent the different types of weapons. The right hand column (A) contains two code numbers which represent the fire mode. The code numbers below describe the items they represent:

Weapon ("W")	Fire Mode ("A")
1 - M-1 Rifle	1 - Single Shot
2 - M-1 or M-2 Carbine	2 - Burst (full automatic)
3 - M-14 Rifle	
4 - M-16 Rifle	
5 - Browning Automatic Rifle	
6 - M-60 Light Machine Gun (Bipod Mounted Only)	

In the weapon column when the code number 2 - "M-1 or M-2 Carbine" appears the weapon can be an M-2 carbine when the code number 2 - "Burst" also appears in the fire mode column.

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
RD/ BUR	This heading contains two columns which present the average number of rounds per trigger pull when code number 2 - "Burst" appears in the fire mode ("A") column (see p. E-36). The average number of rounds per trigger pull was determined by dividing the total number of rounds expended by the total number of trigger pulls. When "1" appears in the TRG PUL column the number appearing in the RD/BUR column represents the exact number of rounds expended for one trigger pull.
16 B T	This heading contains two columns which present data about the M-16 rifle. The left hand column contains two code numbers which represent M-16 burst length. The right hand column contains three code numbers which represent M-16 tracer use. The code numbers below describe the items they represent:

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION	
(cont.)	<u>M-16 Burst Length</u>	<u>M-16 Tracer Use</u>
16 B T	0 - Not Applicable 1 - More than 8 rounds*	0 - Not Applicable 1 - Yes 2 - No
FIRE TIME 1ST SUB ALL	The Fire Time heading contains three columns which contain fire times in seconds and tenths of seconds. Fire time is defined as meaning the time it took to aim/point at a target and pull the trigger. This time starts with the weapon in position (e.g., rifle at shoulder) and ends with the trigger pull. Times were calculated from numbers of film frames and camera speed. The left hand ("1st") column contains the fire time for the aim/point time for the first trigger pull. In some cases this first fire time may not be the complete time because the firer had his weapon at his shoulder when the	

* This was only a gross indicator, but burst size was also determined more precisely as described above (see RD/BUR).

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
(cont.) FIRE TIME 1ST SUB ALL	sequence started. In these cases, it was impossible to tell how long he had been sighting. Those cases are identifiable under the heading TIM/TO/POS (p. E-41). If in this column the time entered is 0.0, the first fire time cannot be considered to be the full aim/point time. The center ("SUB") column contains the average aim/point fire time for each subsequent trigger pull. (When this number is 0.0 it means there was only one trigger pull, which is also shown in the TRG/PUL column.) The right hand ("ALL") column contains the average aim/point fire time for all trigger pulls (including the first).
R C H	This heading contains one column which represents the change of trigger pull rate. The term "trigger pull rate" means the speed with which the firer discharged his weapon in a series of trigger pulls. This data was collected to see if there was any noticeable change in trigger pull rate during sustained

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
(cont.) R C H	firing sequences. Code numbers 2 - "Fast to Slow" and 3 - "Slow to Fast" are the ones that show a (recognizable) change (however, they only appear in 4 percent of the cases). Code numbers 0 - "Not Applicable" (i.e., only one trigger pull shows on the film) and 1 - "Constant" appear the rest of the time.
D I R	This heading contains one column which represents the direction of fire. The term "Direction of Fire" refers to pointing the weapon up or down. The code numbers are listed below: <u>Direction of Fire</u> 0 - Not Applicable 1 - Up 2 - Down When code numbers 1 - "Up" or 2 - "Down" appear in the direction of fire column this means that the weapon's vertical angle was great enough to distort the normal body firing position (e.g., man in street firing into upper story window).

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
TIM TO POS	This heading contains two columns which contain the "Time to Position" in seconds and tenths of seconds. This data was collected in an effort to see how long it took a firer to go from a prefire position to a firing position (e.g., standing to prone). By referring to the POS/FSP headings and comparing the left hand (F) column code number to the right hand (P) column code number, it is possible to single out those few occurrences where there was a difference between the prefire and fire positions. When the left hand (F) column and the right hand (P) column have the same code numbers, there was no change in position just before firing, and the time that appears in the "time to position" column describes the time it took the firer to get the weapon to his shoulder. The times that appear in the "Time to Position" column are somewhat misleading because some of them also include time in which no movement occurred (e.g., a firer was seen standing, stood for some seconds, and then went into a

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
(cont.) TIM TO POS	prone fire position). Only the minimum times entered in this column are useful indicators of time required. When 0.0 appears in the "time to position" column this means that the firer had his weapon at his shoulder when the firing sequence was first seen on the film.
TRG PUL	This heading contains two columns which represent the total number of trigger pulls. These numbers describe the total number of times the firer pulled the trigger (e.g., a firer firing two rounds semi-automatic would appear as 02; a firer firing three bursts of automatic fire would appear as 03).
2ND POSN FS M A D	This heading contains five columns which describe changes in firing positions, aim methods, use of automatic fire, and pointing up or down during a single firing sequence. These data were collected to see if there was any detectable change made by the firer after the first trigger pull in a firing sequence (in a

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
(cont.) 2ND POSN FS M A D	majority of the cases there was no change in any of the items noted). When a change took place after the first trigger pull, the data do not describe at what point during the sequence it took place. The left hand (F) column represents the second firing position (parent column - "F" - Firing Position). The "S" column represents the second type of support (parent column - "S" type support). The "M" column represents the second sighting method (parent column - "M" sighting method). The "A" column represents the second firing mode (parent column - "A" firing mode). The right hand (D) column represents the second direction of fire (parent column "DIR" direction of fire).
R G E	This heading contains one column of code numbers which describe the firing range. The term "firing range" is defined as meaning estimated distance from the firer to the target area. Because range was difficult to estimate from the film, a process which produced

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
(cont.) RGE	consistent estimates from three observers was developed on the basis of brackets of range within which the estimate could be confidently estimated to fall (e.g., code number 3 means the target was not further away than 300 meters and was not closer than 50 meters to the firer). The code numbers below describe the range brackets they correspond to:

Firing Range

0 - Undetermined

1 - Not more than about 50 meters

2 - Not more than about 100 meters

3 - Not less than about 50 meters and not more than about 300 meters

4 - Not less than about 75 meters and not more than about 450 meters

5 - Not less than about 100 meters and not more than about 400 meters

6 - Not less than about 175 meters and not more than about 450 meters

7 - Not less than about 350 meters

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
M E C	This heading contains three columns which describe how firers moved to the location of their firing positions (when such movement was seen), the amount each was exposed to view from the direction of the target area, and whether the part of each that was not exposed was behind physical cover or only concealed.

The left hand ("M") column describes any movement of the firer to his fire location.

The center ("E") column describes the amount of each firer that was visible from the area toward which he was firing.

The right hand ("C") column describes the firer's use of cover and concealment. The code numbers below describe the items they represent:

Moving into Fire Location	Firer's Exposure	Use of Cover and Concealment
0 - No movement	1 - Full	0 - None
1 - Walk	2 - Half	1 - Cover
2 - Run	3 - Minimum	2 - Concealment
3 - Crawl		3 - Cover/ Concealment

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
(cont.) M E C	When the code number 0 - "no movement observed" appears in the left hand ("M") column this means the firer was, when first seen on the film, already at his fire location. The code number 4 - "Other" appears when more than one way was used to move into fire location (e.g., firer walked and then ran to his fire location). When code number 1 - "Full"* appears in the center ("E") column this means the firer was as completely visible to his target area as his firing position would permit (e.g., firer in prone position with no cover or concealment). The code number 2 - "Half" appears when the firer had roughly half of his body (as it appeared in that position) exposed in the direction of his target area (e.g., firer standing in waist high grass).

* When this code number appears the code number 0 - "None" will always appear in the right hand "C" column.

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
(cont.) M E C	When the code number 3 - "Minimum" appears in the center ("E") column the firer had a very small portion of his body exposed in the direction of his target area (e.g., firer kneeling behind a fallen tree). When code number 0 - "None" appears in the right hand ("C") column this means the firer was fully exposed. When code number 1 - "Cover" appears this means the firer was partly behind some type of material that would presumably stop a bullet, e.g., standing behind a wall. (The amount of the firer that was behind the cover is indicated in the center column.) The code number 2 - "Concealment" appears when the firer was behind some type of material that would not stop a bullet, such as a bush. When code number 3 - "Cover/Concealment" appears this means that the firer was behind a mi› of the two types of materials--some par y "concealed" (e.g., kneeling behind a fallen tree with branches concealing a further part of his body).

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION

OTHR
C U
F

This heading contains four columns which describe the action of other soldiers who were visible in the film of soldier firing a small arm.

The left hand ("O") column describes whether or not there were others in the firing sequence. Column "C" describes the appearance of other soldiers in the sequences in terms of whether or not they appeared to be concerned about what the firer was doing. Column "F" indicates whether anyone else in the group of men who were visible was firing a weapon. Column "U" indicates whether most of these other men had taken cover or not.

The code numbers below describe the items they represent:

Others in Sequence	Concerned
0 - Not applicable	0 - Not applicable
1 - Other in sequence	1 - Yes
	2 - No

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION

(cont.)

	Firing	Undercover
OTHR	0 - Not applicable	0 - Not applicable
C U	1 - Yes	1 - Yes
F	2 - No	2 - No

In the left hand ("O") column when the code number 0 - "Not applicable" appears, this describes that the firer was the only soldier seen in the film of the firing sequence. (When this code number ("O") appears, columns "C", "F", and "U" will, also, appear as zeros.) When the code number 1 - "Other in sequence" appears, this means some number of people were present in the firing sequence other than the firer. There is no way of accurately determining how many people were in a firing sequence.*

When the code number 1 - "Yes" appears in column "C" this describes the apparent attitude of the majority of the people, other than the firer, as being interested in or concerned

*When code number 1 - "Others in sequence" appears in column "O", the number that appears under column "No" describes the position of the firer in the group, counting from the left--see p. E-54.

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
(cont.) OTHR C U F	about what the firer was shooting at. When the code number 2 - "no" appears, this indicates that the majority of the other soldiers were taking little or no interest in what the firer was shooting at. When code number 1 - "Yes" appears in column "F" this describes that one or more of the other soldiers in the firing sequence was also firing. When code number 1 "Yes" appears in column "U" this meant that soldiers other than the firer were seen taking cover.
MSUM OIRA VZBN	This heading contains four columns which describe the target's movement or lack of movement, the size of the target, whether or not the firer's location was in an urban area, and if the firer was firing from a man-made position or not (e.g., foxhole, building, etc.). The left hand ("V") column describes whether the target appeared to be moving. Column "Z" describes the estimated size of the

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
(cont.) MSUM OIRA VZBN	target area being fired at. Column "B" describes whether or not the firing sequence took place in a city or large village. Column "N" describes whether or not the firer's position was man-made (such as a foxhole, bunker, etc.). The code numbers below describe the items they represent:

Target Movement

0 - Undetermined*

1 - Stationary

2 - Moving

Target Size

0 - Undetermined*

1 - Point

2 - Small Area

3 - Large Area

Urban Area

1 - Yes

2 - No

Position Man-Made

1 - Yes

2 - No

In column "Z" when the code number 1 - "point" appears, the term point describes the target size as being about that of a field fortification embrasure or an individual. When the code number 2 - "small area appears the

*I.e., target could not be seen.

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
(cont.) MSUM OIRA VZBN	term small area describes the target size as being about that of a window/door or large weapon signature or tank/truck. When the code number 3 - "large area" appears, the term large area describes the target size as being about that of a building (shooting through walls) or a treeline or no specifically defined target. The remaining headings contain columns which describe data items that were used for administrative use (e.g., DATE, FRAME, etc.) and in the selection of pictures of men firing for analysis of firing positions details.
Q	The "Q" column describes how clearly the firer can be seen-- "1" means "well" and "2" means "poorly."
V	Column "V" describes how much of the firer appears in the film--"1" means "full" view, "2" means "half" and "3" means that only a small "portion" of the firer's body was visible.

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
AN	Columns "AN" describe the camera's horizontal angle relative to the direction of fire in clock terms (i.e., "One o'clock" is shown as "01").
A R	The "A R" column describes whether or not the firer was wearing torso body armor. (This data was collected to see if body armor would have any effect on the placement of the weapon against the firer's shoulder.) Code number "1" appears when the firer was wearing upper body armor, and code number "2" when the firer was not.
S	Column "S" describes a ground slope in the area the firer occupied that would affect the firer's position--"0" means there was "no effect" on the firer's position, "1" means there was an "upward effect" (i.e., firer positioned on a steep incline facing toward the top of the incline), "2" means there was a "downward effect" (i.e., firer positioned on a steep decline facing toward the bottom of the decline).

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
NO	Column "No" describes the position of the firer when some number of people were present in the firing sequence other than t[illegible] firer, counting from the left (e.g., 04 means there were 3 other people to the left of the firer). "[illegible]0" appears when only the firer was present in the firing sequences.
REEL	This heading describes where the film was viewed and the reel number. In the left hand column "1" means the film was viewed at the Army Motion Picture Depository and Records Center (AMPD-RC) and "2" means the U.S.M.C. Motion Picture Archives. The remaining columns indicate the reel number.
[illegible]E	This heading contains columns which describe (in feet and frames) the starting point of the firing sequence.
DATE	This heading contains columns which describe the calendar date (day, month, year) the firing sequences took place (e.g., 050345 means 5 March 1945).

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
R	Column "R" describes whether the firer was attached to a different unit from his normal organic assignment (code number "1") or attached to an organizational type other than those described in column "B_R" (code number "2") or not. Code number "0" means "unknown."
BN	This heading contains three columns which describe the firer's battalion numerical designation (right justified, e.g., 78th battalion appears as 078).
B_R	Column "B_R" describes the firer's "Battalion Branch Type." The code numbers below the items they represent:

Battalion Branch Type

0 - Unknown	6 - Engineer
1 - Tank Destroyer	7 - Ranger/Special Forces
2 - Artillery	8 - Marine
3 - Tank/Armored	9 - Other
4 - Recon	
5 - Infantry	

REG	This heading contains three columns which describe the firer's Regimental numerical designation (right justified, e.g., 78th Regiment appears as 078).

FIGURE 1 HEADING ABBREVIATIONS	DATA ELEMENT DESCRIPTION
DIV	This heading contains three columns which describe the firer's Division numerical designation (right justified, e.g., 99th Division appears as 099).
B	Column "B" describes the firer's "Division Branch Type" and has the same code numbers as the "B" column. R
A M	Column "A" describes which "Military Force" M the firer was in--"1" means "U.S. Army" and "2" means "U.S. Marine Corps."
L O C	Column "L" describes in which conflict the O C firing sequence took place--"1" means "World War II in Europe," "2" means "World War II in the South Pacific," "3" means "Korea" and "4" means "Vietnam."

FIGURE 1

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	W A	RD/BUR 16 B T	FIRE TIME 1ST	FIRE TIME SUB	FIRE TIME ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND POSN FS	2ND POSN M	2ND POSN A	2ND POSN D	R G E	M E C	OTHR C U F	MSUM OIRA VZBN	Q V AN / A NO H S	REEL	FRAME	DATE BN R R	DIV REG B	L AO MC
0001	1	151	111	52	3.000	1.5	2.2	2.0	1	0	0.0	05	00	0	0	0	1	010	1112	1122	12052001	1000000503	037804	24034400000	0000000	12
0002	1	752	211	52	2.500	1.2	0.7	0.9	1	0	0.0	02	00	0	0	0	1	010	1112	1322	12042003	1000000503	039313	24034400000	0000000	12
0003	1	252	111	52	3.000	1.6	1.0	1.1	1	0	0.0	06	00	0	0	0	1	010	1112	1322	11042002	1000000503	039313	24034400000	0000000	12
0004	1	151	111	11	0.000	2.9	2.2	2.5	1	0	0.0	02	00	0	0	0	0	010	0000	0022	12032000	1000000503	040705	24034400000	0000000	12
0005	1	131	100	11	0.000	1.1	0.0	1.1	0	0	0.0	01	00	0	0	0	1	031	1121	1122	22052001	1000000647	049912	[illegible]0034400000	0000000	12
0006	1	131	111	21	0.000	2.2	1.2	1.5	1	0	0.0	03	00	0	0	0	1	031	0000	0022	12032000	1000000647	05210	[illegible]034400000	0000000	12
0007	1	151	111	11	0.000	0.6	0.3	0.4	1	0	0.0	03	00	0	0	0	1	022	1121	1122	21092001	1000000647	055215	00034400000	0000000	12
0008	1	252	100	11	0.000	0.6	0.0	0.6	0	0	0.0	01	00	0	0	0	1	031	0000	0022	23032000	1000000647	069314	00034400000	0000000	12
0009	1	751	211	11	0.000	0.8	0.3	0.4	1	0	0.0	05	00	0	0	0	1	010	1112	1122	11102001	1000000647	071107	00034400000	0000000	12
0010	1	151	132	52	2.800	0.5	0.8	0.8	2	0	0.0	05	00	0	0	0	1	010	1121	1122	11092001	1000000647	072501	00034400000	0000000	12
0011	3	232	111	11	0.000	3.6	0.5	0.9	3	0	0.0	07	00	0	0	0	7	031	0000	1222	13052000	1000000663	041000	22024400000	0000000	11
0012	3	434	111	11	0.000	0.3	0.6	0.6	1	0	0.0	08	00	0	0	0	7	031	0000	1222	13052000	1000000663	042310	22024400000	0000000	11
0013	3	414	111	11	0.000	1.8	0.8	0.9	1	0	0.0	07	00	0	0	0	7	031	0000	1222	13072000	1000000663	043311	22024400000	0000000	11
0014	3	353	111	11	0.000	1.2	1.0	1.0	1	0	0.0	08	00	0	0	0	7	031	0000	1222	12082100	1000000663	044504	22024400000	0000000	11
0015	3	353	111	11	0.000	0.5	1.3	1.2	1	0	0.0	07	00	0	0	0	7	031	0000	1222	13052000	1000000663	046114	22024400000	0000000	11
0016	1	252	111	52	3.500	1.0	1.5	1.4	1	0	7.8	04	00	0	0	0	1	231	0000	1322	11042000	1000000667	016408	00124300000	0000000	22
0017	1	131	142	11	0.000	1.0	3.2	2.5	2	0	0.0	03	00	0	0	0	1	033	1112	1222	21042001	1000000667	074514	00124300000	0000000	22
0018	1	151	111	11	0.000	0.5	1.0	0.8	1	1	5.1	03	00	0	0	0	2	031	1121	0021	22082002	1000000826	022609	00114300000	0000000	22
0019	1	454	100	11	0.000	1.7	0.0	1.7	0	0	4.0	01	00	0	0	0	2	031	1121	0021	22042002	1000000826	028203	00114300000	0000000	22
0020	1	252	111	11	0.000	1.7	1.5	1.6	1	0	0.0	02	00	0	0	0	2	031	0000	0021	23072000	1000000826	060410	00114300000	0000000	21
0021	1	252	111	11	0.000	1.1	1.9	1.7	1	0	1.2	04	00	0	0	0	1	210	1112	1122	11052001	1000000837	010600	00024420000	0000000	12
0022	1	151	100	11	0.000	1.2	0.0	1.2	0	0	0.0	01	00	0	0	0	1	010	1121	0022	21092001	1000000837	029202	00024420000	0000000	12
0023	1	252	111	52	2.500	0.3	1.6	1.0	1	0	0.0	02	00	0	0	0	1	022	1122	1222	21052002	1000000837	030910	00024420000	0000000	12
0024	1	151	111	11	0.000	1.0	0.5	0.6	1	0	0.0	[illegible]	00	0	0	0	1	010	0000	1222	21062000	1000000837	032609	00024420000	0000000	12
0025	2	151	111	11	0.000	1.1	1.3	1.3	1	0	0.0	[illegible]	00	0	0	0	1	010	1112	0022	11022001	1000000897	001409	16034400000	0000000	12
0026	2	151	111	21	0.000	1.0	1.0	1.0	1	0	0.0	0	00	0	0	0	1	010	1112	0022	11022004	1000000897	001409	16034400000	0000000	12
0027	2	151	111	11	0.000	0.7	1.5	1.1	1	0	1.4	02	00	0	0	0	1	110	1112	0022	11022003	1000000897	002509	16034400000	0000000	12
0028	2	151	111	21	0.000	0.2	1.6	1.3	1	0	0.6	05	00	0	0	0	1	010	1112	0022	12022001	1000000897	002912	16034400000	0000000	12
0029	2	151	111	11	0.000	1.3	0.9	0.9	1	0	0.0	07	00	0	0	0	1	010	1112	0022	11022003	1000000897	002614	16034400000	0000000	12
0030	2	252	111	11	0.000	2.3	1.4	1.7	1	0	2.0	03	00	0	0	0	1	010	1112	0022	11022008	1000000897	003114	16034400000	0000000	12
0031	3	151	111	11	0.000	1.7	0.9	1.0	1	0	0.0	07	00	0	0	0	1	010	1121	0022	12012001	1000000897	025609	16034400000	0000000	12
0032	2	232	111	52	2.000	0.9	0.8	0.8	1	0	0.0	05	00	0	0	0	1	031	1121	0021	13022001	1000000897	026712	16034400000	0000000	12
0033	3	252	111	52	2.300	1.0	1.8	1.7	1	0	0.0	07	00	0	0	0	1	021	0000	1321	12052000	1000000897	027414	16034400000	0000000	12
0034	1	151	100	11	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	1	010	1121	1122	11042003	1000000897	034205	16034400000	0000000	12
0035	1	151	100	51	0.000	3.4	0.0	3.4	0	0	0.0	01	00	0	0	0	1	010	1122	1122	11082002	1000000897	034706	16034400000	0000000	12
0036	1	434	111	11	0.000	0.8	0.6	0.7	1	0	0.0	06	00	0	0	0	1	031	0000	0021	12112000	1000001073	076501	00064400000	0000000	12
0037	1	151	111	11	0.000	0.5	1.8	1.1	1	0	0.0	02	00	0	0	0	1	023	0000	0022	23102000	1000001073	077306	00064400000	0000000	12
0038	1	252	111	11	0.000	1.2	3.2	2.2	1	0	0.0	02	00	0	0	0	1	033	0000	0022	23112000	1000001073	077903	00064400000	0000000	12
0039	1	353	100	11	0.000	1.4	0.0	1.4	0	0	0.0	01	00	0	0	0	1	031	0000	0022	23012000	1000001073	078707	00064400000	0000000	12
0040	1	232	111	11	0.000	2.0	1.7	1.9	1	0	0.0	02	00	0	0	0	1	031	0000	0022	23032000	1000001073	079303	00064400000	0000000	12
0041	1	232	100	11	0.000	1.0	0.0	1.0	0	0	0.0	01	00	0	0	0	1	031	0000	0022	23032000	1000001073	080010	00064400000	0000000	12
0042	1	151	100	11	0.000	1.0	0.0	1.0	0	0	0.0	01	00	0	0	0	1	010	1122	1212	22062001	1000002303	009313	08084400000	0000365	11
0043	1	151	100	11	0.000	0.8	0.0	0.8	0	0	0.0	01	00	0	0	0	1	010	1122	1312	12032002	1000002303	019303	08084400000	0000365	11
0044	1	151	131	11	0.000	0.6	3.6	2.1	1	0	0.0	02	00	0	0	0	1	010	1112	1212	21102003	1000002303	025715	08084400000	0000365	11
0045	1	151	200	11	0.000	3.2	0.0	3.2	0	0	4.5	01	00	0	0	0	1	010	1112	1212	21082006	1000002303	026412	08084400000	0000365	11
0046	1	252	111	11	0.000	0.1	1.2	1.1	1	0	0.0	07	00	0	0	0	1	021	0000	1211	11042000	1000002073	057215	08084400000	3130000	11
0047	1	252	111	11	0.000	0.7	1.5	1.4	1	0	0.0	08	00	0	0	0	1	021	0000	1211	12062000	1000002073	556614	08084400000	3130000	11
0048	1	151	100	11	0.000	1.4	0.0	1.4	0	0	0.0	01	00	0	0	0	1	010	0000	1212	12062000	1000001599	051000	24024500000	0000000	11
0049	1	151	200	11	0.000	1.0	0.0	1.0	0	0	1.2	01	00	0	0	0	1	110	1122	1212	21062003	1000001955	076710	05034500000	0000033	11

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	W A	RD/16 BUR B T	FIRE TIME 1ST	SUB	ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	R G E	M E C	OTHR C U F	MSUM OIRA VZBN	O V A R N O AN S	REEL	FRAME	DATE BN B R R	DIV REG B	L AO MC
0050	1	151	111	21	0.000	0.3	1.2	0.8	1	0	0.0	02	00	0	0	0	2	010	0000	1212	12072000	1000001955	079502	05034500000	0000033	11
0051																										
0052	1	252	100	11	0.000	1.7	0.0	1.7	0	0	5.2	01	00	0	0	0	1	021	1121	0021	23092002	1000001715	069707	10034400000	0000000	22
0053	1	151	100	11	0.000	1.4	0.0	1.4	0	0	5.4	01	00	0	0	0	1	110	0000	1122	21062000	1000001631	006112	22064400000	1860415	12
0054	3	131	100	11	0.000	1.7	0.0	1.7	0	0	0.0	01	00	0	0	0	0	031	1121	0021	21072001	1000001334	008507	11074400025	0380025	11
0055	3	131	100	52	2.000	2.8	0.0	2.9	0	0	0.0	01	00	0	0	0	0	031	1121	0021	12042002	1000001334	009404	11074400025	0380025	11
0056																										
0057	3	252	100	21	0.000	2.1	0.0	2.1	0	0	0.0	01	00	0	0	0	0	021	0000	0011	11032000	1000003751	000312	21034500000	0000055	11
0058	1	353	100	11	0.000	2.0	0.0	2.0	0	0	0.0	01	00	0	0	0	1	031	0000	1222	12042000	1000002627	037901	02114400000	1100285	11
0059	1	434	111	11	0.000	1.0	2.5	2.0	1	0	0.0	03	00	0	0	0	2	031	1111	0011	21042002	1000002719	062007	17114400000	0471045	11
0060	1	434	111	11	0.000	1.2	4.8	3.0	1	0	0.0	02	00	0	0	0	2	031	1111	0011	12042001	1000002719	062007	17114400000	0471045	11
0061	1	434	111	11	0.000	1.0	1.0	1.0	1	0	1.3	02	00	0	0	0	2	031	1111	0011	11052002	1000002719	063801	17114400000	0471045	11
0062	1	434	100	11	0.000	1.0	0.0	1.0	0	0	0.0	01	00	0	0	0	2	031	1111	0011	11042001	1000002719	063801	17114400000	0471045	11
0063	1	732	231	11	0.000	3.0	6.2	5.1	1	0	0.0	03	00	0	0	0	1	031	0000	1122	12062100	1000003107	060409	20104400000	0000000	12
0064	3	131	100	11	0.000	2.3	0.0	2.3	0	0	0.0	01	00	0	0	0	3	010	1121	0021	11022009	1000003203	013405	30104400000	0000345	12
0065	3	343	111	52	4.000	2.5	2.9	2.7	1	0	0.0	02	00	0	0	0	7	010	0000	1222	21062000	1000003265	050607	04024500035	0390095	11
0066	3	343	100	52	5.000	2.2	0.0	3.1	0	0	0.0	01	00	0	0	0	7	010	0000	1222	21062000	1000003265	053811	04024500035	0390095	11
0067	3	252	111	11	0.000	0.7	1.3	1.1	1	0	0.0	04	00	0	0	0	7	010	0000	1222	21062000	1000003265	054311	04024500035	0390095	11
0068	3	252	111	11	0.000	0.7	1.5	1.2	1	0	0.0	03	00	0	0	0	7	010	1112	1222	21042003	1000003265	055013	04024500035	0390095	11
0069	3	151	111	11	0.000	1.4	2.1	1.8	1	0	0.0	03	00	0	0	0	7	010	0000	1222	22062000	1000003265	057805	04024500035	0390095	11
0070	3	353	200	52	2.000	6.1	0.0	6.2	0	0	0.0	01	00	0	0	0	4	010	0000	1322	22052000	1000003265	063911	04024500035	0390095	11
0071	1	252	100	11	0.000	0.6	0.0	0.6	0	0	0.0	01	00	0	0	0	3	022	1121	1322	11072001	1000003747	014205	21034500000	3170000	11
0072	1	414	100	11	0.000	2.4	0.0	2.4	0	0	0.0	01	00	0	0	0	1	031	1111	1321	11042001	1000003736	027112	25034500035	3050775	12
0073	1	414	111	11	0.000	1.5	1.7	1.6	1	0	0.0	02	00	0	0	0	1	031	1111	1321	11042002	1000003736	027112	25034500035	3050775	12
0074	1	751	211	11	0.000	0.6	0.4	0.5	1	0	0.0	04	00	0	0	0	1	010	1122	0012	21042002	1000003725	045909	20034500000	0000043	11
0075	1	111	100	21	0.000	2.2	0.0	2.2	0	0	0.0	01	00	0	0	0	0	031	1121	0021	23022002	1000003725	089201	20034500000	0000043	11
0076	1	151	100	11	0.000	1.8	0.0	1.8	0	0	1.0	01	00	0	0	0	0	121	1121	0021	21062003	1000003725	091211	20034500000	0000043	11
0077	3	151	111	11	0.000	1.2	3.1	2.1	1	0	0.0	02	00	0	0	0	3	031	0000	1311	13052000	1000003660	039712	18034500000	0000000	11
0078	3	555	121	11	0.000	1.3	4.1	2.7	1	0	0.0	02	00	0	0	0	0	031	1111	0011	12032002	1000003478	006909	19024500000	0000375	12
0079	3	151	100	11	0.000	5.7	0.0	5.7	0	0	1.3	01	00	0	0	0	0	031	1111	0011	11032005	1000003478	007108	19024500000	0000375	12
0080	1	353	100	11	0.000	7.6	0.0	7.6	0	0	0.0	01	00	0	0	0	0	031	0000	0022	11042000	1000003478	051504	19024500000	0000375	12
0081	1	555	111	11	0.000	3.3	1.0	1.7	1	0	0.0	03	00	0	0	0	1	021	1121	0022	21092001	1000003476	070704	19024500000	0000113	12
0082	1	353	111	11	0.000	1.5	7.9	4.7	1	0	0.0	02	00	0	0	0	2	031	0000	1222	12092000	1000003476	077609	19024500000	0000113	12
0083	1	131	111	11	0.000	1.4	1.5	1.4	1	0	0.0	02	00	0	0	0	1	031	0000	1221	22032000	1000003458	018615	23024500000	0360033	11
0084	3	454	100	11	0.000	7.1	0.0	7.1	0	0	0.0	01	00	0	0	0	1	010	0000	2122	21052000	1000003803	022003	06044500000	3780955	11
0085	3	151	100	11	0.000	3.9	0.0	3.9	0	0	0.0	01	00	0	0	0	1	010	1212	2122	21032002	1000003803	023404	06044500000	3780955	11
0086	3	454	100	11	0.000	4.3	0.0	4.3	0	0	6.6	01	00	0	0	0	1	010	1212	2122	21032003	1000003803	024703	06044500000	3780955	11
0087	1	131	111	11	0.000	0.6	1.5	1.2	1	0	0.0	03	00	0	0	0	0	031	1111	0021	21042003	1000003823	023105	01044500000	3971005	11
0088	1	111	111	11	0.000	1.2	1.1	1.2	1	0	0.0	03	00	0	0	0	0	031	1111	0021	21042001	1000003823	023105	01044500000	3971005	11
0089	1	721	200	11	0.000	3.0	0.0	3.0	0	0	0.0	01	00	0	0	0	0	031	1111	0021	21052004	1000003823	023105	01044500000	3971005	11
0090	1	353	100	11	0.000	1.2	0.0	1.2	0	0	0.0	01	00	0	0	0	2	031	0000	1322	11052000	1000003823	024512	01044500000	3971005	11
0091	1	252	100	11	0.000	3.8	0.0	3.8	0	0	0.0	01	00	0	0	0	0	031	0000	0011	11072000	1000003881	074112	31034500000	3130795	11
0092	1	151	131	11	0.000	0.5	2.4	1.8	1	0	0.0	03	00	0	0	0	1	021	0000	1221	22092000	1000003905	058910	06044500000	0000173	11
0093	1	131	100	11	0.000	4.7	0.0	4.7	0	0	0.0	01	00	0	0	0	0	031	1121	0011	23032001	1000003954	022303	09044500000	3450875	11
0094	1	151	111	11	0.000	2.5	1.4	1.8	1	0	0.0	03	00	0	0	0	0	031	0000	0011	23032000	1000003954	024001	09044500000	3450875	11
0095	1	151	111	11	0.000	0.7	2.3	1.5	1	0	0.0	02	00	0	0	0	3	010	1112	1322	12052002	1000003954	033808	09044500000	3450875	11
0096	1	151	100	21	0.000	1.3	0.0	1.3	0	0	0.9	01	00	0	0	0	3	010	1112	1322	13042001	1000003954	033913	09044500000	3450875	11
0097	1	252	100	11	0.000	4.9	0.0	4.9	0	0	0.0	01	00	0	0	0	2	032	1121	1212	11052002	1000003967	072608	00044500000	0000043	11
0098	1	151	111	11	0.000	0.5	1.4	1.1	1	0	0.0	03	00	0	0	0	7	010	1121	1322	11092003	1000004008	026809	14044500000	0001045	11

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	W A	RD/16 BUR B T	FIRE TIME 1ST	SUB	ALL	R C H	O I R	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	R G E	M •E C	OTHR C U F	MSUM OIRA VZBN	Q V A R NO AN S	REEL	FRAME	DATE BN B R R	DIV REG B	L AO MC
0099	1	256	111	11	0.000	0.5	0.8	0.7	1	1	2.5	03	00	0	0	0	1	022	1121	1222	22072103	1000004037	007500	27034500000	0000325	12
0100	1	156	111	11	0.000	0.8	0.3	0.5	1	0	1.1	03	00	0	0	0	1	122	1111	1222	11072102	1000004037	009710	27034500000	0000325	12
0101	1	252	141	11	0.000	2.7	5.1	3.9	1	0	0.0	02	00	0	0	0	1	033	1111	1322	11062002	1000004970	039607	13074500000	0000320	12
0102	1	752	211	52	2.300	0.9	0.8	0.8	1	0	2.5	06	00	0	0	0	1	033	1111	1322	11052001	1000004970	041905	13074500000	0000320	12
0103	1	111	111	21	0.000	2.3	1.1	1.7	1	0	0.0	02	00	0	0	0	2	031	0000	1321	13062000	1000004970	054605	13074500000	0000320	12
0104	1	754	211	11	0.000	0.6	1.4	1.1	1	0	0.0	03	00	0	0	0	1	031	1122	1221	22092001	1000004825	054902	15064500000	0000075	12
0105	1	151	111	11	0.000	0.7	2.0	1.6	1	1	1.2	03	00	0	0	0	2	110	1111	0022	11092001	1000004768	027609	30054500000	0000375	12
0106	1	751	211	11	0.000	0.9	2.0	1.7	1	1	5.3	04	00	0	0	0	2	010	1111	0022	11082002	1000004768	027706	30054500000	0000375	12
0107	1	751	211	11	0.000	4.1	0.6	1.8	1	1	0.0	03	00	0	0	0	2	110	1111	0022	11092003	1000004768	027501	30054500000	0000375	12
0108	1	151	100	11	0.000	1.0	0.0	1.0	0	0	3.8	01	00	0	0	0	1	010	1112	0022	21032007	1000004768	075015	30054500000	0000375	12
0109	1	454	100	11	0.000	1.2	0.0	1.2	0	0	0.0	01	00	0	0	0	0	032	1111	0022	21032003	1000004768	090600	30054500000	0000375	12
0110	1	752	200	11	0.000	4.3	0.0	4.3	0	0	0.0	01	00	0	0	0	0	022	1111	0022	21032002	1000004768	090600	30054500000	0000375	12
0111	1	252	100	11	0.000	1.0	0.0	1.0	0	0	0.0	01	00	0	0	0	1	022	1121	1322	13062008	1000004765	018411	00000000000	1450375	12
0112	1	151	132	21	0.000	0.6	2.2	1.9	2	2	0.0	05	00	0	0	0	1	021	1111	1222	11052002	1000004630	000210	27054500000	0000355	12
0113	1	751	200	11	0.000	1.2	0.0	1.2	0	2	0.0	01	00	0	0	0	1	021	1111	1222	11042001	1000004630	000210	27054500000	0000355	12
0114	1	151	100	11	0.000	3.0	0.0	3.0	0	0	0.0	01	00	0	0	0	1	010	1121	1212	12062003	1000004423	029109	30044500000	0000113	11
0115	1	151	111	52	2.500	1.9	2.5	2.2	1	0	0.0	02	00	0	0	0	1	010	0000	1212	12032000	1000004423	030700	30044500000	0000113	11
0116	3	151	111	21	0.000	0.8	1.2	1.0	1	0	0.0	02	00	0	0	0	0	010	1111	0022	11032003	1000004423	038206	30044500000	0000113	11
0117	3	111	100	11	0.000	1.6	0.0	1.6	0	0	0.0	01	00	0	0	0	0	021	1111	0021	12032002	1000004423	038206	30044500000	0000113	11
0118	3	111	111	11	0.000	5.6	2.5	4.1	1	0	0.0	02	00	0	0	0	6	031	1111	1221	11072001	1000004184	010306	30044500000	0300035	11
0119	3	353	100	11	0.000	4.5	0.0	4.5	0	0	0.0	01	00	0	0	0	6	031	1111	1221	11082002	1000004184	011613	30044500000	0300035	11
0120	3	131	111	11	0.000	0.9	0.7	0.8	1	0	0.0	02	00	0	0	0	6	031	1111	1221	11082003	1000004184	011613	30044500000	0300035	11
0121	1	757	241	11	0.000	0.0	1.4	1.2	3	0	0.0	06	00	0	0	0	2	210	1111	1322	11062012	1000004184	025213	30044500000	0300035	11
0122	1	757	200	11	0.000	0.0	0.0	0.0	0	0	0.0	01	00	0	0	0	2	210	1111	1322	11062011	1000004184	025811	30044500000	0300035	11
0123	1	757	200	11	0.000	0.0	0.0	0.0	0	0	0.0	01	00	0	0	0	2	210	1111	1322	11062001	1000004184	026502	30044500000	0300035	11
0124	1	751	200	11	0.000	2.2	0.0	2.2	0	0	0.0	01	00	0	0	0	1	010	1121	1222	11082002	1000003960	068614	12044500000	1340355	11
0125	1	256	100	21	0.000	1.8	0.0	1.8	0	0	6.0	01	00	0	0	0	0	031	0000	0011	12072000	1000003923	000902	05044500244	0040000	11
0126	1	151	111	11	0.000	1.0	0.8	0.9	1	1	0.6	03	00	0	0	0	1	110	1122	1212	11032003	1000003923	022512	05044500244	0040000	11
0127	1	131	111	21	0.000	0.7	1.5	1.3	1	0	0.0	03	00	0	0	0	1	031	1111	1211	12072001	1000003923	023702	05044500244	0040000	11
0128	1	751	211	21	0.000	0.4	1.0	0.7	1	0	0.0	02	00	0	0	0	1	010	1122	1122	21072003	1000009627	021109	00000000000	0000000	22
0129	1	751	211	11	0.000	1.5	1.0	1.3	1	0	0.0	02	00	0	0	0	0	010	1122	0022	12042002	1000009589	001200	00004400000	0000000	22
0130	1	151	111	21	0.000	0.5	0.1	0.3	1	0	0.0	02	00	0	0	0	0	022	1111	0022	12032001	1000009589	003907	00004400000	0000000	22
0131	1	555	122	11	0.000	0.5	0.7	0.7	1	0	0.0	05	00	0	0	0	0	022	1111	0022	12032003	1000009589	003907	00004400000	0000000	22
0132	3	151	100	11	0.000	5.6	0.0	5.6	0	0	0.0	01	00	0	0	0	4	031	1121	1322	11062003	1000004417	019502	01054500015	1510385	11
0133	1	151	111	11	0.000	3.3	3.7	3.5	1	1	0.7	02	00	0	0	0	0	010	1121	0022	11102005	1000004417	035207	01054500015	1510385	11
0134	3	151	111	11	0.000	1.4	0.7	1.0	1	0	2.5	02	00	0	0	0	3	031	1121	1321	22032001	1000004217	047209	18044500000	3971005	11
0135	1	252	111	11	0.000	2.2	0.9	1.3	1	0	0.0	03	00	0	0	0	2	010	1111	1212	11092002	1000009743	006308	29044500000	0000000	11
0136	1	252	111	21	0.000	1.8	1.4	1.5	1	1	0.0	05	00	0	0	0	2	010	1111	1212	11092008	1000009743	006308	29044500000	0000000	11
0137	1	252	100	21	0.000	0.6	0.0	0.6	0	0	0.0	01	00	0	0	0	2	010	1121	1212	11072001	1000009743	007715	29044500000	0000000	11
0138	1	252	100	11	0.000	2.1	0.0	2.1	0	0	0.0	01	00	0	0	0	2	031	0000	1211	12072000	1000009743	039304	29044500000	0000000	11
0139	1	151	311	52	1.400	0.9	0.8	0.8	2	0	0.0	07	00	0	1	0	3	022	1111	1322	12052001	1000010429	028500	12094400000	0000000	11
0140	1	252	111	11	0.000	0.0	1.5	0.8	1	0	0.0	02	00	0	0	0	0	010	1112	0022	11072002	1000010429	029313	12094400000	0000000	11
0141	3	151	111	11	0.000	1.3	1.5	1.4	1	0	0.0	02	00	0	0	0	3	010	0000	1322	11052000	1000010429	030011	12094400000	0000000	11
0142	1	151	111	21	0.000	0.4	0.7	0.6	1	0	0.0	03	00	0	0	0	1	010	0000	1212	13082000	1000010434	036800	08084400035	3150855	11
0143	1	151	111	52	6.500	1.0	3.9	2.4	2	1	0.0	02	00	0	0	0	1	010	1121	1211	13062002	1000010434	036403	08084400035	3150855	11
0144	1	151	100	21	0.000	0.9	0.0	0.9	0	0	0.0	01	00	0	0	0	2	010	1121	1212	22092004	1000010434	040100	08084400035	3150858	11
0145	3	151	100	52	4.000	0.4	0.0	0.7	0	0	0.0	01	00	0	0	0	7	010	0000	1321	11052000	1000003085	001800	07014500044	2000000	11
0146	3	111	100	11	0.000	0.3	0.0	0.8	0	0	0.0	01	00	0	0	0	7	010	1111	1321	11032003	1000003085	003210	07014500044	2000000	11
0147	3	151	100	11	0.000	1.5	0.0	1.5	0	0	3.0	01	00	0	0	0	7	010	1111	1321	11032003	1000003085	005011	07014500044	2000000	11

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	RD/ W A	16 RUR B T	1ST	SUB	ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	R G E	M E C	OTHR C U F	MSUM OIRA VZBN	U V A R AN S NO	REEL	FRAME	DATE BN R B R	DIV REG B	L AO MC
0148	3	151	100	11	0.000	2.2	0.0	2.2	0	0	0.0	01	00	0	0	0	0	010	0000	0022	13012000	1000003085	005412	07014500044	2000000	11
0149	3	252	100	11	0.000	3.7	0.0	3.7	0	0	1.6	01	00	0	0	0	0	010	1121	0022	11032004	1000003085	006208	07014500044	2000000	11
0150	3	151	111	11	0.000	0.7	1.8	1.5	1	0	0.0	04	00	0	0	0	0	010	1112	0022	11092001	1000003085	007711	07014500044	2000000	11
0151	3	252	111	11	0.000	1.1	1.6	1.4	1	0	0.0	03	00	0	0	0	0	010	1112	0022	11092003	1000003085	007711	07014500044	2000000	11
0152	3	252	111	11	0.000	2.5	2.1	2.3	1	0	1.9	02	00	0	0	0	0	010	1112	0022	11092004	1000003085	008008	07014500044	2000000	11
0153	3	252	111	11	0.000	2.3	5.0	4.1	1	0	0.0	03	00	0	0	0	0	032	0000	0022	13092000	1000003085	014002	07014500044	2000000	11
0154	3	151	111	11	0.000	0.3	0.4	0.4	1	0	4.0	03	00	0	0	0	6	010	0000	1322	12052000	1000003085	025910	07014500044	2000000	11
0155	3	252	111	11	0.000	0.8	1.8	1.5	1	0	0.0	04	00	0	0	0	6	010	1122	1322	11072004	1000003085	027000	07014500044	2000000	11
0156	1	252	100	41	0.002	0.3	0.0	0.3	0	1	0.0	01	00	0	0	0	1	010	1111	1322	11092001	1000048136	016601	20086420000	0000077	14
0157	1	252	100	41	0.002	0.8	0.0	0.9	0	1	1.2	01	00	0	0	0	1	110	1111	1322	11092101	1000048136	021914	20086420000	0000077	14
0158	1	252	111	41	0.002	1.2	0.7	0.9	1	1	0.5	03	00	0	0	0	1	210	1111	1322	11092103	1000048136	022812	20086420000	0000077	14
0159	1	252	100	42	10.012	0.0	0.0	4.7	0	0	0.0	01	00	0	0	0	1	022	0000	0022	21072000	1000052867	016505	15046800000	0000255	14
0160	1	252	111	41	0.002	1.6	1.0	1.1	2	0	0.0	05	00	0	0	0	1	022	0000	0022	23042000	1000052867	016801	18046800000	0000255	14
0161	1	252	111	41	0.002	1.4	0.4	0.7	1	0	0.0	04	00	0	0	0	1	032	0000	0022	23052000	1000052867	017735	18046800000	0000255	14
0162	1	252	400	42	5.002	0.3	0.0	1.8	0	0	0.0	01	00	0	0	0	1	022	0000	0022	22071000	1000052867	018018	18046800000	0000255	14
0163	1	752	211	42	4.002	1.4	2.2	1.8	1	0	0.0	02	00	0	0	0	1	021	1121	1222	21032002	1000052867	019016	18046800000	0000255	14
0164	1	751	200	42	10.012	0.0	0.0	2.4	0	0	0.0	01	00	0	0	0	1	010	1121	0022	11081001	1000052867	019604	18046800000	0000255	14
0165	3	752	611	42	2.502	0.6	1.1	0.9	1	0	0.0	02	00	0	0	0	1	032	1111	0022	12082001	1000054913	031708	29026800000	0000255	14
0166	3	751	200	41	0.002	0.7	0.0	0.7	0	0	0.0	01	00	0	0	0	1	022	0000	0022	13032000	1000054913	033203	29026800000	0000255	14
0167	1	755	231	42	3.502	0.3	3.9	2.1	1	0	0.0	02	00	0	0	0	1	010	0000	1222	11042000	1000051335	035306	26046720045	0310000	14
0168	3	141	411	62	3.300	0.0	3.5	2.6	1	0	0.0	04	00	0	0	0	3	031	0000	0021	13052000	1000051350	020403	11036700000	0000000	14
0169	3	136	100	41	0.002	0.5	0.0	0.5	0	0	4.0	01	00	0	0	0	3	031	1111	0021	13102001	1000051350	024510	11036700000	0000000	14
0170	3	353	111	41	0.002	0.7	2.0	1.6	1	0	0.0	03	00	0	0	0	3	031	1121	0022	13032002	1000051350	024714	11036700000	0000000	14
0171	1	353	111	42	4.002	0.8	5.9	3.4	1	0	0.0	02	00	0	0	0	1	032	1111	0022	23032003	1000050869	064200	04026700000	0000000	14
0172	1	353	100	42	2.002	6.0	0.0	6.2	0	0	0.0	01	00	0	0	0	1	032	1111	0022	23032001	1000050869	064200	04026700000	0000000	14
0173	3	343	111	62	12.000	0.0	2.4	1.9	3	0	0.0	05	00	0	0	0	2	031	1121	1322	12042003	1000049957	028604	18016620000	0000015	14
0174	1	151	111	32	4.000	1.0	2.5	1.8	1	0	0.7	02	00	0	0	0	0	010	1112	0022	11092002	1000049957	062504	18016620000	0000015	14
0175	1	151	111	31	0.000	1.0	0.6	0.7	1	0	0.7	05	00	0	0	0	0	010	1112	0022	11092005	1000049957	062505	18016620000	0000015	14
0176	3	741	200	62	5.000	0.0	0.0	1.8	0	0	0.0	01	00	0	0	0	4	021	1121	0021	21032004	1000054141	068200	13036920000	0040255	14
0177	3	751	200	42	2.002	0.1	0.0	0.5	0	0	0.0	01	00	0	0	0	4	021	1121	0021	21032003	1000054141	068907	13036900000	0040255	14
0178	1	343	200	62	9.000	0.8	0.0	4.1	0	0	0.0	01	00	0	0	0	1	010	1111	1222	22072001	1000054552	048317	31016800000	0470095	14
0179	1	151	111	41	0.002	0.1	1.0	0.7	1	0	0.0	03	00	0	0	0	1	022	1111	1322	21091004	1000054552	048536	31016800000	0470095	14
0180	1	111	100	41	0.002	0.6	0.0	0.6	0	0	2.2	01	00	0	0	0	1	031	1111	1321	23051002	1000054552	050936	31016800000	0470095	14
0181	3	434	111	62	7.000	0.2	2.3	1.6	1	0	0.0	03	00	0	0	0	4	031	1121	1321	11021004	1000051699	037205	26096700000	0000095	14
0182	3	232	100	62	3.000	0.7	0.0	1.5	0	0	0.0	01	00	0	0	0	4	031	1121	1321	12031005	1000051699	038001	26096700000	0000095	14
0183	1	151	100	41	0.002	2.0	0.0	2.0	0	0	0.0	01	00	0	0	0	2	022	1121	1322	12062002	1000051787	039713	26076720014	0090019	14
0184																										
0185	3	353	100	42	3.002	3.9	0.0	4.4	0	0	1.7	01	00	0	0	0	1	010	0000	1212	13071000	1000052643	002700	31016800000	0000000	14
0186	3	151	111	32	2.000	0.9	1.5	1.3	1	0	0.0	03	00	0	0	0	2	031	1111	0011	22041003	1000052643	004100	31016800000	0000000	14
0187	1	141	211	62	5.000	1.2	6.1	3.6	1	0	0.0	02	00	0	0	0	1	021	0000	0021	22051000	1000051805	057212	21076700000	0000255	14
0188	1	111	100	42	3.002	4.2	0.0	5.2	0	0	0.0	01	00	0	0	0	1	021	1121	1321	22051002	1000051805	062205	21076700000	0000255	14
0189	1	141	211	62	2.200	1.3	1.7	1.6	1	0	0.0	05	00	0	0	0	4	021	0000	1321	23042000	1000051805	064930	21076700000	0000255	14
0190	3	151	100	31	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	0	010	1122	0022	13092002	1000051824	001236	02046700000	0000095	14
0191	3	252	200	41	0.002	1.5	0.0	1.5	0	0	9.1	01	00	0	0	0	0	010	0000	0022	21031000	1000051826	051603	28076700045	0390095	14
0192	3	252	111	41	0.002	1.0	0.5	0.8	1	0	6.2	02	00	0	0	0	2	021	0000	1321	12061000	1000052788	051600	09046820000	0000019	14
0193	3	111	111	42	2.502	0.2	3.1	1.7	1	0	0.0	02	00	0	0	0	3	021	0000	1321	12031000	1000052788	051817	09046820000	0000019	14
0194	3	343	100	62	31.000	0.0	0.0	12.5	0	0	0.0	01	00	0	0	0	7	032	1121	1322	12032002	1000052788	054007	09046820000	0000019	14
0195	3	751	211	41	0.002	1.2	0.8	0.9	1	0	0.0	06	00	0	0	0	0	010	1122	0022	12031001	1000052788	056313	09046820000	0000019	14
0196	3	343	111	62	3.000	0.4	3.9	2.7	1	0	0.0	03	00	0	0	0	0	032	1121	0022	13032004	1000052788	056910	09046820000	0000019	14

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	RD/ W A	BUR B T	FIRE TIME 1ST	SUB	ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	R G E	M E C	OTHR C U F	MSUM OIRA VZBN	Q V AN / A R / NO S	REEL	FRAME	DATE BN R B R	DIV REG B	L AO MC
0197	1	343	111	62	15.000	2.0	5.1	4.1	1	0	0.0	03	00	0	0	0	2	033	1111	0022	23032001	1000050883	043305	08016700000	0000015	14
0198	1	252	111	41	0.002	1.1	0.6	0.7	1	0	0.0	03	00	0	0	0	2	032	1111	0022	21022001	1000050883	045207	08016700000	0000015	14
0199	1	151	200	42	2.002	0.6	0.0	0.7	0	2	0.0	01	00	0	0	0	1	021	1121	1222	11092001	1000050933	068708	26016700000	0000000	14
0200	3	752	600	62	80.000	0.5	0.0	11.2	0	0	6.3	01	00	0	0	0	3	010	1122	1322	12032002	1000050962	005801	10016700000	0000255	14
0201	1	752	200	42	2.001	0.8	0.0	1.0	0	0	0.0	01	00	0	0	0	1	032	0000	0022	11032000	1000051034	003300	22026700000	0000255	14
0202	1	751	211	62	3.300	0.2	2.7	1.9	1	0	0.0	03	00	0	0	0	2	010	1122	1322	11092001	1000051184	045604	13046700000	0000095	14
0203	1	151	111	41	0.001	0.4	2.6	1.9	1	0	0.0	03	00	0	0	0	3	010	0000	1322	12051000	1000051184	046503	13046700000	0000095	14
0204	1	454	111	41	0.002	0.2	1.6	0.9	1	0	0.0	02	00	0	0	0	3	031	1111	1321	13042001	1000051183	059107	13046700000	0000095	14
0205	1	744	211	62	3.500	1.0	1.8	1.6	1	0	0.0	04	00	0	0	0	0	022	1121	0022	11032201	1000052121	017208	23096720015	0080019	14
0206	1	752	200	62	15.000	0.0	0.0	3.9	0	2	0.0	01	00	0	0	0	7	010	0000	1321	23052000	1000052811	020701	05056800000	0000000	14
0207	1	754	200	42	3.001	0.8	0.0	1.4	0	2	0.0	01	00	0	0	0	7	010	0000	1321	22061000	1000052811	046804	05056800000	0000000	14
0208	3	252	100	42	4.002	0.2	0.0	1.3	0	0	0.0	01	00	0	0	0	0	031	0000	0022	13032000	1000052437	023213	28126700025	0350045	14
0209	3	454	122	41	0.002	0.8	3.1	2.3	3	0	0.0	03	00	0	0	0	6	010	1122	1222	11032003	1000050512	012508	06096620175	0001015	14
0210	3	555	100	41	0.002	5.3	0.0	5.3	0	0	0.0	01	00	0	0	0	6	010	0000	1322	11062000	1000050512	013605	06096620175	0001015	14
0211	1	151	111	31	0.000	0.3	1.4	1.1	1	0	0.0	04	00	0	0	0	1	022	0000	0022	12092000	1000050697	065315	10056600015	0180015	14
0212	3	252	100	32	4.000	0.2	0.0	0.9	0	0	0.0	01	00	0	0	0	1	031	0000	1222	21062000	1000050697	066314	10056600015	0180015	14
0213	3	252	100	42	5.002	0.5	0.0	1.8	0	0	0.0	01	00	0	0	0	1	031	1121	0022	12092001	1000050697	067109	10056600015	0180015	24
0214	3	555	111	41	0.002	1.6	0.7	0.8	1	0	0.0	13	00	0	0	0	2	010	1111	1322	21091001	1000054059	020612	20026920000	0000000	14
0215	3	232	111	41	0.002	20.0	1.5	7.7	1	0	0.0	03	00	0	0	0	2	031	0000	1321	23092000	1000054059	023633	20026920000	0000000	14
0216	3	151	111	41	0.002	0.3	1.2	1.0	1	0	0.0	06	00	0	0	0	1	022	0000	1322	23062000	1000054059	025318	20026920000	0000000	14
0217	3	151	100	41	0.002	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	1	010	0000	1222	12061000	1000054006	025319	23026920000	0110000	14
0218	1	151	100	41	0.002	0.7	0.0	0.7	0	0	0.0	01	00	0	0	0	1	010	0000	1322	12072000	1000054006	031017	23026920000	0110000	14
0219	1	751	200	41	0.002	0.3	0.0	0.3	0	0	2.0	01	00	0	0	0	1	122	1121	1322	12071002	1000054358	021918	00046900000	0000255	14
0220	3	[illegible]	111	41	0.002	12.8	1.4	2.1	1	0	0.0	16	00	0	0	0	1	032	0000	0022	21051000	1000053735	008028	25116900000	0000045	14
0221	1	753	211	42	3.002	1.5	4.4	3.0	1	0	0.0	02	00	0	0	0	1	022	0000	1212	11072000	1000052556	019818	31016800000	0000255	14
0222	3	252	100	42	5.002	0.4	0.0	1.7	0	0	2.0	01	00	0	0	0	1	031	0000	0021	22052000	1000052556	020310	31016800000	0000255	14
0223	3	252	111	41	0.002	1.4	0.9	0.9	1	0	0.0	09	00	0	0	0	2	021	0000	0011	13091000	1000052556	021819	31016800000	0000255	14
0224	3	131	100	31	0.000	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	2	031	1121	0011	22092002	1000052556	022321	31016800000	0000255	14
0225	1	353	111	41	0.002	0.5	1.2	1.0	1	0	0.0	06	00	0	0	0	0	010	0000	0022	12082000	1000055495	024317	02037002303	0000000	14
0226	1	353	111	41	0.002	1.0	1.3	1.2	1	0	0.0	07	00	0	0	0	0	010	0000	0022	12091000	1000055495	024723	02037002303	0000000	14
0227	1	353	111	41	0.002	1.0	0.9	0.9	1	0	0.0	07	00	0	0	0	0	010	0000	0022	11112000	1000055495	026411	02037002303	0000000	14
0228	1	353	111	41	0.002	3.6	1.1	1.5	1	0	0.0	06	00	0	0	0	0	010	0000	0022	13091000	1000055495	058930	02037002303	0000000	14
0229	1	151	100	31	0.000	3.0	0.0	3.0	0	0	0.0	01	00	0	0	0	2	010	1111	1212	11041001	1000052554	010135	31016800000	0000015	14
0230	1	751	211	41	0.002	0.7	0.2	0.5	1	0	0.0	02	00	0	0	0	1	110	1122	1222	11031002	1000054628	020933	03036700015	0260015	14
0231	1	751	211	41	0.002	1.3	0.7	0.9	1	2	0.0	03	00	0	0	0	1	010	1122	1222	11031002	1000054628	021035	03036700015	0260015	14
0232	1	751	211	31	0.000	0.7	1.0	0.9	1	0	0.0	03	00	0	0	0	1	021	1121	1222	21032002	1000054628	028634	03036700015	0260015	14
0233	1	252	111	41	0.002	0.8	1.0	1.0	1	0	0.0	04	00	0	0	0	0	022	1111	0022	11031002	1000054628	032511	03036700015	0260015	14
0234	1	152	100	41	0.002	0.6	0.0	0.6	0	0	1.9	01	00	0	0	0	0	010	1111	0022	11032001	1000054628	032838	03036700015	0260015	14
0235	1	252	111	41	0.002	1.0	0.9	0.9	1	0	0.0	03	00	0	0	0	0	010	1111	0022	11032002	1000054628	033503	03036700015	0260015	14
0236	1	151	100	41	0.002	1.6	0.0	1.6	0	0	0.0	01	00	0	0	0	1	010	0000	1322	11082000	1000052867	016215	18046800000	0000255	14
0237	1	754	200	42	8.012	0.6	0.0	3.0	0	0	0.0	01	00	0	0	0	1	022	0000	1322	11041000	1000052867	016514	18046800000	0000255	14
0238	1	454	111	42	2.302	1.7	2.0	1.9	1	0	0.0	03	00	0	0	0	1	022	0000	1222	23071000	1000052667	016810	18046800000	0000255	14
0239	1	252	111	41	0.002	0.7	0.7	0.7	1	0	0.0	04	00	0	0	0	1	010	0000	1222	23072000	1000052867	017804	18046800000	0000255	14
0240	1	252	400	42	5.002	0.6	0.0	2.1	0	0	0.0	01	00	0	0	0	1	010	0000	1222	12052000	1000052867	018026	18046800000	0000255	14
0241	1	752	211	42	3.502	1.2	2.5	1.9	1	0	0.0	02	00	0	0	0	1	021	1121	1222	11091002	1000052867	019025	18046800000	0000255	14
0242	1	151	200	42	7.002	0.0	0.0	1.7	0	0	0.0	01	00	0	0	0	1	010	1122	0022	11052002	1000052867	019613	18046800000	0000255	14
0243	1	151	100	41	0.002	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	1	032	1121	0022	22051005	1000054801	022434	29076920065	0310000	14
0244	1	434	411	62	7.500	2.1	9.0	5.6	1	0	0.0	02	00	0	0	0	0	022	1111	0022	12042002	1000053425	041035	25096800000	0000255	14
0245	1	252	100	42	3.002	1.8	0.0	2.7	0	0	8.3	01	00	0	0	0	0	022	1111	0022	12042001	1000053425	041536	25096800000	0000255	14

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	W	RD/16 BUR B A T	FIRE TIME 1ST	SUB	ALL	RCH	DIR	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	RGE°	MEC	OTHR CUF	MSUM OIRA VZBN	Q V AN A R S NO	REEL	FRAME	DATE BN B R R	REG DIV B	L AO MC
0246	1	151	111	41	0.002	1.8	1.6	1.6	1	0	0.0	04	00	0	0	0	0	010	0000	0022	13032000	1000053425	042914	25096800000	0000255	14
0247	1	353	111	42	2.302	0.9	1.5	1.4	1	0	0.0	04	00	0	0	0	0	010	0000	0022	13072000	1000053425	044630	25096800000	0000255	14
0248	1	333	111	62	2.000	1.2	1.0	1.1	1	0	0.0	02	00	0	0	0	0	031	0000	0021	13092000	1000053425	045108	25096800000	0000255	14
0249	1	353	111	41	0.002	0.7	1.3	1.2	1	0	0.0	09	00	0	0	0	0	010	0000	0022	13102000	1000053425	046337	25096800000	0000255	14
0250	1	752	611	62	5.000	0.3	2.0	1.8	1	0	0.0	06	00	0	0	0	0	010	0000	0022	13092000	1000053425	047023	25096800000	0000255	14
0251	1	252	100	41	0.002	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	1	032	0000	0022	11092000	1000051299	038217	07056700000	0000255	14
0252	1	756	600	42	9.012	0.0	0.0	3.3	0	0	0.0	01	00	0	0	0	1	022	0000	1322	12062000	1000055231	049015	25106920000	0000825	14
0253	1	252	111	41	0.002	2.2	0.7	1.1	1	0	0.0	04	00	0	0	0	1	022	0000	1322	21062000	1000055231	050207	25106920000	0000825	14
0254	1	152	100	41	0.002	0.6	0.0	0.6	0	0	2.9	01	00	0	0	0	1	022	1111	1322	21062002	1000055231	051105	25106920000	0000825	14
0255	1	752	242	41	2.002	0.5	2.0	1.7	3	0	0.0	04	10	1	2	0	1	022	0000	1322	22032000	1000055231	052508	25106920000	0000825	14
0256	1	152	100	41	0.002	0.4	0.0	0.4	0	0	2.9	01	00	0	0	0	1	022	0000	1322	22062000	1000055231	053630	25106920000	0000825	14
0257	1	212	111	62	4.300	4.2	1.2	1.7	1	0	3.5	06	00	0	0	0	0	031	1121	0022	11052002	2000004049	029105	06096600000	0000825	14
0258	3	353	111	41	0.002	0.6	4.1	2.4	1	0	0.0	02	00	0	0	0	2	010	0000	0012	13112000	2000002804	003017	00026800000	0000035	24
0259	3	151	122	41	1.602	1.9	1.6	1.7	3	0	7.1	07	00	0	2	0	1	021	0000	1211	12071000	2000002804	007420	00026800000	0000000	24
0260	1	751	200	42	8.002	0.0	0.0	2.7	0	2	0.0	01	00	0	0	0	1	031	1111	1122	11032001	2000002859	006720	26126700000	0000035	24
0261	1	751	200	62	13.000	0.0	0.0	1.5	0	2	0.0	01	00	0	0	0	1	031	1111	1122	11031002	2000002859	006720	26126700000	0000035	24
0262	1	151	100	31	0.000	1.6	0.0	1.6	0	0	0.2	01	00	0	0	0	1	110	1122	1322	13062001	2000003688	012005	11096500000	0000035	24
0263	3	353	100	31	0.000	1.7	0.0	1.7	0	0	0.0	01	00	0	0	0	0	032	0000	0022	12032000	2000003688	016510	11096500000	0000035	24
0264	3	343	111	62	7.400	7.3	1.7	2.8	1	0	0.0	05	00	0	0	0	2	021	1121	1321	12052001	2000003688	017330	11096500000	0000035	24
0265	3	242	111	62	11.500	3.4	3.2	3.3	1	0	0.0	02	00	0	0	0	0	031	1121	0021	12032001	2000003688	018216	11096500000	0000035	24
0266	3	242	111	62	14.500	0.1	4.1	2.1	1	0	0.0	02	00	0	0	0	0	021	1121	0021	13032001	2000003688	018720	11096500000	0000035	24
0267	3	343	122	62	4.300	0.2	2.5	1.7	1	0	0.0	03	00	0	0	0	0	031	0000	0022	13011000	2000003690	030610	09116500000	0000000	24
0268	3	343	100	62	4.000	0.1	0.0	0.2	0	0	0.0	01	00	0	0	0	0	031	1111	0022	13011002	2000003690	031515	09116500000	0000000	24
0269	1	252	111	41	0.002	1.7	0.5	1.1	1	0	0.0	02	00	0	0	0	1	031	0000	0022	12061000	2000003695	035310	04096500000	0000000	24
0270	1	151	100	31	0.000	1.4	0.0	1.4	0	0	0.0	01	00	0	0	0	1	010	0000	1122	12041000	2000003695	039330	04096500000	0000000	24
0271	1	252	111	31	0.000	1.5	2.4	2.0	1	0	4.7	02	00	0	0	0	1	032	1121	0022	23052002	2000003946	019915	00000000000	0000000	24
0272	3	151	111	31	0.000	0.2	0.8	0.7	1	0	0.0	04	00	0	0	0	1	032	0000	0022	13032000	2000003946	020710	00000000000	0000000	24
0273	3	242	100	32	3.000	0.8	0.0	1.6	0	0	0.0	01	00	0	0	0	0	031	0000	0022	11092000	2000003835	031627	28116500000	0000000	24
0274	3	242	100	32	2.000	1.0	0.0	1.2	0	0	0.0	01	00	0	0	0	0	031	0000	0022	11092000	2000003835	032200	28116500000	0000000	24
0275	3	252	100	31	0.000	0.6	0.0	0.6	0	0	0.0	01	00	0	0	0	0	031	0000	0022	12062000	2000003835	032610	28116500000	0000000	24
0276	3	252	100	31	0.000	1.9	0.0	1.9	0	0	0.0	01	00	0	0	0	1	033	1111	1221	21032004	2000003969	022610	12076700000	0000000	24
0277	3	252	111	31	0.000	3.9	1.7	2.8	1	0	0.0	02	00	0	0	0	1	033	1111	1221	23032001	2000003969	022610	12076700000	0000000	24
0278	1	751	211	31	0.000	0.2	0.3	0.3	1	0	0.0	02	00	0	0	0	1	110	1112	1322	12032006	2000003969	025110	12076700000	0000000	24
0279	1	751	200	31	0.000	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	1	110	1112	1322	12032004	2000003969	025110	12076700000	0000000	24
0280	1	751	200	31	0.000	0.6	0.0	0.6	0	0	0.0	01	00	0	0	0	1	110	1112	1322	12052006	2000003969	025430	12076700000	0000000	24
0281	1	751	211	31	0.000	1.5	0.7	0.9	1	0	0.0	04	00	0	0	0	1	110	1112	1322	13032004	2000003969	025430	12076700000	0000000	24
0282	3	343	111	62	4.000	0.0	2.1	1.4	1	0	0.0	03	00	0	0	0	0	031	1121	0021	11071002	2000004161	029200	20016700035	0030000	24
0283	3	343	111	62	5.300	0.6	1.0	0.9	1	0	0.0	03	00	0	0	0	0	031	1111	0021	12091002	2000004161	029636	20016700035	0030000	24
0284	3	353	111	31	0.000	1.1	1.2	1.2	1	0	0.0	04	00	0	0	0	0	032	0000	0022	11041000	2000004161	030026	20016700035	0030000	24
0285	3	353	111	31	0.000	0.5	1.8	1.6	1	0	0.0	07	00	0	0	0	3	032	0000	1322	11031000	2000004161	030333	20016700035	0030000	24
0286	3	252	100	31	0.000	0.3	0.0	0.3	0	0	0.0	01	00	0	0	0	4	010	0000	1222	12051000	2000004162	024217	26016700000	0000000	24
0287	3	252	100	31	0.000	0.0	0.0	0.0	0	0	0.0	01	00	0	0	0	4	010	0000	1222	13061000	2000004162	024415	26016700000	0000000	24
0288	3	252	111	31	0.000	0.3	2.4	1.4	1	0	0.0	02	00	0	0	0	0	010	1112	0022	11091001	2000004162	028213	26016700000	0000000	24
0289	3	252	100	31	0.000	1.2	0.0	1.2	0	0	0.0	01	00	0	0	0	0	010	1112	0022	11091002	2000004162	028213	26016700000	0000000	24
0290	3	252	111	31	0.000	0.0	2.4	1.8	1	0	0.0	04	00	0	0	0	0	010	1112	0022	11091003	2000004162	028213	26016700000	0000000	24
0291	3	252	111	31	0.000	2.2	3.1	2.7	1	0	0.0	02	00	0	0	0	0	010	0000	0022	12061000	2000004162	028708	26016700000	0000000	24
0292	3	252	111	31	0.000	1.4	1.5	1.4	1	0	0.0	03	00	0	0	0	4	010	0000	1322	12051000	2000004162	029100	26016700000	0000000	24
0293	3	252	111	32	3.000	1.3	2.4	1.9	1	0	0.0	02	00	0	0	0	0	010	1112	0022	11031004	2000004162	030102	26016700000	0000000	24
0294	3	454	100	31	0.000	0.5	0.0	0.5	0	0	0.0	01	00	0	0	0	0	010	1112	0022	11031003	2000004162	030102	26016700000	0000000	24

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	W A	RD/ BUR 16 B T	FIRE TIME 1ST	SUB	ALL	RCH	OIR	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	RGE	ME C	OTHR CUF	MSUM OIRA VZDN	QV AR NO ANS	REEL	FRAME	DATE BN R B R	DIV REG B	LAO MC
0295	3	252	111	32	3.700	2.3	2.3	2.3	1	0	0.0	03	00	0	0	0	0	010	0000	0022	12042000	2000004162	030320	26016700000	0000000	24
0296	1	242	111	62	4.200	0.3	2.2	1.9	1	0	0.0	05	00	0	0	0	0	021	1121	0022	11092002	2000004257	032812	12126600000	0000000	24
0297	1	242	111	62	3.000	0.0	2.8	1.9	1	0	0.0	03	00	0	0	0	3	021	1121	1022	13062002	2000004257	033400	12126600000	0000000	24
0298	1	252	111	62	4.300	0.5	2.0	1.5	1	0	0.0	03	00	0	0	0	0	021	1121	0022	12031001	2000004257	033812	12126600000	0000000	24
0299	3	252	111	41	0.002	0.2	2.4	1.9	1	0	0.0	04	00	0	0	0	0	032	0000	0022	22092000	2000004275	025310	08026700000	0000000	24
0300	1	151	100	31	0.000	1.9	0.0	1.9	0	0	0.0	01	00	0	0	0	1	010	1112	1322	11061003	2000004286	004822	14016700015	0010000	24
0301	1	751	200	31	0.000	1.0	0.0	1.0	0	0	0.0	01	00	0	0	0	1	010	1112	1322	11031001	2000004286	004822	14016700015	0010000	24
0302	1	252	100	31	0.000	0.9	0.0	0.9	0	0	0.0	01	00	0	0	0	3	022	0000	1322	11061000	2000004286	005429	14016700015	0010000	24
0303	1	353	100	31	0.000	1.4	0.0	1.4	0	0	0.0	01	00	0	0	0	1	032	0000	1322	23061000	2000004286	013732	14016700015	0010000	24
0304	1	252	100	31	0.000	0.5	0.0	0.5	0	0	0.0	01	00	0	0	0	0	032	1121	0022	12031002	2000004286	014400	14016700015	0010000	24
0305	1	151	111	31	0.000	1.6	3.2	2.9	1	0	0.0	05	00	0	0	0	1	010	1111	0022	11051001	2000004286	020134	14016700015	0010000	24
0306	1	252	100	31	0.000	1.2	0.0	1.2	0	0	0.0	01	00	0	0	0	1	010	1112	1322	11051001	2000004286	021104	14016700015	0010000	24
0307	1	454	111	31	0.000	3.1	1.1	2.1	1	0	0.0	02	00	0	0	0	1	010	1112	1322	11041002	2000004286	021104	14016700015	0010000	24
0308	1	252	111	31	0.000	2.4	2.5	2.4	1	0	0.0	02	00	0	0	0	0	010	1111	0022	11041002	2000004286	021439	14016700015	0010000	24
0309	1	454	111	31	0.000	2.4	2.2	2.3	1	0	0.0	02	00	0	0	0	0	021	1111	0022	11051003	2000004286	021439	14016700015	0010000	24
0310	1	454	100	31	0.000	1.3	0.0	1.3	0	0	0.0	01	00	0	0	0	0	021	0000	0022	12021000	2000004286	021903	14016700015	0010000	24
0311	3	353	111	31	0.000	1.2	4.3	2.8	1	0	0.0	02	00	0	0	0	1	031	1111	1322	11071001	2000004301	030632	05016700025	0030000	24
0312	3	353	100	31	0.000	1.4	0.0	1.4	0	0	0.0	01	00	0	0	0	1	031	1111	1322	11071002	2000004301	030632	05016700025	0030000	24
0313	3	252	111	31	0.000	3.6	2.4	3.0	1	0	0.0	02	00	0	0	0	1	031	0000	1322	13051000	2000004301	031133	05016700025	0030000	24
0314	3	353	111	31	0.000	5.8	2.1	3.4	1	0	0.0	03	00	0	0	0	1	031	1111	1322	13071002	2000004301	031725	05016700025	0030000	24
0315	3	353	111	31	0.000	2.1	5.1	3.6	1	0	0.0	02	00	0	0	0	1	031	1111	1322	11041001	2000004301	032334	05016700025	0030000	24
0316	3	353	111	31	0.000	2.7	4.5	3.6	1	0	0.0	02	00	0	0	0	1	031	0000	1322	12031000	2000004301	033010	05016700025	0030000	24
0317	3	353	100	31	0.000	7.8	0.0	7.8	0	0	0.0	01	00	0	0	0	1	031	0000	1322	12051000	2000004301	038702	05016700025	0030000	24
0318	3	156	200	32	18.000	0.1	0.0	2.3	0	0	2.4	01	00	0	0	0	1	022	0000	1322	12021000	2000004322	001622	17106600000	0000000	24
0319	3	444	111	62	5.000	2.4	2.5	2.5	1	0	0.0	05	00	0	0	0	0	031	1121	0021	11032002	2000004327	022422	05106600000	0000000	24
0320	3	646	111	62	5.200	0.7	2.2	1.9	1	0	0.0	05	00	0	0	0	0	031	1121	0022	13041002	2000004327	023317	05106700000	0000000	24
0321	3	343	142	62	3.200	0.0	4.1	3.3	2	0	0.0	05	00	0	0	0	0	031	0000	0021	13051000	2000004327	023932	05106700000	0000000	24
0322	3	343	111	62	4.000	0.7	3.0	2.6	1	0	0.0	05	00	0	0	0	0	031	1121	0021	12051002	2000004327	025012	05106700000	0000000	24
0323	3	444	111	62	4.400	0.0	2.3	1.8	1	0	0.0	05	00	0	0	0	0	031	1121	0022	12031001	2000004327	027423	05106700000	0000000	24
0324	3	444	100	62	3.000	1.4	0.0	2.1	0	0	0.0	01	00	0	0	0	0	031	0000	0021	12091000	2000004339	032500	17036700015	0090000	24
0325	3	444	100	62	3.000	5.1	0.0	6.1	0	0	0.0	01	00	0	0	0	0	031	1122	0021	12091001	2000004339	032710	17036700015	0090000	24
0326	3	454	100	62	4.000	11.7	0.0	12.4	0	0	0.0	01	00	0	0	0	0	031	1121	0021	12091001	2000004339	033338	17036700015	0090000	24
0327	1	242	100	62	3.000	0.0	0.0	0.9	0	0	0.0	01	00	0	0	0	0	031	1121	0022	11042002	2000004790	013036	06106700000	0000000	24
0328	1	242	111	62	18.500	0.4	5.9	3.1	1	0	0.0	02	00	0	0	0	0	031	1121	0022	11032101	2000004790	013312	06106700000	0000000	24
0329	1	242	111	62	11.700	0.0	3.0	2.0	1	0	0.0	03	00	0	0	0	0	031	1121	0022	11032001	2000004790	014035	06106700000	0000000	24
0330	1	252	100	41	0.002	0.6	0.0	0.6	0	0	0.0	01	00	0	0	0	4	010	1121	1322	11061003	2000004791	029102	09086700025	0090000	24
0331	1	252	111	41	0.002	0.3	0.5	0.5	1	0	0.0	[illegible]	00	0	0	0	4	[illegible]	1121	1322	11071002	2000004791	029207	09086700025	0090000	24
0332	1	252	111	41	0.002	0.1	2.2	1.1	1	0	0.0	02	00	0	0	0		010	1112	1322	11071003	2000004791	029337	09086700025	0090000	24
0333	1	252	100	41	0.002	4.0	0.0	4.0	0	0	0.0	01	00	0	0	0		010	1111	1322	11071002	2000004791	029337	09086700025	0090000	24
0334	3	353	100	31	0.000	4.2	0.0	4.2	0	0	0.0	01	00	0	0	0	0	031	1121	0021	11091001	2000005104	000412	23026800000	0000000	24
0335	3	252	100	31	0.000	3.5	0.0	3.5	0	0	0.0	01	00	0	0	0	0	021	1121	0021	12011001	2000005104	000720	23026800000	0000000	24
0336	3	343	100	62	9.000	5.2	0.0	6.2	0	0	0.0	01	00	0	0	0	0	031	1111	0022	12032106	2000005156	000232	17036800025	0030000	24
0337	3	343	111	62	16.000	0.1	5.1	2.6	3	0	0.0	02	00	0	0	0	0	031	0000	0022	13032100	2000005156	000828	17036800025	0030000	24
0338	3	343	111	62	8.700	0.7	2.2	1.7	3	0	0.0	03	00	0	0	0	0	031	1121	0022	12031002	2000005156	002902	17036800025	0030000	24
0339	3	343	111	62	4.000	0.4	1.0	0.9	1	0	0.0	05	00	0	0	0	0	031	1121	0022	13091001	2000005156	003838	17036800025	0030000	24
0340	3	343	111	62	4.800	0.0	1.0	0.9	1	0	0.0	11	00	0	0	0	0	031	1121	0022	13091001	2000005156	004124	17036800025	0030000	24
0341	3	353	111	41	0.002	0.5	0.6	0.6	1	0	0.0	12	00	0	0	0	0	031	1111	0021	13101008	2000005030	014031	02126700000	0000000	24
0342	3	252	131	41	0.002	1.1	1.7	1.5	1	0	0.0	03	00	0	0	0		021	1111	0021	12111007	2000005030	014031	02126700000	0000000	24
0343	3	353	111	41	0.002	0.8	0.9	0.9	1	0	0.0	05	00	0	0	0	0	031	1111	0021	13101005	2000005030	014031	02126700000	0000000	24

SMALL ARMS EFFECT DATA

LSN	O	POS FSP	AIM M	W A	RD/16 BUR R T	FIRE TIME 1ST	SUB	ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	R G E	M E C	OTHR C U F	MSUM OIRA VZUN	Q V AN	A R S NO	REEL	FRAME	DATE BN B R R	DIV REG B	L AO MC
0344	1	252	111	41	0.002	0.5	1.0	0.9	1	0	0.0	09	00	0	0	0	0	021	0000	0022	1102	1000	2000004755	007610	07106700015	0090000	24
0345	3	751	211	41	2.502	2.3	1.0	1.2	1	0	0.0	08	00	0	2	0	0	110	1112	0022	1111	2002	2000004775	020004	07106700015	0090000	24
0346	3	751	211	41	0.002	8.7	1.0	1.9	1	0	0.0	08	00	0	0	0	0	010	1112	0022	1110	2001	2000004775	019915	07106700015	0090000	24
0347	1	252	111	41	0.002	0.6	0.8	0.8	1	0	0.0	14	00	0	0	0	0	031	1111	0021	1103	1002	2000005731	036916	20096800025	0070015	24
0348	1	252	111	41	0.002	1.9	1.0	1.0	1	0	0.0	11	00	0	0	0	0	031	1111	0021	1103	1001	2000005731	036916	20096800025	0070015	24
0349	1	252	111	41	0.002	0.2	0.2	0.2	1	0	0.0	11	00	0	0	0	0	010	0000	0022	1109	1000	2000005731	038107	20096800025	0070015	24
0350	1	252	111	41	0.002	0.4	0.4	0.4	1	0	0.0	05	00	0	0	0	0	022	1111	0022	1203	2002	2000005734	003417	30116800035	0050015	24
0351	1	252	111	41	0.002	1.6	3.0	2.3	1	0	0.0	02	00	0	0	0	0	022	1111	0022	1203	2001	2000005734	003417	30116800035	0050015	24
0352	1	252	111	41	0.002	1.3	0.3	0.4	1	0	6.4	11	00	0	0	0	3	022	1111	[illegible]	1106	2002	2000005734	004218	30116800035	0050015	24
0353	1	252	111	41	0.002	7.7	1.9	4.8	1	0	0.0	02	00	0	0	0	3	022	1111	[illegible]	1106	2001	2000005734	003825	30116800035	0050015	24
0354	1	252	111	41	0.002	0.5	0.4	0.4	1	0	0.0	13	00	0	0	0	0	022	0000	[illegible]	1304	2000	2000005734	004623	30116800035	0050015	24
0355	3	252	111	41	0.002	0.3	1.4	1.3	1	0	0.0	09	00	0	0	0	0	032	1111	[illegible]	1302	2002	2000005734	022827	01126800035	0050015	24
0356	3	252	111	41	0.002	1.4	2.2	2.1	1	0	0.0	05	00	0	0	0	0	032	1111	0022	1302	2001	2000005734	022827	01126800035	0050015	24
0357	3	252	111	41	0.002	0.6	0.6	0.6	1	0	0.8	07	00	0	0	0	0	032	1121	0022	1203	2002	2000005734	024123	01126800035	0050015	24
0358	3	151	111	41	0.002	0.4	0.2	0.2	1	0	0.0	05	00	0	0	0	0	010	1121	0022	1103	2001	2000005734	024630	01126800035	0050015	24
0359	1	141	100	62	40.000	0.0	0.0	5.9	0	0	0.0	01	00	0	0	0	0	031	0000	0022	1206	2000	2000005734	033628	01126800035	0050015	24
0360	3	454	100	41	0.002	0.3	0.0	0.3	0	0	5.7	01	00	0	0	0	0	031	1121	0022	1105	2001	2000005734	034328	01126800035	0050015	24
0361	1	454	111	41	0.002	1.5	0.7	1.1	1	0	0.0	02	00	0	0	0	0	031	1121	0022	1103	2001	2000005734	034712	01126800035	0050015	24
0362	3	252	111	41	0.002	0.0	0.7	0.5	2	0	0.0	03	00	0	0	0	2	032	0000	0022	2304	1000	2000005766	000417	16016900015	0050015	24
0363	3	151	111	41	0.002	0.4	0.4	0.4	1	0	2.5	03	00	0	0	0	2	032	1121	0022	2309	2001	2000005766	000836	16016900015	0050015	24
0364	3	252	111	41	0.002	0.0	0.5	0.4	1	0	0.0	06	00	0	0	0	2	032	0000	0022	1202	1000	2000005766	001129	16016900015	0050015	24
0365	3	252	111	41	0.002	0.1	0.4	0.2	1	0	0.0	02	00	0	0	0	2	032	0000	0022	1203	1000	2000005766	001702	16016900015	0050015	24
0366	3	151	111	41	0.002	0.0	0.5	0.4	1	0	0.0	06	00	0	0	0	0	032	1121	0022	1209	1001	2000005766	025410	16016900015	0050015	24
0367	3	151	111	41	0.002	0.2	0.5	0.4	1	0	0.0	04	00	0	0	0	0	022	0000	0022	1204	2000	2000005766	025900	16016900015	0050015	24
0368	3	151	111	41	0.002	1.1	1.0	1.0	1	0	0.0	06	00	0	0	0	0	010	1112	0022	1109	1003	2000005767	000002	16016900000	0000015	24
0369	3	151	111	41	0.002	0.5	1.6	1.3	1	0	2.8	04	00	0	0	0	0	010	1112	0022	1109	2002	2000005767	000130	16016900000	0000015	24
0370	3	752	211	62	6.000	0.0	2.6	1.7	1	0	0.0	03	00	0	0	0	0	033	0000	0022	2303	1000	2000005782	000925	29126800035	0030035	24
0371	3	252	111	41	0.002	0.8	1.0	1.0	1	0	0.0	04	00	0	0	0	0	033	1111	0022	2209	1002	2000005782	001230	29126800035	0030035	24
0372	3	252	111	41	0.002	1.2	0.5	0.6	1	0	0.0	12	00	0	0	0	0	033	0000	0022	2306	1000	2000005782	001703	29126800035	0030035	24
0373	3	151	111	41	0.002	0.3	3.0	2.1	1	0	0.0	03	00	0	0	0	0	032	1111	0022	2103	2002	2000005797	008223	28106800035	0050015	24
0374	3	151	111	41	0.002	3.4	4.9	4.1	1	0	0.0	02	00	0	0	0	0	032	1121	0022	2207	2002	2000005797	008702	28106800035	0050015	24
0375	3	343	111	62	2.000	1.7	5.3	3.5	1	0	0.0	02	00	0	0	0	0	031	1121	0022	2202	2002	2000005797	009210	28106800035	0050015	24
0376	3	353	111	62	2.000	2.9	8.6	5.7	1	0	0.0	02	00	0	0	0	3	031	1121	1322	1206	2002	2000005797	009921	28106800035	0050015	24
0377	3	343	111	62	3.000	1.0	1.5	1.2	1	0	0.0	02	00	0	0	0	0	031	1121	0022	1204	2002	2000005797	014835	28106800035	0050015	24
0378	3	353	111	62	2.000	1.4	1.2	1.3	1	0	1.2	02	00	0	0	0	0	031	1121	0022	1204	2002	2000005797	015132	28106800035	0050015	24
0379	3	343	111	62	3.700	0.0	0.9	0.9	1	0	0.0	12	00	0	0	0	3	032	0000	1322	1305	2000	2000005797	015315	28106800035	0050015	24
0380																											
0381																											
0382																											
0383	3	252	111	41	0.002	0.2	0.9	0.9	3	0	0.0	09	00	0	0	0	0	032	1111	0022	1109	2001	2000005983	016016	21046900015	0050015	24
0384	3	752	242	62	7.300	0.0	2.0	1.4	3	0	0.0	03	20	1	0	0	0	010	0000	0022	2109	2000	2000005983	016617	21046900015	0050015	24
0385	3	252	111	62	2.500	0.0	1.4	1.2	1	0	0.0	10	00	0	0	0	0	021	1121	0022	1107	2002	2000005983	016836	21046900015	0050015	24
0386	3	252	100	62	37.000	0.2	0.0	7.9	0	0	0.0	01	00	0	0	0	0	010	1122	0022	1104	2002	2000005983	017610	21046900015	0050015	24
0387	3	252	111	41	0.001	0.9	0.7	0.7	1	0	0.0	13	00	0	0	0	2	021	0000	132	1104	1000	2000005983	018113	21046900015	0050015	24
0388	3	414	100	31	0.000	6.8	0.0	6.8	0	0	0.0	01	00	0	0	0	2	021	0000	1321	1104	1000	2000005983	018714	21046900015	0050015	24
0389	3	151	111	41	0.002	0.3	0.6	0.6	1	0	0.6	12	00	0	0	0	0	032	1111	0022	1209	2002	2000005983	020025	21046900015	0050015	24
0390	3	252	100	41	0.002	1.6	0.0	1.6	0	0	0.0	01	00	0	0	0	0	032	1121	0022	1109	2002	2000005983	020637	21046900015	0050015	24
0391	1	751	211	41	0.002	0.1	0.5	0.4	1	0	0.0	05	00	0	0	0	1	110	0000	1322	1105	1000	2000005983	021100	21046900015	0050015	24
0392	1	751	211	31	0.000	1.1	2.3	1.7	1	0	0.0	02	00	0	0	0	[illegible]	110	0000	1322	1105	1006	2000005983	021319	21046900015	0050015	24

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	W BUR A	RD/16 BUR B T	FIRE TIME 1ST	SUB	ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	R G E	M E C	OTHR C U F	MSUM OIRA VZBN	Q V A NO R AN S	REEL	FRAME	DATE BN B R R	DIV REG B	L AO MC
0393	1	756	200	31	0.000	1.1	0.0	1.1	0	0	0.0	01	00	0	0	0	1	010	0000	1122	11061000	2000005983	021933	21046900015	0050015	24
0394	1	751	211	41	0.002	3.8	2.4	3.1	1	0	0.0	02	00	0	0	0	1	110	1112	1322	11092002	2000005983	022505	21046900015	0050015	24
0395	1	751	211	41	0.002	3.8	0.8	1.6	1	0	0.0	04	00	0	0	0	1	110	1112	1322	11091003	2000005983	022505	21046900015	0050015	24
0396	1	751	211	41	0.002	2.2	0.7	1.0	1	0	0.0	06	00	0	0	0	1	110	1112	1322	11091004	2000005983	022505	21046900015	0050015	24
0397	1	751	211	41	0.002	0.7	0.6	0.6	1	0	0.0	08	00	0	0	0	1	110	0000	1322	11081000	2000005983	023038	21046900015	0050015	24
0398	3	343	111	62	3.300	4.1	1.6	2.4	1	0	0.0	03	00	0	0	0	0	031	1121	0022	23072102	2000006000	018437	10056900000	0050015	24
0399	3	343	111	62	3.800	3.2	2.6	2.7	1	0	20.8	05	00	0	0	0	5	031	1121	1322	12051002	2000006000	020205	10056900000	0050015	24
0400	1	151	111	41	0.002	1.8	0.4	0.5	3	0	14.2	15	00	0	0	0	2	031	0000	1221	13051000	2000006102	003807	04066900015	0030035	24
0401	3	454	111	52	2.500	0.2	1.1	0.6	1	2	0.0	02	00	0	0	0	1	022	1121	1122	21092203	2000000398	000032	21034400000	0000000	22
0402	3	454	111	52	1.500	1.5	1.3	1.4	1	2	0.0	02	00	0	1	0	1	022	1121	1122	22092201	2000000398	000223	21034400000	0000000	22
0403	3	454	100	52	2.000	2.1	0.0	2.2	0	2	0.0	01	00	0	0	0	1	022	0000	1122	21092200	2000000398	001619	21034400000	0000000	22
0404	3	454	100	52	2.000	0.5	0.0	0.5	0	2	0.0	01	00	0	0	0	1	022	1121	2122	22032207	2000000398	001822	21034400000	0000000	22
0405	1	751	211	52	4.000	0.0	1.9	1.0	1	0	0.0	02	00	0	0	0	1	010	0000	1122	12062000	2000000404	001929	25084400000	0000000	22
0406	1	111	100	52	3.000	0.1	0.0	0.3	0	0	0.0	01	00	0	0	0	0	031	0000	0021	12052000	2000000467	017108	08034500000	0000000	22
0407	1	353	100	11	0.000	0.9	0.0	0.9	0	0	0.0	01	00	0	0	0	0	031	0000	0022	12032000	2000000460	023838	22024500000	0000000	22
0408	1	343	400	62	2.000	0.0	0.0	0.2	0	0	0.0	01	00	0	0	0	0	031	1121	1321	11051003	2000005577	012617	09096800035	0050015	24
0409	1	343	111	62	4.000	0.0	1.6	1.4	1	0	0.0	08	00	0	0	0	0	031	1121	0022	11052003	2000005577	012828	09096800035	0050015	24
0410	1	343	111	62	3.500	1.3	0.9	1.0	1	0	0.0	04	00	0	0	0	0	031	1121	0022	11052003	2000005577	013907	09096800035	0050015	24
0411	3	343	100	62	3.000	0.3	0.0	0.5	0	0	0.0	01	00	0	0	0	0	031	0000	0022	12032000	2000005577	014123	09096800035	0050015	24
0412	1	343	111	62	4.000	0.1	1.2	1.1	1	0	0.0	07	00	0	0	0	0	031	1121	0021	11032001	2000005577	014500	09096800035	0050015	24
0413	3	151	100	41	0.002	0.5	0.0	0.5	0	0	0.0	01	00	0	0	0	0	031	1122	0022	12062001	2000005577	015310	09096800035	0050015	24
0414	1	212	111	11	0.000	1.4	3.0	2.4	1	0	0.0	03	00	0	0	0	0	031	0000	0021	23102000	2000000456	006807	21034400000	0000035	22
0415	1	313	111	11	0.000	0.7	3.6	2.2	1	0	0.0	02	00	0	0	0	0	031	0000	0022	23092000	2000000456	007534	21034400000	0000035	22
0416	1	751	200	11	0.000	0.0	0.0	0.0	0	0	0.0	01	00	0	0	0	1	010	0000	1122	23052000	2000000433	013815	26024500025	0090000	22
0417	3	232	111	11	0.000	0.6	1.3	0.9	1	0	0.0	02	00	0	0	0	1	031	0000	0021	21092000	2000000039	010230	00084400000	0220000	22
0418	1	212	111	11	0.000	0.6	1.1	0.8	1	0	0.0	02	00	0	0	0	2	031	1111	1222	11062003	2000000695	013810	00000000000	0000045	22
0419	1	212	111	11	0.000	0.9	1.4	1.1	1	0	0.0	02	00	0	0	0	2	031	1111	1222	11062002	2000000695	013810	00000000000	0000045	22
0420	1	212	111	11	0.000	1.8	1.7	1.8	1	0	0.0	02	00	0	0	0	2	031	1111	1222	11072001	2000000695	013810	00000000000	0000045	22
0421	1	755	211	11	0.000	1.1	0.5	0.8	1	0	0.0	02	00	0	0	0	1	110	1112	1122	11032002	2000000695	017108	00000000000	0000045	22
0422	1	751	211	51	0.000	0.2	1.1	0.8	1	0	0.0	03	00	0	0	0	1	110	1112	1222	11032001	2000000695	017113	00000000000	0000045	22
0423	1	151	111	11	0.000	0.7	0.5	0.5	1	0	0.0	08	00	0	0	0	1	110	1112	1222	11062003	2000000695	017022	00000000000	0000045	22
0424	1	751	211	11	0.000	0.2	0.9	0.7	1	0	0.0	04	00	0	0	0	1	110	1112	1222	11062004	2000000695	017128	00000000000	0000045	22
0425	1	252	100	21	0.000	2.9	0.0	2.9	0	2	0.0	01	00	0	0	0	1	010	1112	1122	11082002	2000000822	026128	00034500000	0000000	22
0426	1	252	100	11	0.000	2.8	0.0	2.8	0	0	0.0	01	00	0	0	0	1	010	1112	1122	11072001	2000000822	026128	00034500000	0000000	22
0427	1	252	100	21	0.000	4.2	0.0	4.2	0	0	10.8	01	00	0	0	0	1	010	1112	1122	11082002	2000000822	026808	00034500000	0000000	22
0428	1	252	100	21	0.000	3.5	0.0	3.5	0	0	19.1	01	00	0	0	0	1	010	1112	1122	11082002	2000000822	027307	00034500000	0000000	22
0429	1	353	111	21	0.000	2.9	1.5	1.6	1	0	0.0	03	00	0	0	0	0	031	0000	0022	13032000	2000000822	027625	00034500000	0000000	22
0430	1	353	100	11	0.000	1.7	0.0	1.7	0	0	0.0	01	00	0	0	0	0	031	1121	0022	12052002	2000000831	007835	06034500000	0000000	22
0431	1	414	100	11	0.000	4.4	0.0	4.4	0	0	0.0	01	00	0	0	0	0	031	1121	0021	12092002	2000000836	032714	08034500000	0000000	22
0432	1	454	100	11	0.000	0.5	0.0	0.5	0	0	0.0	01	00	0	0	0	2	010	0000	0022	11062000	2000001805	005621	17094400000	0000000	22
0433	1	252	100	11	0.000	1.2	0.0	1.2	0	0	0.0	01	00	0	0	0	3	021	1111	1322	12062001	2000001284	003315	00024400035	0250000	22
0434	1	252	100	11	0.000	2.7	0.0	2.7	0	0	0.0	01	00	0	0	0	3	021	1111	1321	12062002	2000001284	003315	00024400035	0250000	22
0435	1	252	111	11	0.000	1.5	4.2	3.3	1	0	0.0	03	00	0	0	0	2	021	0000	1321	13062000	2000001284	003708	00024400035	0250000	22
0436	1	751	211	52	4.000	0.6	1.4	1.2	3	0	0.0	04	00	0	0	0	1	010	1121	1122	11092003	2000001175	001220	16054500000	0290000	22
0437	1	151	100	11	0.000	0.8	0.0	0.8	0	0	0.0	01	00	0	0	0	0	031	0000	0021	12012000	2000001175	023214	16054500000	0290000	22
0438	1	252	111	52	2.700	0.2	1.0	0.7	1	0	0.0	03	00	0	0	0	0	031	1121	0021	12092003	2000001175	024126	16054500000	0290000	22
0439	1	755	200	11	0.000	0.0	0.0	0.0	0	0	0.0	01	00	0	0	0	0	010	1122	0022	12062002	2000001261	006510	14014400000	0000000	22
0440	1	252	100	11	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	1	031	1121	1322	11052002	2000001116	006515	29074400000	0000000	22
0441	1	252	111	11	0.000	2.0	2.4	2.3	1	0	0.0	03	00	0	0	0	1	031	1111	1322	11052002	2000001116	006524	29074400000	0000000	22

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	RD/16 W BUR	B A T	FIRE TIME 1ST	SUB	ALL	R C H	O I W	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	R G E	M E • C	OTHR C U F	MSUM OIRA VZBN	Q V A NO R AN S	REEL	FRAME	DATE BN B R R	DIV REG B	L AO MC
0491	1	232	111	51	0.000	4.6	1.7	2.4	1	0	0.0	04	00	0	0	0	0	031	0000	0022	13092000	2000000197	012636	09104400000	0070000	22
0492	1	232	111	52	3.500	0.9	4.8	2.9	1	0	0.0	02	00	0	0	0	0	031	0000	0022	13112000	2000000197	013405	09104400000	0070000	22
0493	1	353	111	21	0.000	1.0	1.7	1.5	1	0	0.0	03	00	0	0	0	2	031	0000	1222	13052000	2000000197	014215	09104400000	0070000	22
0494	1	353	111	52	3.200	1.0	2.6	2.0	1	0	0.0	03	00	0	0	0	2	031	0000	1222	13052000	2000000197	014610	09104400000	0070000	22
0495	1	252	111	11	0.000	1.0	1.5	1.5	1	0	0.0	08	00	0	0	0	0	031	1121	0022	13032001	2000000197	015007	09104400000	0070000	22
0496	1	111	111	52	2.300	0.6	4.0	3.1	1	0	0.0	04	00	0	0	0	0	031	0000	0022	11052000	2000000197	023501	09104400000	0070000	22
0497	1	151	100	11	0.000	2.8	0.0	2.8	0	0	0.0	01	00	0	0	0	1	010	1121	1122	11062001	2000000195	011318	00000000000	0000000	22
0498	1	751	200	21	0.000	0.1	0.0	0.1	0	0	0.0	01	00	0	0	0	1	010	0000	1122	11062000	2000000195	011704	00000000000	0000000	22
0499	1	333	100	21	0.000	7.5	0.0	7.5	0	0	0.0	01	00	0	0	0	0	031	1111	0021	11042003	2000000195	033000	00000000000	0000000	22
0500	1	252	100	11	0.000	9.0	0.0	9.0	0	0	0.0	01	00	0	0	0	0	021	1111	0021	11042004	2000000195	033000	00000000000	0000000	22
0501	1	333	100	11	0.000	3.3	0.0	3.3	0	0	0.0	01	00	0	0	0	0	031	0000	0021	11042000	2000000195	033608	00000000000	0000000	22
0502																										
0503																										
0504	1	353	111	11	0.000	0.7	2.3	1.9	1	0	0.0	04	00	0	0	0	0	031	1121	0022	11092001	2000002435	001130	00054500000	0000000	22
0505	1	151	100	11	0.000	0.0	0.0	0.0	0	0	0.0	01	00	0	0	0	0	010	1112	0022	11062002	2000002435	003302	00054500000	0000000	22
0506	1	151	100	11	0.000	0.3	0.0	0.3	0	0	0.0	01	00	0	0	0	0	010	1112	0022	11062003	2000002435	003302	00054500000	0000000	22
0507	1	151	100	11	0.000	1.1	0.0	1.1	0	0	0.0	01	00	0	0	0	0	010	1112	0022	11062002	2000002435	003302	00054500000	0000000	22
0508	1	151	111	11	0.000	1.7	1.2	1.3	1	0	0.0	0?	00	0	0	0	0	010	1112	0022	11062002	2000002435	008816	00054500000	0000000	22
0509	1	151	111	11	0.000	0.5	1.2	1.0	1	0	0.5	04	00	0	0	0	0	110	1112	0022	11062002	2000002435	004033	00054500000	0000000	22
0510	1	751	200	11	0.000	0.1	0.0	0.1	0	0	0.0	01	00	0	0	0	1	010	1121	1122	11092002	2000002435	010035	00054500000	0000000	22
0511	1	252	100	11	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	0	010	1121	0022	11032003	2000002435	013712	00054500000	0000000	22
0512	1	252	111	11	0.000	1.7	2.2	2.0	1	0	0.0	02	00	0	0	0	0	010	1121	0022	11032002	2000002435	013908	00054500000	0000000	22
0513	1	154	100	11	0.000	0.8	0.0	0.8	0	0	0.0	01	00	0	0	0	0	031	0000	0022	13042000	2000002455	004106	24054500015	0010000	22
0514	1	454	100	11	0.000	3.7	0.0	3.7	0	0	0.0	01	00	0	0	0	0	031	0000	0022	11052000	2000002522	002003	06064500035	0040000	22
0515	1	353	100	11	0.000	8.7	0.0	8.7	0	0	0.0	01	00	0	0	0	0	031	1121	0022	11062003	2000002522	004031	06064500035	0040000	22
0516	1	333	100	11	0.000	7.9	0.0	7.9	0	0	0.0	01	00	0	0	0	0	031	0000	0022	13042000	2000002522	004707	06064500035	0040000	22
0517	1	131	111	52	2.500	0.5	5.6	3.0	1	0	0.0	02	00	0	0	0	0	031	0000	0021	12042000	2000002522	007427	06064500035	0040000	22
0518	1	353	111	11	0.000	4.0	8.0	6.0	1	0	0.0	02	00	0	0	0	0	031	0000	0022	12052000	2000002522	007907	06064500035	0040000	22
0519	1	353	100	52	3.000	1.5	0.0	1.9	0	0	0.0	01	00	0	0	0	3	031	0000	1322	13062000	2000002522	008633	06064500035	0040000	22
0520	1	353	100	11	0.000	4.0	0.0	4.0	0	0	0.0	01	00	0	0	0	0	031	1121	0022	11082001	2000001444	005705	14095000000	0000000	23
0521	3	151	111	11	0.000	0.8	1.2	1.1	1	0	0.0	04	00	0	0	0	0	021	0000	0021	12072000	2000001567	000310	12035100000	0070015	23
0522	1	353	111	21	0.000	1.5	1.3	1.4	1	0	2.7	02	00	0	0	0	0	031	1111	0022	12052002	2000001603	016925	04025100000	0070015	23
0523	1	212	100	11	0.000	5.7	0.0	5.7	0	0	0.0	01	00	0	0	0	0	031	1121	0022	11092001	2000001604	004816	00000000000	0000000	23
0524	1	454	100	21	0.000	3.7	0.0	3.7	0	0	0.0	01	00	0	0	0	0	021	1121	0022	11072002	2000001604	005635	00000000000	0000000	23
0525	1	454	100	21	0.000	5.8	0.0	5.8	0	0	0.0	01	00	0	0	0	0	021	1121	0022	11072002	2000001604	005930	00000000000	0000000	23
0526	1	454	100	21	0.000	1.8	0.0	1.8	0	0	0.0	01	00	0	0	0	0	010	0000	0022	11072000	2000001604	006504	00000000000	0000000	23
0527	1	252	100	11	0.000	1.5	0.0	1.5	0	0	0.5	01	00	0	0	0	0	321	1121	0022	11042002	2000001604	006735	00000000000	0000000	23
0528	1	252	100	11	0.000	1.3	0.0	1.3	0	0	0.0	01	00	0	0	0	0	010	1122	0022	11072002	2000001638	034513	04095000000	0000000	23
0529	1	353	111	52	1.600	1.6	1.4	1.4	1	0	0.0	11	00	0	1	0	0	010	0000	0022	12032000	2000001638	036617	04095000000	0000000	23
0530	1	353	100	11	0.000	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	0	031	0000	0022	12052000	2000001639	019025	04095000015	0050000	23
0531	1	252	100	11	0.000	2.9	0.0	2.9	0	0	0.0	01	00	0	0	0	0	031	1111	0021	13092003	2000001640	012028	03095000015	0010000	23
[illegible]	1	252	111	11	0.000	4.1	2.7	3.4	1	0	0.0	02	00	0	0	0	0	021	1111	0021	13092004	2000001640	012028	03095000015	0010000	23
[illegible]	1	252	100	11	0.000	1.0	0.0	1.0	0	0	5.6	01	00	0	0	0	0	031	1111	0022	12092002	2000001640	012402	03095000015	0010000	23
[illegible]	3	232	100	11	0.000	0.9	0.0	0.9	0	0	0.0	01	00	0	0	0	7	031	0000	1122	13061000	2000001727	001533	01095200000	0010000	23
0535	3	434	100	11	0.000	11.5	0.0	11.5	0	0	0.0	01	00	0	0	0	0	031	0000	0021	13032000	2000001727	002703	01095200000	0010000	23
0536	1	151	111	41	0.002	0.4	0.8	0.7	1	0	0.0	05	00	0	0	0	0	010	0000	0022	13061000	2000005790	031815	05016900015	0050000	24
0537	1	252	100	62	9.000	0.0	0.0	1.2	0	0	0.0	01	00	0	0	0	0	032	1121	0022	12031001	2000005790	032117	05016900015	0050000	24
0538	1	242	111	62	7.200	0.2	2.8	2.2	1	0	0.0	04	00	0	0	0	3	031	0000	1321	13061000	2000005790	032719	05016900015	0050000	24
0539	1	242	100	62	41.000	0.2	0.0	6.2	0	0	0.0	01	00	0	0	0	2	031	1121	1321	13051001	2000005790	035402	05016900015	0050000	24

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	W A	RD/16 BUR B T	FIRE TIME 1ST	SUB	ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND FS	POSN M	A	D	R G E	M E C	OTHR C U F	MSUM OIRA VZBN	Q V AN	A R S NO	REEL	FRAME	DATE	BN R B R	DIV REG	B	L AO MC
0540	1	151	111	41	0.002	0.2	0.4	0.3	1	0	0.2	06	00	0	0	0	1	110	1112	1222	21071002		2000005790	036426	05016900015		0050000		24
0541	1	151	111	41	0.002	1.1	0.8	0.9	1	0	0.4	04	00	0	0	0	1	110	1112	1222	21081006		2000005790	036515	05016900015		0050000		24
0542	1	751	211	41	0.002	0.0	1.1	0.9	1	0	0.0	05	00	0	0	0	1	110	1112	1222	21071001		2000005790	036404	05016900015		0050000		24
0543	1	151	100	41	0.002	0.3	0.0	0.3	0	0	0.0	01	00	0	0	0	1	110	1112	1222	11071003		2000005790	036723	05016900015		0050000		24
0544	1	751	211	62	4.000	0.0	1.0	0.5	1	0	0.0	02	00	0	0	0	1	110	1122	1322	12061001		2000005790	037105	05016900015		0050000		24
0545	1	343	111	62	6.200	0.5	1.5	1.4	1	0	0.0	06	00	0	0	0	0	010	0000	0022	13042000		2000005790	040923	05016900015		0050000		24
0546	1	333	111	11	0.000	1.2	1.2	1.2	1	0	0.0	07	00	0	0	0	3	031	0000	1222	12052000		1000001023	021212	00024400000		0000000		11
0547	1	353	111	11	0.000	2.2	2.7	2.6	1	0	0.0	05	00	0	0	0	3	032	0000	1222	23062000		1000001023	027409	00024400000		0000000		11
0548	1	353	111	11	0.000	2.2	2.1	2.1	1	0	5.2	03	00	0	0	0	3	132	0000	1222	23022000		1000001023	026211	00024400000		0000000		11
0549	1	252	111	11	0.000	1.1	2.6	1.9	1	0	0.0	02	00	0	0	0	2	022	1121	1322	23052001		1000001023	054610	00024400000		0003000		11
0550	1	252	111	11	0.000	0.5	3.4	2.5	1	0	0.0	03	00	0	0	0	2	023	0000	1222	23052000		1000001023	056110	00024400000		0000000		11
0551	1	751	200	11	0.000	7.0	0.0	7.0	0	0	0.0	01	00	0	0	0	2	022	0000	1222	12032000		1000002070	057403	26064400000		0000000		12
0552	1	353	111	11	0.000	1.0	0.0	0.5	1	0	2.2	02	00	0	0	0	3	432	0000	0021	23072000		1000001976	011614	27074410000		4420345		11
0553	1	252	100	11	0.000	0.5	0.0	0.5	0	0	0.0	01	00	0	0	0	1	010	1111	1212	23052001		1000001951	021909	28024500000		0000945		11
0554	1	353	100	11	0.000	1.3	0.0	1.3	0	1	0.5	01	00	0	0	0	1	021	1112	1211	11062002		1000001951	022002	28024500000		0000945		11
0555	1	353	131	11	0.000	1.8	5.4	4.5	1	0	0.0	04	00	2	0	0	4	010	1112	1322	11012001		1000001951	058811	28024500515		0000043		11
0556	1	353	111	11	0.000	2.7	2.2	2.4	1	0	0.9	02	00	0	0	0	4	410	1112	1322	11012003		1000001951	059714	28024500515		0000043		11
0557	1	151	211	21	0.000	0.2	1.2	0.7	1	0	0.7	02	00	0	0	0	4	010	1122	1312	11032006		1000001512	078010	26064400000		3130795		11
0558	1	151	100	52	4.000	1.3	0.0	2.2	0	0	0.0	01	00	0	0	0	5	010	1122	1322	11072003		1000002519	032512	00084400000		0000455		11
0559	1	151	100	11	0.000	0.5	0.0	0.5	0	0	0.0	01	00	0	0	0	5	010	1122	1322	11072002		1000002519	033106	00084400000		0000455		11
0560	1	232	100	52	7.000	1.2	0.0	3.7	0	0	0.0	01	00	0	0	0	3	033	1121	1212	11062002		1000002946	033815	23124400015		3250000		11
0561	1	656	211	52	4.000	0.4	2.8	1.6	1	0	1.0	02	00	0	0	0	2	122	0000	1222	12062000		1000003174	040901	24054400000		0000000		12
0562	1	252	200	52	5.000	0.2	0.0	0.6	0	0	0.8	01	00	0	0	0	2	132	0000	1222	12062000		1000003174	042212	24054400000		0000000		12
0563	1	751	200	21	0.000	0.2	0.0	0.2	0	0	0.1	01	00	0	0	0	1	132	1121	1222	21062000		1000003174	051509	24054400000		0000000		12
0564	1	151	111	52	6.700	1.1	2.6	2.1	1	0	0.0	03	00	0	0	0	4	010	0000	0022	12032000		1000003319	002709	04024500010		0390095		12
0565	1	151	111	52	4.000	0.4	1.1	0.9	1	0	0.0	03	00	0	0	0	3	021	1121	1211	11092001		1000003344	010215	06024500000		1450000		12
0566	1	212	100	11	0.000	0.5	0.0	0.5	0	0	0.0	01	00	0	0	0	3	033	0000	1211	11022000		1000003344	011510	06024500000		1450000		12
0567	1	555	100	11	0.000	2.5	0.0	2.5	0	0	0.0	01	00	0	0	0	3	023	1121	1211	11052002		1000003344	012313	06024500000		1450000		12
0568	1	353	100	52	4.000	0.2	0.0	1.8	0	0	0.0	01	00	0	0	0	4	031	1121	0022	11042107		1000003732	007904	21034500000		3020945		11
0569	1	252	111	11	0.000	0.5	0.9	0.7	1	0	0.6	03	00	0	0	0	4	031	1121	0022	11052101		1000003732	024115	21034500000		3020945		11
0570	1	252	141	52	4.000	1.6	2.0	1.8	1	0	0.0	02	00	0	0	0	4	031	1222	0022	11042101		1000003732	024906	21034500000		3020945		11
0571	1	252	100	52	8.000	0.2	0.0	4.0	0	2	0.0	01	00	0	0	0	1	021	0000	1122	11042000		1000003490	007813	23024500000		0000375		12
0572	1	151	100	51	0.000	1.7	0.0	1.7	0	0	0.0	01	00	0	0	0	2	010	0000	1222	22052000		1000003477	048014	17024500000		0000000		12
0573	1	751	211	11	0.000	1.2	1.2	1.2	1	0	0.0	03	00	0	0	0	2	033	1112	1222	23092002		1000003477	049413	17024500000		0000000		12
0574	1	151	100	21	0.000	1.4	0.0	1.4	0	0	0.0	01	00	0	0	0	2	022	0000	1222	23072000		1000003477	051211	17024500000		0000000		12
0575	1	751	612	52	3.300	1.7	3.7	3.0	2	0	6.0	03	00	0	0	0	2	010	1121	2322	11072002		1000003477	056406	17024500000		0000000		12
0576	1	252	100	11	0.000	4.1	0.0	4.1	0	0	0.0	01	00	0	0	0	3	021	0000	1222	12052000		1000004148	026211	21044500000		5030000		12
0577	1	454	111	11	0.000	0.0	1.6	1.2	1	0	0.0	04	00	0	0	0	3	033	0000	1222	12062000		1000004148	028810	21044500000		5030000		12
0578	1	252	111	52	4.500	2.8	3.4	3.1	1	0	1.0	02	00	0	0	0	2	110	1122	1222	11032001		1000003820	038702	10034500000		0000965		12
0579	1	151	100	52	12.000	0.5	0.0	2.6	0	1	0.0	01	00	0	0	0	0	010	1121	0022	11022003		1000004129	087815	23044500000		0000375		12
0580	1	454	100	11	0.000	1.4	0.0	1.4	0	0	0.0	01	00	0	0	0	3	010	1221	1321	22032003		1000003871	072003	29034500000		0000033		11
0581	1	151	100	11	0.000	0.4	0.0	0.4	0	0	0.0	01	00	0	0	0	4	010	0000	1222	13082000		1000003933	012308	08044500000		0160015		11
0582	1	131	111	52	6.000	0.4	2.6	1.9	1	0	0.0	03	00	0	0	0	4	010	1122	1222	13052001		1000003933	012614	08044500000		0160015		11
0583	1	131	111	11	0.000	7.3	4.3	5.8	1	0	0.0	02	00	0	0	0	4	021	1121	1221	11022002		1000003958	024810	12044500000		0000063		11
0584	1	454	100	11	0.000	3.8	0.0	3.8	0	0	0.0	01	00	0	0	0	2	031	1121	1211	23042005		1000004016	013204	12044500000		0460053		11
0585	1	454	100	11	0.000	1.2	0.0	1.2	0	1	0.0	01	00	0	0	0	2	022	1121	1222	13072003		1000004127	000610	24044500000		0000275		12
0586	1	751	211	11	0.000	1.6	1.7	1.7	1	2	0.0	03	00	0	0	0	1	010	1122	1122	21092001		1000004127	011307	24044500000		0000275		12
0587	1	454	100	11	0.000	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	4	032	1121	1222	11082001		1000004849	053308	22064500000		3050775		12
0588	1	353	121	11	0.000	0.1	8.5	4.3	1	0	0.0	02	00	0	0	0	2	033	1121	2222	13072001		1000004849	056700	22064500000		3050775		12

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS AIM FSP	M	CS/16 W BUR A	B T	FIRE TIME 1ST	SUB	ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND POSN FS	H	A	D	R G E	M E C	OTHR C U F	MSUM OIRA VZBN	Q V AN / A R S / NO	REEL	FRAME	DATE BN B R R	DIV REG B	L AO MC
0589	1	151	111	21	0.000	0.2	1.7	1.3	1	0	0.0	04	00	0	0	0	3	033	0000	1222	21072100	1000004809	053212	17064500000	3820965	12
0590	1	151	100	21	0.000	5.2	0.0	5.2	0	0	0.0	01	00	0	0	0	3	033	1222	1222	21072102	1000004809	056811	17064500000	3820965	12
0591	1	111	100	11	0.000	3.0	0.0	3.0	0	1	0.0	01	00	0	0	0	3	031	0000	1221	23082000	1000004767	023613	30054500000	6000375	12
0592	1	751	241	11	0.000	1.0	1.0	1.0	1	0	0.0	06	00	0	0	0	1	010	1222	1222	21092005	1000004758	036203	04064500000	1290375	12
0593	1	151	100	11	0.000	0.2	0.0	0.2	0	2	0.0	01	00	0	0	0	1	010	0000	1122	11042002	1000004758	040013	04064500000	1290375	12
0594	1	151	100	11	0.000	0.0	0.0	0.0	0	2	2.5	01	00	0	0	0	1	010	1122	1122	23052005	1000004758	041515	04064500000	1290375	12
0595	1	751	200	52	5.000	0.2	0.0	1.5	0	2	0.4	01	00	0	0	0	1	110	1122	1122	21042004	1000004758	041600	04064500000	1290375	12
0596	1	353	100	11	.000	4.5	0.0	4.5	0	0	0.0	01	00	0	0	0	4	010	1111	1222	11082002	1000004203	022008	14044500000	0000063	11
0597	1	252	142	11	0.000	0.8	0.7	0.7	2	0	3.5	08	10	3	0	0	4	010	1111	2222	11072004	1000004203	022513	14044500000	0000063	11
0598	1	353	100	11	0.000	0.3	0.0	0.3	0	0	0.0	01	00	0	0	0	4	010	1122	1222	13092002	1000004203	026812	14044500000	0000063	11
0599	1	252	100	21	0.000	0.5	0.0	0.5	0	0	0.0	01	00	0	0	0	4	010	1122	1222	13092004	1000004203	026812	14044500000	0000063	11
0600	1	731	200	42	3.002	0.0	0.0	1.2	0	0	0.0	01	00	0	0	0	1	031	0000	1121	23072000	1000054479	000321	01126920000	0000019	14
0601	1	751	211	42	3.002	0.3	3.0	1.7	1	0	0.0	02	00	0	0	0	3	031	1111	1221	23032002	1000054048	005200	21026970000	0110000	14
0602	1	151	211	62	6.000	0.0	0.9	0.7	1	0	0.0	05	00	0	0	0	2	021	1121	1221	12032001	1000054326	036125	10046900000	0000255	14
0603	1	751	200	42	18.012	0.0	0.0	0.9	0	0	0.0	01	00	0	0	0	3	010	1112	1222	11082001	1000054326	037418	10046900000	0000255	14
0604	1	751	211	42	3.502	0.1	0.4	0.2	1	0	0.0	02	00	0	0	0	3	010	1112	1222	11061002	1000054326	037508	10046900000	0000255	14
0605	1	151	111	42	3.002	0.1	0.9	0.5	1	0	0.0	02	00	0	0	0	3	010	1112	1222	13082003	1000054326	037419	10046900000	0000255	14
0606	1	151	211	42	3.002	0.2	1.5	0.8	1	0	0.0	02	00	0	0	0	3	010	1112	1222	12092004	1000054326	037418	10046900000	0000255	14
0607	1	751	211	62	5.000	0.1	1.2	0.9	1	0	0.0	04	00	0	0	0	3	021	1121	1211	22042001	1000054326	038308	10046900000	0000255	14
0608	1	751	611	62	10.000	0.1	2.0	1.1	1	0	9.0	02	00	0	0	0	3	010	1121	1222	11072003	1000054326	052703	10046900000	0000255	14
0609	1	751	200	42	5.002	0.0	0.0	0.6	0	0	0.0	01	00	0	0	0	3	010	1121	1222	21082001	1000054326	052900	10046900000	0000255	14
0610	1	151	211	41	0.002	0.2	0.6	0.5	1	0	0.1	03	00	0	0	0	3	021	0000	1222	13052000	1000054326	053020	10046900000	0000255	14
0611	1	751	200	62	20.000	0.3	0.0	2.0	0	0	2.6	01	00	0	0	0	1	110	1122	1222	21072002	1000054326	053418	10046900000	0000255	14
0612	1	454	111	41	0.002	0.5	2.0	1.8	1	0	1.5	11	00	0	0	0	3	022	0000	1222	12102000	1000051617	030232	00000000000	0000000	14
0613	1	454	111	41	0.002	1.8	2.6	2.6	1	0	2.2	13	00	0	0	0	3	022	0000	1222	12112000	1000051617	032407	00000000000	0000000	14
0614	1	353	100	41	0.002	1.5	0.0	1.5	0	0	3.0	01	00	0	0	0	4	032	1121	1321	22021001	1000051603	033100	07106620000	0110000	14
0615	1	252	131	41	0.002	1.4	4.7	3.0	1	0	0.0	02	00	0	0	0	3	010	1111	1222	12092001	1000051618	045817	00000000000	0000000	14
0616	1	252	100	41	0.002	0.7	0.0	0.7	0	0	0.6	01	00	0	0	0	3	022	1111	1222	13092002	1000051618	046300	00000000000	0000000	14
0617	1	252	111	42	4.002	2.5	1.1	1.4	1	0	0.0	05	00	0	0	0	3	010	1111	1222	11032001	1000051618	046537	00000000000	0000000	14
0618	1	252	111	42	9.012	1.2	2.7	2.0	2	0	5.2	02	00	0	0	0	3	010	1122	1222	11022001	1000051618	047421	00000000000	0000000	14
0619	1	454	111	42	2.002	0.6	2.2	1.9	1	0	4.4	05	00	0	0	0	3	022	0000	1222	12022000	1000051618	048433	00000000000	0000000	14
0620	1	454	111	41	0.002	0.9	2.4	1.9	1	0	0.5	03	00	0	0	0	3	022	0000	1222	12022000	1000051618	050325	00000000000	0000000	14
0621	1	151	100	31	0.000	1.3	0.0	1.3	0	0	2.4	01	00	0	0	0	3	031	1121	1211	11091002	1000052564	015400	31016800000	0000000	14
0622	1	353	111	42	4.002	0.3	1.3	1.0	1	0	0.0	03	00	0	0	0	3	031	1111	1211	23091001	1000052564	015623	31016800000	0000000	14
0623	1	151	100	31	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	3	021	1111	1211	21091002	1000052564	015632	31016800000	0000000	14
0624	1	252	111	32	5.000	0.2	4.3	3.3	1	0	0.0	04	00	0	0	0	2	022	1121	1212	23061001	1000052564	020513	31016800000	0000000	14
0625	1	353	112	41	1.202	0.9	1.1	1.1	1	0	0.0	10	00	0	2	0	1	032	1111	1222	23032001	1000053726	031230	02126800000	0000045	14
0626	1	252	111	42	2.202	0.9	2.0	1.9	1	0	0.0	08	00	0	0	0	1	032	1111	1222	23032002	1000053726	031230	02126800000	0000045	14
0627	1	353	111	41	0.002	0.2	0.9	0.8	1	0	0.0	18	00	0	0	0	1	032	1111	1222	23032001	1000053726	032233	02126800000	0000045	14
0628	1	252	111	42	6.002	1.0	8.5	4.7	1	0	7.8	02	00	0	0	0	1	022	1111	1222	23032002	1000053726	032720	02126800000	0000045	14
0629	1	656	122	41	0.002	0.7	2.4	1.9	1	0	9.0	03	00	0	0	0	2	210	1112	1222	11022001	1000053726	035123	02126800000	0000045	14
0630	1	252	100	42	4.002	1.1	0.0	1.5	0	0	15.1	01	00	0	0	0	1	110	1112	1222	11022002	1000053726	035405	02126800000	0000045	14
0631	1	353	111	41	0.002	0.9	1.2	1.2	1	0	0.0	09	00	0	0	0	2	032	0000	1222	23032000	1000053726	046230	02126800000	0000045	14
0632	1	656	122	41	0.002	0.2	1.6	1.4	1	0	7.5	04	00	0	0	0	2	210	1112	1222	11042001	1000053726	049832	02126800000	0000045	14
0633	1	252	100	42	4.002	1.2	0.0	1.7	0	0	14.7	01	00	0	0	0	2	210	1112	1222	13042004	1000053726	050117	02126800000	0000045	14
0634	1	232	311	42	6.012	0.7	2.2	1.7	3	0	1.0	03	00	0	0	0	2	031	1121	1222	22052003	1000054755	048940	05056800000	0001015	14
0635	1	232	400	42	12.012	0.5	0.0	3.2	0	0	0.5	01	00	0	0	0	2	031	1121	1222	21052001	1000054755	049723	05056800000	0001015	14
0636	1	252	411	42	7.012	0.7	1.7	1.2	1	0	0.0	02	00	0	0	0	2	021	1121	1222	23062003	1000054755	052032	05056800000	0001015	14
0637	2	454	211	41	0.001	0.0	0.4	0.3	1	1	0.0	09	00	0	0	0	1	022	1121	1222	11042001	1000052337	062815	15116720015	5030030	14

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	RD/ W BUR A	16 B T	FIRE TIME 1ST	SUB	ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND POSN FS	H	A	D	R G E	M E C	OTHR C U F	MSUM OIRA VZBN	Q V AN A R S NO	REEL	FRAME	DATE BN B R R	DIV REG B	L AO MC
0638	1	454	100	31	0.000	3.2	0.0	3.2	0	0	0.0	01	00	0	0	0	3	022	0000	1222	12032000	1000051236	011305	14016700023	0340043	14
0639	1	454	100	31	0.000	7.0	0.0	7.0	0	0	0.0	01	00	0	0	0	3	032	0000	1222	23052000	1000051236	011533	14016700023	0340043	14
0640	1	454	100	31	0.000	2.0	0.0	2.0	0	0	0.0	01	00	0	0	0	3	022	0000	1122	12032000	1000051236	016322	14016700023	0340043	14
0641	1	454	100	31	0.000	5.9	0.0	5.9	0	0	0.0	01	00	0	0	0	3	022	0000	1122	13042000	1000051236	017202	14016700023	0340043	14
0642	1	151	100	41	0.002	1.9	0.0	1.9	0	1	0.0	01	00	0	0	0	6	010	1112	1322	11032002	1000054773	038707	14016820020	0120019	14
0643	1	151	100	41	0.002	2.0	0.0	2.0	0	1	0.7	01	00	0	0	0	6	010	1112	1322	13012001	1000054773	038724	14016820020	0120019	14
0644	1	751	600	62	25.000	0.0	0.0	5.6	0	0	0.0	01	00	0	0	0	4	010	1122	1322	23062002	1000054773	039212	14016820020	0120019	14
0645	1	751	600	62	30.000	0.0	0.0	11.5	0	0	0.0	01	00	0	0	0	3	010	1122	1322	12092002	1000054773	039702	14016820020	0120019	14
0646	1	343	400	62	35.000	0.0	0.0	5.8	0	0	0.0	01	00	0	0	0	4	033	1121	1322	23072002	1000054773	069200	14016820020	0120019	14
0647	1	242	141	62	6.600	0.0	1.5	1.4	1	0	0.0	09	05	0	0	0	4	033	1121	1322	22072002	1000054773	070706	14016820020	0120019	14
0648	1	242	111	62	4.000	0.0	0.9	0.8	1	0	0.0	10	00	0	0	0	4	033	1121	1322	23102002	1000054773	070211	14016820020	0120019	14
0649	1	151	100	41	0.002	1.1	0.0	1.1	0	0	0.7	01	00	0	0	0	3	032	0000	1322	12032000	1000056532	011207	10037100000	0000053	14
0650	1	151	100	41	0.002	0.5	0.0	0.5	0	0	0.0	01	00	0	0	0	3	022	0000	1322	23032000	1000056532	011415	10037100000	0000053	14
0651	1	751	200	62	4.000	0.0	0.0	0.7	0	0	0.1	01	00	0	0	0	3	022	0000	1322	23032000	1000056532	011825	10037100000	0000053	14
0652	1	151	100	41	0.002	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	3	022	0000	1322	23042000	1000056532	031613	10037100000	0000053	14
0653	1	751	611	62	5.700	0.1	2.1	1.4	1	0	2.1	03	00	0	0	0	3	010	1122	1322	21082001	1000056532	032423	10037100000	0000053	14
0654	1	353	111	41	0.002	0.2	0.4	0.3	1	0	1.1	06	00	0	0	0	3	232	0000	1222	23082000	1000055951	001730	22087020035	0170000	14
0655	1	232	111	41	0.002	0.2	[illegible]	0.4	3	0	0.0	05	00	0	0	0	4	033	0000	1322	13042000	1000055365	051725	04017000025	0220255	14
0656	1	252	111	41	0.002	0.1	0.5	0.4	1	0	0.0	10	00	0	0	0	4	033	0000	1322	23042000	1000055365	052323	04017000025	0220255	14
0657	1	744	200	62	30.000	0.2	0.0	7.8	0	0	6.8	01	00	0	0	0	4	023	1121	1322	12072002	1000055365	047327	04017000025	0220255	14
0658	2	751	211	62	7.200	0.0	0.8	0.7	1	0	0.0	06	00	0	0	0	4	033	1121	1322	13062002	1000055365	052927	04017000025	0220255	14
0659	2	151	111	41	0.002	0.1	0.6	0.5	1	0	0.0	06	00	0	0	0	4	033	1121	1322	11052001	1000055365	053224	04017000025	0220255	14
0660	2	141	100	61	0.000	2.4	0.0	2.4	0	0	[illegible]	01	00	0	0	0	4	033	1121	1322	13042002	1000055365	054604	04017000025	0220255	14
0661	2	141	111	62	6.000	0.0	2.8	2.1	1	0	[illegible]	04	00	0	0	0	4	033	1121	1322	12042002	1000055365	055323	04017000025	0220255	14
0662	1	751	600	52	18.000	0.0	0.0	3.7	0	0	[illegible]	01	00	0	0	0	1	010	0000	1222	23062000	1000008262	031203	18095000000	0000000	13
0663	1	252	111	11	0.000	0.5	0.8	0.7	1	0	0.0	04	00	0	0	0	4	033	0000	1222	13062000	1000008262	063009	18095000000	0000000	13
0664	1	212	111	52	4.000	0.0	4.2	2.1	1	0	0.0	02	00	0	0	0	3	033	1121	1322	13082002	1000008262	068612	18095000000	0000000	13
0665	1	252	111	11	0.000	2.1	1.6	1.8	1	0	0.0	04	00	0	0	0	3	022	0000	1222	13062000	1000008252	029413	18095000000	0000000	13
0666	1	151	111	11	0.000	0.5	0.3	0.4	1	0	0.0	05	00	0	0	0	2	010	1112	1222	11032002	1000008252	035812	18095000000	0000000	13
0667	1	151	211	21	0.000	0.0	0.2	0.2	1	0	0.0	20	00	0	0	0	2	010	1112	1222	12042003	1000008252	035812	18095000000	0000000	13
0668	1	151	211	22	4.000	0.2	1.5	1.1	1	2	0.9	03	00	0	0	0	1	010	0000	1122	22022000	1000008252	038511	18095000000	0000000	13
0669	1	212	100	11	0.000	0.7	0.0	0.7	0	1	0.0	01	00	0	0	0	0	033	1121	0022	21042002	1000008245	074412	06095020000	0080000	13
0670	1	212	111	11	0.000	0.5	0.9	0.8	1	1	0.0	06	00	0	0	0	0	031	1122	0022	23082001	1000008245	075214	06095020000	0080000	13
0671	1	151	100	11	0.000	2.7	0.0	2.7	0	0	0.0	01	00	0	0	0	3	010	0000	1322	21062000	1000008163	066011	12085020000	0000019	13
0672	1	751	200	11	0.000	0.4	0.0	0.4	0	0	1.0	01	00	0	0	0	3	010	0000	1322	23062000	1000008163	067005	12085020000	0000019	13
0673	1	232	100	11	0.000	5.4	0.0	5.4	0	0	0.0	01	00	0	0	0	3	033	1122	1322	13022002	1000008126	056413	25075000000	0000275	13
0674	1	131	111	11	0.000	2.0	1.1	1.5	1	0	0.0	02	00	0	0	0	3	031	1111	1211	11042005	1000008120	052315	24075020000	0000019	13
0675	1	252	122	21	0.000	0.4	1.9	1.4	3	0	0.0	03	00	0	0	0	3	032	1111	1311	11072006	1000008120	052315	24075020000	0000019	13
0676	1	252	111	11	0.000	0.6	1.2	1.1	1	0	1.2	05	00	0	0	0	3	032	1121	1311	12092003	1000008120	053200	24075020000	0000019	13
0677	1	151	111	22	6.500	0.1	7.7	3.9	1	1	0.0	02	00	0	0	0	0	033	1111	0011	22102004	1000008115	031201	19075000025	021[illegible]5	13
0678	1	151	100	11	0.000	0.6	0.0	0.6	0	1	0.0	01	00	0	0	0	0	033	1111	0011	23072001	1000008115	031305	19075000025	0210245	13
0679	1	252	111	52	2.500	0.0	0.8	0.4	1	0	0.0	02	00	0	0	0	0	010	0000	0022	11082000	1000008115	036114	19075000025	0210245	13
0680	1	343	111	52	8.000	0.0	7.3	3.7	1	0	0.0	02	00	0	0	0	4	033	1121	1322	11072001	1000008106	054009	22075000000	0000000	13
0681	1	252	100	11	0.000	2.1	0.0	2.1	0	0	0.0	01	00	0	0	0	4	032	1121	1322	23082004	1000009534	039809	19075120000	0230000	13
0682	1	252	100	11	0.000	0.1	0.0	0.1	0	0	0.0	01	00	0	0	0	4	032	0000	1322	22082000	1000009534	050305	19075120000	0230000	13
0683	1	232	111	11	0.000	0.6	3.9	2.3	1	0	0.0	02	00	0	0	0	3	033	0000	1221	11052000	1000009468	026709	07025100000	0000275	13
0684	1	131	111	11	0.000	3.1	0.7	1.0	1	0	0.0	08	00	0	0	0	4	031	1122	1321	11032001	1000009466	030314	31015100893	0000030	13
0685	1	454	111	11	0.000	1.2	1.2	1.2	1	0	0.0	06	00	0	0	0	4	010	0000	1321	11072000	1000009456	031713	31015100893	0000000	13
0686	1	454	111	22	8.000	0.8	2.0	1.4	1	0	2.1	02	00	0	0	0	4	010	0000	1321	11092000	1000009466	033315	31015100893	0000000	13

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	W A	RD/ BUR 16 B T	FIRE TIME 1ST	SUB	ALL	R C H	D I R	TIM TO POS	TNG PUL	2ND POSN FS	M	A	D	R G E	M E C	OTHR C U F	MSUM OIRA VZHN	Q V A R AN S NO	REEL	FRAME	DATE BN R B R	REG DIV B	L AO MC
0687	2	131	100	21	0.000	1.2	0.0	1.2	0	0	0.0	01	00	0	0	0	4	031	0000	1221	23022000	1000009463	016501	13015100000	0000000	13
0688	2	131	111	11	0.000	2.7	2.6	2.6	1	0	0.0	03	00	0	0	0	3	033	1111	1321	23022002	1000009463	018301	13015100000	0000006	13
0689	2	131	132	11	0.000	0.7	7.2	4.0	1	0	0.0	02	00	0	0	0	4	033	1111	1321	23022001	1000009463	018301	13015100000	0000000	13
0690	2	111	111	11	0.000	0.4	1.1	0.9	1	0	0.0	04	00	0	0	0	4	033	1111	1221	13012002	1000009463	019609	13015100000	0000000	13
0691	2	111	111	11	0.000	0.9	1.2	1.1	1	0	0.7	03	00	0	0	0	4	033	1111	1321	13012001	1000009463	019711	13015100000	0000000	13
0692	2	111	111	11	0.000	0.3	1.3	1.1	1	0	0.0	06	00	0	0	0	4	033	1111	1321	13012002	1000009463	020313	13015100000	0000000	13
0693	2	111	100	11	0.000	1.0	0.0	1.0	0	0	0.0	01	00	0	0	0	4	033	1111	1321	13012001	1000009463	020312	13015100000	0000000	13
0694	2	131	100	11	0.000	1.9	0.0	1.9	0	0	0.0	01	00	0	0	0	4	033	0000	1321	23062000	1000009463	021413	13015100000	9000000	13
0695	2	131	100	11	0.000	1.9	0.0	1.9	0	0	0.0	01	00	0	0	0	4	033	0000	1321	23062000	1000009463	022615	13015100000	0000000	13
0696	2	111	100	11	0.000	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	4	033	1121	1321	13022001	1000009463	023307	13015100000	0000000	13
0697	2	151	111	52	3.000	0.2	2.4	1.6	1	0	0.0	03	00	0	0	0	4	033	1121	1221	23012001	1000009414	061308	25065120000	0230000	13
0698	2	131	100	11	0.000	0.1	0.0	0.1	0	0	0.0	01	00	0	0	0	4	033	1121	1321	23022001	1000009414	062015	25065120000	0230000	13
0699	1	151	111	52	3.700	0.1	0.9	0.7	1	2	0.0	03	00	0	0	0	0	022	1121	0022	11042102	1000009363	022205	17115100000	0000000	13
0700	1	454	111	52	4.700	1.3	4.9	3.7	1	0	0.0	03	00	0	0	0	0	032	1111	0022	11082001	1000009184	036214	00000000000	0000000	13
0701	1	252	100	22	5.000	1.7	0.0	2.7	0	0	4.8	01	00	0	0	0	0	032	1111	0022	11082002	1000009184	037002	00000000000	0000000	13
0702	1	212	100	11	0.000	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	2	032	0000	1222	23062000	1000009184	047203	00000000000	0000000	13
0703	1	252	111	52	4.500	0.6	1.9	1.6	1	0	0.0	04	00	0	0	0	0	022	1111	0022	23032004	1000009184	053714	00000000000	0000000	13
0704	1	252	100	52	4.000	0.2	0.0	2.8	0	0	0.0	01	00	0	0	0	0	033	0000	0022	12042000	1000009184	055308	00000000000	0000000	13
0705	1	151	100	21	0.000	1.0	0.0	1.0	0	1	0.0	01	00	0	0	0	0	010	1121	0012	12022001	1000008372	073003	25095000000	0000000	13
0706	1	131	100	21	0.000	2.3	0.0	2.3	0	0	0.0	01	00	0	0	0	0	031	0000	0011	12032000	1000008372	082909	25095000000	0000000	13
0707	1	131	100	52	4.000	7.1	0.0	7.7	0	0	0.0	01	00	0	0	0	0	031	0000	0011	12092003	1000008372	085813	25095000000	0000000	13
0708	1	131	100	52	3.000	9.6	0.0	10.2	0	0	0.0	01	00	0	0	0	0	031	1121	0011	13102001	1000008372	087110	25095000000	0000000	13
0709	1	252	100	11	0.000	3.0	0.0	3.0	0	0	0.0	01	00	0	0	0	0	010	0000	0022	21022000	1000008370	052501	25095000000	0000075	13
0710	1	454	111	11	0.000	1.6	3.7	2.6	1	2	0.0	02	00	0	0	0	7	010	1122	1322	11062001	1000008370	053415	25095000000	0000075	13
0711	1	252	141	11	0.000	0.8	2.2	1.5	1	2	0.0	02	00	0	0	0	7	010	1112	1322	23022003	1000008370	055706	25095000000	0000075	13
0712	1	343	142	52	3.000	0.4	5.8	4.0	1	0	0.0	03	00	0	0	0	0	010	1112	0022	23022001	1000008680	032006	29015120000	0000019	13
0713	1	353	100	11	0.000	2.6	0.0	2.6	0	0	0.0	01	00	0	0	0	0	010	1112	0022	23012002	1000008680	032006	29015120000	0000019	13
0714	1	252	111	11	0.000	0.0	0.6	0.5	1	0	0.0	05	00	0	0	0	0	010	0000	0022	12042000	1000008680	033811	29015120000	0000019	13
0715	1	252	111	11	0.000	0.6	0.7	0.7	1	0	0.0	06	00	0	0	0	3	010	0000	1322	12042000	1000008680	034308	29015120000	0000019	13
0716	1	353	142	11	0.000	5.0	1.1	1.6	1	0	0.0	07	00	0	0	0	5	032	0000	1322	12042000	1000008680	035409	29015120000	0000019	13
0717	1	353	100	11	0.000	0.5	0.0	0.5	0	0	1.7	01	00	0	0	0	5	032	0000	1322	12042000	1000008680	038002	29015120000	0000019	13
0718	1	151	111	21	0.000	0.3	0.9	0.8	1	0	6.0	09	00	0	0	0	0	010	0000	0022	23112000	1000008680	038107	29015120000	0000019	13
0719	1	343	142	52	4.700	0.1	5.5	3.7	1	0	0.0	03	00	0	0	0	0	010	0000	0022	23022000	1000008680	039308	29015120000	0000019	13
0720																										
0721	1	254	111	11	0.000	0.4	0.8	0.6	1	0	4.0	02	00	0	0	0	0	010	1122	0022	12032001	1000008680	055015	29015120000	0000019	13
0722	1	353	142	11	0.000	3.5	1.6	2.2	1	0	0.0	03	00	0	0	0	0	010	1121	0022	12022001	1000008680	055411	29015120000	0000019	13
0723	1	151	111	11	0.000	1.7	2.3	2.0	1	1	0.0	02	00	0	0	0	0	010	1122	0022	23022001	1000008695	072208	06025100000	0270255	13
0724	1	151	100	11	0.000	0.2	0.0	0.2	0	0	0.4	01	00	0	0	0	4	210	1122	1322	11082001	1000033262	070606	28055300000	0000405	13
0725	1	751	200	11	0.000	0.8	0.0	0.8	0	0	0.5	01	00	0	0	0	3	110	1222	1322	11082001	1000033262	071700	28055300000	0000405	13
0726	1	751	200	11	0.000	3.4	0.0	3.4	0	0	0.5	01	00	0	0	0	2	110	1122	1322	22022004	1000033262	073702	28055300000	0000405	13
0727	1	151	100	11	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	2	010	0000	1322	21092000	1000033262	074507	28055300000	0000405	13
0728	2	131	611	52	3.600	2.4	2.7	2.6	1	2	0.0	05	00	0	0	0	0	031	0000	0021	13022000	1000033258	002509	28055300000	0000405	13
0729	2	131	411	11	0.000	4.3	2.5	2.8	1	2	0.0	06	00	0	0	0	0	031	0000	0021	12021000	1000033258	006008	28055300000	0000405	13
0730	2	131	100	11	0.000	0.6	0.0	0.6	0	2	0.0	01	00	0	0	0	0	010	0000	0022	23011000	1000033258	008700	28055300000	0000405	13
0731	2	252	111	11	0.000	1.4	1.4	1.4	1	0	0.0	06	00	0	0	0	0	031	0000	0021	12031000	1000033265	009503	28055300000	0000405	13
0732	2	232	111	11	0.000	1.6	1.8	1.8	1	0	0.0	07	00	0	0	0	0	031	0000	0021	12031000	1000033265	010904	28055300000	0000405	13
0733	2	131	111	11	0.000	0.0	1.8	1.5	1	0	0.0	08	00	0	0	0	5	031	0000	1321	12061000	1000033265	013108	28055300000	0000405	13
0734	2	131	111	11	0.000	0.0	0.3	0.3	1	0	0.0	07	00	0	0	0	0	031	0000	0021	13021000	1000033265	015203	28055300000	0000405	13
0735	2	131	111	11	0.000	0.0	1.3	1.1	1	0	0.0	07	00	0	0	0	0	031	0000	0021	13021000	1000033265	015615	28055300000	0000405	13

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	RD/16 W BUR E A	T	FIRE TIME 1ST	SUB	ALL	R C H	C I R	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	R G E•	H E C	OTHR C U F	KSUM OTRA VZBN	Q V R AN S A NO	REEL	FRAME	DATE UN B R R	DIV REG B	L AO MC
0736	2	131	111	11	0.000	1.7	1.0	1.1	1	2	0.0	04	00	0	0	0	0	031	1111	0021	11071002	1000033265	018008	28055300000	0000405	13
0737	2	131	111	11	0.000	0.7	1.0	1.0	1	2	0.0	06	00	0	0	0	0	031	1111	0021	11071003	1000033265	018008	28055300000	0000405	13
0738	2	131	111	52	3.000	0.3	1.3	1.1	1	2	0.0	06	00	0	0	0	6	031	1121	1321	12071001	1000033265	019307	28055300000	0000405	13
0739	2	131	111	11	0.000	0.2	0.4	0.4	1	2	0.0	03	00	0	0	0	6	031	1121	1321	12071002	1000033265	020315	28055300000	0000405	13
0740	2	131	111	52	3.600	0.0	1.9	1.5	1	2	0.0	05	00	0	0	0	0	031	0000	0021	23021000	1000033265	021307	28055300000	0000405	13
0741	1	151	241	11	0.000	0.5	1.7	1.3	1	0	0.6	03	00	0	0	0	2	110	1122	1222	21022004	1000033263	018301	28055300000	0000405	13
0742																										
0743																										
0744																										
0745																										
0746																										
0747	1	151	100	11	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	3	010	0000	1322	12062000	1000008690	053501	03025100000	0000000	13
0748	1	151	111	11	0.000	0.8	0.3	0.5	1	0	0.0	04	00	0	0	0	3	010	0000	1322	12062000	1000008690	054110	03025100000	0000000	13
0749	3	151	111	52	2.100	0.7	1.1	1.0	1	0	0.0	09	00	0	0	0	0	010	0000	0022	23012000	1000033261	000302	28055300000	0000405	13
0750	1	353	111	11	0.000	0.4	1.4	1.3	1	0	0.0	08	00	0	0	0	0	010	1122	0022	23112001	1000033261	019111	28055300000	0000405	13
0751	1	353	111	11	0.000	0.7	1.0	0.8	1	1	0.0	02	00	0	0	0	0	033	0000	0022	23111000	1000033261	028805	28055300000	0000405	13
0752	3	353	111	11	0.000	4.3	1.0	2.7	1	1	0.0	02	00	0	0	0	0	033	0000	0022	23111000	1000033261	030600	28055300000	0000405	13
0753	2	131	100	52	5.000	6.0	0.0	6.8	0	2	0.0	01	00	0	0	0	0	031	0000	0021	23101000	1000033259	038511	28055300000	0000405	13
0754	2	131	100	11	0.000	1.1	0.0	1.1	0	2	0.0	01	00	0	0	0	0	031	0000	0021	13021000	1000033259	078811	28055300000	0000405	13
0755	2	131	111	11	0.000	0.7	1.2	1.1	1	2	0.0	05	00	0	0	0	0	031	0000	0021	12031000	1000033259	079615	28055300000	0000405	13
0756	1	252	111	52	4.800	1.2	2.3	2.1	1	1	0.0	04	00	0	0	0	0	023	0000	0022	12031000	1000033257	084212	28055300000	0000405	13
0757	1	151	100	11	0.000	0.1	0.0	0.1	0	0	1.5	01	00	0	0	0	0	022	1122	0022	22081102	1000033255	041603	28055300000	0000405	13
0758	1	151	111	11	0.000	1.8	2.4	2.1	1	0	0.4	02	00	0	0	0	0	022	1121	0022	22041006	1000033255	044605	28055300000	0000405	13
0759	1	252	211	11	0.000	2.4	2.0	2.0	1	0	2.8	05	00	0	0	0	0	010	1122	0022	23011001	1000033255	046915	28055300000	0000405	13
0760	1	151	111	11	0.000	1.7	2.0	1.9	1	1	0.0	06	00	0	0	0	0	010	0000	0022	23011000	1000033255	048715	28055300000	0000405	13
0761	1	252	111	52	3.600	1.1	2.0	1.8	1	1	0.0	05	00	0	0	0	0	022	0000	0022	23021000	1000033255	050514	28055300000	0000405	13
0762	1	252	111	52	3.600	0.7	0.8	0.8	1	1	4.2	05	00	0	0	0	0	010	0000	0022	23021000	1000033255	052801	28055300000	0000405	13
0763	3	751	242	22	2.500	0.3	3.1	1.7	2	0	0.0	02	00	0	0	0	0	010	0000	0022	22042000	1000032569	007101	26035300000	0150035	13
0764	3	751	211	21	0.000	1.6	0.7	0.9	1	0	0.0	05	00	0	0	0	0	010	0000	0022	11032000	1000032569	008205	26035300000	0150035	13
0765	2	131	111	21	0.000	1.4	1.7	1.7	1	0	0.0	07	00	0	0	0	0	031	0000	0021	13092000	1000031608	075311	26035300000	0150035	13
0766	2	131	411	21	0.000	0.2	0.7	0.6	1	2	0.0	05	00	0	0	0	6	031	0000	0021	13052000	1000031608	076105	26035300000	0150035	13
0767	2	141	111	52	5.000	1.5	8.2	4.9	1	0	0.0	02	00	0	0	0	0	031	1121	0021	22062002	1000031497	057904	16125200000	0000025	13
0768	2	141	111	52	8.000	0.5	3.8	2.2	1	0	0.0	02	00	0	0	0	0	031	0000	0021	23112000	1000031497	059403	16125200000	0000025	13
0769	2	141	100	52	14.000	0.9	0.0	2.2	0	0	0.0	01	00	0	0	0	0	031	0000	0021	23117000	1000031497	060909	16125200000	0000025	13
0770	2	131	111	11	0.000	0.0	1.1	0.8	1	0	0.0	04	00	0	0	0	0	031	0000	0021	13022000	1000031497	062104	16125200000	0000025	13
0771	2	151	111	11	0.000	0.1	0.8	0.6	1	0	0.8	03	00	0	0	0	0	031	0000	0021	23022000	1000031497	063410	16125200000	0000025	13
0772	1	242	200	62	8.000	1.0	0.0	1.5	0	0	0.0	01	00	0	0	0	0	033	0000	0022	13042000	2000005449	024900	00000000000	0000000	24
0773	1	242	200	62	12.000	8.8	0.0	10.2	0	0	0.0	01	00	0	0	0	0	033	0000	0022	13042000	2000005449	025602	00000000000	0000000	24
0774	1	751	200	52	6.000	0.1	0.0	2.7	0	0	2.0	01	00	0	0	0	3	010	1122	1222	23052005	2000000503	036512	00000000000	0000045	22
0775	3	751	211	52	6.000	6.1	2.9	4.0	1	0	0.0	03	00	0	0	0	0	010	1112	0022	11022002	2000000547	010213	00004400000	0000000	22
0776	3	751	242	52	4.000	7.7	3.1	4.0	1	0	0.0	05	00	0	0	0	0	010	1112	0022	11022001	2000000547	010213	00004400000	0000000	22
0777	3	751	211	52	2.500	0.6	1.0	1.0	1	0	0.0	07	00	0	0	0	0	010	1122	0022	11022002	2000000547	013511	00004400000	0000000	22
0778	3	252	111	52	3.200	2.2	2.0	2.0	1	0	0.0	06	00	0	0	0	0	010	1112	0022	11012001	2000000547	015200	00004400000	0000000	22
0779	3	252	111	52	2.900	3.0	2.3	2.4	1	0	0.0	07	00	0	0	0	0	010	1112	0022	11012002	2000000547	015200	00004400000	0000000	22
0780	3	751	200	51	0.000	1.1	0.0	1.1	0	0	2.2	01	00	0	0	0	0	010	0000	0022	12032000	2000000547	020514	00004400000	0000000	22
0781	3	751	211	52	3.000	0.6	1.4	1.2	1	0	0.0	06	00	0	0	0	0	010	0000	0022	12032000	2000000547	021508	00004400000	0000000	22
0782	3	751	211	52	5.000	0.8	1.2	1.1	1	0	0.0	04	00	0	0	0	0	010	0000	0022	12032000	2000000547	024107	00004400000	0000000	22
0783	3	252	111	52	2.900	0.9	1.4	1.3	1	0	0.0	07	00	0	0	0	0	010	0000	0022	11022000	2000000547	026211	00004400000	0000000	22
0784	3	152	132	52	3.000	0.7	5.9	3.3	1	0	0.0	02	00	0	0	0	0	010	0000	0022	11022000	2000000547	028709	00004400000	0000000	22

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	RD/ 16 W BUR B A	T	FIRE TIME 1ST	SUB	ALL	R C H	O I R	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	R G E	M E C	OTHR C U F	MSUM OIRA VZRN	Q V AN R S NO	REEL	FRAME	DATE BN B R R	DIV REG B	L AO MC
0785	1	751	211	21	0.000	1.4	1.8	1.7	1	0	0.0	04	00	0	0	0	0	022	1112	0022	12072001	2000000551	058405	00004400000	0000000	22
0786	3	751	611	21	0.000	0.5	1.5	1.4	1	0	0.7	09	00	0	0	0	0	422	1112	0022	12062001	2000000551	059810	00004400000	0000000	22
0787	1	157	200	11	0.000	0.5	0.0	0.5	0	0	2.0	01	00	0	0	0	2	210	1122	1222	23042003	2000000558	033405	12054500035	0220065	22
0788	1	751	241	52	2.000	0.2	2.6	1.4	1	0	0.5	02	00	0	0	0	1	110	1122	1222	11062003	2000000558	034208	12054500035	0220065	22
0789	1	151	142	11	0.000	1.0	3.7	2.4	1	0	0.0	02	00	0	0	0	1	033	0000	1222	23102100	2000000971	018311	20074400035	0000015	22
0790	1	151	111	52	5.000	0.3	1.6	1.0	1	0	0.0	02	00	0	0	0	0	010	1122	0022	23062002	2000000971	027600	20074400035	0000015	22
0791	1	131	600	52	9.000	1.5	0.0	2.4	0	0	0.0	01	00	0	0	0	0	033	0000	0022	23032000	2000000971	042515	24094400035	0000015	22
0792	3	454	111	52	3.800	0.8	1.1	1.1	1	0	0.0	05	00	0	0	0	0	033	0000	0022	23022000	2000000972	006506	24094400000	0000015	22
0793	3	131	111	52	4.500	0.5	3.4	1.9	1	0	0.0	02	00	0	0	0	0	033	0000	0022	23082000	2000000972	007904	24094400000	0000015	22
0794	1	131	142	52	4.500	3.3	10.5	8.7	1	0	0.0	04	00	0	0	0	0	033	1121	0022	11042002	2000000974	034104	29094400035	0050000	22
0795	1	131	100	52	0.000	1.0	0.0	1.2	0	0	0.0	01	00	0	0	0	0	033	0000	0022	13022000	2000000974	036305	29094400035	0050000	22
0796	1	454	211	11	0.000	0.4	1.2	0.9	1	0	0.0	03	00	0	0	0	2	010	1122	1222	12072002	2000000974	061613	28094400025	0070000	22
0797	1	252	111	21	0.000	1.5	0.6	0.9	1	0	2.4	03	00	0	0	0	0	010	1121	0022	23092002	2000000974	061903	28094400025	0070000	22
0798	1	252	121	11	0.000	0.5	3.2	1.9	1	0	0.0	02	00	0	0	0	0	010	1121	0022	13112003	2000000974	062615	28094400025	0070000	22
0799	1	151	111	52	4.000	2.3	3.7	3.0	1	0	0.0	02	00	0	0	0	0	010	1122	0022	13052002	2000000977	017709	25014400025	3210000	22
0800	1	151	100	21	0.000	5.0	0.0	5.0	0	0	4.0	01	00	0	0	0	0	010	1122	0022	13052001	2000000977	018310	25014400025	3210000	22
0801	3	151	111	11	0.000	1.2	3.5	2.4	1	1	0.0	02	00	0	0	0	0	010	0000	0022	23022000	2000000977	020011	25014400025	3210000	12
0802	3	131	100	21	0.000	0.3	0.0	0.3	0	1	0.0	01	00	0	0	0	0	031	0000	0022	23022000	2000000977	022714	25014400025	3210000	22
0803	1	151	100	11	0.000	0.0	0.0	0.0	0	1	0.0	01	00	0	0	0	1	010	1121	1122	23022005	2000000977	036914	25014400025	3210000	22
0804	1	151	300	11	0.000	1.9	0.0	1.9	0	0	1.2	01	00	0	0	0	1	010	1122	2122	11062001	2000001013	020903	15094400000	0000000	12
0805	1	252	100	11	0.000	0.8	0.0	0.8	0	0	2.7	01	00	0	0	0	0	033	1121	0021	23042007	2000001013	044205	15094400000	0000000	12
0806	1	151	111	11	0.000	0.3	1.0	0.5	1	1	0.6	02	00	0	0	0	2	033	1122	1221	23082002	2000004726	015101	00004400000	0000025	22
0807	1	252	111	11	0.000	1.4	1.6	1.5	1	0	0.0	02	00	0	0	0	0	023	0000	0021	13072000	2000004726	018500	00004400000	0000025	22
0808	1	254	100	11	0.000	1.9	0.0	1.9	0	0	3.7	01	00	0	0	0	0	033	1121	0021	23022003	2000004726	029611	00004400000	0000025	22
0809	1	151	111	52	4.000	0.1	0.7	0.5	1	0	0.0	03	00	0	0	0	1	010	1121	1122	22022002	2000004718	047508	00004500000	0000000	22
0810	1	151	132	52	4.500	0.8	3.4	2.1	1	0	0.0	02	00	0	0	0	0	023	0000	0022	23022000	2000004718	050006	00004500000	0000000	22
0811	1	151	100	11	0.000	0.6	0.0	0.6	0	0	0.0	01	00	0	0	0	0	010	1122	0022	12032002	2000004709	008211	00024500000	0000000	22
0812	1	151	100	11	0.000	0.1	0.0	0.1	0	0	0.0	01	00	0	0	0	0	022	1122	0022	23022001	2000004709	009514	00024500000	0000000	22
0813	1	151	100	11	0.000	1.6	0.0	1.6	0	0	0.0	01	00	0	0	0	4	021	0000	1321	11062000	2000001795	000001	20074400000	0000035	22
0814	1	751	211	21	0.000	0.3	0.8	0.6	1	0	0.0	02	00	0	0	0	1	010	1122	1121	23082002	2000001793	023105	23074400000	0000035	12
0815	1	252	111	11	0.000	2.0	2.5	2.2	1	0	0.0	02	00	0	0	0	0	032	1121	0022	23022002	2000001791	067202	10074400000	0000035	22
0816	3	454	100	21	0.000	3.0	0.0	3.0	0	0	0.0	01	00	0	0	0	0	033	1121	0021	22022001	2000001640	011213	01084400000	0000000	22
0817	3	434	100	11	0.000	2.2	0.0	2.2	0	0	0.0	01	00	0	0	0	0	033	1121	0021	23022002	2000001640	012707	01084400000	0000000	22
0818	1	151	111	11	0.000	0.5	1.6	1.0	1	0	0.0	02	00	0	0	0	0	010	0000	0022	23032000	2000000830	005510	18094400000	0240015	22
0819	1	353	111	21	0.000	0.9	1.3	1.2	1	0	0.0	04	00	0	0	0	2	023	0000	1222	13042000	2000000830	006404	18094400000	0240015	22
0820	3	151	100	51	0.000	0.4	0.0	0.4	0	0	0.0	01	00	0	0	0	0	022	0000	0022	23032000	2000000137	024815	00124300000	0000000	22
0821	3	151	100	11	0.000	1.5	0.0	1.5	0	0	2.5	01	00	0	0	0	0	022	1121	0022	23032002	2000000137	025503	00124300000	0000000	22
0822	3	454	100	31	0.000	7.2	0.0	7.2	0	0	0.0	01	00	0	0	0	0	010	1122	0022	23032004	2000005715	010818	06106800000	0000000	24
0823	3	454	100	31	0.000	3.2	0.0	3.2	0	0	0.0	01	00	0	0	0	0	010	1122	0022	23032004	2000005715	011421	06106800000	0000000	24
0824																										
0825	1	343	142	62	5.000	0.0	5.4	2.7	3	0	0.0	02	00	0	0	0	4	032	0000	1322	13061000	2000005606	001031	00056800000	0000000	24
0826	1	242	100	62	22.000	0.0	0.0	3.1	0	0	0.0	01	00	0	0	0	2	031	0000	1222	13061000	2000005606	002427	00056800000	0000300	24
0827	1	151	111	62	5.000	0.0	2.4	1.6	1	0	0.0	03	00	0	0	0	0	010	1122	0022	21031002	2000005606	023707	00056800000	0000000	24
0828	3	151	212	11	0.000	0.0	0.4	0.3	2	0	0.0	08	00	0	0	0	0	010	1122	0022	21042001	2000000019	019806	02084400000	0000045	22
0829	1	252	111	11	0.000	0.3	0.2	0.2	1	0	0.0	05	00	0	0	0	0	032	0000	0022	23072000	2000001252	017306	16025300035	0000015	23
0830	1	252	100	11	0.000	0.6	0.0	0.6	0	0	0.0	01	00	0	0	0	0	022	0000	0022	23072000	2000001252	018204	16025300035	0000015	23
0831	1	151	111	22	5.000	0.3	0.8	0.6	1	0	0.0	03	00	0	0	0	0	022	0000	0022	23052000	2000001252	018413	16025300035	0000015	23
0832	3	131	111	52	2.000	0.2	0.6	0.5	1	0	0.0	03	00	0	0	0	0	033	0000	0022	22032000	2000004664	015409	00004500000	0000000	22
0833	3	454	100	11	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	0	010	0000	0022	21062000	2000004664	015707	00004500000	0000000	22

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	RD/ W BUR A	16 B T	FIRE TIME 1ST	SUB	ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND FS	POSN M	A	D	R G E	M E C	OTHR C U F	MSUM OIRA VZBN	Q A NO V R AN S	REEL	FRAME	DATE BN B R R	DIV REG B	L AO MC
0834	3	252	100	11	0.000	0.1	0.0	0.1	0	0	0.0	01	00	0	0	0	0	033	0000	0022	22082000	2000004664	015805	00004500000	0000000	22
0835	3	333	100	11	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	0	033	0000	0022	23042000	2000004664	015901	00004500000	0000000	22
0836	3	353	100	11	0.000	0.0	0.0	0.0	0	0	0.0	01	00	0	0	0	0	033	0000	0022	23042000	2000004664	080106	00004500000	0000000	22
0837	3	151	100	52	3.000	0.0	0.0	0.4	0	0	0.0	01	00	0	0	0	0	010	1122	0022	23022002	2000004664	067001	00004500000	0000000	22
0838	3	353	100	11	0.000	0.1	0.0	0.1	0	0	0.0	01	00	0	0	0	1	033	1121	1222	23022001	2000004664	066006	00004500000	0000000	12
0839	3	454	100	51	0.000	0.3	0.0	0.3	0	0	0.0	01	00	0	0	0	0	022	1121	0022	11032001	2000000812	012113	00055100000	0000000	23
0840	3	353	100	51	0.000	0.8	0.0	0.8	0	0	0.0	01	00	0	0	0	0	010	0000	0022	13062000	2000000812	019105	00055100000	0000000	23
0841	3	353	111	52	4.000	0.5	1.6	1.2	1	0	0.0	03	00	0	0	0	0	010	0000	0022	13062000	2000000812	019414	00055100000	0000000	23
0842	1	252	100	21	0.000	0.6	0.0	0.6	0	0	0.0	01	00	0	0	0	0	010	1121	0022	11102002	2000000814	020810	00005100000	0000000	23
0843	1	454	111	52	3.200	0.3	1.1	0.9	1	2	0.0	04	00	0	0	0	0	010	0000	0022	11092005	2000000814	021502	00005100000	0000000	23
0844	2	515	100	11	0.000	1.4	0.0	1.4	0	1	0.0	01	00	0	0	0	0	031	1121	0021	11062001	2000000789	006807	17045100000	0000000	23
0845	1	232	100	11	0.000	1.0	0.0	1.0	0	0	1.6	01	00	0	0	0	0	031	1121	0022	22042001	2000001021	029008	23025100015	0010000	23
0846	1	343	100	52	5.000	0.3	0.0	0.6	0	0	0.0	01	00	0	0	0	4	033	0000	1322	23022000	2000001021	029314	23025100015	0010000	23
0847	1	313	100	11	0.000	3.9	0.0	3.9	0	0	0.0	01	00	0	0	0	0	010	0000	0022	11042100	2000001020	031309	02035100035	0010000	23
0848	1	751	200	11	0.000	0.8	0.0	0.8	0	2	1.5	01	00	0	0	0	1	010	0000	1122	11112000	2000001020	040205	02035100035	0010000	23
0849	1	353	111	11	0.000	1.2	1.8	1.5	1	0	0.0	02	00	0	0	0	0	032	1111	0022	11032004	2000001002	007803	00005100000	0000000	23
0850	1	131	111	11	0.000	1.5	2.1	1.9	1	0	0.0	03	00	0	0	0	0	031	0000	0022	12032000	2000001002	014304	00005100000	0000000	23
0851	1	131	100	11	0.000	4.1	0.0	4.1	0	0	0.0	01	00	0	0	0	0	031	0000	0012	13022030	2000001002	015603	00005100000	0000000	23
0852	1	131	100	11	0.000	3.5	0.0	3.5	0	0	5.7	01	00	0	0	0	0	031	0000	0022	13022000	2000001002	017406	00005100000	0000000	23
0853	1	131	111	11	0.000	1.0	2.7	1.9	1	0	0.0	02	00	0	0	0	0	033	0000	0022	13042000	2000001002	018003	00005100000	0000000	23
0854	1	343	111	52	3.500	0.9	4.0	2.5	1	0	0.0	02	00	0	0	0	0	033	1121	0022	11032002	2000001002	033814	00005100000	0000000	23
0855	1	343	111	52	3.500	1.0	3.6	2.3	1	0	0.0	02	00	0	0	0	0	033	1121	0022	13022002	2000001002	034612	00005100000	0000000	23
0856	1	353	100	21	0.000	1.3	0.0	1.3	0	0	0.0	01	00	0	0	0	0	010	0000	0022	13042000	2000000966	047009	01035100025	0010015	23
0857	1	252	111	11	0.000	0.0	1.6	0.8	1	0	0.0	02	00	0	0	0	0	022	1121	0022	12062001	2000000896	013613	06075100000	0000000	23
0858	1	151	100	11	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	0	010	0000	0022	21082000	2000000896	016702	06075100000	0000000	23
0859	1	252	121	11	0.000	0.9	3.0	2.3	1	0	0.0	03	00	0	0	0	0	023	0000	0022	12012000	2000000569	017707	23055100000	0010000	23
0860	1	252	111	11	0.000	0.1	1.4	0.9	1	0	0.0	03	00	0	0	0	0	033	0000	0022	13012000	2000000569	018808	23055100000	0010000	23
0861	1	252	111	22	4.500	1.4	1.7	1.5	1	0	0.0	02	00	0	0	0	0	023	0000	0022	13012000	2000000569	019307	23055100000	0010000	23
0862	1	252	111	52	2.000	1.4	0.8	1.1	1	0	0.0	02	00	0	0	0	0	033	0000	0022	23022000	2000000569	020008	23055100000	0010000	23
0863	1	353	100	11	0.000	3.0	0.0	3.0	0	0	0.0	01	00	0	0	0	0	032	1121	0022	11092001	2000000569	020701	23055100000	0010006	23
0864	1	616	100	11	0.000	2.7	0.0	2.7	0	0	0.0	01	00	0	0	0	0	033	0000	0022	12032000	2000000569	021410	23055100000	0010000	23
0865	1	252	100	11	0.000	0.5	0.0	0.5	0	0	0.0	01	00	0	0	0	0	023	0000	0022	13042000	2000000569	022814	23055100000	0010000	23
0866	1	414	111	11	0.000	1.5	3.0	2.2	1	0	2.0	02	00	0	0	0	0	010	0000	0022	11042000	2000000569	023905	23055100000	0010000	23
0867	1	313	100	11	0.000	0.3	0.0	0.3	0	0	0.0	01	00	0	0	0	0	021	1121	0022	13102001	2000000569	034000	23055100000	0010000	23
0868	1	313	111	11	0.000	0.2	1.4	0.8	1	0	0.0	02	00	0	0	0	0	021	0000	0022	12092000	2000000569	034610	23055100000	0010000	23
0869	1	353	111	52	6.000	0.0	2.5	1.3	1	0	0.0	02	00	0	0	0	0	033	0000	0022	11082000	2000000569	035114	23055100000	0010000	23
0870	3	454	100	51	0.000	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	0	010	0000	0022	11042000	2000000891	011111	02035100000	0000000	23
0871	3	353	111	52	6.000	0.0	3.1	1.6	1	0	0.0	02	00	0	0	0	0	010	0000	0022	12032000	2000000891	012306	02035100000	0000000	23
0872	3	353	111	51	0.000	0.0	1.0	0.7	1	0	0.0	03	00	0	0	0	0	010	1122	0022	13012002	2000000891	012813	02035100000	0000000	23
0873	3	454	100	11	0.000	0.1	0.0	0.1	0	0	0.0	01	00	0	0	0	0	010	0000	0022	12032000	2000000891	013209	02035100000	0000000	23
0874	3	151	100	11	0.000	1.5	0.0	1.5	0	1	0.0	01	00	0	0	0	0	010	1122	0022	11072001	2000000890	029407	00000000000	0000000	23
0875	1	252	100	21	0.000	1.8	0.0	1.8	0	0	0.0	01	00	0	0	0	0	010	0000	0022	22072000	2000000890	031201	00000000000	0000000	23
0876	1	454	111	11	0.000	0.2	1.2	0.9	1	0	0.0	04	00	0	0	0	0	010	1122	0022	11082201	2000000890	055114	00000000000	0000000	23
0877	1	252	111	11	0.000	1.5	2.3	1.9	1	0	0.0	02	00	0	0	0	0	010	0000	0022	23012000	2000000890	056603	00000000000	0000000	23
0878	1	454	100	11	0.000	0.0	0.0	0.0	0	0	0.0	01	00	0	0	0	0	022	0000	0022	21072000	2000000871	027809	00115000000	0000000	23
0879	1	252	111	11	0.000	0.2	2.1	1.1	1	0	0.0	02	00	0	0	0	0	010	1222	0022	23032001	2000000871	028901	00115000000	0000000	23
0880	3	252	100	11	0.000	0.6	0.0	0.6	0	0	0.0	01	00	0	0	0	2	010	0000	1322	12062000	1000000510	001203	03034400000	0000000	12
0881	1	333	100	52	10.000	2.3	0.0	6.3	0	0	0.0	01	00	0	0	0	7	031	0000	1322	13052000	1000000576	035705	00014400000	0000000	11
0882	1	232	122	21	0.000	0.7	2.0	1.7	1	0	0.0	05	00	0	0	0	0	032	0000	0022	13042000	1000000576	036913	00014400000	0000000	11

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	W BUR A	RD/16 B T	FIRE TIME 1ST	SUB	ALL	R C H	C I R	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	R G E	M E C	OTHR C U F	MSUM OIRA VZBN	Q V AN / A NO R S	REEL	FRAME	DATE R / BN B R	REG DIV B	L AO MC
0883	1	232	111	21	0.000	1.3	0.9	1.0	3	0	0.0	07	00	0	0	0	0	033	0000	0022	11082000	1000000576	039410	00014400000	0000000	11
0884	1	252	111	51	0.000	2.1	0.7	0.8	1	0	0.0	10	00	0	0	0	0	010	0000	0022	13032000	1000000576	042607	00014400000	0000000	11
0885	1	252	111	51	0.000	1.0	0.5	0.6	1	0	0.0	15	00	0	0	0	0	010	0000	0022	13032000	1000000576	043903	00014400000	0000000	11
0886	1	752	111	51	0.000	1.0	1.0	1.0	1	0	0.0	04	00	0	0	0	0	021	0000	0022	13022000	1000000576	047905	00014400000	0000000	11
0887	1	152	100	52	16.000	1.1	0.0	2.9	0	0	0.0	01	00	0	0	0	0	022	0000	0022	13032000	1000000576	048711	00014400000	0000000	11
0888	1	353	141	11	0.000	0.8	12.7	8.7	1	0	0.0	03	00	0	0	0	0	033	0000	0022	13102000	1000000576	059413	00014400000	0000000	11
0889	1	353	122	11	0.000	1.6	1.1	1.1	2	0	0.0	08	00	0	0	0	0	031	1112	0022	12022001	1000000576	065100	00014400000	0000000	11
0890	1	353	111	11	0.000	0.9	0.9	0.9	1	0	0.0	08	00	0	0	0	3	022	1111	0022	13032002	1000000576	066906	00014400000	0000000	11
0891	1	337	111	11	0.000	1.1	1.5	1.4	1	0	0.0	07	00	0	0	0	3	033	0000	0022	11052000	1000000576	066906	00014400000	0000000	11
0892																										
0893																										
0894	2	131	122	21	0.000	0.2	2.4	2.2	1	0	0.0	12	00	0	0	0	3	033	0000	1221	12032000	1000000689	000211	09034400000	1450375	12
0895	2	131	111	21	0.000	1.9	2.1	2.0	1	0	0.5	04	00	0	0	0	3	033	1121	1121	22052001	1000000689	007013	09034400000	1450375	12
0896	1	353	111	11	0.000	1.3	1.4	1.3	1	0	0.0	02	00	0	0	0	4	010	1111	1322	12082002	1000000832	059203	00000000037	0000000	11
0897	1	353	111	52	2.000	10.0	1.5	5.7	1	0	0.0	02	00	0	0	0	4	010	1111	1322	12072001	1000000832	059203	00000000037	0000000	11
0898	1	353	100	11	0.000	2.3	0.0	2.3	0	0	0.0	01	00	0	0	0	0	032	0000	0022	12042000	1000000890	066305	00024400000	0000000	11
0899	1	353	111	11	0.000	1.0	3.1	2.8	1	0	0.0	06	00	0	0	0	0	031	0000	0022	12042000	1000000890	066615	00024400000	0000000	11
0900	1	353	111	11	0.000	1.0	1.4	1.3	1	0	0.0	06	00	0	0	0	0	010	0000	0022	12042000	1000000890	070912	00024400000	0000000	11
0901	3	353	100	11	0.000	2.6	0.0	2.6	0	2	0.0	01	00	0	0	0	7	031	0000	1322	23072000	1000000907	001400	00024400000	0000000	11
0902	3	353	211	11	0.000	2.2	2.9	2.7	1	1	0.0	04	00	0	0	0	0	032	0000	0022	13022100	1000000907	016612	00024400000	0000000	11
0903	3	733	211	11	0.000	0.6	0.9	0.9	1	0	4.4	04	00	0	0	0	4	031	0000	0022	22052000	1000000907	039615	00024400000	0000000	11
0904	1	131	111	52	3.700	2.2	2.4	2.3	2	0	0.0	03	00	0	0	0	0	031	0000	0011	23042000	1000001141	042505	25054400025	0020000	11
0905	1	131	111	11	0.000	1.4	1.4	1.4	1	0	0.0	03	00	0	0	0	3	033	0000	1222	12082000	1000002308	071503	07004400000	3700925	11
0906	1	434	100	11	0.000	1.0	0.0	1.0	0	0	0.0	01	00	0	0	0	3	031	1121	0011	22072002	1000002084	028315	08084400000	3130000	11
0907	1	434	100	11	0.000	1.8	0.0	1.8	0	0	0.0	01	00	0	0	0	3	031	1121	0011	13072002	1000002084	029106	08084400000	3130000	11
0908	1	252	131	11	0.000	2.7	0.8	1.7	1	0	1.1	02	00	0	0	0	1	010	1112	1222	21052001	1000001957	041607	03034500044	0000000	11
0909	1	151	111	11	0.000	0.8	1.7	1.3	1	0	2.3	02	00	0	0	0	1	110	1112	1222	21042002	1000001957	041908	03034500044	0000000	11
0910	1	151	111	11	0.000	0.6	3.2	1.9	1	0	0.0	02	00	0	0	0	6	021	1121	1321	21062002	1000001754	014115	28044500083	0000203	11
0911	1	151	100	11	0.000	3.7	0.0	3.7	0	0	0.0	01	00	0	0	0	6	021	1111	1321	22032001	1000001754	016414	28044500083	0000203	11
0912	1	131	111	11	0.000	1.3	2.2	1.7	1	0	0.0	02	00	0	0	0	1	031	0000	1211	11062000	1000001486	077509	19064400000	0000795	11
0913	1	252	111	11	0.000	1.2	0.7	0.8	3	0	1.7	05	00	0	0	0	1	021	0000	0011	23082000	1000001486	081000	19064400000	0000795	11
0914	1	252	100	11	0.000	2.0	0.0	2.0	0	0	5.0	01	00	0	0	0	1	032	1221	0022	13032002	1000001525	043502	30044420000	0000000	12
0915	1	131	111	52	2.500	1.5	2.1	1.8	1	0	0.0	02	00	0	0	0	2	023	1111	0022	13082102	1000001525	044409	30044420000	0000000	12
0916	1	151	100	21	0.000	2.8	0.0	2.8	0	0	4.3	01	00	0	0	0	1	022	1122	2122	12032002	1000001525	049201	30044420000	0000000	12
0917	1	151	111	11	0.000	0.2	1.1	0.9	1	0	0.0	05	00	0	0	0	0	031	0000	0022	12062000	1000002663	050803	00000000000	0000000	12
0918	1	353	100	11	0.000	2.2	0.0	2.2	0	0	0.0	01	00	0	0	0	2	010	1111	1322	13072001	1000002977	013512	00114400000	0000000	12
0919	1	353	100	11	0.000	1.4	0.0	1.4	0	0	0.0	01	00	0	0	0	0	010	1111	0022	13082001	1000002977	014408	00114400000	0000000	12
0920																										
0921	1	151	100	11	0.000	1.0	0.0	1.0	0	0	1.4	01	00	0	0	0	1	110	1112	1122	11102002	1000003228	014007	17014500000	0000000	12
0922	1	151	100	21	0.000	0.3	0.0	0.3	0	0	2.6	01	00	0	0	0	1	110	1112	1122	11102001	1000003228	014203	17014500000	0000000	12
0923	1	151	100	11	0.000	0.0	0.0	0.0	0	0	0.0	01	00	0	0	0	2	010	1222	0022	11092001	1000003333	015115	07024500030	1610255	12
0924	1	252	111	11	0.000	1.5	2.4	1.9	1	0	0.0	02	00	0	0	0	0	022	1111	0022	11042002	1000003333	015400	07024500030	1610255	12
0925	1	252	100	11	0.000	1.7	0.0	1.7	0	0	0.5	01	00	0	0	0	0	032	1111	0022	12042003	1000003333	015412	07024500030	1610255	12
0926	3	732	211	52	3.000	1.0	1.1	1.1	1	0	0.0	03	00	0	0	0	0	031	0000	0021	22052000	1000002176	020902	21024500000	1480375	12
0927	3	751	211	11	0.000	0.5	0.3	0.3	1	0	0.0	08	00	0	0	0	2	010	0000	0012	22062000	1000002176	022106	21024500000	1480375	11
0928	3	232	100	11	0.000	0.3	0.0	0.3	0	0	1.2	01	00	0	0	0	2	031	1121	0011	23082002	1000002176	023713	21024500000	1480375	12
0929	3	111	100	21	0.000	3.3	0.0	3.3	0	0	0.0	01	00	0	0	0	0	010	1222	0021	11032000	1000003723	039504	25034500000	0000000	11
0930	3	111	111	21	0.000	2.9	5.2	4.1	1	0	0.0	02	00	0	0	0	2	010	0000	2121	21082000	1000003723	041209	25034500000	0000000	11
0931	3	454	100	11	0.000	0.1	0.0	0.1	0	0	0.0	01	00	0	0	0	2	022	0000	2121	11082000	1000003723	045907	25034500000	0000000	11

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	RD/ W BUR A	16 B T	FIRE TIME 1ST	FIRE TIME SUB	FIRE TIME ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND FS	POSN M	POSN A	POSN D	R G E	M E C	OTHR C U F	MSUM OIRA VZBN	Q V AN S A R NO	REEL	FRAME	DATE BN B R R	DIV REG B	L AO MC
0932	3	235	111	11	0.000	1.1	4.7	3.5	3	0	4.7	03	00	0	0	0	3	031	0000	1111	11042000	1000003481	022303	19024500000	0000375	12
0933	3	232	111	11	0.000	0.4	1.1	0.9	1	0	0.0	03	00	0	0	0	3	031	0000	1111	13052000	1000003481	024003	19024500000	0000375	12
0934	3	535	100	52	4.000	0.5	0.0	1.2	0	0	0.0	01	00	0	0	0	3	031	1111	0011	21052001	1000003481	025011	19024500000	0000375	12
0935	3	232	111	11	0.000	1.3	1.6	1.5	1	0	0.0	04	00	0	0	0	3	031	1111	0011	21052003	1000003481	025011	19024500000	0000375	12
0936	1	151	100	11	0.000	0.2	0.0	0.2	0	0	0.7	01	00	0	0	0	1	110	1222	0022	23062009	1000003474	012714	17024500000	0000115	12
0937	1	252	111	11	0.000	0.3	2.3	1.6	3	0	5.7	03	00	0	0	0	1	010	0000	0022	11072000	1000003474	016313	17024500000	0000115	12
0938	1	353	111	11	0.000	3.0	3.1	3.1	1	0	0.0	04	00	0	0	0	0	032	1122	0022	11082001	1000003773	020912	00004400000	0000000	12
0939	1	353	111	11	0.000	1.2	2.4	2.1	1	0	0.0	04	00	0	0	0	0	032	1122	0022	11072001	1000003773	023411	00004400000	0000000	12
0940	1	333	122	11	0.000	2.0	4.7	4.0	3	0	3.1	04	00	0	0	0	1	231	1111	1321	11052001	1000003773	047607	00004400000	0000000	12
0941	1	333	111	11	0.000	4.0	3.9	3.9	1	0	1.4	04	00	0	0	0	1	233	1111	1321	12062002	1000003773	047508	00004400000	0000000	12
0942	3	353	100	11	0.000	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	0	010	0000	0022	12032000	1000003773	055307	00004400000	0000000	12
0943	1	353	111	11	0.000	1.5	1.4	1.5	1	0	2.2	03	00	0	0	0	2	422	1111	0022	11082001	1000003773	066007	00004400000	0000000	12
0944	1	353	111	11	0.000	1.5	2.4	2.2	1	0	2.5	04	00	0	0	0	2	433	1111	0022	12082002	1000003773	066212	00004400000	0000000	12
0945	3	353	100	11	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	0	022	1111	0022	12032002	1000003675	009301	28034500000	0000073	11
0946	3	353	100	21	0.000	1.2	0.0	1.2	0	0	0.0	01	00	0	0	0	0	022	1111	0022	13022001	1000003875	009301	28034500000	0000073	11
0947	1	151	100	21	0.000	1.3	0.0	1.3	0	0	0.0	01	00	0	0	0	2	010	1122	0012	11062005	1000003875	027904	28034500000	0000073	11
0948	3	151	100	11	0.000	0.5	0.0	0.5	0	0	9.8	01	00	0	0	0	0	010	0000	0022	13022000	1000003934	022604	08044500000	0280085	11
0949	2	232	111	52	3.500	1.2	3.3	2.3	3	0	0.0	02	00	0	0	0	0	031	0000	0021	23042000	1000003934	039502	09044500000	1370355	11
0950	1	232	121	11	0.000	1.8	26.8	14.3	1	0	0.0	02	00	0	0	0	3	031	1121	1321	13052001	1000003990	000805	12044500000	0000000	11
0951	2	232	100	11	0.000	3.2	0.0	3.2	0	0	0.0	01	00	0	0	0	6	031	1121	1321	13052001	1000003990	004009	12044500000	0000000	11
0952	2	232	100	11	0.000	2.0	0.0	2.0	0	0	0.0	01	00	0	0	0	1	031	1111	1221	13062002	1000003990	005303	12044500000	0000000	11
0953	2	232	100	11	0.000	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	1	031	1111	1221	13062001	1000003990	005303	12044500000	0000000	11
0954	3	222	100	21	0.000	9.2	0.0	9.2	0	0	0.0	01	00	0	0	0	1	031	0000	1221	11032000	1000003990	016709	12044500000	0000000	11
0955	3	212	111	21	0.000	2.0	1.8	1.9	1	0	0.0	02	00	0	0	0	1	031	0000	1221	13052000	1000003990	016208	12044500000	0000000	11
0956	1	333	111	11	0.000	0.7	2.7	1.7	1	0	0.0	02	00	0	0	0	1	031	1111	1322	11032002	1000007315	025900	00000000000	3060770	11
0957	1	414	100	11	0.000	0.6	0.0	0.6	0	0	1.0	01	00	0	0	0	1	031	1111	1322	12032001	1000007315	026007	00000000000	3060770	11
0958	1	751	231	11	0.000	0.2	1.0	0.6	1	0	0.5	02	00	0	0	0	1	110	1122	0022	22042002	1000004824	016604	00064500000	0000075	12
0959	1	151	111	11	0.000	0.3	2.6	1.5	1	0	0.0	02	00	0	0	0	1	022	1112	0022	12042003	1000004824	032014	00064500000	0000075	12
0960	1	151	100	11	0.000	0.4	0.0	0.4	0	0	2.6	01	00	0	0	0	1	022	1112	0022	11042002	1000004824	032413	00064500000	0000075	12
0961	1	756	200	52	5.000	0.1	0.0	0.2	0	0	0.0	01	00	0	0	0	1	022	1122	0022	22052002	1000004824	033610	00064500000	0000075	12
0962	1	751	211	21	0.000	1.1	0.4	0.6	1	2	0.7	04	00	0	0	0	1	110	1112	0022	21062101	1000004850	022711	21064500000	1840075	12
0963	1	151	100	11	0.000	0.8	0.0	0.8	0	1	0.0	01	00	0	0	0	1	010	1112	1222	11062003	1000004720	041309	01034500000	0000375	12
0964	1	151	132	21	0.000	0.5	0.5	0.5	2	0	0.0	03	00	2	0	2	1	010	1112	1222	11042002	1000004720	041309	01034500000	0000375	12
0965	1	252	100	11	0.000	2.2	0.0	2.2	0	0	0.0	01	00	0	0	0	1	022	0000	0022	12062000	1000004389	001310	16044500000	0000065	12
0966	3	154	111	51	0.000	1.3	0.7	0.9	1	0	0.0	04	00	0	0	0	0	010	1121	0012	21092203	1000004158	021412	28044500000	3510885	11
0967	3	151	100	11	0.000	0.9	0.0	0.9	0	1	0.0	01	00	0	0	0	0	010	1121	0012	21092004	1000004158	022212	28044500000	3510885	11
0968	3	131	131	51	0.000	1.4	4.5	3.0	1	0	0.0	02	75	2	0	0	0	021	1221	0011	21092001	1000004158	023410	28044500000	3510885	11
0969	3	232	100	11	0.000	2.2	0.0	2.2	0	1	0.0	01	00	0	0	0	0	031	1111	0011	21082001	1000004158	026506	28044500000	3510885	11
0970	1	151	100	11	0.000	0.5	0.0	0.5	0	1	1.2	01	00	0	0	0	1	010	1112	1222	23062001	1000002735	074307	17114400000	0000000	11
0971	1	151	100	11	0.000	0.6	0.0	0.6	0	1	0.3	01	00	0	0	0	1	010	1112	1222	22062005	1000002735	073400	17114400000	0000000	11
0972	1	151	200	11	0.000	0.4	0.0	0.4	0	0	1.0	01	00	0	0	0	1	010	1122	1222	22062001	1000002735	074804	17114400000	0000000	11
0973	3	151	111	11	0.000	0.4	3.0	1.7	1	0	0.0	02	00	0	0	0	2	010	1121	1322	22072004	1000002735	076409	17114400000	0000000	11
0974	3	353	100	11	0.000	1.3	0.0	1.3	0	0	0.0	01	00	0	0	0	2	010	1122	1322	12052001	1000003163	024511	22064500000	3030795	11
0975	3	353	100	11	0.000	0.1	0.0	0.1	0	0	7.5	01	00	0	0	0	2	010	1121	1322	13052002	1000003163	025700	22064500000	3030795	11
0976	3	252	111	11	0.000	1.2	1.8	1.7	1	0	0.0	05	00	0	0	0	2	031	0000	1221	23062000	1000003163	031815	22064500000	3030795	11
0977	3	252	100	11	0.000	2.6	0.0	2.6	0	0	3.6	01	00	0	0	0	0	021	1111	0022	21092001	1000003163	034700	22064500000	3030795	11
0978	3	131	111	11	0.000	3.2	1.6	2.2	1	0	1.0	03	00	0	0	0	0	021	1121	0022	21082001	1000003163	036402	22064500000	3030795	11
0979	1	252	100	11	0.000	1.6	0.0	1.6	0	0	1.6	01	00	0	0	0	0	131	1111	0022	22032001	1000003992	022304	13044500000	0000000	11
0980	1	252	100	52	5.000	0.9	0.0	1.1	0	0	0.0	01	00	0	0	0	1	031	0000	1211	11062000	1000003942	063004	10044500000	0000975	11

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	RD/16 W BUR A	B T	FIRE TIME 1ST	SUB	ALL	R C H	D I R	TIM TO PCS	TRG PUL	2ND POSN FS	M	A	D	R G E	M E C	OTHR C U F	MSUM OIRA VZBN	Q V R AN S A NO	REEL	FRAME	DATE R	BN B R	DIV REG B	L AO MC
0981	1	252	111	52	3.000	3.0	2.8	2.8	1	0	0.0	05	00	0	0	0	1	031	0000	1211	11062000	1000003942	064000	10044500000		0000975	11
0982	1	252	100	11	0.000	2.0	0.0	2.0	0	0	0.0	01	00	0	0	0	1	031	0000	1211	13062000	1000003942	067407	10044500000		0000975	11
0983	3	454	131	21	0.000	2.0	5.2	3.6	1	0	0.0	02	00	0	0	0	2	031	1121	1311	11062002	1000003345	027901	13044500000		0000000	12
0984	3	151	100	11	0.000	0.7	0.0	0.7	0	0	0.0	01	00	0	0	0	0	010	1122	0012	13042002	1000009703	000213	06034500000		4151045	11
0985	3	212	200	11	0.000	1.8	0.0	1.8	0	0	0.0	01	00	0	0	0	0	031	0000	0011	23062000	1000009703	009410	06034500000		4151045	11
0986	1	252	100	11	0.000	1.2	0.0	1.2	0	1	1.3	01	00	0	0	0	0	010	1122	0022	21062002	1000004388	005106	16084500015		1510385	12
0987	1	454	111	11	0.000	1.9	4.0	3.0	1	0	0.0	02	00	0	0	0	3	010	1122	1321	22052005	1000004049	011600	19044500000		0000000	11
0988	1	353	111	52	3.700	0.9	1.3	1.2	1	0	0.0	03	00	0	0	0	4	021	1121	1322	11052001	1000009786	067815	00114300017		0000000	11
0989	1	373	111	11	0.000	1.0	4.9	3.6	1	0	0.0	03	00	0	0	0	4	032	0000	1322	12032000	1000004808	000215	07064500000		0000000	12
0990	1	353	111	11	0.000	1.8	2.8	2.5	1	2	1.9	03	00	0	0	0	4	010	0000	1322	11042000	1000004808	002913	07064500000		0000000	12
0991	1	454	100	11	0.000	0.0	0.0	0.0	0	0	0.0	01	00	0	0	0	4	010	0000	1322	12052000	1000004808	004207	07064500000		0000000	12
0992	1	353	211	11	0.000	3.2	3.9	3.7	1	2	0.0	03	00	1	0	0	4	022	0000	1322	12072000	1000004808	004802	07064500000		0000000	12
0993	1	353	111	11	0.000	3.2	3.7	3.5	1	0	1.4	03	00	0	0	0	0	010	0000	0022	12092000	1000004808	006815	07064500000		0000000	12
0994																											
0995	1	151	100	11	0.000	2.4	0.0	2.4	0	0	0.0	01	00	0	0	0	2	010	0000	1212	13072000	1000002208	007402	06034500000		0000033	11
0996	1	252	100	11	0.000	1.9	0.0	1.9	0	0	0.0	01	00	0	0	0	2	010	0000	1212	13062000	1000002208	008012	06034500000		0000033	11
0997	1	151	111	11	0.000	1.9	1.6	1.7	1	0	0.8	02	00	0	0	0	0	010	1111	0012	21082005	1000002208	018215	06034500000		0000033	11
0998	1	151	100	11	0.000	1.0	0.0	1.0	0	0	0.0	01	00	0	0	0	2	010	1112	1322	12072002	1000003168	036010	24014500000		0000000	11
0999	1	151	111	11	0.000	0.3	1.0	0.8	1	0	0.0	03	00	0	0	0	2	010	1112	1322	12072001	1000003168	036010	24014500000		0000000	11
1000	3	343	111	62	3.000	0.1	1.7	0.9	1	0	0.0	02	00	0	0	0	0	010	1111	0022	23022005	1000049660	054809	07026600000		3271015	14
1001	3	151	111	41	0.002	0.6	1.9	1.2	1	0	0.0	02	00	0	0	0	1	010	0000	1222	13062000	1000053410	040530	25036800000		0000825	14
1002	1	751	241	62	2.800	0.0	0.3	0.2	1	0	0.0	04	00	0	0	0	1	010	0000	1122	21072000	1000051381	032813	11056720000		0000255	14
1003	3	751	500	42	4.002	0.2	0.0	0.4	0	0	0.0	01	00	0	0	0	1	410	1122	1121	12032001	1000050865	010527	23116600000		0000007	14
1004	3	131	200	41	0.002	2.3	0.0	2.3	0	0	0.0	01	00	0	0	0	0	031	0000	0021	23092000	1000049848	032000	08046600015		0050255	14
1005	3	752	211	32	4.300	0.2	1.5	1.0	1	0	0.0	03	00	0	0	0	1	010	1112	1122	11032001	1000049848	036209	08046600015		0050255	14
1006	3	151	100	41	0.002	0.2	0.0	0.2	0	0	1.3	01	00	0	0	0	0	010	0000	0022	22072000	1000054137	071225	00026900000		0000000	14
1007	3	242	200	62	5.000	0.0	0.0	1.5	0	0	0.0	01	00	0	0	0	0	010	1121	0022	21042001	1000054137	082912	00026900000		0000000	14
1008	3	252	122	41	0.002	1.0	3.0	2.3	1	0	0.0	03	00	0	0	0	0	021	1121	0021	12031002	1000054515	041320	31016800000		0000000	14
1009	3	232	111	41	0.002	1.4	0.5	0.7	1	0	0.0	05	00	0	0	0	0	010	1121	0021	21031002	1000054515	042022	31016800000		0000000	14
1010																											
1011	1	756	200	42	7.002	0.0	0.6	1.9	0	2	0.6	01	00	0	0	0	1	110	0000	1122	21102000	1000051631	003924	04026720025		5030000	14
1012	1	756	641	41	0.002	0.2	0.3	0.3	1	0	0.7	06	00	0	0	0	1	110	0000	1322	22082000	1000051631	004930	04026720025		5030000	14
1013	1	751	641	42	2.802	0.3	0.5	0.4	1	0	0.0	05	00	0	0	0	1	010	0000	1322	21092000	1000051631	008005	04026720025		5030000	14
1014	3	353	100	41	0.002	5.0	0.0	5.0	0	0	0.0	01	00	0	0	0	2	031	1122	1322	13032001	1000051642	015028	20056700000		0000255	14
1015	1	353	100	41	0.002	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	0	010	0000	0022	12032000	1000051642	017401	20056700000		0000255	14
1016	3	454	111	41	0.002	0.8	1.4	1.1	1	0	0.0	02	00	0	0	0	0	010	0000	0022	22032000	1000051642	018106	20056700000		0000255	14
1017	1	252	100	41	0.002	0.0	0.0	0.0	0	0	0.1	01	00	0	0	0	1	010	1122	1322	23052001	1000051642	020321	20056700000		0000255	14
1018	1	323	200	42	9.012	0.0	0.0	2.4	0	0	1.0	01	00	1	0	0	1	310	1112	1322	21042001	1000051642	021821	20056700000		0000255	14
1019	1	333	111	41	0.002	0.0	0.6	0.4	3	0	0.0	04	00	0	0	0	1	010	0000	1322	21042000	1000051642	023714	20056700000		0000255	14
1020	1	757	241	41	0.002	0.2	1.0	0.6	1	0	0.0	02	00	0	0	0	1	010	1111	1322	23042001	1000051642	024334	20056700000		0000255	14
1021	1	333	100	42	9.012	0.0	0.0	0.7	0	0	0.0	01	00	0	0	0	1	031	0000	1322	13052000	1000051642	028528	20056700000		0000255	14
1022	1	252	142	41	0.002	0.3	2.0	1.4	2	0	2.0	03	00	2	0	0	2	010	1121	1322	12032001	1000051642	034622	20056700000		0000255	14
1023	1	252	111	41	0.002	3.7	1.9	2.5	1	0	0.0	03	00	0	0	0	2	010	1121	1322	23062001	1000051642	035010	20056700000		0000255	14
1024	1	751	200	62	7.000	1.5	0.0	2.8	0	0	0.0	01	00	0	0	0	3	010	0000	1322	11082000	1000052614	023915	10096700055		0600095	14
1025	1	151	200	62	5.000	1.0	0.0	1.2	0	0	0.0	01	00	0	0	0	3	010	0000	1322	13072000	1000052614	024710	10096700055		0600095	14
1026	3	151	111	41	0.002	3.5	1.1	1.9	1	0	0.0	03	00	0	0	0	0	031	0000	0022	21052000	1000052786	041818	00056820000		0000019	14
1027	3	151	111	41	0.002	1.5	1.8	1.8	1	0	0.0	06	00	0	0	0	0	010	0000	0022	12041000	1000052786	042311	00056820000		0000019	14
1028	3	131	411	41	0.002	0.4	0.5	0.5	1	0	0.0	04	00	0	0	0	0	031	0000	0022	22072000	1000052786	044117	00056820000		0000019	14
1029	3	515	100	42	4.002	1.3	0.0	1.8	0	0	0.0	01	00	0	0	0	1	010	0000	1322	21032000	1000054478	023216	01126920000		0000019	14

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS AIM FSP	M	RD/ 16 W BUR 8 A	T	FIRE TIME 1ST	SUB	ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	R G E	M E °C	OTHR C U F	MSUM OIKA VZBN	G A NO V R AN S	REEL	FRAME	DATE BN 8 R R	DIV REG B	L AO MC
1030	1	252	111	6211.700		0.0	0.9	0.6	1	0	0.0	03	00	0	0	0	1	010	0000	1322	12082000	1000054478	027921	01126920000	0000019	14
1031	1	252	111	41	0.002	0.8	0.7	0.8	1	0	6.0	02	00	0	0	0	1	021	1122	1322	23101003	1000054478	035727	01126920000	0000019	14
1032	1	252	100	41	0.002	1.8	0.0	1.8	0	0	0.0	01	00	0	0	0	0	010	1122	0012	11031001	1000054478	038023	01126920000	0000019	14
1033	1	151	111	6212.500		0.0	1.2	0.6	1	0	0.0	02	00	0	0	0	0	010	1222	0022	21022002	1000054478	038323	01126920000	0000019	14
1034	3	111	100	41	0.002	4.0	0.0	4.0	0	0	5.9	01	00	0	0	0	0	031	1111	0021	23022010	1000054478	052513	01126920000	0000019	14
1035	3	111	100	41	0.002	2.0	0.0	2.0	0	0	8.0	01	00	0	0	0	0	031	1111	0021	23022009	1000054478	052623	01126920000	0000019	14
1036	1	232	442	6215.000		0.6	5.6	3.9	1	0	0.5	03	00	0	0	0	1	032	1111	1322	11082003	1000054478	055935	01126920000	0000019	14
1037	1	151	200	42	6.012	0.8	0.0	1.7	0	0	1.1	01	00	0	0	0	1	010	1111	1322	11092004	1000054478	056007	01126920000	0000019	14
1038	1	151	111	41	0.002	1.8	0.7	1.0	1	0	2.4	04	00	0	0	0	1	110	1111	1322	11082005	1000054478	056223	01126920000	0000019	14
1039	1	555	100	41	0.002	2.0	0.0	2.0	0	0	9.9	01	00	0	0	0	1	032	1111	1322	11072001	1000054478	056517	01126920000	0000019	14
1040	3	754	241	41	0.002	1.0	0.5	0.6	1	1	0.4	03	00	0	0	0	0	010	1111	0022	23092004	1000051481	067620	07046720000	0000000	14
1041	3	252	111	41	0.002	0.1	0.7	0.6	1	1	0.0	11	00	0	0	0	0	010	1111	0022	22082002	1000051481	067832	07046720000	0000000	14
1042	3	252	111	41	0.002	3.3	1.2	1.7	1	1	0.0	04	00	0	0	0	0	010	1111	0022	21072003	1000051481	067738	07046720000	0000000	14
1043	3	252	100	41	0.002	0.4	0.0	0.4	0	1	0.0	01	00	0	0	0	1	010	1122	1222	22052001	1000051481	068413	07046720000	0000000	14
1044	3	252	100	41	0.002	0.5	0.0	0.5	0	0	0.0	01	00	0	0	0	1	010	1122	1222	22062001	1000051481	068533	07046720000	0000000	14
1045	3	254	111	41	0.002	0.3	0.3	0.3	1	0	0.0	04	00	0	0	0	1	022	1112	1322	21092001	1000051481	073722	07046720000	0000000	14
1046	3	252	132	42	4.702	0.0	3.8	2.5	1	0	0.0	03	00	0	0	0	0	010	0000	0022	12012000	1000052603	016738	21106720025	5021015	14
1047	1	151	111	41	0.002	0.9	1.0	1.0	1	0	0.0	10	00	0	0	0	1	022	1112	1322	22052001	1000052603	017513	21106720025	5021015	14
1048	3	252	111	41	0.002	0.6	0.6	0.6	1	0	0.0	19	00	0	0	0	1	032	1111	1322	23052002	1000052603	017513	21106720025	5021015	14
1049	3	751	242	62	6.200	0.7	1.6	1.6	1	0	0.9	16	00	6	0	0	1	010	1111	1322	21062004	1000052603	017535	21106720025	5021015	14
1050	3	555	111	41	0.002	0.6	0.6	0.6	1	0	6.9	05	00	0	0	0	1	022	1112	1322	22062001	1000052603	019507	21106720025	5021015	14
1051	3	353	111	41	0.002	0.4	0.4	0.4	1	0	0.0	08	00	0	0	0	0	010	0000	0022	12082000	1000052603	021018	21106720025	5021015	14
1052	3	444	142	62	6.000	0.6	4.6	3.3	1	0	0.0	03	00	0	0	0	0	033	1121	0022	13022001	1000052603	021418	21106720025	5021015	14
1053	3	353	100	41	0.001	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	0	032	0000	0022	13082000	1000052603	022503	21106720025	5021015	14
1054	3	353	111	41	0.002	0.3	0.3	0.3	1	0	0.0	05	00	0	0	0	0	022	0000	0022	12032100	1000052603	022917	21106720025	5021015	14
1055	1	232	111	41	0.002	1.5	1.6	1.6	1	0	0.0	06	00	0	0	0	1	031	1111	1311	21031001	1000052748	003515	06056800000	0000000	14
1056	2	434	100	31	0.000	4.2	0.0	4.2	0	0	0.0	01	00	0	0	0	3	031	1111	1321	13081004	1000054049	060007	21026920000	0110000	14
1057	2	434	100	31	0.000	0.6	0.0	0.6	0	0	0.0	01	00	0	0	0	3	031	1111	1321	11081003	1000054049	060007	21026920000	0110000	14
1058	2	232	100	31	0.000	2.0	0.0	2.0	0	0	0.0	01	00	0	0	0	3	031	0000	1321	12071000	1000054049	062115	21026920000	0110000	14
1059	2	232	111	31	0.000	2.7	2.7	2.7	1	0	0.0	03	00	0	0	0	3	031	0000	1321	12071000	1000054049	062725	21026920000	0110000	14
1060	2	232	111	31	0.000	0.1	2.9	2.2	1	0	0.0	04	00	0	0	0	3	031	1111	1321	11081002	1000054049	068807	21026920000	0110000	14
1061	2	232	111	31	0.000	2.2	6.7	4.5	1	0	0.0	02	00	0	0	0	3	031	1111	1321	11081003	1000054049	068807	21026920000	0110000	14
1062	2	434	131	31	0.000	0.5	6.2	3.4	1	0	0.0	02	00	0	0	0	3	031	1111	1321	11061001	1000054049	069913	21026920000	0110000	14
1063	2	515	100	31	0.000	3.2	0.0	3.2	0	0	0.0	01	00	0	0	0	3	031	1111	1321	11061002	1000054049	069913	21026920000	0110000	14
1064	2	232	100	31	0.000	1.4	0.0	1.4	0	0	0.0	01	00	0	0	0	3	031	0000	1321	11091000	1000054049	070527	21026920000	0110000	14
1065	2	555	111	31	0.000	1.8	0.7	0.8	1	0	0.0	08	00	0	0	0	3	031	1111	1321	13031001	1000054049	071932	21026920000	0110000	14
1066	2	434	111	31	0.000	1.8	1.2	1.3	1	0	0.0	05	00	0	0	0	3	031	1111	1321	11031002	1000054049	071932	21026920000	0110000	14
1067																										
1068																										
1069	1	751	211	41	0.002	0.7	0.7	0.7	1	0	0.0	03	00	0	0	0	0	031	0000	0021	21092000	1000054753	065116	07056800000	0000000	14
1070	1	151	111	41	0.002	0.5	1.9	1.2	1	0	0.0	02	00	0	0	0	0	021	1111	0021	22092002	1000054753	065323	07056800000	0000000	14
1071	3	656	111	41	0.002	0.2	0.4	0.4	1	0	0.0	05	00	0	0	0	0	021	1111	0021	23092002	1000054753	066104	07056800000	0000000	14
1072	1	751	211	62	3.600	0.2	1.1	0.9	1	0	0.0	07	00	0	0	0	0	010	1221	0022	21092002	1000054753	066630	07056800000	0000000	14
1073	1	151	111	41	0.002	1.9	1.7	1.8	1	0	0.0	02	00	0	0	0	3	010	1112	1322	22092004	1000054773	038715	14016820025	0120019	14
1074	3	751	211	62	6.700	0.8	5.4	3.8	1	0	0.0	03	00	0	0	0	1	010	1121	1322	23042001	1000054773	039710	14016820025	0120019	14
1075	3	343	100	6217.000		0.4	0.0	5.7	0	0	0.0	01	00	0	0	0	0	032	1121	0022	23042001	1000054773	069226	14016820025	0120019	14
1076	3	242	111	62	2.600	0.1	1.5	1.2	1	0	0.0	05	05	0	0	0	2	033	1121	1322	23032003	1000054773	069618	14016820025	0120019	14
1077	3	242	111	62	2.300	0.5	0.9	0.9	1	0	0.0	10	00	0	0	0	2	033	1121	1322	23032002	1000054773	070237	14016820025	0120019	14
1078	3	242	111	62	3.400	0.0	1.9	1.6	1	0	0.0	07	00	0	0	0	2	033	1121	1322	22062001	1000054773	070811	14016820025	0120019	14

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	RD/ W BUR A	16 B T	FIRE TIME 1ST	SUB	ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	R G E	M E C	OTHR C U F	MSUM OIRA VZBN	Q V A NO R AN S	REEL	FRAME	DATE BN B R R	REG DIV B	L AO MC
1079	3	751	641	62	2.500	0.8	2.2	2.1	1	2	0.0	12	00	0	0	0	1	010	1122	1322	22062001	1000053528	015421	22076820015	0080019	14
1080	3	751	200	62	5.000	1.4	0.0	1.7	0	0	0.0	01	00	0	0	0	2	010	1222	1322	21092001	1000052355	068130	05096720000	0000000	14
1081	3	151	111	41	0.002	0.5	2.6	1.9	1	0	0.0	03	00	0	0	0	0	022	1111	0022	22042008	1000052355	070710	05096720000	0000000	14
1082	3	151	100	41	0.002	5.5	0.0	5.5	0	0	0.0	01	00	0	0	0	0	022	1111	0022	22042007	1000052355	070710	05096720000	0000000	14
1083	3	151	111	41	0.002	3.8	0.2	2.0	1	0	0.0	02	00	0	0	0	0	022	1111	0022	23042004	1000052355	070710	05096720000	0000000	14
1084	3	454	100	31	0.000	2.6	0.0	2.6	0	0	0.0	01	00	0	0	0	1	010	1111	1322	21092001	1000052555	040307	31016800000	0000255	14
1085	3	151	111	31	0.000	0.6	10.2	5.4	1	0	0.0	02	00	0	0	0	3	010	1122	1322	11072003	1000050478	017518	01106500025	0160015	14
1086	1	756	241	31	0.000	0.0	1.0	0.5	1	0	0.0	02	00	0	0	0	0	210	1122	0022	11032002	1000050476	020433	01106500025	0160015	14
1087	1	343	111	62	5.000	6.2	2.9	4.6	1	0	0.0	02	00	0	0	0	0	032	1111	0022	13032002	1000050478	021323	01106500025	0160015	14
1088	1	751	211	62	7.000	0.0	2.9	1.5	1	0	0.0	02	00	0	0	0	0	022	1122	0022	12092001	1000056031	003605	21087000015	0610055	14
1089	1	751	211	62	7.000	0.0	4.1	2.1	1	0	0.0	02	00	0	0	0	0	022	0000	0022	12102000	1000056031	003813	21067000015	0610055	14
1090	3	151	211	41	0.002	0.0	1.0	0.5	1	1	1.1	02	00	0	0	0	1	010	1222	1222	12092006	1000056419	060909	15017120000	0000019	14
1091	3	151	200	41	0.002	1.1	0.0	1.1	0	1	0.0	01	00	0	0	0	1	010	1222	1222	22122003	1000056419	061437	15017120000	0000019	14
1092	3	751	611	62	4.700	0.0	1.6	1.5	1	0	0.0	15	00	0	0	0	0	010	1122	0012	11031004	1000055334	084520	01126900000	0000000	14
1093	3	751	641	62	8.300	0.0	5.4	3.6	1	0	0.0	03	00	0	0	0	3	022	1121	1322	21061002	1000055334	095403	01126900000	0000000	14
1094	1	751	611	62	3.400	1.5	0.8	0.9	1	0	0.0	05	00	0	0	0	0	010	1122	0022	21092004	1000055334	096818	01126900000	0000000	14
1095	1	751	241	42	3.002	0.1	0.5	0.4	1	0	0.6	04	00	0	0	0	1	110	1112	1222	21042002	2000004476	012122	08056700000	0000000	24
1096	1	751	200	42	6.002	0.0	0.0	0.4	0	0	6.9	01	00	0	0	0	1	010	1112	1222	21052001	2000004476	012133	08056700000	0000000	24
1097	1	751	241	42	4.002	0.5	2.0	1.6	1	0	0.0	04	00	0	0	0	1	010	1112	1222	21041001	2000004476	013800	08056700000	0000000	24
1098	1	151	141	41	0.002	0.6	0.3	0.4	1	0	5.4	04	00	0	0	0	1	110	1112	1222	21061002	2000004476	014133	08056700000	0000000	24
1099	2	151	132	42	4.002	1.6	1.2	1.3	1	0	3.4	03	00	0	0	0	3	023	1222	1321	12071002	2000004476	021108	08056700000	0000000	24
1100	1	252	100	62	4.000	6.5	0.0	7.0	0	0	0.0	01	00	0	0	0	0	022	1121	0022	23062001	2000005747	003103	20116800000	0000000	24
1101	3	751	211	62	15.000	0.1	4.3	2.2	1	0	0.0	02	00	6	0	0	3	010	1112	1322	13082001	2000005747	009315	20116800000	0000000	24
1102	3	751	211	62	7.500	0.0	2.8	1.4	1	0	0.0	02	00	6	0	0	3	010	1112	1322	23082001	2000005747	009605	20116800000	0000000	24
1103																										
1104																										
1105	3	151	111	41	0.002	0.0	1.6	1.2	1	2	0.0	04	00	0	0	0	1	010	1122	1222	21031004	2000006860	030337	18047000000	0000000	24
1106	1	151	111	41	0.002	1.9	0.5	0.6	3	2	3.7	18	00	0	0	0	1	010	0000	1222	11032200	2000006861	027303	18047000000	0000000	24
1107	1	151	111	41	0.002	3.8	2.6	3.2	1	2	0.0	02	00	0	0	0	1	010	0000	1222	11032000	2000006861	027917	16047000000	0000000	24
1108	3	656	100	31	0.000	1.3	0.0	1.3	0	0	0.0	01	00	0	0	0	3	021	0000	1321	22052000	2000004003	010934	08066600015	0010000	24
1109	1	343	111	62	4.500	1.2	1.5	1.5	1	0	0.0	04	00	0	0	0	0	022	1122	0022	13052001	2000004006	014414	10066600000	0000035	24
1110	1	343	100	62	2.000	0.5	0.0	0.7	0	0	0.0	01	00	0	0	0	0	022	1122	0022	13052001	2000004006	014737	10066600000	0000035	24
1111	1	752	200	31	0.000	0.5	0.0	0.5	0	0	0.0	01	00	0	0	0	1	010	0000	1122	11102000	2000004006	018133	10066600000	0000035	24
1112	1	151	100	31	0.000	0.4	0.0	0.4	0	0	0.0	01	00	0	0	0	0	010	1122	0022	11032003	2000004006	018818	10066600000	0000035	24
1113	1	751	200	31	0.000	2.0	0.0	2.0	0	0	0.0	01	00	0	0	0	0	010	1122	0022	11032002	2000004006	019033	10066600000	0000035	24
1114	3	645	111	62	8.500	3.7	2.5	3.1	1	0	0.0	02	00	0	0	0	2	010	1122	1222	23062001	2000004006	020834	10066600000	0000035	24
1115	3	343	100	62	5.000	0.0	0.0	0.3	0	0	0.0	01	00	0	0	0	0	022	0000	0022	13082000	2000004013	035521	06076600015	0030000	24
1116	3	343	111	62	4.300	0.6	1.0	0.9	1	0	0.0	04	00	0	0	0	0	022	0000	0012	13071090	2000004013	035623	06076600015	0030000	24
1117	3	712	211	31	0.000	0.5	1.0	0.7	1	0	0.0	02	00	0	0	0	0	021	0000	0022	13032000	2000004016	013422	10066600000	0000000	24
1118	3	242	100	62	6.000	0.1	0.0	0.5	0	0	0.0	01	00	0	0	0	5	031	0000	1321	13072000	2000004016	016412	10066600000	0000000	24
1119	3	242	111	62	5.000	0.0	1.6	0.8	1	0	0.0	02	00	0	0	0	5	031	0000	1321	13082000	2000004016	016505	10066600000	0000000	24
1120	3	242	111	62	5.700	0.5	1.2	1.1	1	0	0.0	07	00	0	0	0	5	031	0000	1321	12092000	2000004016	016810	10066600000	0000000	24
1121	3	111	111	31	0.000	0.9	2.1	1.7	1	0	0.0	03	00	0	0	0	0	010	1112	0022	11031002	2000004035	013314	00076600000	0000000	24
1122	3	151	100	31	0.000	1.4	0.0	1.4	0	0	1.6	01	00	0	0	0	0	010	1112	0022	11031001	2000004035	013413	00076600000	0000000	24
1123	3	151	100	31	0.000	1.8	0.0	1.8	0	0	2.5	01	00	0	0	0	0	010	1112	0022	11041003	2000004035	013434	00076600000	0000000	24
1124	3	343	111	62	4.000	2.0	1.8	1.9	1	0	0.0	03	00	0	0	0	0	031	1121	0022	21082101	2000004037	025304	05096600000	0000000	24
1125	3	343	100	62	5.000	2.9	0.0	3.5	0	0	0.0	01	00	0	0	0	0	031	1121	0022	11082101	2000004037	025722	05096600000	0000000	24
1126	3	343	100	62	7.000	0.0	0.0	0.9	0	0	0.0	01	00	0	0	0	3	031	1121	1322	12072101	2000004037	026713	05096600000	0000000	24
1127	3	131	100	42	4.002	3.5	0.0	3.8	0	0	0.0	01	00	0	0	0	2	031	1121	0021	12081003	2000005260	015123	14026800000	0000000	24

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	W A	RD/ BUR 16 9 T	FIRE TIME 1ST	SUB	ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	R G E	M E C	OTHR C U F	MSUM OIMA VZBN	Q V AN	A NO R S	REEL	FRAME	DATE BN B R R	DIV REG B	L AO MC
1128	3	111	200	42	5.002	0.8	0.0	1.4	0	0	0.0	01	00	0	0	0	2	031	1111	1321	2304	2001	2000005260	015408	14026800000	0000000	24
1129	3	131	411	42	2.202	0.2	0.5	0.5	1	0	0.0	06	00	0	0	0	2	031	1111	1321	2106	1007	2000005260	015408	14026800000	0000000	24
1130	3	131	100	42	3.002	1.0	0.0	1.1	0	0	0.0	01	00	0	0	0	2	031	1111	1321	2107	1008	2000005260	015408	14026800000	0000000	24
1131	3	151	111	62	3.700	0.2	1.8	1.5	1	0	0.0	06	00	0	0	0	2	010	1112	1212	1206	1001	2000005260	016002	14026800000	0000000	24
1132	3	151	100	41	0.002	0.7	0.0	0.7	0	0	0.0	01	00	0	0	0	2	010	1112	1212	1208	1002	2000005260	016527	14026800000	0000000	24
1133	3	252	111	41	0.002	0.7	0.8	0.8	1	0	0.0	08	00	0	0	0	0	010	1121	0012	1109	1003	2000005260	025505	14026800000	0000000	24
1134	3	232	111	41	0.002	2.6	2.7	2.7	1	0	0.0	03	00	0	0	0	0	021	0000	0012	2109	1000	2000005260	027307	14026800000	0000000	24
1135	3	151	211	41	0.002	0.2	0.4	0.3	1	0	0.0	06	00	0	0	0	0	010	1111	0012	1209	1003	2000005260	028225	14026800000	0000000	24
1136	3	751	211	41	0.001	0.2	0.3	0.3	1	0	0.1	10	00	0	0	0	0	010	1111	0012	1309	1001	2000005260	028227	14026800000	0000000	24
1137	3	641	111	62	6.500	0.0	1.0	0.8	1	0	0.0	06	00	0	0	0	0	010	1112	0011	1102	1003	2000005260	028903	14026800000	0000000	24
1138	3	151	111	41	0.002	1.7	2.1	2.0	1	0	0.0	03	00	0	0	0	0	010	1112	0012	1102	1001	2000005260	028903	14026800000	0000000	24
1139	3	646	111	62	4.000	0.4	1.0	0.7	1	0	0.0	02	00	0	0	0	0	010	1112	0011	1102	1003	2000005260	029303	14026800000	0000000	24
1140	3	151	100	41	0.001	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	0	010	1112	0012	1303	1001	2000005260	029303	14026800000	0000000	24
1141	1	156	100	41	0.002	2.4	0.0	2.4	0	0	1.2	01	00	0	0	0	1	010	1122	1212	1108	1001	2000005274	011627	07026800000	0000000	24
1142	3	242	111	62	2.500	0.0	1.5	1.3	1	0	0.0	08	00	0	0	0	0	031	1121	0011	1108	1001	2000005274	026003	07026800000	0000000	24
1143	3	154	111	41	0.002	2.7	1.9	2.3	1	0	22.6	02	00	0	0	0	1	410	0000	2121	1107	1000	2000004965	031527	22126700000	0000000	24
1144	3	151	111	41	0.001	2.1	2.4	2.2	1	0	3.3	02	00	0	0	0	1	010	0000	2121	1107	1000	2000004965	032237	22126700000	0000000	24
1145	3	252	100	41	0.002	0.1	0.0	0.1	0	0	0.0	01	00	0	0	0	1	022	1121	1211	2207	1001	2000005216	016020	15026800000	0000000	24
1146	3	252	211	41	0.002	0.3	0.8	0.6	1	0	0.0	02	00	0	0	0	0	031	0000	0011	1107	1000	2000005216	017617	15026800000	0000000	24
1147	3	111	100	41	0.002	0.9	0.0	0.9	0	0	0.0	01	00	0	0	0	2	031	0000	0011	1308	1000	2000005216	026817	15026800000	0000000	24
1148	3	111	111	41	0.002	0.7	1.5	1.4	1	0	0.0	05	00	0	0	0	2	031	0000	0011	1307	1000	2000005216	027204	15026800000	0000000	24
1149	3	252	100	41	0.002	1.4	0.0	1.4	0	0	3.4	01	00	0	0	0	0	021	1122	0022	2107	1001	2000005235	024100	24036800000	0000000	24
1150	3	242	211	62	4.000	0.6	5.2	3.7	1	0	0.0	03	00	0	0	0	0	033	1121	0022	2206	1001	2000004410	010415	21036700000	0000000	24
1151	3	444	142	62	5.000	1.3	2.3	2.1	1	0	0.0	04	05	0	0	0	6	033	1121	0022	2207	1001	2000004410	011334	21036700000	0000000	24
1152	3	444	111	62	7.000	3.5	1.7	2.1	1	0	1.6	05	00	0	0	0	6	033	1121	0022	1106	1001	2000004410	012603	21036700000	0000000	24
1153	3	242	111	62	7.500	1.5	6.2	3.9	1	0	0.6	02	00	0	0	0	6	033	1111	0022	1206	1002	2000004410	014137	21036700000	0000000	24
1154	3	252	100	41	0.002	8.1	0.0	8.1	0	0	0.0	01	00	0	0	0	0	031	1111	0022	2203	2001	2000004805	001737	01036700000	0000000	24
1155	3	353	111	41	0.002	6.9	3.0	4.0	1	0	0.0	04	00	0	0	0	0	010	1111	0022	2310	2002	2000004805	001737	01036700000	0000000	24
1156	3	454	111	41	0.002	1.2	3.7	3.2	1	0	0.0	05	00	0	0	0	0	021	1111	0022	2310	2003	2000004805	001737	01036700000	0000000	24
1157	3	454	111	41	0.002	0.7	3.5	2.1	1	0	0.0	02	00	0	0	0	0	021	1111	0022	1109	2003	2000004805	002803	01036700000	0000000	24
1158	3	353	100	41	0.002	2.9	0.0	2.9	0	0	0.0	01	00	0	0	0	0	010	1111	0022	1209	2002	2000004805	002803	01036700000	0000000	24
1159	3	252	111	41	0.002	1.5	4.6	3.0	1	0	0.0	02	00	0	0	0	0	031	1111	0022	2308	2001	2000004805	002803	01036700000	0000000	24
1160	3	353	100	41	0.002	0.1	0.0	0.1	0	0	0.0	01	00	0	0	0	5	010	0000	0022	1306	2000	2000004805	003137	01036700000	0000000	24
1161	3	353	111	41	0.002	0.5	3.6	2.6	1	0	0.0	03	00	0	0	0	3	010	0000	1222	1306	2000	2000004805	003504	01036700000	0000000	24
1162	3	454	111	41	0.002	1.0	4.2	3.1	1	0	0.0	03	00	0	0	0	0	021	1122	0022	1303	2001	2000004805	004037	01036700000	0000000	24
1163	3	343	121	62	7.000	0.4	6.2	3.3	1	0	0.0	02	00	0	0	0	0	032	1121	0022	1310	1002	2000004429	037533	12026700000	0000000	24
1164	3	353	111	31	0.000	0.2	2.0	1.4	1	0	0.0	03	00	0	0	0	0	010	1111	0022	2307	1002	2000004421	037528	21026700015	0090000	24
1165	3	252	111	31	0.000	0.4	1.9	1.6	1	0	0.0	05	00	0	0	0	0	022	1111	0022	1304	1001	2000004421	037917	21026700015	0090000	24
1166	3	555	131	31	0.000	2.2	9.6	5.9	1	0	0.0	02	00	0	0	0	0	022	1111	0022	1209	2002	2000004421	039426	21026700015	0090000	24
1167	3	353	100	31	0.000	2.5	0.0	2.5	0	0	6.3	01	00	0	0	0	0	022	1111	0022	1109	2001	2000004421	039818	21026700015	0090000	24
1168	3	454	111	31	0.000	0.5	1.8	1.5	1	0	0.0	04	00	0	0	0	0	022	1111	0022	2109	1007	2000004421	039426	21026700015	0090000	24
1169	3	252	100	31	0.000	2.2	0.0	2.2	0	0	0.0	01	00	0	0	0	0	022	1111	0022	2304	2005	2000004421	039426	21026700015	0090000	24
1170	3	252	111	41	0.002	0.1	0.3	0.3	1	0	0.0	05	00	0	0	0	0	021	1111	0022	1304	2003	2000004420	000808	24056700000	0000000	24
1171	3	242	111	62	6.700	0.4	1.0	0.8	1	0	0.0	03	00	0	0	0	0	021	1111	0022	1209	2001	2000004420	000808	24056700000	0000000	24
1172	3	242	111	62	2.200	0.6	0.4	0.4	1	0	0.0	06	00	0	0	0	0	021	1121	0022	1302	2001	2000004420	001604	24056700000	0000000	24
1173	3	242	111	62	4.800	2.2	1.6	1.6	1	0	0.0	08	00	4	0	0	4	021	0000	1322	1307	2000	2000004420	002813	24056700000	0000000	24
1174	3	713	200	41	0.002	0.2	0.0	0.2	0	0	1.7	01	00	0	0	0	0	031	1111	0022	2103	2002	2000004420	005428	24056700000	0000000	24
1175	3	753	211	41	0.002	1.9	1.5	1.7	1	0	0.0	02	00	0	0	0	0	031	1111	0022	2303	2001	2000004420	005327	24056700000	0000000	24
1176	3	222	111	41	0.002	1.1	1.9	1.6	1	0	0.0	03	00	0	0	0	2	031	1121	1322	2304	2001	2000004420	028339	24056700000	0000000	24

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	RD/16 W A	BUR B T	FIRE TIME 1ST	SUB	ALL	RCH	DIR	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	RGE	MEC	OTHR CUF	MSUM OIRA VZBN	QVAN ARS NO	VEEL	FRAME	DATE BN B R R	DIV REG B	LAO MC
1177	3	252	241	41	0.002	0.0	0.5	0.3	3	0	0.0	03	00	0	0	0	0	021	1121	0022	11091001	2000004420	029322	24056700000	0000000	24
1178	1	752	211	32	2.400	0.2	0.7	0.6	1	0	1.0	07	00	0	0	0	1	110	1112	1222	11031001	2000004350	020707	06096600036	0000000	24
1179	1	252	111	31	0.000	0.2	0.5	0.5	1	0	2.8	05	00	0	0	0	1	110	1112	1222	11031002	2000004350	020803	06096600036	0000000	24
1180	1	252	142	32	2.800	0.1	0.7	0.6	1	0	2.9	06	50	0	0	0	1	110	1112	1222	11031003	2000004350	020807	06096600036	0000000	24
1181	3	756	611	62	4.200	0.3	1.1	1.0	1	0	6.3	07	00	0	0	0	0	022	0000	0022	12061000	2000004391	014929	17046700000	0000000	24
1182	3	752	600	42	6.002	0.2	0.0	0.9	0	0	0.0	01	00	0	0	0	0	032	0000	0022	11031000	2000004391	015336	17046700000	0000000	24
1183	3	343	111	62	6.700	6.2	3.3	4.3	1	0	0.0	03	00	0	0	0	0	010	1122	0022	11041001	2000004391	036338	17046700000	0000000	24
1184	3	343	111	62	5.000	0.0	8.0	4.0	1	0	0.0	02	00	0	0	0	0	010	1122	0022	12051001	2000004391	037128	17046700000	0000000	24
1185	3	151	122	41	0.002	1.0	1.2	1.2	3	0	0.0	04	00	0	0	0	0	021	0000	0021	12041000	2000004391	037811	17046700000	0000000	24
1186	3	731	600	42	8.012	0.0	0.0	1.3	0	0	0.0	01	00	0	0	0	2	021	0000	1321	12061000	2000004391	038633	17046700000	0000000	24
1187	3	151	111	41	0.002	1.2	1.9	1.6	1	0	0.5	02	00	0	0	0	0	010	0000	0022	11091000	2000004393	039404	03056700000	0000000	24
1188	3	242	142	62	4.400	4.2	3.7	3.7	1	0	0.0	09	00	0	0	0	0	023	1121	0022	23051002	2000004393	042423	03056700000	0000000	24
1189	3	252	111	31	0.000	0.8	1.7	1.5	1	0	0.0	08	00	0	0	0	0	032	1112	0022	11051002	2000004448	010822	12046700000	0000000	24
1190	3	252	122	31	0.000	0.0	1.5	1.4	1	0	0.0	10	00	0	0	0	0	010	1111	0022	11051001	2000004448	010822	12046700000	0000000	24
1191	3	252	100	31	0.000	1.2	0.0	1.2	0	0	0.0	01	00	0	0	0	0	032	1111	0022	11031001	2000004448	011633	12046700000	0000000	24
1192	3	252	111	31	0.000	1.2	2.6	2.1	1	0	0.0	03	00	0	0	0	0	032	1111	0022	13032002	2000004448	011633	12046700000	0000000	24
1193	3	252	411	31	0.000	0.0	0.4	0.4	1	0	0.0	06	00	0	0	0	0	022	0000	0022	11031000	2000004448	012128	12046700000	0000000	24
1194																										
1195	3	751	211	62	4.400	0.0	1.5	1.3	1	0	0.0	09	00	6	0	0	1	022	1121	1222	13091003	2000004448	029113	12046700000	0000000	24
1196	3	751	200	62	4.000	0.0	0.0	0.5	0	0	0.0	01	00	0	0	0	1	022	1122	1222	12071002	2000004448	029813	12046700000	0000000	24
1197	3	751	611	62	4.000	0.0	0.9	0.9	1	0	0.0	13	00	0	0	0	1	022	1122	1222	12031002	2000004448	033106	12046700000	0000000	24
1198	3	151	111	31	0.000	0.0	0.5	0.3	1	0	0.0	02	00	0	0	0	1	022	0000	1222	12091000	2000004448	033915	12046700000	0000000	24
1199	3	751	211	62	6.000	0.0	1.4	0.9	1	0	0.0	03	00	6	0	0	0	022	0000	0022	13041006	2000004448	034023	12046700000	0000000	24
1200	3	752	200	31	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	0	010	0000	0022	21012000	2000004444	025328	05026700000	0000000	24
1201	3	252	100	31	0.000	0.0	0.0	0.0	0	0	0.0	01	00	0	0	0	3	010	0000	1322	11052000	2000004444	025720	05026700000	0000000	24
1202	3	252	100	31	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	3	010	0000	1322	11072000	2000004444	025817	05026700000	0000000	24
1203	1	752	200	62	4.000	1.8	0.0	2.2	0	0	0.0	01	00	0	0	0	1	032	1122	1222	23031002	2000004363	030414	17036700000	0000035	24
1204	1	752	211	62	4.200	0.1	1.3	1.0	1	0	0.0	04	00	0	0	0	1	032	1122	1222	11021001	2000004363	030537	17036700000	0000035	24
1205	1	751	211	62	3.800	0.0	0.9	0.7	1	0	0.0	05	00	0	0	0	0	010	1122	0022	11091001	2000004363	[illegible]	17036700000	0000035	24
1206	1	752	211	32	4.000	1.0	1.0	1.0	1	0	0.0	02	00	0	0	0	2	010	1112	1322	11031001	2000004363	034512	17036700000	0000035	24
1207	1	752	242	62	5.200	0.2	1.4	1.0	1	0	4.8	03	00	0	0	0	2	010	1112	1322	13031002	2000004363	034808	17036700000	0000035	24
1208	1	252	142	31	0.000	0.7	0.9	0.8	3	0	2.0	06	00	0	0	0	0	021	1112	0022	11091002	2000004367	029623	10036700000	0000000	24
1209	1	252	100	31	0.000	1.5	0.0	1.5	0	0	7.9	01	00	0	0	0	1	323	1111	0022	11051004	2000004367	031504	10036700000	0000000	24
1210	3	152	100	41	0.002	0.5	0.0	0.5	0	0	0.0	01	00	0	0	0	2	032	1121	0012	12061002	2000005244	031517	13026800000	0000000	24
1211	3	257	111	31	0.000	0.5	0.3	0.3	1	0	0.0	05	00	0	0	0	1	021	0000	1222	21071000	2000005245	024733	21026800000	0000035	24
1212	3	252	100	41	0.002	0.9	0.0	0.9	0	0	0.0	01	00	0	0	0	1	031	1121	1221	21061001	2000005245	025915	21026800000	0000035	24
1213	3	252	111	42	4.002	0.5	1.2	0.8	1	0	0.0	02	00	4	0	0	2	010	1121	1222	21061002	2000005245	026335	21026800000	0000035	24
1214	3	252	111	41	0.002	1.0	0.4	0.7	1	0	4.6	02	00	0	0	0	2	310	1121	1222	22061001	2000005245	026737	21026800000	0000035	24
1215	3	212	111	42	4.002	0.8	2.9	1.9	1	0	0.0	02	00	0	0	0	2	021	1121	1221	22071001	2000005245	027024	21026800000	0000035	24
1216	3	212	111	41	0.002	0.6	1.5	1.3	1	0	0.0	05	00	0	0	0	0	021	0000	0021	23071000	2000005245	027615	21026800000	0000035	24
1217																										
1218																										
1219	3	252	100	31	0.000	0.5	0.0	0.5	0	0	0.0	01	00	0	0	0	2	022	0000	1322	13061000	2000004501	035633	07036700015	0090035	24
1220	1	751	200	31	0.000	0.0	0.0	0.0	0	0	0.3	01	00	0	0	0	1	010	1122	1222	21081003	2000004523	000510	04076700000	0000000	24
1221	1	454	132	41	0.002	2.1	2.4	2.4	1	0	5.2	05	00	0	0	0	0	021	1111	0021	11071101	2000004523	005733	04076700000	0000000	24
1222	1	454	132	41	0.001	1.1	2.0	1.9	1	0	5.9	06	00	0	0	0	3	021	1111	1321	11061102	2000004523	005810	04076700000	0000000	24
1223	1	751	611	41	0.002	0.4	0.4	0.4	1	0	0.0	07	00	0	0	0	3	010	0000	1322	21061000	2000004523	006607	04076700000	0000000	24
1224	1	751	611	62	3.500	0.6	1.2	0.9	1	0	0.0	02	00	0	0	0	0	022	1121	0022	22032003	2000004524	028223	01076700035	0260015	24
1225	1	751	211	62	4.300	0.1	1.2	1.0	1	0	0.0	06	00	6	0	0	0	022	1122	0022	22032003	2000004524	029633	01076700035	0260015	24

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	W A	RD/16 BUR B T	FIRE TIME 1ST	FIRE TIME SUB	FIRE TIME ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND FS	POSN M	POSN A	POSN D	R G E	M E C	OTHR C U F	MSUM OIRA VZBN	Q V A R NO AN S	REEL	FRAME	DATE BN B R R	REG DIV B	L AO MC
1226	3	454	100	41	0.002	1.9	0.0	1.9	0	0	0.0	01	00	0	0	0	0	010	0000	0022	11032000	2000004544	006402	06076700035	0050015	24
1227																										
1228	1	252	111	31	0.000	0.3	0.3	0.3	1	0	0.0	03	00	0	0	0	0	032	0000	0022	12101000	2000004671	021116	10036700025	0050015	24
1229	3	343	100	62	4.000	4.7	0.0	5.1	0	0	0.0	01	00	0	0	0	0	010	0000	0022	23041000	2000004671	021238	10036700025	0050015	24
1230	1	454	100	31	0.000	1.6	0.0	1.6	0	0	0.0	01	00	0	0	0	3	010	0000	1322	12061000	2000004671	021823	10036700025	0050015	24
1231	1	751	211	42	2.302	0.0	0.7	0.5	1	0	0.0	03	00	0	0	0	5	010	0000	1321	12051000	2000004709	022900	05096700000	0000000	24
1232	3	151	111	31	0.000	2.5	1.3	1.5	1	2	0.0	05	00	0	0	0	1	010	0000	0021	11032000	2000004746	026425	00106700000	0000000	24
1233	3	454	100	41	0.002	[illegible]	0.0	1.7	0	1	0.5	01	00	0	0	0	0	022	0000	0022	12021000	2000004748	000535	02036700000	0000035	24
1234	3	253	111	31	0.000	1.0	0.4	0.6	1	1	6.2	03	00	0	0	0	0	032	0000	0022	12021000	2000004748	001302	02036700000	0000035	24
1235																										
1236	3	252	132	41	0.002	0.0	4.5	3.4	3	0	0.0	04	00	0	0	0	0	022	1121	0022	22021102	2000004748	006100	02036700000	0000035	24
1237	1	151	111	41	0.002	0.4	0.4	0.4	1	0	0.0	04	00	0	0	0	0	010	1121	0021	23092001	2000006964	007022	10047000000	0000015	24
1238	3	131	411	62	6.200	0.5	2.6	2.3	1	0	0.0	08	00	0	0	0	1	021	1121	0022	22061002	2000004312	026736	25096600000	0000035	24
1239	3	353	100	61	0.000	3.5	0.0	3.5	0	0	0.0	01	00	0	0	0	1	032	0000	0022	13041000	2000004312	028112	25096600000	0000035	24
1240	3	353	411	62	3.200	0.0	0.6	0.4	1	0	0.0	03	00	0	0	0	1	032	0000	0022	23041000	2000004312	029237	25096600000	0000035	24
1241	3	141	611	62	5.400	0.0	1.2	1.0	1	0	0.0	07	00	0	0	0	1	033	0000	0022	23031000	2000004312	033127	25096600000	0000035	24
1242	3	131	611	62	2.400	0.9	1.1	1.1	1	0	0.0	20	00	0	0	0	1	033	0000	0022	23031000	2000004312	034903	25096600000	0000035	24
1243	3	232	611	62	3.300	0.2	1.1	0.8	1	0	0.0	03	00	0	0	0	1	033	1121	1322	23061003	2000004313	000039	27096600000	0000035	24
1244	3	232	611	62	3.800	0.0	1.2	1.0	1	0	0.0	06	00	0	0	0	1	033	1121	1322	23051001	2000004313	000924	27096600000	0000035	24
1245	3	212	111	31	0.000	0.8	0.4	0.5	1	0	0.0	06	00	0	0	0	0	031	1111	0022	23022001	2000004326	032237	30096600000	0000035	24
1246	3	212	132	31	0.000	0.1	0.3	0.3	2	0	0.0	08	00	0	0	0	0	031	1111	0022	23032002	2000004326	032237	30096600000	0000035	24
1247	3	555	111	41	0.002	2.7	1.2	1.7	1	0	1.7	03	00	0	0	0	0	032	1111	0022	12031001	2000005681	008229	27076700015	0070015	24
1248	3	252	111	41	0.002	2.2	1.7	1.8	1	0	2.4	09	00	0	0	0	0	032	1111	0022	13031002	2000005681	008304	27076700015	0070015	24
1249	3	252	111	41	0.002	1.0	1.9	1.7	1	0	0.0	05	00	0	0	0	0	032	1111	0022	12031002	2000005681	013108	27076700015	0070015	24
1250	3	357	111	41	0.002	0.0	0.5	0.4	1	0	0.0	09	00	0	0	0	0	010	0000	0022	22031000	2000005681	027714	27076700015	0070015	24
1251	3	454	111	41	0.002	0.8	0.5	0.5	1	0	0.0	17	00	0	0	0	0	032	0000	0022	13041000	2000005681	029713	27076700015	0070015	24
1252	3	343	111	62	6.100	0.6	1.7	1.6	1	0	0.0	09	00	4	0	0	0	010	1122	0022	23021001	2000005682	025826	00006800000	0000000	24
1253	3	347	111	62	5.500	5.8	1.4	2.1	1	2	1.1	06	00	0	0	0	3	010	1122	1322	13041002	2000005682	026900	00006800000	0000000	24
1254	3	111	111	41	0.002	0.0	1.1	1.0	1	0	0.0	09	00	0	0	0	2	031	1111	1321	22061004	2000005337	017015	05056800000	0000035	24
1255	3	131	132	41	0.002	2.1	1.9	1.9	1	0	0.0	15	00	0	0	0	2	031	1111	1321	21062002	2000005337	017015	05056800000	0000035	24
1256	3	131	111	42	3.002	0.3	1.8	1.5	3	0	0.0	03	00	0	0	0	2	031	0000	1321	21061000	2000005337	018726	05056800000	0000035	24
1257	3	131	111	41	0.002	1.1	2.7	2.4	1	0	0.0	05	00	4	0	0	2	031	1121	1321	12061002	2000005337	025622	05056800000	0000035	24
1258	3	131	111	41	0.002	0.1	0.3	0.3	1	0	20.0	16	00	0	0	0	2	031	1121	1321	12061003	2000005337	026821	05056800000	0000035	24
1259	3	111	100	42	9.012	1.6	0.0	3.2	0	0	0.6	01	00	0	0	0	0	031	1111	0021	23071003	2000005337	028229	05056800000	0000035	24
1260	3	131	111	41	0.001	5.9	0.5	1.4	1	0	3.6	05	00	0	0	0	0	031	1111	0021	22081001	2000005337	028422	05056800000	0000035	24
1261	3	131	100	41	0.002	1.8	0.0	1.8	0	0	2.0	01	00	0	0	0	0	031	1111	0021	23071002	2000005337	028324	05056800000	0000035	24
1262	3	414	122	41	1.812	1.4	0.7	0.7	3	0	9.5	09	00	0	2	0	3	010	1121	0021	21041005	2000005337	029613	05056800000	0000035	24
1263	3	414	111	41	0.002	5.5	6.0	5.7	1	0	5.4	02	00	0	0	0	3	010	1122	0021	21051002	2000005337	030413	05056800000	0000035	24
1264	3	131	100	41	0.002	4.2	0.0	4.2	0	0	12.6	01	00	0	0	0	0	031	0000	0021	13081000	2000005337	032010	05056800000	0000035	24
1265	3	751	242	41	2.502	0.2	1.2	1.1	3	0	2.1	08	00	6	2	0	0	110	1112	0022	21091003	2000004775	020114	02076700000	0000000	24
1266	3	751	242	41	2.302	1.0	1.1	1.1	3	0	7.5	07	00	6	2	0	0	010	1112	0022	21092001	2000004775	020338	02076700000	0000000	24
1267	3	751	200	41	0.002	0.0	0.0	0.0	0	0	0.5	01	00	0	0	0	0	110	1112	0022	22091002	2000004775	020517	02076700000	0000000	24
1268	3	141	111	62	5.000	0.0	2.2	1.7	1	0	0.0	04	00	0	0	0	4	031	1121	0021	21071002	2000005236	004617	24036400000	0000000	24
1269	3	141	111	62	6.800	0.0	3.3	2.5	1	0	0.0	04	00	0	0	0	4	031	1122	0021	22061004	2000005236	005103	24036400000	0000000	24
1270	3	141	111	62	8.500	0.0	3.4	2.6	1	0	0.0	04	00	0	0	0	4	031	1121	0021	23021002	2000005236	006133	24036400000	0000000	24
1271	3	141	111	62	10.000	0.0	3.6	1.8	1	0	0.0	02	00	0	0	0	4	031	1121	0021	23061002	2000005236	006912	24036400000	0000000	24
1272	3	252	100	41	0.002	2.3	0.0	2.3	0	0	0.0	01	00	0	0	0	4	031	0000	1322	13051000	2000005430	018337	26056800035	0090035	24
1273	1	752	642	62	10.500	0.0	3.0	2.2	2	0	0.7	04	00	0	0	0	2	210	0000	1322	21051000	2000005430	035736	26056800035	0090035	24
1274	1	151	211	41	0.002	0.3	2.2	1.6	1	0	0.0	03	00	1	0	0	1	010	1222	1222	21041001	2000005430	038002	26056800035	0090035	24

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	RD/16 W BUR A	R T	FIRE TIME 1ST	SUB	ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND FS	POSN M	A	D	R G E	M E . C	OTHR C U F	MSUM OIRA VZMN	Q V A NO R AN S	REEL	FRAME	DATE BN B R R	DIV REG B	L AO MC
1275	3	111	100	41	0.002	1.9	0.0	1.9	0	0	1.7	01	00	0	0	0	0	131	1221	0021	22051001	2000005701	020633	1303680000	0000035	24
1276	3	111	100	41	0.002	2.8	0.0	2.8	0	0	0.0	01	00	0	0	0	0	031	0000	0021	11041000	2000005701	021026	1303680000	0000035	24
1277	3	131	100	31	0.000	2.2	0.0	2.2	0	0	0.0	01	00	0	0	0	0	031	1121	0021	11091001	2000005504	026304	0002680000	0000000	24
1278	3	131	100	31	0.000	0.8	0.0	0.8	0	0	0.0	01	00	0	0	0	0	031	0000	0021	13091000	2000005504	028533	0002680000	0000000	24
1279	3	131	100	31	0.000	3.2	0.0	3.2	0	0	0.0	01	00	0	0	0	6	031	0000	0021	13061000	2000005504	029038	0002680000	0000000	24
1280	1	252	111	41	0.002	0.6	0.5	0.5	1	0	0.0	06	00	4	0	0	0	010	0000	0012	13081000	2000005544	040503	1809680025	0070015	24
1281	1	752	600	62	4.000	1.1	0.0	1.4	0	0	0.0	01	00	0	0	0	2	022	1122	1322	13091001	2000005544	040837	1809680025	0070015	24
1282	3	454	111	41	0.002	0.8	1.5	1.4	1	0	0.0	09	00	0	0	0	0	032	1111	0022	13081003	2000005544	041027	1809680025	0070015	24
1283	3	252	111	41	0.002	3.5	1.2	1.5	1	0	0.0	09	00	0	0	0	0	023	1111	0022	13091004	2000005544	041027	1809680025	0070015	24
1284	3	252	111	41	0.002	1.2	0.7	0.8	1	0	0.0	12	00	0	0	0	0	022	1111	0022	13091004	2000005544	041830	1809680025	0070015	24
1285	3	454	132	41	0.002	0.5	1.3	1.2	1	0	0.0	07	00	2	0	0	0	032	1111	0022	13081003	2000005544	041830	1809680025	0070015	24
1286	3	752	642	62	5.200	1.4	2.0	1.9	1	0	0.0	05	20	0	0	0	0	010	1111	0022	23081004	2000005544	043004	1809680025	0070015	24
1287	3	252	111	62	4.700	0.0	1.4	1.0	1	0	0.0	03	00	0	0	0	0	010	0000	0022	13091000	2000005544	043534	1809680025	0070015	24
1288	3	252	611	62	4.800	0.6	1.1	1.0	1	0	0.0	05	00	0	0	0	0	022	1121	0022	22031002	2000005544	044303	1809680025	0070015	24
1289	3	151	111	41	0.002	0.5	1.0	0.8	1	0	0.0	02	00	0	0	0	0	031	0000	0011	12091000	2000006364	004928	0000680000	0000000	24
1290	1	252	600	62	26.000	0.0	0.0	2.8	0	0	0.0	01	00	0	0	0	4	010	0000	1322	12051000	2000006686	031117	2005700025	0050015	24
1291																										
1292	3	353	111	11	0.000	11.7	2.5	7.1	1	0	0.0	02	00	0	0	0	3	031	0000	0022	13062000	2000002523	000001	0806450000	0290065	22
1293	1	333	100	11	0.000	0.0	0.0	0.0	0	0	0.0	01	00	0	0	0	0	031	0000	0022	11062100	2000002523	015917	0806450000	0290065	22
1294	1	151	100	52	4.000	0.3	0.0	0.8	0	0	0.0	01	00	0	0	0	0	010	1112	0022	12032002	2000002523	019220	0806450000	0290065	22
1295	1	151	111	11	0.000	2.0	2.0	2.0	1	0	11.9	02	00	0	0	0	0	010	1122	0022	12032002	2000002523	019926	0806450000	0290065	22
1296	1	212	100	11	0.000	3.2	0.0	3.2	0	0	0.0	01	00	0	0	0	0	031	0000	0022	12092000	2000002523	022805	0806450000	0290065	22
1297																										
1298																										
1299																										
1300	1	151	411	41	0.002	0.2	1.4	1.0	1	0	0.0	03	00	0	0	0	0	022	1121	0022	12031002	2000005792	007919	2311680025	0070015	24
1301	3	151	132	41	0.002	0.5	2.8	2.5	1	0	0.0	07	00	0	0	0	0	022	0000	0022	12031000	2000005792	008626	2311680025	0070015	24
1302	1	751	200	41	0.002	0.0	0.0	0.0	0	0	0.6	01	00	0	0	0	1	122	0000	1222	12071000	2000005792	010118	2311680025	0070015	24
1303	1	151	111	62	5.100	0.1	1.1	0.9	1	0	0.0	07	00	0	0	0	1	022	1121	1322	22031002	2000005792	010203	2311680025	0070015	24
1304	3	751	241	41	0.002	2.4	2.5	2.5	1	0	0.0	03	00	0	0	0	2	010	1122	0022	21041004	2000005792	011212	2311680025	0070015	24
1305	3	151	400	62	7.000	0.2	0.0	1.0	0	0	0.0	01	00	0	0	0	1	010	0000	1322	13061000	2000005792	012602	2311680025	0070015	24
1306	3	752	211	41	0.002	0.9	0.9	0.9	1	0	0.0	02	00	0	0	0	2	022	1121	0022	23082002	2000005792	014023	2311680025	0070015	24
1307	3	252	111	62	4.700	0.0	1.2	0.8	1	0	0.0	03	00	0	0	0	0	022	1111	0022	23041003	2000005792	015007	2311680025	0070015	24
1308	1	252	100	31	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	2	010	0000	0022	11081000	2000004409	022235	2103670000	0000015	24
1309	1	252	100	31	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	2	010	1122	0022	21051003	2000004409	022525	2103670000	0000015	24
1310	3	252	100	31	0.000	1.9	0.0	1.9	0	0	0.0	01	00	0	0	0	2	010	1122	0022	21051003	2000004409	022709	2103670000	0000015	24
1311	3	252	111	31	0.000	4.1	3.2	3.5	1	0	0.0	03	00	0	0	0	2	010	1112	1222	21061005	2000004409	023301	2103670000	0000015	24
1312	1	731	600	62	15.000	0.4	0.0	2.2	0	0	2.4	01	00	0	0	0	3	031	0000	0022	12051100	2000004409	035832	2103670000	0000015	24
1313	3	353	111	31	0.000	1.2	3.8	3.2	1	0	0.4	04	00	0	0	0	0	010	1111	0022	21031104	2000004409	036300	2103670000	0000015	24
1314	3	252	100	31	0.000	1.0	0.0	1.0	0	0	10.9	01	00	0	0	0	0	031	1111	0022	23031001	2000004409	036912	2103670000	0000015	24
1315	3	353	111	31	0.000	1.1	0.9	0.9	1	0	0.2	03	00	0	0	0	0	031	1111	0022	21031104	2000004409	037110	2103670000	0000015	24
1316	3	252	411	31	0.000	0.8	0.9	0.8	1	0	0.0	05	00	0	0	0	0	021	1111	0022	22031002	2000004409	037104	2103670000	0000015	24
1317	3	333	111	31	0.000	0.6	1.2	0.9	1	0	0.0	02	00	0	0	0	0	031	1111	0022	23031001	2000004409	037104	2103670000	0000015	24
1318	3	454	100	41	0.002	0.3	0.0	0.3	0	0	0.0	01	00	0	0	0	0	021	1112	0022	12041003	2000005858	000817	0703690015	0050015	24
1319	3	343	111	62	4.500	0.4	1.4	1.1	1	0	0.0	04	00	0	0	0	0	021	1111	0022	13041002	2000005858	000817	0703690015	0050015	24
1320	1	151	111	41	0.002	1.0	0.4	0.6	1	0	0.2	03	00	0	0	0	1	033	1111	0022	21051002	2000005860	025705	1403690035	0010015	24
1321	1	151	141	41	0.002	0.3	3.6	2.5	1	2	0.0	03	00	0	0	0	0	022	1121	0022	22041002	2000005860	026300	1403690035	0010015	24
1322	1	751	242	11	0.000	0.0	2.4	1.9	1	0	0.8	05	10	1	0	0	0	110	1122	0022	11112009	2000000500	015716	1506440000	0000045	22
1323	1	251	141	11	0.000	2.7	1.2	2.0	1	0	4.0	02	10	2	0	0	0	010	1111	0022	21032001	2000000500	018013	1506440000	0000045	22

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	W A	RD/16 BUR BT	FIRE TIME 1ST	FIRE TIME SUB	FIRE TIME ALL	HCM	DIR	TIM TC POS	TRG PUL	2ND POSN FS	M	A	D	RGE	MEC	OTHR CUF	MSUM OIRA VZBN	OVR ANS	A NO REEL	FRAME	DATE BNR BR	DIV REG B	LAGMC
1324	1	151	100	11	0.000	4.7	0.0	4.7	0	1	0.0	01	00	0	0	0	0	010	1111	0022	21022002	2000000500	017737	15064400000	0000045	22
1325	1	151	111	11	0.000	0.5	0.8	0.7	1	2	0.0	04	00	0	0	0	1	010	0000	1222	21062000	2000000501	027832	15064500000	0000000	22
1326	1	751	200	11	0.000	0.0	0.0	0.0	0	0	0.6	01	00	0	0	0	2	110	0000	0022	21072000	2000000519	000709	07064400000	0000045	22
1327	1	757	200	21	0.000	0.0	0.0	0.0	0	0	0.0	01	00	0	0	0	1	010	0000	1222	21082000	2000000519	000735	07064400000	0000045	22
1328	1	151	100	11	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	0	010	0000	0022	21072000	2000000519	000823	07064400000	0000045	22
1329	1	751	200	11	0.000	0.1	0.0	0.1	0	0	0.0	01	00	0	0	0	0	010	0000	0022	21062000	2000000519	000910	07064400000	0000045	22
1330	1	151	131	11	0.000	0.1	1.0	0.6	1	0	0.0	02	00	0	0	0	0	010	1112	0022	11092002	2000000519	001100	07064400000	0000045	22
1331	1	151	100	11	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	3	010	1112	0022	21032001	2000000525	022126	02074400000	0000045	22
1332	1	151	100	11	0.000	0.7	0.0	0.7	0	0	0.0	01	00	0	0	0	3	010	1112	0022	[illegible]32002	2000000525	022126	02074400000	0000045	22
1333	1	151	100	11	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	0	010	1122	0022	1[illegible]32001	2000000525	022417	02074400000	0000045	22
1334	3	151	100	11	0.000	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	5	010	0000	1322	23062000	2000000526	019809	05074400000	0000045	22
1335	3	232	100	11	0.000	0.2	0.0	0.2	0	0	19.5	01	00	0	0	0	0	031	1111	0022	12092204	2000000526	024232	05074400000	0000045	22
1336	3	222	100	11	0.000	0.4	0.0	0.4	0	0	0.0	01	00	0	0	0	0	031	1121	0022	13092204	2000000526	024232	05074400000	0000045	22
1337	3	434	100	11	0.000	2.7	0.0	2.7	0	0	0.0	01	00	0	0	0	0	031	0000	0022	12032000	2000000525	027633	05074400000	0000045	22
1338	1	751	232	11	0.000	0.0	0.8	0.5	3	1	0.3	03	00	0	0	0	0	022	1121	0022	23052002	2000000556	015634	04084400043	0000045	22
1339	1	751	200	52	4.000	2.3	0.0	2.5	0	0	2.7	01	00	0	0	0	0	122	1121	0022	22032002	2000000563	016108	30074400000	0000000	22
1340	3	252	111	11	0.000	0.6	1.4	1.1	1	0	0.0	03	00	0	0	0	0	031	1122	0022	23032002	2000000556	013101	04084400043	0000045	22
1341	3	252	100	11	0.000	2.5	0.0	2.5	0	0	3.5	01	00	0	0	0	0	010	0000	0022	12042000	2000000580	023135	27024500000	0000000	22
1342	1	151	100	11	0.000	2.7	0.0	2.7	0	0	0.0	01	00	0	0	0	1	010	1121	1122	23062001	2000000589	011836	02034500000	0000000	22
1343	3	732	200	51	0.000	0.9	0.0	0.9	0	2	0.0	01	00	0	0	0	1	021	0000	0022	21052000	2000000613	002423	05034500000	0000000	22
1344	3	732	200	51	0.000	0.0	0.0	0.0	0	2	0.0	01	00	0	0	0	1	021	0000	0022	21052000	2000000613	002602	05034500000	0000000	22
1345	3	752	200	52	9.000	0.0	0.0	0.7	0	2	0.0	01	00	0	0	0	1	021	0000	0022	22042000	2000000613	002703	05034500000	0000000	22
1346	3	434	100	11	0.000	5.3	0.0	5.3	0	0	0.0	01	00	0	0	0	0	031	0000	0022	23062100	2000000660	010617	28024500000	0000000	22
1347	1	151	141	52	5.200	0.6	1.7	1.3	1	2	0.3	03	00	0	0	0	1	110	1122	1222	21032102	2000000677	003033	00034500000	0250045	22
1348	1	151	132	51	1.500	0.6	1.5	1.3	3	0	0.2	04	00	0	2	0	1	031	1121	1221	23062002	2000000677	003802	00034500000	0250045	22
1349	1	252	141	52	2.500	0.1	1.5	1.3	3	0	0.0	08	00	0	0	0	1	010	1112	0022	22052003	2000000677	007123	00034500000	0250045	22
1350	1	454	100	11	0.000	1.0	0.0	1.0	0	0	6.1	01	00	0	0	0	1	010	1112	0022	23042201	2000000677	007509	00034500000	0250045	22
1351	3	252	100	11	0.000	3.1	0.0	3.1	0	2	0.0	01	00	0	0	0	0	022	1121	0022	23012004	2000000677	012032	00034500000	0250045	22
1352	3	151	131	11	0.000	1.2	3.3	2.3	1	0	0.0	02	00	0	0	0	0	010	1122	0022	11042002	2000002428	004319	00034500000	0000065	22
1353	3	454	100	52	3.000	2.0	0.0	2.5	0	0	0.0	01	00	0	0	0	0	032	0000	0022	13022000	2000002428	007314	00034500000	0000065	22
1354	3	454	111	52	2.500	0.4	3.5	1.9	1	0	0.0	02	00	0	0	0	0	010	0000	0022	22082100	2000002428	008824	00034500000	0000065	22
1355	3	151	100	11	0.000	1.8	0.0	1.8	0	0	0.0	01	00	0	0	0	0	010	0000	0022	12062000	2000002428	009602	00034500000	0000065	22
1356	3	151	111	11	0.000	1.6	3.1	2.4	1	0	0.0	02	00	0	0	0	0	010	0000	0022	12062000	2000002428	009728	00034500000	0000065	22
1357	3	414	111	52	2.000	0.5	2.1	1.3	1	0	0.0	02	00	0	0	0	2	021	0000	0022	12052000	2000002428	010026	00034500000	0000065	22
1358	3	151	141	11	0.000	1.3	6.5	3.9	1	0	0.0	02	00	0	0	0	0	010	1112	0022	11082001	2000002428	010232	00034500000	0000065	22
1359	3	151	100	11	0.000	0.1	0.0	0.1	0	0	0.0	01	00	0	0	0	0	010	1112	0022	13082002	2000002428	010232	00034500000	0000065	22
1360	3	353	100	11	0.000	11.0	0.0	11.0	0	0	0.0	01	00	0	0	0	3	022	1121	0022	11092002	2000002428	010735	00034500000	0000065	22
1361	3	252	300	11	0.000	4.0	0.0	4.0	0	0	0.0	01	00	0	0	0	0	032	1121	0022	11062002	2000002428	011511	00034500000	0000065	22
1362	3	252	100	11	0.000	0.7	0.0	0.7	0	0	0.0	01	00	0	0	0	0	032	1121	0022	11072002	2000002428	011939	00034500000	0000065	22
1363	3	151	111	52	4.000	1.0	2.9	1.9	2	0	0.0	02	00	0	0	0	3	010	1122	1222	23072002	2000002428	012636	00034500000	0000065	22
1364	3	353	111	11	0.000	2.6	1.5	2.0	1	0	0.0	02	00	0	0	0	0	032	1111	0022	22042002	2000002428	013939	00034500000	0000065	22
1365	3	352	111	11	0.000	0.2	1.6	1.1	1	0	0.0	03	00	0	0	0	0	032	1111	0022	22042001	2000002428	013939	00034500000	0000065	22
1366	3	252	111	51	0.000	1.4	2.2	2.0	1	0	0.0	03	00	0	0	0	4	010	0000	1322	23052000	2000002428	014522	00034500000	0000065	22
1367	3	252	100	51	0.000	1.1	0.0	1.1	0	0	0.0	01	00	0	0	0	0	010	0000	0022	23072200	2000002428	014916	00034500000	0000065	22
1368	3	252	100	11	0.000	1.1	0.0	1.1	0	0	0.0	01	00	0	0	0	0	010	1122	0022	13032001	2000002428	015027	00034500000	0000065	22
1369	3	454	100	[illegible]	0.000	0.3	0.0	0.3	0	0	0.0	01	00	0	0	0	0	010	1112	0022	23072001	2000002428	015217	00034500000	0000065	22
1370	3	454	111	11	0.000	1.1	1.7	1.5	1	0	0.0	03	00	0	0	0	0	010	1112	0022	23072002	2000002428	015217	00034500000	0000065	22
1371	3	454	111	11	0.000	1.9	1.5	1.6	1	0	0.0	03	00	0	0	0	0	010	1112	0022	23072003	2000002428	015217	00034500000	0000065	22
1372	3	454	100	11	0.000	2.4	0.0	2.4	0	0	0.0	01	00	0	0	0	0	010	1112	0022	23072005	200000242[illegible]	015217	00034500000	0000065	22

SMALL ARMS EFFECTIVENESS DATA

LSN	O	POS FSP	AIM M	RD/ W A	16 RUR B T	FIRE TIME 1ST	SUB	ALL	R C H	O I R	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	R G E	M E C	OTHR C U F	MSUM OINA VZHN	O V AN	A R S NO	REEL	FRAME	DATE BN R B R	DIV REG B	L A O M C
1373	1	454	131	11	0.000	1.1	4.5	2.8	1	0	7.2	02	00	0	0	0	0	033	1121	0022	13072003	2000002429	003323	12054500035	0290000	22
1374	3	454	111	11	0.000	1.8	2.5	2.2	1	0	0.0	02	00	0	0	0	2	010	0000	0022	11062000	2000002429	003726	12054500035	0290000	22
1375	3	414	111	21	0.000	0.3	2.9	1.6	1	0	0.0	02	00	0	0	0	0	031	1121	0022	13052001	2000000198	010820	04104400035	0050000	22
1376	3	454	111	52	1.700	0.2	3.7	2.5	1	0	0.0	03	00	0	1	0	0	031	1111	0022	11042001	2000000198	011130	04104400035	0050000	22
1377	3	414	100	21	0.000	7.0	0.0	7.0	0	0	0.0	01	00	0	0	0	0	031	1111	0022	11052102	2000000198	011130	04104400035	0050000	22
1378	3	232	100	11	0.000	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	0	031	1111	[illegible]	13032001	2000000198	011630	04104400035	[illegible]	22
1379	3	252	111	52	3.500	0.4	1.1	0.9	1	0	0.0	04	00	0	0	0	3	031	0000	[illegible]	13062000	2000000198	011907	04104400035	0050000	22
1380	3	151	111	11	0.000	0.9	2.7	2.1	1	0	0.0	03	00	0	0	0	0	033	1121	0022	21032101	2000000079	002121	29094400000	0000000	22
1381	1	151	100	11	0.000	2.8	0.0	2.8	0	2	1.3	01	00	0	0	0	1	010	1222	1222	12062001	2000000067	003413	16094400000	0000015	22
1382	3	151	100	11	0.000	0.6	0.0	0.6	0	2	0.0	01	00	0	0	0	1	010	1122	1222	23032004	2000000234	000702	17094400000	0000000	22
1383	1	252	100	52	3.000	2.4	0.0	2.4	0	0	5.3	01	00	0	0	0	1	031	1121	1221	23062002	2000000226	003708	15074400000	0000015	22
1384	3	434	100	11	0.000	2.6	0.0	2.6	0	0	0.0	01	00	0	0	0	1	031	1121	1221	23062002	2000000225	005220	15074400000	0000015	22
1385	3	434	100	11	0.000	2.0	0.0	2.0	0	0	0.0	01	00	0	0	0	0	031	1111	0022	11052102	2000000200	019420	04104400035	0050000	22
1386	3	333	100	52	2.000	1.8	0.0	1.9	0	0	0.0	01	00	0	0	0	0	031	1121	0022	22042103	2000000200	020310	04104400035	0050000	22
1387	1	353	100	11	0.000	0.1	0.0	0.1	0	0	0.0	01	00	0	0	0	0	010	1112	0022	2109200[illegible]	[illegible]000003461	029533	00000000000	0000000	22
1388	1	353	111	11	0.000	0.8	0.3	0.5	1	0	4.9	02	00	0	0	0	0	010	1112	0022	23092004	2000003461	029830	00000000000	0000000	22
1389	1	252	111	11	0.000	0.1	0.7	0.6	1	2	0.0	06	00	0	0	0	1	010	0000	1122	23032000	2000003461	037322	00000000000	0000000	22
1390	3	454	100	52	2.000	0.0	0.0	0.1	0	0	0.0	01	00	0	0	0	2	021	0000	0022	23062000	2000001526	008122	00054500000	0000065	22
1391	1	151	111	11	0.000	0.3	1.1	0.9	1	0	0.0	05	00	0	0	0	2	010	1112	1322	13052001	2000000085	033305	26094400015	0050000	22
1392	1	131	100	11	0.000	2.1	0.0	2.1	0	0	0.0	01	00	0	0	0	0	031	1112	0021	21032001	2000000085	033600	26094400015	0050000	22
1393	1	157	100	11	0.000	0.8	0.0	0.8	0	0	0.0	01	00	0	0	0	0	010	1111	0022	21052002	2000000085	033600	26094400015	0050000	22
1394	1	151	100	11	0.000	0.2	0.0	0.2	0	0	0.0	01	00	0	0	0	2	010	1121	1322	11062001	2000000085	034928	26094400015	0050000	22
1395	3	555	100	11	0.000	0.7	0.0	0.7	0	0	0.4	01	10	0	0	0	0	031	1112	0022	21042002	2000000044	036017	16084400000	0000000	22
1396	3	151	100	11	0.000	0.7	0.0	0.7	0	0	0.0	01	00	0	0	0	0	010	1111	0022	23032001	2000000044	036007	16084400000	0000000	22
1397	3	151	100	11	0.000	1.2	0.0	1.2	0	0	0.0	01	00	0	0	0	0	010	1111	0022	23042003	2000000044	036304	16084400000	0000000	22
1398	3	151	100	11	0.000	2.7	0.0	2.7	0	0	0.2	01	00	0	0	0	0	010	1111	0022	23032001	2000000044	036309	16084400000	0000000	22
1399	3	151	131	52	2.000	1.8	3.2	2.5	1	0	0.0	02	00	0	0	0	0	010	1121	0022	22052003	2000000044	036929	16084400000	0000000	22
1400	3	252	100	52	4.000	1.6	0.0	1.9	[illegible]	0	0.0	01	00	0	0	0	0	033	0000	0022	13052000	2000000132	016007	05054500035	0070000	22
1401	3	232	411	52	5.500	0.0	2.9	1.5	1	0	0.0	02	00	0	0	0	0	033	0000	0022	13052000	2000000132	016217	05054500035	0070000	22
1402	3	131	100	11	0.000	2.0	0.0	2.0	0	0	0.0	01	00	0	0	0	0	033	1111	0022	23042002	2000000127	024217	02054500000	0000000	22
1403	1	151	100	11	0.000	4.4	0.0	4.4	0	1	1.7	01	00	0	0	0	0	010	1121	0022	23092003	2000000087	023618	09104400000	0000000	22
1404	3	111	111	11	0.000	5.1	4.5	4.8	1	0	0.0	02	00	0	0	0	0	031	0000	0022	13072000	2000001528	005723	00054500000	0000000	22
1405	2	111	131	11	0.000	1.6	10.9	6.3	1	0	0.0	02	00	0	0	0	0	031	1111	0021	23022002	2000001528	007006	00054500000	0000000	22
1406	2	111	111	11	0.000	3.3	3.5	3.5	1	0	0.0	04	00	0	0	0	0	031	1111	0021	23022003	2000001528	007006	00054500000	0000000	22
1407	3	454	100	11	0.000	1.2	0.0	1.2	0	0	0.0	01	00	0	0	0	0	021	1121	0021	21062002	2000001528	008817	00054500000	0000000	22
1408	3	414	100	11	0.000	3.1	0.0	3.1	0	0	0.0	01	00	0	0	0	0	021	1121	0021	21062002	2000001528	009336	00054500000	0000000	22
1409	3	414	100	11	0.000	0.3	0.0	0.3	0	0	0.0	01	00	0	0	0	0	021	1121	0021	21062002	2000001528	009637	00054500000	0000000	22
1410	3	252	100	11	0.000	0.4	0.0	0.4	0	0	0.0	01	00	0	0	0	0	032	0000	0021	13092000	2000000208	004426	01074400000	0000000	22
1411	3	454	142	11	0.000	3.5	3.7	3.7	3	0	0.0	05	00	0	0	0	6	032	0000	0022	12052000	2000000208	007325	01074400000	0000000	22
1412	1	111	111	52	3.000	0.0	2.1	1.6	1	1	0.0	04	00	0	0	0	0	031	0000	0022	22042100	2000002457	001213	00064500000	0000000	22
1413	1	454	111	11	0.000	0.2	1.6	1.1	1	0	0.0	03	00	0	0	0	0	010	1122	0022	23092002	2000002457	008915	04064500015	0040605	22
1414	3	151	100	11	0.000	0.7	0.0	0.7	0	0	0.0	01	00	0	0	0	0	033	1111	0021	23092006	2000002459	013016	00054500000	0000000	22
1415	3	151	100	21	0.000	0.3	0.0	0.3	0	0	0.0	01	00	0	0	0	0	033	1121	0021	12092005	2000002459	015000	00054500000	0000000	22
1416	1	151	111	52	5.500	0.6	2.0	1.3	2	0	0.9	02	00	0	0	0	1	210	0000	1222	11062000	2000002459	022525	00054500000	0600000	22
1417	3	252	111	51	1.500	3.8	6.5	5.1	1	0	0.0	02	00	0	2	0	0	021	0000	0021	13092000	2000002477	022025	19064500000	0220063	22
1418	3	252	111	11	0.000	0.2	3.9	2.1	1	0	0.0	02	00	0	0	0	0	010	1121	0022	13072001	2000002477	022635	19064500000	0220065	22
1419	3	333	111	52	2.300	2.4	3.1	2.8	1	0	0.0	03	00	0	0	0	0	031	0000	0022	11102000	2000002481	033312	06204500000	0000065	22
1420	3	252	111	51	0.000	1.7	2.2	2.0	1	0	0.0	03	00	0	0	0	3	010	0000	0022	13062000	2000002481	033906	06204500000	0000065	22
1421	1	755	241	11	0.000	1.5	6.2	3.9	1	2	5.4	02	00	0	0	0	1	010	1122	1122	11062002	2000002494	036430	00064500000	0290000	22

SMALL ARMS EFFECTIVENESS DATA

LF	O	POS FSP	AIM M	W A	RD/16 BUR B T	FIRE TIME 1ST	SUB	ALL	R C H	D I R	TIM TO POS	TRG PUL	2ND POSN FS	M	A	D	R G E	M E °C	OTHR C U F	MSUM OIHA VZBN	Q V R AN	A NO R S	REEL	FRAME	DATE BN B R R	DIV REG B	L AO MC
1422	3	353	100	11	0.000	2.7	0.0	2.7	0	0	0.0	01	00	0	0	0	3	010	0000	0022	1307	2000	2000002493	023312	00064500000	0000000	22
1423	3	353	100	11	0.000	1.7	0.0	1.7	0	0	0.0	01	00	0	0	0	3	010	0000	0022	1305	2000	2000002493	023537	00064500000	0000000	22
1424	3	353	111	11	0.000	2.1	1.8	2.0	1	0	0.0	02	00	0	0	0	3	010	0000	0022	1305	2000	2000002493	023738	00064500000	0000000	22
1425	3	212	100	11	0.000	1.2	0.0	1.2	0	0	0.0	01	00	0	0	0	0	021	1111	0022	2303	2001	2000002508	001120	00054500000	0000000	22
1426	3	252	111	11	0.000	0.3	2.6	1.5	1	0	0.0	02	00	0	0	0	0	021	1111	0022	2303	2002	2000002508	001120	00054500000	0000000	22
1427	3	212	111	21	0.000	1.0	1.8	1.7	1	0	0.0	06	00	0	0	0	0	031	1111	0022	2302	2003	2000002508	[illegible]	00054500000	0000000	22
1428	3	252	100	11	0.000	0.2	0.0	0.2	0	0	7.3	01	00	0	0	0	0	031	1111	0022	2303	2004	2000002508	[illegible]	00054500000	0000000	22
1429	3	232	100	11	0.000	1.6	0.0	1.6	0	0	0.0	01	00	0	0	0	3	031	0000	0022	1206	2000	2000002508	00[illegible]	00054500000	0000000	22
1430	3	232	100	11	0.000	1.5	0.0	1.5	0	0	0.0	01	00	0	0	0	3	031	0000	0022	1306	2000	2000002508	003[illegible]	00054500000	0000000	22
1431	3	232	100	11	0.000	4.6	0.0	4.6	0	0	0.0	01	00	0	0	0	3	031	0000	0022	1306	2000	2000002508	004202	00054500000	0000000	22
1432	1	751	200	11	0.000	0.9	0.0	0.9	0	0	0.0	01	00	0	0	0	1	022	1121	0022	1204	2003	2000002508	013705	00054500000	0010000	22
1433	1	751	200	11	0.000	0.0	0.0	0.0	0	2	1.4	01	00	0	0	0	1	010	1112	1122	2109	2001	2000002608	032005	27034400000	0000000	22
1434	1	751	211	11	0.000	0.5	0.4	0.5	1	2	0.1	02	00	0	0	0	1	110	1112	1122	2209	2002	2000002608	031932	27034400000	0000000	22
1435	3	252	100	11	0.000	3.5	0.0	3.5	0	0	0.0	01	00	0	0	0	1	022	1112	1222	2106	2004	2000001484	000616	03095000000	0000000	23
1436	3	252	100	11	0.000	4.0	0.0	4.0	0	0	0.0	01	00	0	0	0	1	032	1111	1222	2305	2001	2000001484	000616	03095000000	0000000	23
1437	3	252	111	11	0.000	2.3	3.4	3.1	1	0	0.0	04	00	0	0	0	2	010	1111	0022	1104	2003	2000001484	001632	03095000000	0000000	23
1438	3	252	111	21	0.000	1.6	.7	2.1	1	0	0.0	02	00	0	0	0	2	022	1111	0022	2306	2005	2000001484	001632	03095000000	0000000	23
1439	3	454	100	52	5.000	4.8	.0	5.2	0	0	5.7	01	00	0	0	0	2	032	1111	1222	2304	2003	2000001484	002010	03095000000	0000000	23
1440	1	353	100	11	0.000	2.1	0.0	2.1	0	0	0.0	01	00	0	0	0	0	010	1122	0022	2304	2001	2000001181	009921	04035100000	0000000	23
1441	1	454	100	11	0.000	2.2	0.0	2.2	0	0	0.0	01	00	0	0	0	0	010	1122	0022	2308	2001	2000001181	011429	04035100000	0000000	23
1442	3	353	100	51	0.000	0.7	0.0	0.7	0	0	0.0	01	00	0	0	0	0	021	0000	0022	1203	2000	2000001204	0292[illegible]4	23035100015	0070000	23
1443	3	353	100	51	0.000	0.1	0.0	0.1	0	0	0.0	01	00	0	0	0	0	021	0000	0022	1203	2000	2000001204	029506	23035100015	0070000	23
1444	2	353	111	52	2.300	1.5	1.4	1.4	1	0	0.0	06	00	0	0	0	0	031	0000	0022	1203	2000	2000001204	029611	23035100015	0070000	23
1445	3	353	100	11	0.000	0.0	0.0	0.0	0	0	0.0	01	00	0	0	0	0	031	0000	0022	1302	2100	2000001204	031712	23035100015	0070000	23
1446	3	353	100	11	0.000	2.3	0.0	2.3	0	0	0.0	01	00	0	0	0	0	031	0000	0022	1302	2100	2000001204	032103	23035100015	0070000	23
1447	3	353	111	51	1.800	2.6	1.0	1.3	3	0	0.0	05	00	0	2	0	0	010	0000	0022	1304	2000	2000001204	034605	23035100015	0070000	23
1448	3	353	111	51	1.300	4.2	0.7	1.6	1	0	0.0	04	00	0	2	0	0	010	0000	0022	1304	2000	2000001204	035127	23035100015	0070000	23
1449	3	351	142	11	0.000	0.4	2.0	1.8	3	0	0.0	07	00	0	0	0	0	021	0000	0022	1302	2000	2000001204	035538	23035100015	0070000	23
1450																											
1451	3	252	100	11	0.000	3.6	0.0	3.6	0	0	2.0	01	00	0	0	0	0	010	1122	0022	1303	2004	2000001299	014610	29055100000	0070000	23
1452	3	252	141	21	0.000	2.7	12.5	7.6	1	0	0.0	02	00	0	0	0	0	010	1122	0022	1109	1001	2000001299	015038	29055100000	0070000	23
1453	3	151	111	21	0.000	0.5	1.3	1.2	1	0	0.0	06	00	0	0	0	0	010	1112	0022	1108	2001	2000001299	024802	29055100000	0070000	23
1454	3	157	100	11	0.000	2.5	0.0	2.5	0	0	6.7	01	00	0	0	0	0	010	1112	0022	1309	2002	2000001299	025202	29055100000	0070000	23
1455	3	151	111	21	0.000	9.3	2.0	5.7	1	0	0.0	02	00	0	0	0	0	010	1112	0022	2309	2003	2000001299	024802	29055100000	0070000	23
1456	3	313	111	11	0.000	0.0	2.3	1.2	1	0	0.0	02	00	0	0	0	7	031	1112	0022	1309	2205	2000001299	027729	29055100000	0070000	23
1457	3	454	111	11	0.000	3.2	2.4	2.8	1	0	0.0	02	00	0	0	0	0	010	1111	0022	2309	2004	2000001299	027729	29055100000	0070000	23
1458	3	232	141	11	0.000	1.0	1.0	1.0	1	0	3.0	06	65	0	0	0	7	022	1111	0022	1209	1202	2000001299	031934	29055100000	0070000	23
1459	3	414	141	11	0.000	3.3	9.2	7.2	2	0	0.0	03	00	0	0	0	7	032	1111	0022	1103	2201	2000001299	031803	29055100000	0070000	23
1460	3	454	100	11	0.000	2.2	0.0	2.2	0	0	7.8	01	00	0	0	0	7	022	1111	0022	1110	2203	2000001299	032231	29055100000	0070000	23
1461	3	111	111	11	0.000	2.5	1.6	2.1	1	0	0.6	02	00	0	0	0	7	010	1111	0021	2304	2004	2000001299	032115	29055100000	0070000	23
1462	3	252	100	11	0.000	0.8	0.0	0.8	0	0	0.0	01	00	0	0	0	7	010	1112	0022	1310	2001	2000001299	033118	29055100000	0070000	23
1463	3	252	141	11	0.000	1.4	7.0	4.2	1	0	0.0	02	00	0	0	0	7	010	1112	0022	1310	2001	2000001299	033415	29055100000	0070000	23
1464	3	454	141	11	0.000	0.3	7.7	4.0	1	0	0.0	02	00	0	0	0	7	010	1112	0022	1305	2001	2000001299	034533	29055100000	0070000	23

Appendix F

FURTHER DATA ON CDEC AND IB TESTING RANGES AND NEW RANGE EQUIPMENT AVAILABLE

INTRODUCTION

This appendix supplements and adds detail to the information on the small arms testing ranges discussed in Chapter V. It also describes range target systems and components that are available for instrumenting such ranges but are not now being used. The range complexes are (1) the U.S. Army Infantry Board (IB) ranges at Fort Benning, Georgia, and (2) the test ranges at U.S. Army Combat Developments Experimentation Command (CDEC), Hunter Liggett Military Reservation (HLMR), California.

U.S. ARMY INFANTRY BOARD (IB) RANGES

History

The U.S. Army Infantry Board (IB) has three small arms test ranges. Design was begun in 1965, and though the first service tests were conducted in 1970, a prototype "attack range" was built in 1965. It was manually controlled, and data were collected on an oscillograph and paper-tape recorders. In 1968, the "quick-fire range" was completed, and in 1970, the "defense range." The defense range was the first computer-automated test range at Fort Benning. All three ranges are now computer-operated, and the same computer does all major data collection.

As each range was completed, an "acceptance" test was conducted to determine how well it functioned. Each test proved the instrumentation to be very reliable.* Since their completion, the ranges have been used heavily. Examples of small arms tests recently conducted on the ranges are listed in Table F-1. Since a single computer and control system

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*U.S. Army Infantry Board, Defense Experiment I (Ft. Benning, GA, 25 November 1971); hereafter referred to as Defense Experiment I.

Table F-1

SMALL ARMS TESTS RECENTLY CONDUCTED ON IB RANGES

Test[a]	Date
Combat pack with removable pockets	1973
Rimfire adapter, M16	1974
Reflex colunmator sight, M16	1974
Muzzle break compensator, M16	1974
Control burst mechanism, M16	1974
Chemical protective overgarment	1974
Body armor vest	1974
Improved conventional munitions	1974
Bandoleer, XM-8	1974
Accuracy test, M60	1974
Low light level sight, M16	1974
Small arms measures of effectiveness methodology	1974
Airborne equipment methodology	1974
Night operations test	1974
Squad automatic weapons engineering test	1974

[a]These are informal titles for the tests. The list is not exhaustive but indicates the variety of tests undertaken.

support each range separately, only one range can be used at a time. A single range is used approximately 60-85 hours per month.

Instrumentation

Targets

All three ranges use the stationary head and upper torso (M-silhouette) target and one or more moving targets.* The numbers and types of each are summarized in Table F-2.

Table F-2

NUMBER AND TYPES OF TARGETS ON IB TEST RANGES

Type of Target	Defense Range[a]	Attack Range[b]	Quick-Fire Range
Stationary (pop-up)	88[c]	10	25
Moving (pop-up)	6	1	1

[a]In Chapter V, the firing situation for this range is called "Firing at targets at closer ranges." "Defense" is used in this appendix for simplicity and because it is the term IB uses.

[b]In Chapter V, the firing situation for this range is called "Assault." "Attack" is used in this appendix for simplicity and because it is the term IB uses.

[c]To the 60 day time targets, 28 close-in targets were added for use in night testing.

Programming Target Array

A radio link is used to transmit hit data for moving targets, and relays are used for the stationary targets. All targets can be programmed to appear and reappear in any sequence for varying durations.

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*The head and upper torso target has a presented area of 3.27 sq ft (as described in Chapter V). It will be referred to as the "kneeling-man" target throughout this appendix. Moving and stationary targets are described in Chapter V. Moving targets are also called "running-man" targets.

They can be programmed to stay in view for a certain time or to drop when hit. For checkout or trial, they can be controlled manually from the computer van.

The attack range normally uses a fixed, programmed target scenario; the defense range uses several scenarios; and the quick-fire range uses a sort of shooting gallery, where a single firer moves through a prescribed course, automatically activating targets and simulators.

Near-Miss Sensors

A time-difference near-miss sensor capable of scoring miss distance and miss direction is used on the ranges. Each target array on the defense range and each target on the quick-fire range has a set of four microphones positioned in front of the targets. The target line on the attack range has three near-miss sensors. The microphones tally near misses by sensing the shock wave of passing rounds.

The set of microphones is located along an axis perpendicular to the line of flight of the projectile and directly in front of the target so that the target is at the exact center of the line of microphones. The four microphones are positioned 5 ft and 7 ft from the target, one pair on each side. The supersonic shock wave of a projectile passing over the area between the pairs of microphones causes the microphones to send pulses over the coaxial data link. Their time of arrival is recorded by the computer just as are the pulses from the system to count rounds fired. The times of arrival of the shock wave at one pair and then the other pair of microphones are used to create equations that include the geometric configuration of the microphone location. The two equations thus produced can be solved for the x and y coordinates of the near miss as the projectile passed through the vertical plane of the target array. The resolution of the system, under ideal conditions, exceeds 3 inches.

Since only one target in each target array of three to five targets on the defense range is equipped with the miss distance indicator (MDI), described above, information on miss distance is collected by sample. It is assumed that other targets in the array undergo similar patterns of misses when they are in view. Not all targets have an MDI because of the limited number of data recording channels (256). Each microphone requires one channel, so a set requires four channels. The target requires two other channels, one for hit recording and another that informs the computer that up and down commands have been carried out. Six input channels per target would quickly use up the available channels. Sampling permits more targets to be added without having to add an equal number of miss-distance microphones. A ratio of two targets for each MDI is maintained, however.

Near misses can be measured around each target position on the range, 16 of the 60 targets on the daytime defense range and 3 targets on the attack range.

Interference from small arms simulators is prevented by turning off the microphones (i.e., the computer does not record incoming data from nearby microphones while a simulator is firing).* However, the probability of not recording a near miss while the microphones are turned off is very low.

Round Counters

The system for automatically counting rounds in stationary target firing consists of a sensor, data link, signal conditioner, and computer system. The sensor unit consists of one microphone located directly in front of each firing position. The microphone is attached to a single coaxial cable, which in turn is linked to the signal-conditioning unit in the computer van. The signal conditioner, one per microphone input, "conditions" by discriminating between the actual signal and extraneous noise and creates a pulse for computer input for each signal received. The pulse is fed directly into the computer interface unit that measures time of arrival.

The round-counting system for the attack range consists of a helmet-mounted radio system. The sensor element consists of two parts: an

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*U.S. Army Infantry Board, Technical Memorandum: Scoring Resolution of a Time Difference Miss Distance Scoring System (Ft. Benning, GA, December 1967).

infrared (IR) sensor that "sees" the muzzle blast and turns on an acoustic sensor, which senses the sound of the muzzle report. The short time "window" (the period of time the acoustic sensor is on) prevents "crosstalk" among firers. If a firer happens to be looking at an adjacent firer as the latter's rifle discharges, his IR sensor will open the circuit for the acoustic sensor; however, the window will close before the report of the adjacent firer's weapon arrives. Once a signal passes through the window, it is conditioned and placed on the RF carrier for transmission to the computer van. Tests have shown that firers must be separated by at least 4 ft to prevent crosstalk. Some crosstalk occurs between 4 ft and 16 ft, the degree diminishing with distance. No crosstalk has occurred with 16 ft of separation.*

Recording Equipment

The recording (and target control) equipment consists of a PDP 15/30 computer and its interface equipment. All data recording programs are prepared automatically as the target control programs are written. The programs are written in a programming language close to natural English.** When they are compiled by the computer to produce the actual program, the necessary data-collection routines are added. During the trial run, the computer controls the range according to the instructions of the program preparer and collects the data. A hard-copy "end-of-trial" summary is automatically produced.

Before each trial begins, the computer asks the operator for time, date, and other logging-in information. The information is recorded on magnetic tape along with the substantive data from the trial. The summary recaps each trial in terms of the number of rounds fired by each firer, hits by target, and near misses sensed by microphone. Programs are available to produce other types of hard-copy output.

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*U.S. Army Combat Development Experimentation Command, MFR--Live Fire Test of California Avionics Laboratories Inc. Portable Round Count System (Ft. Ord, CA, 20 June 1973).

**Janes, Mean and Dakon, USAIB Compiler User's Guide (Ft. Benning, GA, February 1971).

The computer has three mini-magnetic tape drives, two teletype printers, one high-speed line printer, a high-speed paper-tape reader and punch, and is equipped with a memory-protection unit that prevents the loss of data in the event of a power failure. It uses either generator power or commercial power. It has 256 lines for data input and 128 lines for range control. A library of programs exists for range control.

Reliability of Instrumentation

The reliability of instrumentation subsystems is reported to be very good. It takes seven hours to move the computer van the 12 miles from the Infantry Board main post at Fort Benning to the range complex, connect it, and check it out. If the range has not been used for a month or more, about two weeks are required to install and recheck the range components. These are current estimates using the new equipment, such as radio data links, installed in recent years.

Rifle Situations

Up to four firers at a time can fire on the attack range,* up to ten on the defense range, and a single firer on the quick-fire range.

Range Layouts

Figures F-1 through F-3 depict the layouts of the three IB ranges.

Cost

The procurement cost of instrumentation components for the IB is shown in Table F-3.

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*U.S. Army Infantry Board, A Pilot Experiment, Attack Experiment I, Small Arms Service Test Design for a Study of Small Arms Test Facilities and Methods, USAIB Project 3091 (Ft. Benning, GA, June 1966).

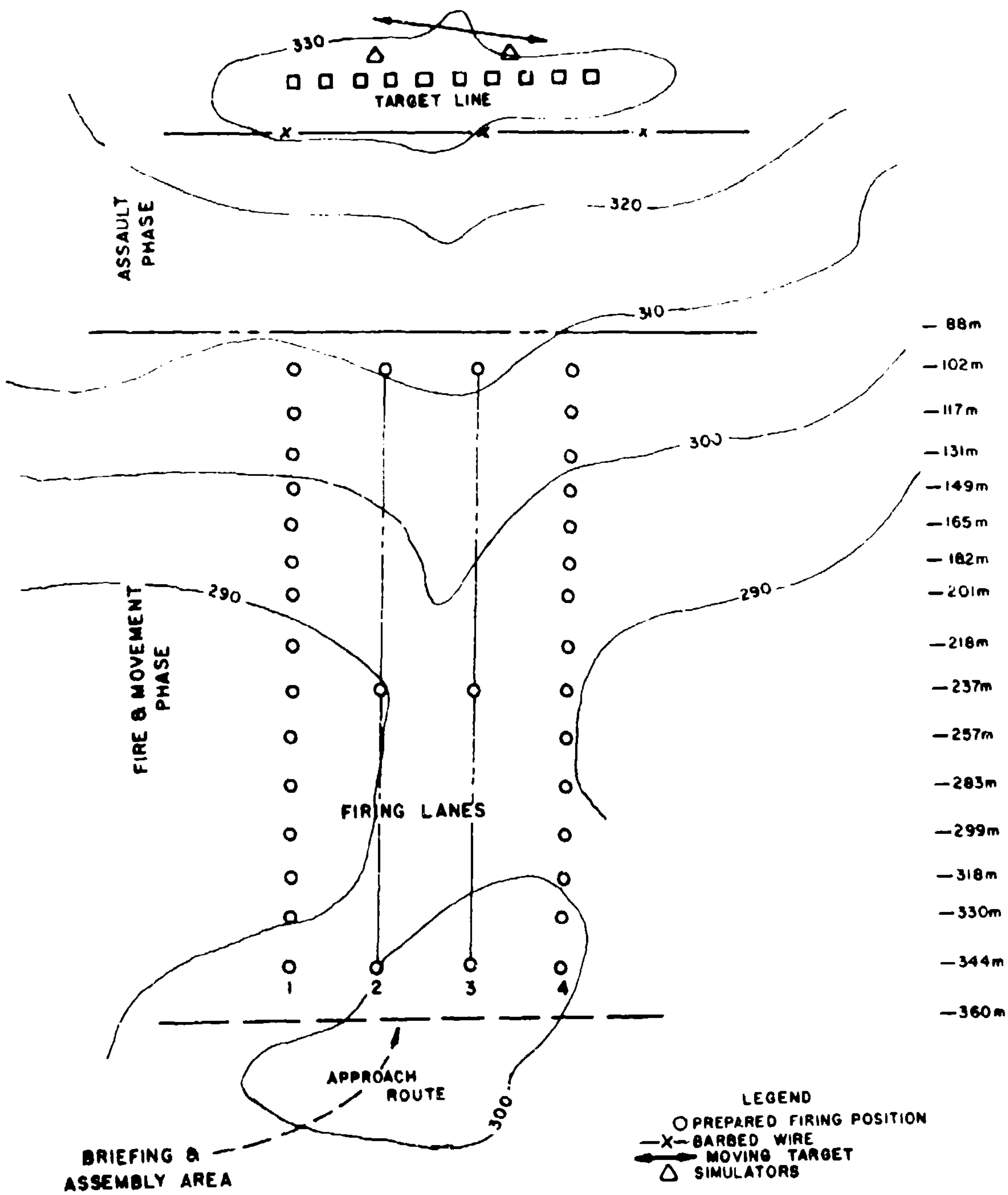
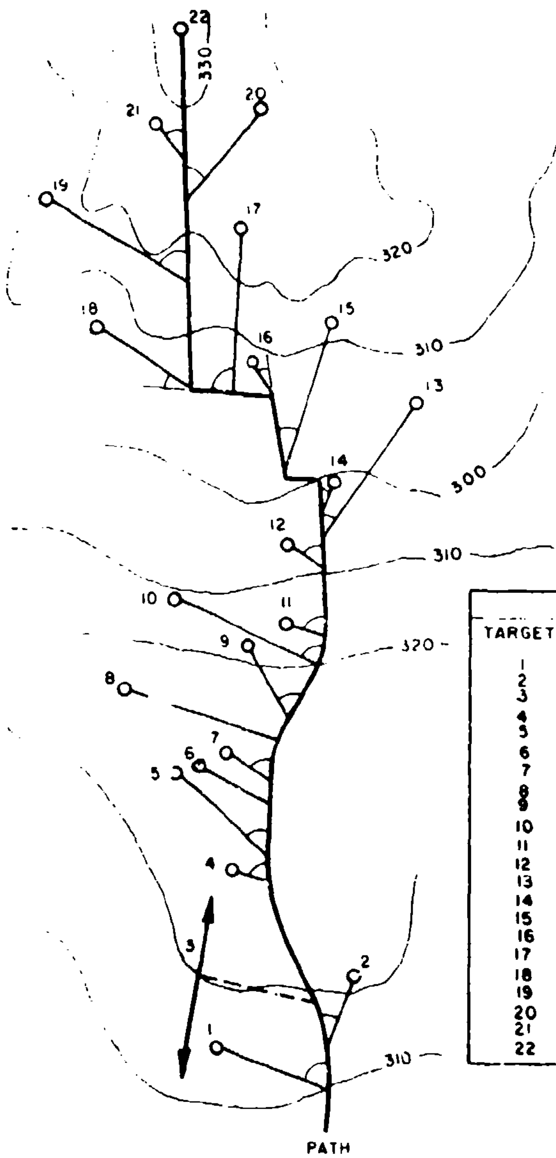


Figure F-1. Layout of IB attack range.



TARGET DATA				
TARGET	ANGLE	LOCATION	TYPE	DISTANCE
1	70°	LEFT	1-POP-UP	60m
2	30°	RIGHT	1-POP-UP	40m
3	35-60°	LEFT	MOVING	80m
4	35°	LEFT	1-POP-UP	20m
5	45°	LEFT	2-POP-UP	60m
6	65°	LEFT	1-POP-UP	40m
7	60°	LEFT	1-POP-UP	20m
8	90°	LEFT	2-POP-UP	80m
9	55°	LEFT	1-POP-UP	40m
10	90°	LEFT	1-POP-UP	80m
11	80°	LEFT	1-POP-UP	20m
12	30°	LEFT	1-POP-UP	20m
13	45°	RIGHT	1-POP-UP	80m
14	30°	RIGHT	1-POP-UP	20m
15	25°	RIGHT	1-POP-UP	60m
16	25°	LEFT	1-POP-UP	20m
17	90°	RIGHT	1-POP-UP	80m
18	30°	RIGHT	1-POP-UP	60m
19	70°	LEFT	1-POP-UP	80m
20	40°	RIGHT	1-POP-UP	20m
21	40°	LEFT	1-POP-UP	20m
22	0°	FRONT	2-POP-UP	40m

Figure F-2. Layout of IB quick-fire range. Adapted from Litton Systems Inc., Mellonics Systems Development Division, Infantry Weapons Test Methodology Study, Quick-fire Experiment I, by Ronald D. Klein (Ft. Benning, GA, 27 June 1969), p. 72.

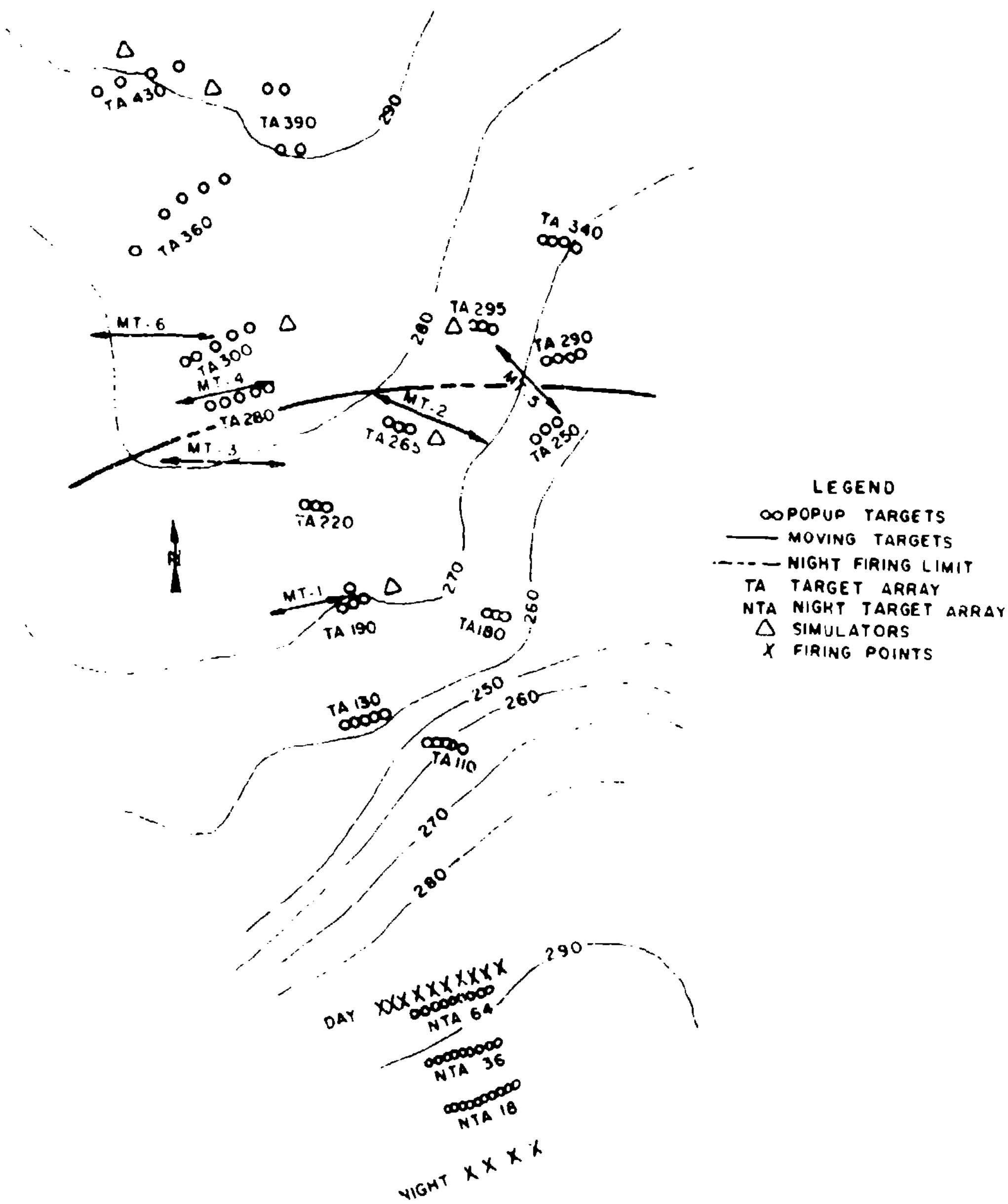


Figure F-3. Layout of IB day and night defense range. Adapted from IB, Defense Experiment 1, pp. 1-2 and 1-3.

Table F-3

ESTIMATED COST OF PROCURING IB DEFENSE RANGE
(1974 DOLLARS)

Equipment	Cost
Target instrumentation	
Raising and lowering mechanism (88 @ $350)	$ 30,800
Moving man target (100-ft track) (6 @ $4,000)	24,000
Weapon-signature simulator (5 @ $1,200)	6,000
Hit sensor (target body) (88 @ $4)	352
Near-miss sensor (64 microphones--16 target arrays with 4 microphones each @ $60)	3,840
Round counter (10 @ $60)	600
Wire network	16,000
Subtotal	$ 81,592
Recording Equipment	
PDP 15/30 computer	$ 49,500
Automatic addressor	25,000
Signal conditioner	16,000
Air conditioner	500
Software	60,000
Subtotal	$151,000
Installation	$250,000
Total	$482,592 ($331,592)[a]

[a]The $482,592 is misleading to the extent that it includes the $151,000 for recording equipment, which is not procured independently for each range but is shared among the three ranges. The figure in parentheses represents the truer cost of just setting up the defense range consisting of 88 stationary and 6 moving targets.

Personnel to operate the ranges are summarized below. Since only one range can be operated at a time, these personnel are adequate for all ranges.

ADP Personnel:	Range Personnel:
1 programmer	1 electrical engineer
1 programmer/operator	2 electronic technicians
Others (numbers unknown):	2-4 controllers
Ammunition handlers	1 statistician
Range guards	1 range officer
Medics	

The estimated daily cost of operating a single range is $540. This includes the services of 6-8 military personnel, 3 Army-employed civilians, and all expendables such as target-body replacements.*

U.S. ARMY COMBAT DEVELOPMENTS EXPERIMENTATION COMMAND (CDEC) SMALL ARMS RANGE

History

The U.S. Army Combat Developments Experimentation Command (CDEC) has three live firing ranges at Hunter Liggett Military Reservation (HLMR), California. Two of the ranges were initially installed at Fort Ord, California, conceived and designed especially for the CDEC-SAWS experiment discussed in Chapter IV. The equipment was moved to HLMR and installed in a different range layout in the spring of 1966. In 1972, a separate "moving target" range was installed at HLMR. The three ranges are designated Alpha, Bravo, and moving target, respectively. The configuration has not changed since. Examples of experiments recently conducted at CDEC are listed in Table F-4.

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*This $540/day estimate is based on estimated personnel costs of $480/day plus a target-body replacement cost of $60/day. The target-body replacement was estimated as follows: for 10 trials a day, 60 targets exposed per trial, 2-3 hits [illegible] target, a replacement estimate of 25 percent was used (2.[illegible] x 60 targ[illegible] = 15 targets replaced per day x $4 per target = $60/day).

Table F-4

SMALL ARMS EXPERIMENTS RECENTLY CONDUCTED AT CDEC

Experiment[a]	Year
Comparison of XM19 and M16 (CDEC 21.9)	1972
Army small arms rifle study (ASARS) II	1973-1974
Parapet-Foxhole (PAR-FOX)	1974
Dispersion against concealed targets (DACTS)	1975

[a]Titles are informal ones. Except for CDEC 21.9, formal reports are not available from DDC.

Targets

Three types of silhouette targets are available for use on the test ranges: head-and-shoulders, kneeling, and standing targets. These 3-dimensional infantry targets* are made of foam laminated to stamped aluminum. There are 64 targets in five arrays on the Alpha range, 49 targets in six arrays on the Bravo range, and 2 targets on each of two cars on the moving target range.

Target Raising and Lowering Mechanism

The CDEC target raising and lowering mechanism is the same M31 target holding mechanism that is used at IB. It was manufactured by the Rock Island Arsenal, Underwood Manufacturing Co., Hartford, Connecticut, and other companies for general use in the U.S. Army during the early 1960s. It operates on 110 volts AC current. It has been locally modified to raise a heavy target in winds up to 15 kn. Electrical filter devices were added to keep the mechanism from interfering with the other electrical components. A bracket has been fabricated locally to allow the height of the target to be adjusted and to provide armored protection

*These targets are called 3-dimensional because they are curved to roughly resemble a human torso, shoulders, and head.

for the hit sensor mounted at the base of the target. Target raising and lowering mechanisms modified for a 24-volt DC power source were installed on the carts for the moving target range.

Weapon-Signature Simulators

Most stationary targets have a weapon-signature simulator that can simulate the noise, flash, and muzzle blast of a rifle, automatic rifle, or machine gun, with rate of fire and burst size controlled by the computer program (see Figure F-4). The simulators are located within the redwood box that houses the target mechanism. The simulation is produced by the spark ignition of a propane-oxygen mixture. The propane and oxygen tanks are located alongside the box that houses the target. The simulators are designed to operate at a maximum rate of 500 simulated rounds per minute.

Target Computer Units (TCUs)

The TCU is an electronic control and signal-conditioning device located at each target emplacement. It processes signals to raise and lower the target and to fire the simulator, and it conditions hit and near-miss signals before they are transmitted to the computer van. The TCU contains a five-position switch to preset the gain of the miss-distance sensors to one of four calibers of ammunition. The gain is usually set for near misses scoring within two meters of the microphone for bullets.

Hit Sensor

A piezo-electric, crystal hit transducer is attached to the aluminum body of the target to detect hits and initiate the lowering of the target. The foam rubber padding bonded to the aluminum surface prevents ricochets from being scored as "lethal" hits and minimizes the vibration likely to cause the sensor to score multiple hits when only a single round has penetrated. The shock detected when the projectile passes through the target is converted into an electrical impulse that is transmitted to the computer van via the TCU to be recorded as a hit on the control

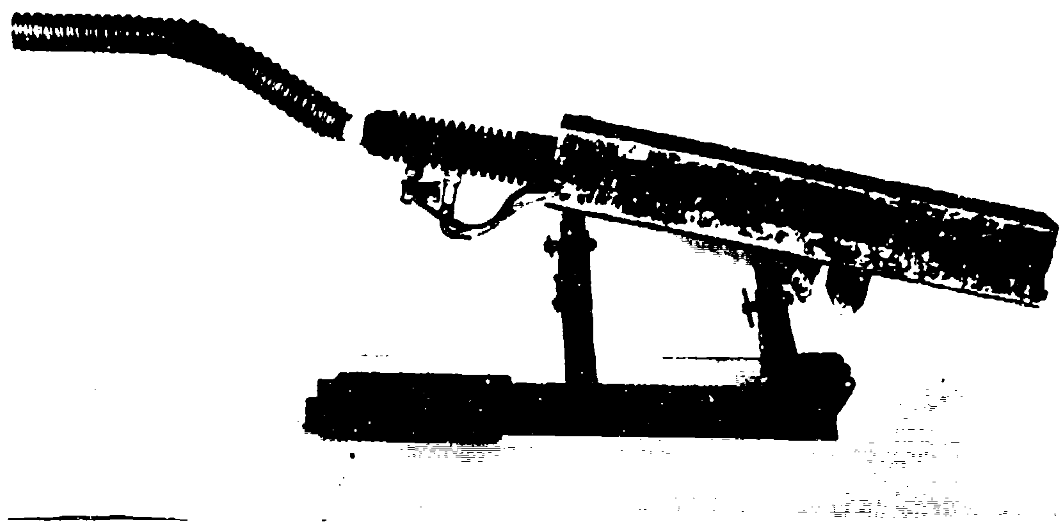

Figure F-4. Weapon-signature simulator (U.S. Army photograph).

console. When a hit is detected, the computer generates a signal that lowers the target.

Near-Miss Sensors

The acoustic near-miss sensor consists of an omnidirectional microphone available for use at each target position. The microphone is activated by the shock wave of a bullet passing within two meters of it.

The target components--raising and lowering mechanism, weapon-signature simulator, TCU, and near-miss sensor--are housed in a box armored with welded sheet steel and with a wooden cover (see Figure F-5).

Stationary Round Counters

An electronic round-counting device is installed at each stationary firing position so that all rounds fired can be sensed and recorded as a function of time. The stationary round-count system consists of a directional microphone connected to a signal-conditioning box. The microphone, mounted on the ground at one side of the weapon muzzle, senses the sound of the report when the weapon is fired. The generated signal is conditioned and transmitted to computer memory for recording on magnetic tape. By setting the gain volume for each sensor properly, the risk of counting rounds from nearby firers is reduced.

Portable Round Counters

A portable round-counting system consisting of a modified M16 rifle stock, a transmitter and power supply that fit in the M16's magazine pouch, and a helmet with a 14-inch whip antenna, provides the means for recording rounds fired as a function of time in moving situations. The portable round counter works only on the M16 rifle or on rifles that can be fitted with the M16's stock. The instrumented stock detects the rearward movement of the buffer group and generates a signal when the weapon is fired. The signal is then processed and transmitted to a radio receiver, which transmits the rounds fired as a function of time by firer to the computer van. The modified M16 rifle stock can be connected to a junction box at a fixed firing point so that round-count signals can be transmitted

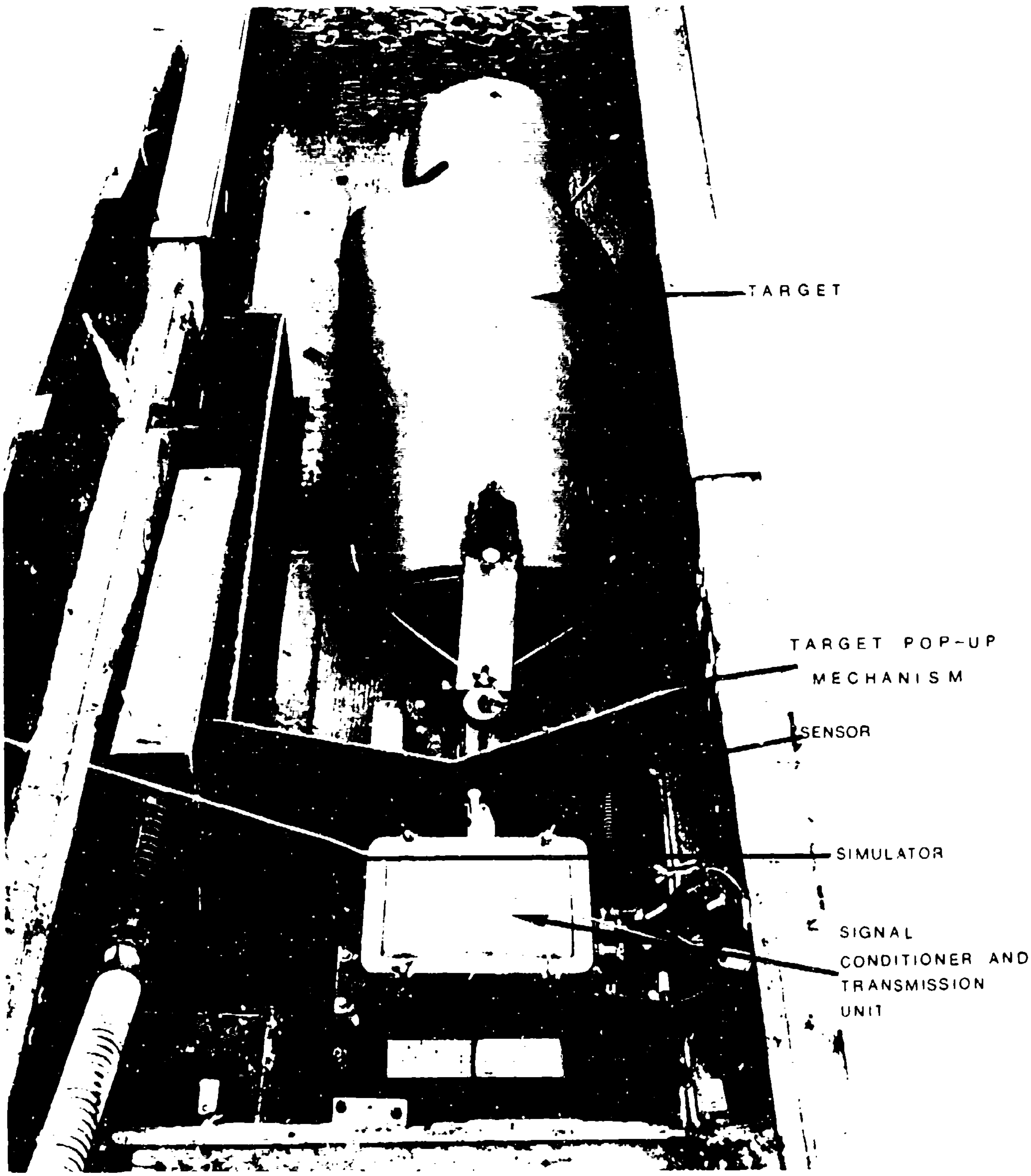

Figure F-5. Target components in armored target box (U.S. Army photograph).

by cable to the computer van. The portable round counter is illustrated in Figure F-6. The system is limited to line of sight, but since the portable round-count receiver is located with the computer vans on high ground at the rear of the ranges, this limitation is not serious.

The portable round-count receiver is a locally fabricated device that has 15 channels, each capable of monitoring a separate firer. The receiver operates on a carrier frequency of 148.020 to 150.740 MHz. Its output is wired to the adjacent computer van to be time-tagged and recorded.

Programming the Target Array

The raising and lowering of targets and the firing of the weapon-signature simulators are controlled from the computer van. The targets can be programmed to appear or reappear in any sequence for any selected duration. They can be programmed (1) to remain in view for a certain time, (2) to drop when hit, and (3) to respond to suppressive fire, i.e., projectile near misses, within a specified time interval. Individual targets can be controlled manually from the computer van for pretrial checkout. Control can be automatic via the computer program or direct by manual override, which can be used to raise or lower targets that fail to respond to the computer program.

In situations where targets are raised when the test squad crosses an event line, the program can be activated by a radio signal or by a visual signal from someone on the spot to an operator in the computer van as the firers move through the course.

Control and Recording Equipment

The control and recording equipment is housed in a mobile computer van. It consists of an SDS Model 910 computer, a magnetic tape unit, a teletype unit, a digital event activator, a digital event evaluator, and control console for monitoring up to 50 targets and their associated simulators. The digital event activator can command up to 102 contact closures to control the raising and lowering of targets, the firing of weapon-signature simulators, and a digital clock. The evaluator subsystem

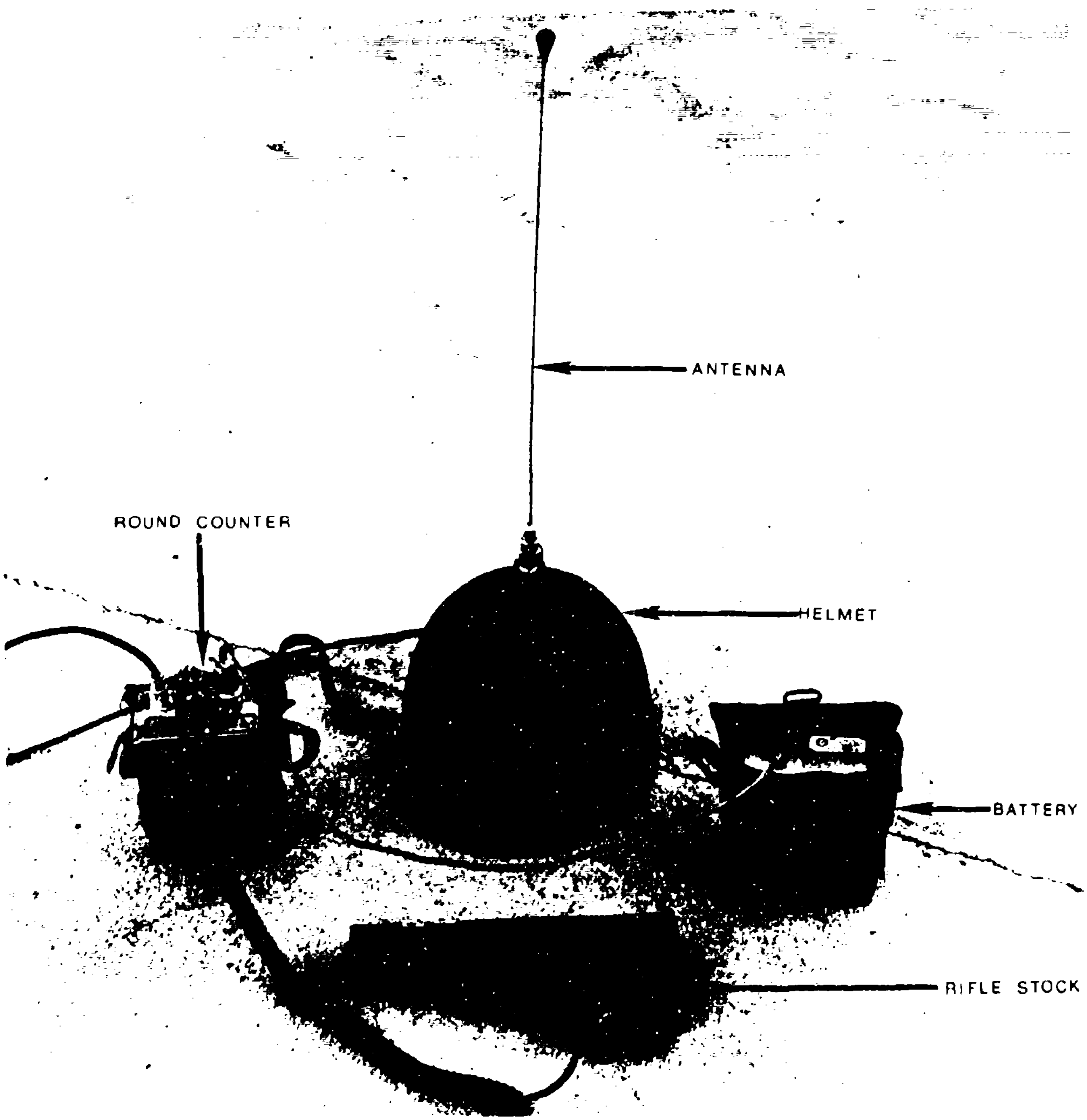

Figure F-6. Portable round counter for the M16 rifle (U.S. Army photograph).

can scan 384 input lines every 4 ms, detecting, storing, and processing signal changes under the program's control. Comparison of current input signals with results stored from the previous scan is the basis for detecting any change in status. Status changes are processed and recorded on magnetic tape. Each change can be summarized on a typed printout. Scanned input signals are classified into hits, near misses, target position, weapon simulator firing, and rounds fired.

The control console is placed in the van so that the console operators can view the firing situations from windows facing down-range. The console has five sections, from which five operators can each control and monitor ten targets and their weapon simulators. During calibration testing and warmup periods, manual controls are used. During experimental trials, the target arrays are driven by the computer program, with the possibility of manual override if necessary. Malfunctions of the target mechanism--raising and lowering devices or weapon-signature simulators--show up on the console by a lighted indicator. Manual controls are then activated to raise or lower the target or fire the simulator, as needed. Each console has ten sets of three push buttons. One push button fires a simulator as long as the button is depressed; the second raises or lowers a target when depressed; and the third reraises a target after it has been hit or suppressed.

Components of the Moving Target Range

The moving target range consists of two parallel aluminum tracks 600 ft long on which four-wheeled, aluminum target carts can be towed in either direction. Both carts are powered by a Volkswagen engine from a bunker by a draw-and-release cable. It is reported to be able to tow the cart along the track at up to 15 mph. The power unit has a hand-controlled accelerator and dial for regulating the speed of the cart. The cart and track are of a local design and fabrication.

Two modified M31A1 target raising and lowering mechanisms are installed on each cart. Modifications include a 24-volt DC battery system. The three-dimensional target bodies used on the Alpha and Bravo ranges are also used on this range. The target instrumentation consists of hit counters and elapsed-time counters that indicate the total length of time the target was raised to the nearest tenth of a second. Both targets on one cart are raised and lowered simultaneously from the control bunker via an RF link. They are not programmed to fall when hit but remain up for a certain time, as ordered.

There are five foxholes in front of the moving target's berm at ranges of 100 to 300 [illegible]s. They are positioned so that the target's track makes an angle of [illegible]° to 60° with the shooter's line of sight to the targets. None of the five firing positions is equipped with a round counter or other instrumentation.

Reliability of Instrumentation

During the approximately 10 years of operation of the CDEC small arms testing ranges, the reliability of the components has naturally varied with the amount of their use and care in their maintenance. Reliability, for example, that of an acoustic near-miss sensor, also depends on the attention given to calibration and checkout, on the age of the components, and on the weather conditions, e.g., rain or high humidity, in which the equipment is operated.

Tests have been made to assess the reliability of target raising and lowering mechanisms, the combined target and hit sensor for recording hits, the acoustic near-miss sensor, and both the stationary and portable round counters for their fidelity in counting the number of rounds fired. The tests have shown the instrumentation to be fairly reliable, but no current information is available. Nor are reliability data available for the SDS 910 computers. In 1974 the computer operated 1007 and 915 hours, respectively, on the Alpha and Bravo ranges. At 83 and 76 hours per month, respectively, that represents extensive use.

The officer in charge of the CDEC ranges estimated that each of the three ranges required 90 minutes of pretrial checkout daily to ensure proper operation, and longer if it was found necessary to replace a main component. If the ranges were shut down for six weeks, it would require about 20 working days to put the Alpha and Bravo ranges back in operation and 5 days to restart trials on the moving target range.*

Relocating any of the ranges would be a major undertaking. Only one target array of 14 targets has been moved during the ten years since the installation of the ranges at Hunter Liggett Military Reservation.** Targets are not moved frequently because of the labor and the cost of rewiring (cabling) involved. In contrast, several new firing lines have been added to the ranges, e.g., five to Bravo range. A new firing line usually requires a single cable trench in front of the line, with junction boxes for each firing point and cabling to the nearest existing firing line for power and for linkage to the computer van. Though adding firing lines provides a variety of target distances for the firers, it may fail to provide situations to adequately test a weapon because of the artificiality of the terrain. It is too easy to detect targets before they are raised where the terrain has been burned out, shot off, or scarred by maintenance crews working on the targets.

Range Layouts

The layouts of Alpha and Bravo ranges are shown in Figures F-7 and F-8.

Cost

The CDEC Alpha and Bravo ranges were initially procured on a "sole source and best effort" basis from Del Mar Engineering Laboratories for $2,253,263. This cost did not include (1) government-furnished equipment, e.g., M31A1 target mechanisms, or (2) installation, which, with minor exceptions, was done by Fort Ord post engineers and troop labor. The value of the labor is impossible to estimate, and in any case the cost

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*The Officer-in-Charge, Live Fire Ranges, Instrumentation Support Group, CDEC, gave these estimates on 13 February 1975, based on 22 months of experience.

**Display A-3 on Alpha range, which was used for the IRUS experiment, was moved about 75 meters south of its initial position. In the process, the array was reduced from 14 to 7 targets and redesignated Array 3. This array is not depicted on the Alpha range layout in Figure F-7 since its exact location is not known.

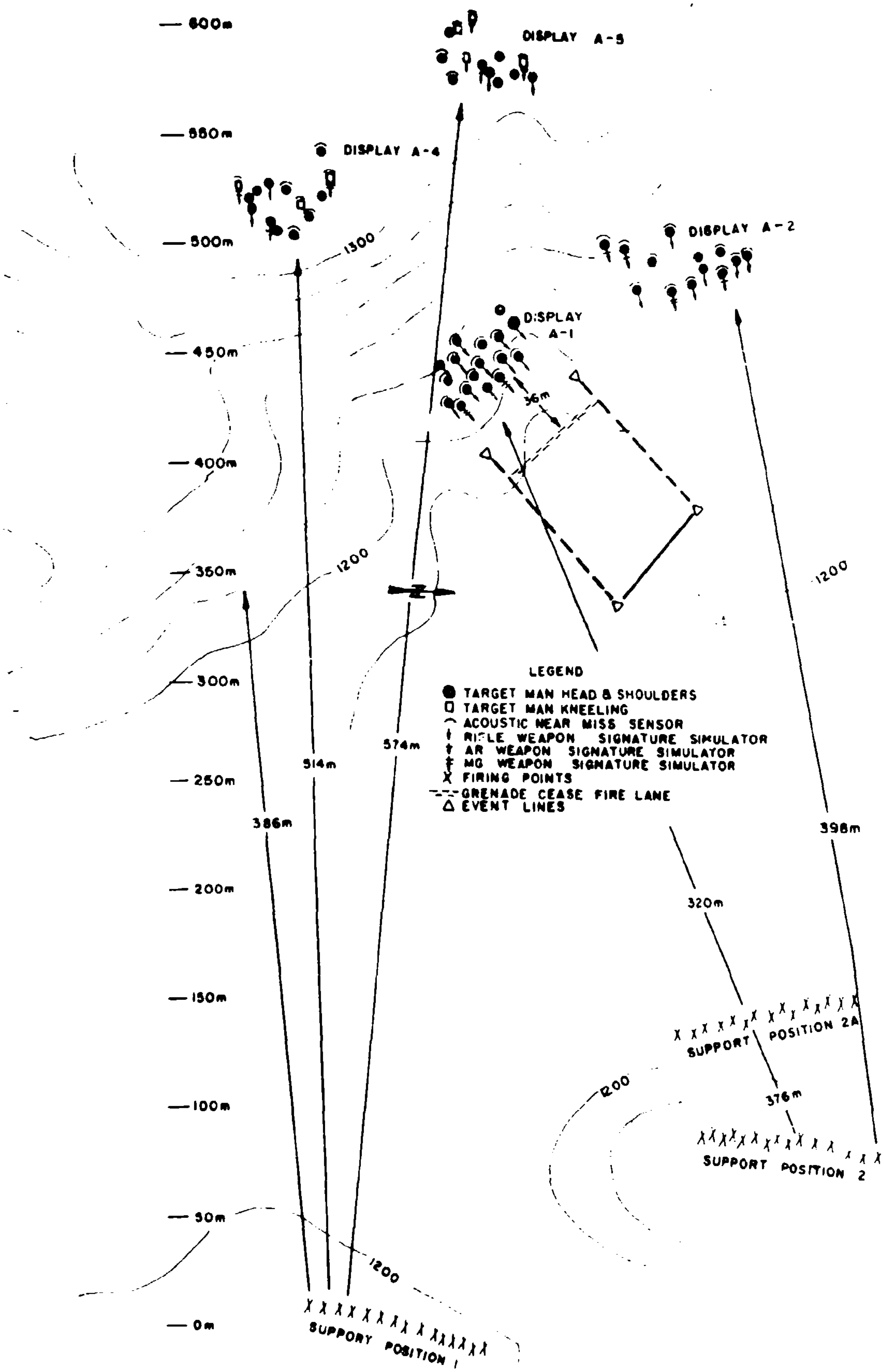

Figure F-7. Layout of Alpha Range, HLMR.

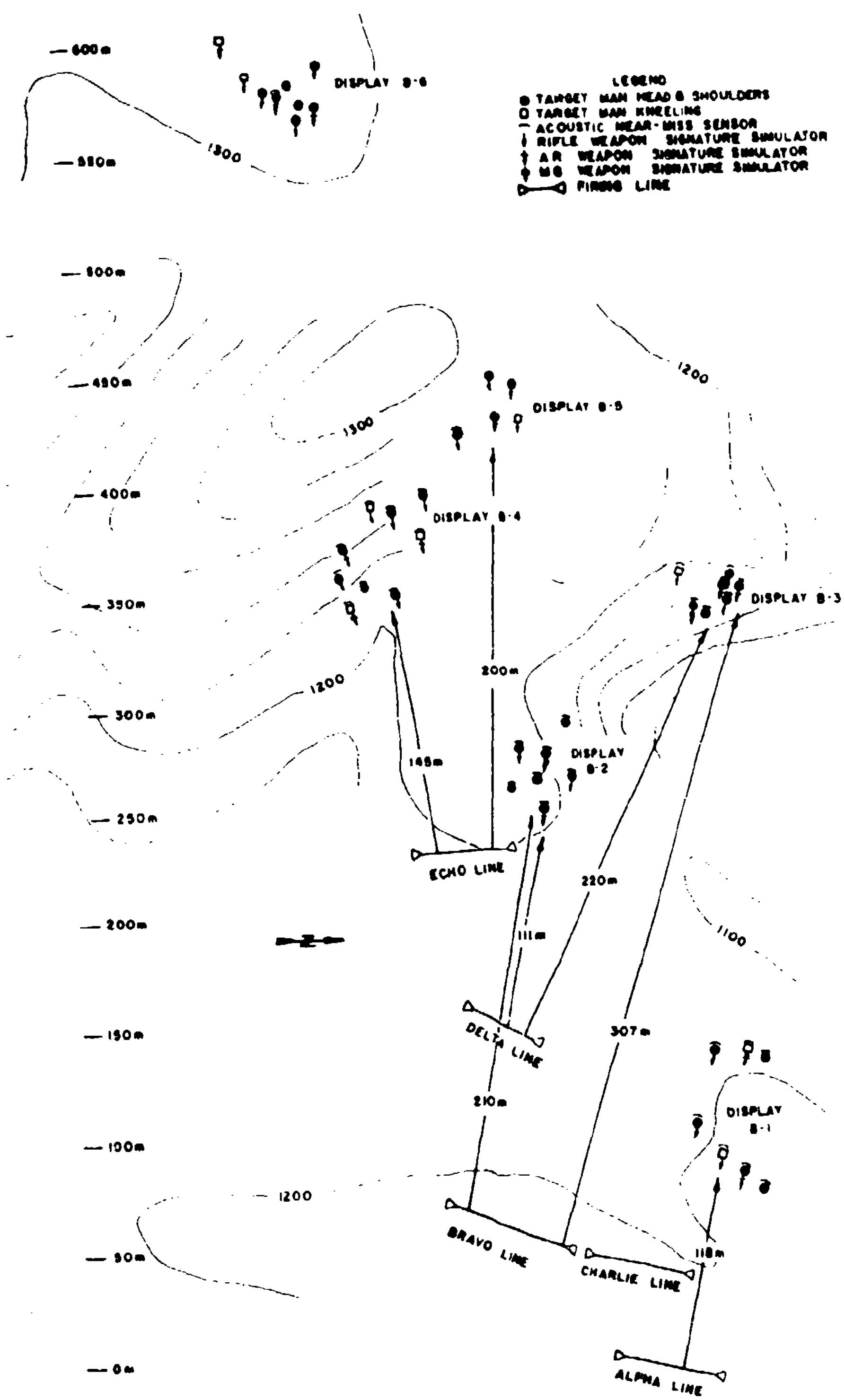

Figure F-8. Layout of Bravo Range, HLMR.

of installation varies from range to range depending on soil and other conditions. The contract did, however, cover unspecified "design costs" that were borne entirely by Del Mar. The cost of the moving target range could not be determined.

When they are being used, the CDEC ranges have a regularly assigned, full-time complement of soldiers supplemented by civilian contractors for technical and analytical support.* The types of personnel involved are identified in Table F-5.

Table F-5

PERSONNEL DIRECTLY ASSIGNED TO CDEC RANGES
WHEN IN OPERATION

		Enlisted Personnel		Contractor Personnel	
Range	Officers	Technician	Operator	Technician	Statis-tician
All (supervisor)	1	-	-	1	-
Alpha	-	1	10	3	1
Bravo	-	1	10	3	1
Moving target	-	-	2	2	1
Total (38)[a]	1	2	23	9	3

[a]Only when all three ranges are used concurrently.

The cost of replacing target bodies, plus the personnel costs, probably amount to $2500/day.** Maintenance and other operating and replacement costs were not determined and are not included in this estimate.

*Equipment maintenance is provided under contract by Bell Aerospace Corporation; scientific support is provided by Braddock, Dunn and McDonald.

**Each target body is replaced after about 100 hits. Therefore, the $2500/day estimate is based on 2-3 hits per target per run, 10 trials per day. This implies that 33 percent of the 49 targets are replaced daily, which amounts to $1536 (16.17 targets x $95); $1536 + $896 (estimated personnel costs) = $2432.

The procurement cost of instrumentation components is shown in Table F-6.

NEW RANGE EQUIPMENT

Besides assessing the small arms range complexes at CDEC and IB, a search was conducted to find and assess other range systems and components available for use on such ranges. In all, the products of about 30 companies were surveyed. Below are described two complete range systems--the DART system, produced by the Australasian Training Aids Pty., Ltd., Albury, N. S. W., Australia, and the SAAB Target System, produced by SAAB-Scania, Jonkoping, Sweden--and then individual component equipment available from various companies.

First, to make meaningful what capabilities the new target systems and components might be able to provide to small arms testing ranges, it is instructive to compare the current capabilities of CDEC and IB in target instrumentation and the capacity to handle test firers. This is done in Table F-7.

DART Target System

Instrumentation

The DART Target System is manufactured by Australasian Training Aids Pty., Ltd. The system consists of a hit-sensitive panel or silhouette, a raising and lowering mechanism, battery or power pack, and weapon-signature simulator. Targets are manually controlled by an operator using a control panel, either through a wire or radio control link. An integrated control panel/transmitter system, which is portable, can be purchased to control up to 10 targets. The various target components are described below.

Raising and lowering mechanisms. The target raising and lowering unit is equipped to hold one target body each and consists of a waterproof, cast aluminum box housing a gear box and motor along with the electrical control module. If AC commercial power is not used, power is supplied by a [illegible]-volt, rechargeable, lead acid battery, which will

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R·ising and lowering mechanisms. The target raising and lowering un equipped to hold one target body each and consists of a water-p' cast aluminum box housing a gear box and motor along with the electrical control module. If AC commercial power is not used, power is supplied by a 12-volt, rechargeable, lead acid battery, which will

Table F-6

PROCUREMENT COSTS OF CDEC RANGE COMPONENTS

Component		Cost per Unit
Target raising and lowering mechanism M31A1		$ 400
Target silhouette without hit sensor		
2-dimensional target:		
head and shoulders		48
kneeling		62
standing		81
3-dimensional target:		
head and shoulders		65[a]
kneeling		95[b]
standing		110[a]
Hit sensor with cable		120[c]
Acoustic near-miss sensor		172
Hit-counting halo for sensing near misses with mount		1080
Target computer unit (TCU)		900
"A" cards for TCU (hit counting)		1195
"B" cards for TCU (miss measuring)		940
"C" cards for TCU (hit counting for halo)		355
Stationary round counter		1314
Portable round co[illegible] (for one soldier)		473
Helmet modification	$ 12.50[d]	
Transmitter	$ 40.00[e]	
Power unit	$ 20.00[d]	
Modified M16 rifle stock	$400.00[d]	
Portable rounds fired indicator receiver and rack		2100[b]

NOTE: Unless otherwise footnoted, costs are taken from CDEC, Instrumentation Support Group, Memorandum for Record, "Historical Brief on Association with Del Mar Engineering Associates," ISG-POR-PFR (Ft. Ord, CA, 14 February 1967). Where necessary, costs were adjusted to 1974 replacement prices.

[a] "Purchase Request and Commitment for: Three-Dimensional Targets," P/N: 10492-501 and P/N: 10490-501 from CDEC Contract Officer to Del Mar Engineering Laboratories, 7 June 1974.

[b] Provided by Officer-in-Charge, Live Fire Ranges, Instrumentation Support Group, CDEC, [illegible]9 February 1975.

[c] "Purchase Request and Commitment for: Hit Transducer," P/N: 10419 from CDEC Contract Officer to Del Mar Engineering Laboratories, 7 June 1974.

[d] Provided by Don Werner, Braddock, Dunn and McDonald, Instrumentation Support Section, HLMR, 13 February 1975.

[e] Estimate.

Table F-7

COMPARISON OF CURRENT IB AND CDEC RANGES IN TARGET INSTRUMENTATION AND CAPACITY TO HANDLE TEST FIRERS

	Number of Simultaneous Firers		Cycle Time[a] (min)		Total Number of Targets		Number of Hit Sensors		Number of Near-Miss Sensors		Total Number of Simulators		Estimated Maximum Capacity (firers/day)	
Situation (or Range)	IB	CDEC	IB	CDEC	IB	CDEC	IB	CDEC	IB	CDEC	IB	CDEC	IB	CDEC
Assault	4	9	8	15	11	17	11	17	3	17	0	15	225	228
Firing at the same targets from different firing points (fire and movement phase)	4	12	15	30	11	28	11	28	3	28	3	21	128	192
Quick-fire	1	NA	15	NA	25	NA	25	NA	25	NA	14	NA	32	NA
Base of Fire:														
for assault	10	15	12[b]	15	12	30	12	30	3	30	3	25	400	480
for advance	NA	15	NA	15	NA	28	NA	28	NA	28	NA	23	NA	480
Day defense	10	12	15[b]	15	66	28	66	28	16	28	6	23	240	384
Night defense	4	NA	15[b]	NA	57	NA	44	NA	--	NA	6	NA	128	NA

[a] Includes the length of the trial, the time to clear the range, and the time to test the instrumentation.

[b] Approximate.

allow over 4000 cycles, i.e., 4000 up and 4000 down actuations, before recharging is necessary.

Normally, the mechanism is controlled by a radio transmitter using the hit-and-fall method, but by continuously depressing the "Up" button, any target can be made to stay up, even when hit. Another form of control is furnished by a manual control and counter unit, which also can override the fall-when-hit mode and record hits on a counter mounted on the target mechanism.

The target holder is mounted on the final drive shaft and can be adjusted to accept flat targets 1/16-1/2-inch thick. It is designed to operate with the full range of targets currently used by NATO and SEATO countries.

Moving target carriers. A carrier capable of holding three target raising and lowering mechanisms is available. No operating specifications are provided. Brochures show the carrier operating on a two-rail, ground-mounted track similar to a railroad track. They do not indicate whether the carrier drive is ground-mounted with a pulley system or is self-propelled. Speeds are listed as equivalent to those of a walking and a running man.

Weapon-signature simulator. A 24-round, single-shot small arms simulator is available with the raising and lowering mechanism. It simulates noise, flash, and dust. Cartridges are reloaded into the simulator and are fired with the command to raise the target.

The simulator consists of a block made of specially hardened steel, drilled to accept twenty-four #33 commercial or marine electric detonators. The block is cable-connected to the mechanism via a 26-pin plug, and the leads of the electrical detonators are connected via a terminal strip. When the "Detonate" command is sent from the transmitter, the effect of a rifle shot is produced, with accompanying noise, flash, smoke, and dust.

Programmed target array. The targets are raised one time by an operator, using a control transmitter, who observes the firing of the test subjects. The targets can be set to drop when hit or to remain in view by continually giving the "Up" command. The running-man targets are also started normally from the control console.

Besides the control panel, the programmer has a transmitter and receiver system. The individual receivers are located at each target position.

The transmitter is powered by three internal, 6-volt cells made of nickel cadmium, which are recharged by a special constant current charger. The transmitter emits a single, radio frequency carrier wave that can be modulated by any of 10 audio channels to keep the target up. A common "Down" button causes all targets to drop simultaneously. A "Detonate" button, when pressed with a target "Up" button, will cause the chosen target to fire a simulated retaliatory or offensive shot.

The receiver consists of a waterproof, cast aluminum box that, although removable, is normally clamped to the mechanism-carrying frame. The receiver is connected by one cable to the mechanism via connectors, and is powered from the main mechanism battery.

Each mechanism requires one receiver, which is identified by number, namely channels 1 to 10, corresponding to the respective "Up" button numbers on the transmitter. The receiver is a conventional superheterodyne type operating in the 27-33 MHz band.

Hit sensors. The hit sensor appears to be a vibration-sensitive element located at the base of an almost rectangular, kneeling-man (type E) polyethylene target. The sensor activates a hit counter located on the target mechanism. Each target will sustain several hundred hits before needing replacement. The vibration-sensitive switch is connected by cable to the target raising and lowering mechanism. The detection of a hit either causes the target to fall or to register a hit on the counter, depending on the operation mode selected.

Night-firing attachment. The night-firing device consists of a small, waterproof aluminum box surmounted by a plastic dome. A light inside the dome illuminates the target when a button is pushed on the control/transmitter panel. When the target is hit, a red light shows briefly to inform the firer. The light is shielded to prevent illumination of the surrounding area.

Other instrumentation. The system has no near-miss sensor or round-counting system. Nor is there a means of producing hard-copy reports of either target presentations or resulting hit data.

Reliability

No data are available on the DART system's reliability. However, spare parts can be bought with the basic system, and malfunctioning components can be quickly changed by range crews.

Cost

The Marine Corps has bought the DART system for two of its installations.* Judging from procurement plans, the cost of one target set is about $2500.

SAAB Small Arms Training System

No technical reports of the SAAB system are available. The description below is based on information provided by the Detroit Bullet Trap Company, Schaumberg, Illinois. The firm is licensed to sell the SAAB system in the United States and is currently negotiating for the rights to manufacture the entire system in this country.**

Instrumentation

The target system consists basically of a raising and lowering mechanism with a target holder capable of holding all sizes and types of target bodies. The mechanism can be purchased with several optional equipment items to produce the desired configuration. They include direct power hook-up, power pack, night-firing illuminator, weapon-signature simulator, wire or radio command link, hit counter, and control console.

Raising and lowering mechanism. The raising and lowering mechanism is equipped with a target holder capable of holding any type of small arms target. It consists of a waterproof, sheet-metal box galvanized for weather protection. It contains an electromechanical gear drive that

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*U.S. Marine Corps, Deputy Chief of Staff, Installation and Logistics, to Naval Training Equipment Center, Commanding Officer, Orlando, Florida, "Marine Corps Procurement Request," 27 June 1974; Naval Training Equipment Center, Commanding Officer, "List of Equipment Required for Commander General, Marine Corps Recruit Depot, Parris Island," (cost included), letter N3203: GDG, 22 May 1973.

**Information provided by Mr. Joseph Nikoden, Marketing Representative, Detroit Bullet Trap Company.

operates on 14 volts DC provided either by a nickel-cadmium power pack or commercial power via reducer-converter. A special air-powered raising and lowering mechanism is also available. With the power pack the unit is capable of 3000 up-down cycles between charges.

The mechanism will operate in several modes: drop when hit, stay up for a preset time period, illuminate a night-firing light, or fire a simulator when raised. Control is by a wire or radio link.

Weapon-signature simulator. The system uses the SAAB "gun," a machine gun-shaped device that produces flash and noise by means of a mixture of oxygen and propane gas ignited by a spark plug. The simulators used at CDEC and IB are similar. The SAAB simulator will fire either single shots or bursts, and several thousand "shots" can be fired before the storage tanks must be recharged. The device is coupled with the raising and lowering mechanism for control.

Programmed target array. Several types of programs are available. Push-button tower or vehicle-mounted units are normally used on training ranges and can be configured for any number of targets. The control link can be either wire or radio. Small computers (PDP 8, Digital Equipment Corporation) have also been used as target controllers.

Hit sensor. The hit sensor is a special vibration-sensitive element located at the base of an aluminum target. Other types of hit-sensitive target bodies (like those used at CDEC and IB) may also be used with the target mechanism. The vibration-sensitive element is connected by cable to the target mechanism. Hits may be registered on a counter attached to the target or transmitted over wire to the recording device.

Night-firing attachment. On command, the night-firing device illuminates the target briefly. It is housed in a waterproof, sheet-metal box with a clear plastic cover. Power supply is from the target.

Reliability

No data are available on the reliability of the SAAB system's instrumentation.

Cost

No cost data are available.

Individual Range Components Available

The various instrumentation components described below are available or have been used on test and training ranges. Some of these components were identified in the body of this report as components of existing ranges. Cross reference is made to their descriptions.

Target Raising and Lowering Mechanisms

The standard M31A1 and M30 mechanisms have been manufactured by several firms under the auspices of the Naval Training Devices Center.* Joanell Engineering Laboratories, producer of the M30 mechanism ($400 each) has designed an improved mechanism that has not been built in quantity. The new unit is lighter and simpler in design. It will hold flat or slightly curved target bodies (kneeling-man) of varying thickness. The operating principle is identical to the M30 mechanism. Estimated cost of the new mechanism is $350 each.

Moving Targets

Four companies were found that manufacture or have manufactured moving targets.

The IB running-man target system was manufactured by the Saratoga Conveyor Company, Atlanta, Georgia. Designated MTV-200, it consists of a ground-mounted pulley drive unit, 20-ft track sections bolted together in lengths of 80 to 200 ft, and a target-carrying cart. The system operates on 220 volts AC with a 1-hp, 3-phase, 208-V, AC reversing-brake motor coupled directly to a V-pulley. In a speed-reducing arrangement, the V-belt couples the drive motor to an axle, which drives an endless cable over an idler wheel at the opposite end of the track. Speeds of 5-15 mph can be obtained by substituting pulleys of various sizes.

The computer, which acts as a controller, sends a start signal to the drive unit; the start signal closes a power relay, which starts the unit in motion. As the carrier passes over a prepositioned friction bar (6 ft long), a small rubber wheel brings the target to an upright position.

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*U.S. Navy Training Devices Center, NAVSO Pamphlet 3108 (Orlando, FL, December 1967).

The target is held in this position by a solenoid until the cart passes over a prepositioned switch on the target or until it is hit. Then, the solenoid releases the target, which by gravity drops to its resting position. The cart continues along the track until the limit switch is triggered. It is then braked to a halt by the drive unit, which then reverses itself and automatically returns the target carrier to its starting position. These units have been in operation for four years. Periodic maintenance consists of adjusting the cable tension and replacing pulleys. The 1/4-inch steel cable tends to pick up dirt, which causes wear on the pulley. Hit data are transmitted to the computer via a radio link manufactured by California Avionics Laboratory, Inc.

Cost of the MTV-200, with 100 ft of track, is $4000 to $4500. The track may be installed on any fairly flat terrain. The target will not negotiate turns.

Two other moving target systems, manufactured by Aircraft Armaments, Inc. (AAI), Cockeysville, Maryland, and Joanell Engineering Laboratories, Livingston, New Jersey, were tested during the mid-1960s by the IB. The AAI system consisted of a self-propelled carrier, a pneumatic lifting mechanism, and a concrete runway with a center guide rail. Commands, current, and data collection were transmitted via the guide rail. The system operated on 200 volts AC on a circular track (one forward speed of 4 mph), powered by a 1-hp motor. The IB found the unit unsuitable because (1) the carrier was so heavy that a wrecker had to be used to emplace it, (2) the 4-ft height of the carrier required an unrealistic protective earth berm that impaired the realism desired for the range, (3) installation cost was $4 per linear foot for the guide rail plus installation of a concrete pad, and procurement cost was $8000 per target carrier.*

The Joanell unit had the same basic components but operated on a 24-volt DC current using a 1-hp motor. The target-lifting mechanism was gear-driven; two rails were used to guide the target. As with the AAI target, the units were heavy and required a protective earth berm.

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*USAIB, Quick-Fire Experiment I, p. 83.

Joanell has manufactured an improved version that is being used on the training range at Camp Pendleton, California. The cost of this unit was $6000. Installation cost included a concrete runway. The unit can operate on either circular or straight courses at a single speed of 4 mph forward or reverse.

The fourth moving target system is manufactured by the Detroit Bullet Trap Company and consists of a ground-mounted drive unit, a track system of 16-ft sections that can be arranged in any length to 500 ft, and an 8-wheeled cart that rides on the track. It operates on a V-pulley drive with a 1-hp, 200-volt AC motor and an endless cable. The carrier can be fitted with up to three SAAB raising and lowering mechanisms. Carrier speed can be varied up to 9 ft/sec. The system can be operated in either direction. It will not negotiate curves. The same company has produced another model that uses the same drive equipment but will operate on a loop or circular track. The track is galvanized for weather protection.

The CDEC moving target system, previously described, was fabricated in-house and the components bought by contract.

Weapon-Signature Simulators

The most commonly used small arms simulator or weapon-signature device is the SAAB machine gun simulator, which operates on a mixture of oxygen and propane gas ignited by a spark plug. The units can be fired remotely by wire and will fire single shots or short bursts. The system operates from a 24-volt DC power pack or, using a current-reduction converter, from commercial power. The rate of fire in the automatic mode is approximately 550 rounds per minute. These simulators were produced under the auspices of the Naval Training Devices Center. They cost approximately $1200 each with pressure hoses and storage tanks.

The DART system uses a device that holds up to 24 blasting caps. As each is detonated, a single rifle shot is electrically simulated. No information is available on the cost of this unit when purchased separately.

Joanell Laboratories claims to have an improved model of the SAAB gun that can fire at a maximum rate of 3000 rounds per minute. Cost depends on the quantity ordered. The utility of this firing rate is doubtful.

Near-Miss Sensors

Several types of near-miss sensors have been developed and used with varying degrees of success. The two most common and least expensive systems both utilize the ballistic shock wave of the passing projectile. One system measures the amplitude or loudness of the sound, while the second system measures the time differential of the arrival of the shock wave at various points. Both use a pressure transducer (microphone) as the sensing element. These systems are described in Chapter V.

CDEC uses the amplitude-measuring system, produced under the brand name Acousticscore by Del Mar Engineering Laboratories, Los Angeles. The cost of a single unit is estimated at $1500. IB uses the time-differential sensing device. The cost is $240 for the four microphones, plus four signal-conditioning units ($250), plus a recording device. The total cost of a single system is thus $490 plus a display unit.

Acubar, Inc., Overton, Pennsylvania, has developed a variation of the time-differential system. Two metal rods (16-40 ft long) are placed near the target, usually at 90° from each other. As the shock wave strikes the rods, they pick up the sound and transmit it to a sensor at each end of each rod. The time of arrival at each point is measured and used to calculate the point at which the shock wave first struck the rod; this is the x,y coordinate. The pulses are fed through signal-conditioning circuits into an electronic counter or computer. The system is claimed to be accurate to 1/10 inch under ideal conditions,* the weapon in a fixed location. This system is also affected by angle of penetration. The cost of a single system with digital display readout is about $13,000, installed. It counts 6000 rounds per minute, with 9100 achievable with special instrumentation.

The Acubar system has been installed at the following installations, almost entirely on indoor test ranges: Eglin Air Force Base, Aberdeen Proving Ground, Rock Island Arsenal, Lake City Arsenal, Twin Cities Arsenal, and Frankfort Arsenal. The systems at Twin Cities and Frankfort use a

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*According to George Rohrbaugh, Acubar, Inc.

PDP 8 computer (Digital Equipment Corporation) as the data collection device.

Aircraft Armaments, Inc. (AAI), Cockeysville, Maryland, has developed a "sky screen," consisting of a high-intensity lamp located near the base of the target that shines directly upward but does not illuminate the target in any way. As projectiles pass through the screen, light is reflected downward and picked up by several photo cells. The result is an x,y coordinate of the point of penetration. No cost data are available and no systems have been installed. The system requires no calibration and is not dependent on a precise angle of penetration.

The Elmer Corp., Wilton, Connecticut, has developed an improved sky screen consisting of a laser illuminator and two laser scanners on either side of the target base. The scanners sense the projectile and record the angle at which the scanner was aimed at the time of contact. The intersection angles of the two scanners determine the point of impact. No cost information is available for this system.

At least one French firm is marketing acoustic near-miss scorers; SFENA builds the acoustic scorers MAE-12B and MAE-14. Air Target, Ltd., in Sweden, is reported to make the AS100 acoustic scorer; SAAB-Bulow of Sweden markets the BT-22 and BT-14 acoustic sensors. These all appear to be air-to-ground strafing scorers. No information on them could be found.

<u>Round-Counting Systems</u>

Three round-counting systems are currently in use on the two major operational testing ranges. No other commercial systems were found.

Two of these systems were developed in-house at CDEC and IB and have been described earlier in this appendix. The third is a portable, helmet-mounted system that permits the firer complete freedom of movement. It is used at the IB during the fire and movement and assault phases of testing on the attack range. It is the only commercially available system and costs $550 per helmet unit and $6000 per eight-channel receiver. A display counting device or computer must be linked to the receiver for data recording. The system is manufactured by California Avionics Laboratory, Palo Alto, California.

Table F-8 lists the companies surveyed and their main products related to small arms testing and training.

Other Instrumentation

Besides what already exists on the CDEC and IB ranges, or what has been described immediately above, no new target programmers, cable networks, camera recording systems, or other ancillary instrumentation have been reported.

Table F-8

COMPANIES PRODUCING EQUIPMENT FOR SMALL ARMS TESTING AND TRAINING

Company	Product
Aircraft Armaments, Inc. Cockeysville, Maryland	Sky screen, miss-distance indicator, moving targets
ABA Industries, Inc. Pinellas Park, Florida	Raising and lowering mechanisms for tank targets
Acubar, Inc. Overton, Pennsylvania	Acubar miss-distance indicator
Air Target, Ltd. Stockholm, Sweden	Acoustic scorer
Australasian Training Aids Pty., Ltd. Albury, N.S.W., Australia	Complete small arms training range (DART system)
Babcock Electronics Corp. Costa Mesa, California	Automated target system Radar miss-distance system
California Avionics Laboratory, Inc. Palo Alto, California	Helmet-mounted round counter Moving target data units Range-computer interface systems Target program-control systems
Celesco Industries, Inc. Costa Mesa, California	Air-to-ground and bomb-scoring ranges
Del Mar Engineering Laboratories Los Angeles, California	Complete range sys em (CDEC) Acousticscore
Detroit Bullet Trap Co. Schaumberg, Illinois	Representative, SAAB complete training system Moving target mechanism
Digital Equipment Corp. Maynard, Massachusetts	Range-computer interface equipment, computers
Ecko Instruments, Ltd. Southend-on-Sea, Essex Great Britain	Radioactive miss-distance scorer
Elmer Corp. Wilton, Connecticut	Laser miss-distance indicator

Table F-8 (Continued)

Company	Product
EMR, Inc. Sarasota, Florida	SIMFIRE non-live fire tank vs. tank system
Essex Corp. Alexandria, Virginia	Human factors analysis and independent instrumentation Evaluation for small arms testing
A. Frederick Flender Co. Bucholdt, West Germany	Moving target drive systems
Jcanell Engineering Laboratories Livingston, New Jersey	Hit-sensitive target material, moving targets, raising and lowering mechanisms
Instrumentsfabriks AB Lyth Stockholm, Sweden	Air-to-air scorer
Mellonics Division, Litton Systems, Inc. Sunnyvale, California	Range-control software
RAI Research Corp. Hauppauge, New York	Representative, DART complete training system
REALTRAIN Chicago, Illinois	Simulated live fire training system, tank vs. tank laser system
SAAB-Bulow Linkoping, Sweden	Air-to-ground acoustic scorers
SAAB-Scania Jonkoping, Sweden	Ground target system
Sanders Associates Boston, Massachusetts	Radar miss-distance scorer
Saratoga Conveyor Company Atlanta, Georgia	Moving man and tank target mechanisms, stationary tank target mechanism
Societe Francaise d'Equipements pour la Navigation Aerienne (SFENA) Velizy-Villacoublay, France	Acoustic scorer

Table F-8 (Continued)

Company	Product
H.R.B. Singer Baltimore, Maryland	Developer of Acubar but no longer producing range equipment
System Consultants, Inc. Jerico, New York	Ammunition test services
Underwood Manufacturing Co. Hartford, Connecticut	Pop-up target mechanism
Wood Ivy, Inc. Alexandria, Virginia	Moving-man target
Xerox Data Systems El Segundo, California	CDEC range computers

Appendix G

SAMPLE DECISION MEMORANDA FROM THE CDEC-SAWS PROJECT

MARINE CORPS LIAISON OFFICER
USACDC EXPERIMENTATION COMMAND
Ft Ord, California 93941

CDEC-LO

18 October 1965

MEMORANDUM FOR RECORD

SUBJECT: Best Firing Technique Meeting of 15 October 1965

1. A meeting on best firing technique commenced at 1700 on 15 October, attended by the Board.

2. Technique of Fire for Approach-to-Contact Phase.

a. The Team Chief raised the question of our purpose in the design of the approach-to-contact situation on Range B. The original plan for this series of sub-situations was to examine the composite pointing characteristics of candidate weapons at typical firing distance for this mode of combat. There was a lengthy discussion which arrived at the consensus that different weapon "holding or pointing" techniques were applied to targets as a function of their range and number of targets that appear (urgency).

b. The Project Scientist reported he had planned the following exploratory firing trial sequence:

(1) Stoner rifle with 2-round burst

(a) Shoulder aimed

(b) Shoulder pointing

(c) Under arm

(d) Shoulder aimed

(e) Shoulder pointing

(f) Underarm without sling

(2) M-14 rifle

(a) Shoulder aimed in 2-round burst

(b) Shoulder aimed in semi-automatic fire

(c) Shoulder aimed in 2-round burst

c. The Project Scientist continued to express concern about some of the short target exposure times in this situation. We concluded that the present command program was tentatively acceptable for target exposure, but it would be examined in the light of experience gained with two new squads not previously exposed to this range. Our "exploratory firing" crew will continue the above series by the following trial sequence:

(1) Pointing (in a variety of weapon holding positions to meet the stress of each event conditioned by the distance to the target) in 2-round burst.

(2) Pointing in semi-automatic

(3) Pointing in 2-round burst

(4) Shoulder pointing 2-round burst

(5) Shoulder pointing semi-automatic

(6) Shoulder pointing 2-round burst

(7) Underarm 2-round burst

d. The Project Scientist then presented the initial exploratory firing data collected on the approach-to-contact situation of Range B on 11 October 1965. A total of 42 targets are included in this situation, with 10 targets being included in the ambush event. Data from four trials using the M-14 armed squad are shown in the table below:

TRIAL DATA FOR M-14 SQUAD, APPROACH-TO-CONTACT SITUATION

Trial	Time	Technique of Fire	Targets Hit	Total Hits	Targets Hit in Ambush	Total Ambush Exposure Time (min)[a]
1	0800	Shoulder aim, 2-rd burst	21	24	5[b]	0.53[b]
2	1100	Shoulder pointing, 2-rd burst	25	49	7	0.39
3	1330	"Low" underarm in 2-rd burst	19	25	5[b]	0.59[b]
4	1530	Shoulder aim, semi-automatic	32	55	10[c]	0.23[c]

[a]Maximum exposure time for all targets on ambush situation is 0.70 minutes.

[b]Probably the most typical of shooter unexposed to this combat situation. Even so our exploratory firers are more experienced than the normal player squad.

[c]Unrealistic performance reflecting strong learning (that would be expected). These results are probably not suitable for a comparison against earlier trials.

USACDC EXPERIMENTATION COMMAND
Ft Ord, California 93941

CDEC-LO

20 October 1965

MEMORANDUM FOR RECORD

SUBJECT: Best Firing Technique Meeting of 19 October 1965

1. A meeting on best firing technique commenced at 1930 on 19 October, attended by the Board.

2. The decision that common firing techniques for machineguns would be applied, where possible, to both machineguns in the rifle squad and machinegun squad was reviewed. The following data were presented on the M-60 machinegun fired on the defensive situation.

M-60 MACHINEGUN FIRED DURING DAYTIME ON RANGE C

Date	Time	Squad	Burst Size (rd)	Ammo Used	Targets Hit	Total Hits	Cum. Exp. Time	Ammo Consumed
7 Oct	0800	A	6	ball	37	62	7.36	767
7 Oct	0900	B	6	ball	32	54	9.47	573
7 Oct	1000	A	6	ball	33	53	8.16	1200
7 Oct	1100	B	6	4 + 1 tracer	42	75	6.58	486
7 Oct	1200	A	4	ball	35	55	8.94	769
1 Oct	0800	B	4	3 + 1 tracer	38	59	7.76	513
1 Oct	1000	A	2	ball	37	57	6.34	487
1 Oct	1330	B	2	4 + 1 tracer	41	67	6.10	370
1 Oct	1530	A	6	ball	36	70	6.42	1000
1 Oct[a]	1600	B	6	4 + 1 tracer	40	78	7.04	724

[a]One of two machineguns was out of action during part of this run.

3. Tracers, when used with the M-60, resulted in more targets being hit in each pairing, e.g., 8.16/6.58 (33/42); 8.94/7.76 (35/38); 6.34/6.10 (37/41); 6.42/7.04 (36/40). In the underlined case, one machinegun failed during the trial, so the results are biased. These pairings show that tracer ammunition improves machinegun first hit (and total targets hit) performance during the daytime. This conforms to established doctrine.

4. Burst size for the M-60 bipod mounted machinegun in terms of first hit performance is shown to be superior for the two-round burst over the other alternatives, i.e., 4- or 6-round burst size. This selection is further reinforced by considering the total ammunition expended in each trial. The machinegunner and ammunition bearer have 273 rounds between them. We will use 300 rounds per gun rather than 273 as it simplifies our logistic problem without prejudice to the M-60 system by allowing it an extra pound of ammunition. Exploratory firing indicates that the 273 rounds per gun will not be exceeded using our selected two-round burst size. The two-round burst results in a significantly lower ammunition consumption. We are also not overheating the barrels and hence minimizing possible "cook-offs." This latter, however, is not really a consideration in our selection of burst size. Tentative decision for the M-60 is to use a two-round burst with a 1-to-1 tracer-to-ball ratio, subject to examining Stoner machinegun exploratory firing data.

5. Bandoleers versus Boxed ammunition Range C were discussed as alternate possibilities for the Stoner and M-60 machinegun.

	Container Capacity (rounds metal link)	
Ammo type	M-60 machinegun	Stoner machinegun
Bandoleer	100	150
Boxed	150	6-150

It was decided that bandoleers are applicable to both machineguns, but that assistant gunner on the M-60 will help the gunner load the M-60, while the Stoner machinegunner has no loading assistance. The assistant gunner on the M-60 will not be permitted to link bandoleers. It is required that briefings include this prohibition. Both machineguns will be tried for both bandoleer and boxes and have photographs taken (to permit a subjective assessment of the problems).

6. Target acquisition alternatives when machineguns are used were discussed. Earlier, we had decided that assistant machinegunners and ammunition bearers would not assist the gunner in detecting the target because the assistant gunner and ammunition bearers had previously seen the ranges. It now appears that some of the machinegunners will also have seen the ranges once because of limitations on the available trained machinegunners. Thus, to minimize this possible bias, the gunner and assistant gunner will be applied to the target acquisition problem when

machinegun squads are fired. We will also permit machinegunners in the rifle squad mixes to be "talked on to the target," i.e., target acquisition assistance will be permitted.

7. Colt Rifle (M-16E1) exploratory firing results on Range C were presented as tabulated below.

COLT RIFLE (M-16E1) ON RANGE C

Date	Time	Burst Size (rd)	Tracer Ratio	Total Targets Hit	Total Hits	Cum. Exp. Time	Ammo Consumed
13 Oct	1130	3	2 + 1 tracer	43	121	4.33	1196
13 Oct	1340	2[a]	1 + 1 tracer	44	114	5.40	1389
13 Oct	1535	Semi	1 + 1 tracer	44	71	5.03	NA
13 Oct	1710	3	2 + 1 tracer	42	74	5.67	1659
14 Oct	1320	3	ball	48	79	4.01	835
14 Oct	1550	3[b]	ball	48	76	7.69	1492

[a]With bipod.

[b]Without bipod.

This data is not particularly conclusive. Two trials are interesting, i.e., the 1130 and 1710 trials with 2- and 3-round bursts. Unfortunately, they include the use of tracers, which we will not use with this weapon in any daytime firings, as per previous decision. Learning might be expected to favor the 1710 trial but is probably minimized because we suspect that the learning curve on our exploratory firers must be flattening out. Note that the two sighted trials (exposure time and ammunition consumption) support our previous decision (13 October meeting) to fire the Colt, Stoner, and M-14E2 in a two-round burst.

8. Forked Stick judgements were rendered and in the absence of factual information the subjective decision is that the forked stick will not be used with the M-14 or AK-47.

9. Colt and Stoner rifles will be fired with system weight on Range C, i.e., 300 and 210 rounds, respectively. If, as we acquire ammunition consumption data on this range, a lesser amount is adequate, we may reduce the ammunitions per firing point to reduce and simplify our logistic effort.

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UNCLASSIFIED
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DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author)
Intrec, Inc.

2a. REPORT SECURITY CLASSIFICATION
Unclassified

2b. GROUP

3. REPORT TITLE
The Evaluation of Small Arms Effectiveness Criteria

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)
Final Technical Report

5. AUTHOR(S) (First name, middle initial, last name)

6. REPORT DATE
May 1975

7a. TOTAL NO. OF PAGES
315

7b. NO. OF REFS
53

8a. CONTRACT OR GRANT NO.
DAAH01-74-C-0649

b. PROJECT NO.

c.

d.

9a. ORIGINATOR'S REPORT NUMBER(S)
None

9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
None

10. DISTRIBUTION STATEMENT
9 JUN 1975
Distribution is limited to U.S. Government agencies--T and E. Other requests must be forwarded to ARPA-TIO, ARL, VA 22209

11. SUPPLEMENTARY NOTES

12. SPONSORING MILITARY ACTIVITY
Defense Advanced Research Projects Agency

13. ABSTRACT

This study includes (1) a description of the various types of small arms tests, the agencies responsible for ordering, planning, and conducting them, and an assessment of the test management structure, (2) a description of the basic steps in designing, conducting, and analyzing operational tests (field experiments) of small arms, with the 1965-1966 small arms test at CDEC presented as a case study, and (3) an evaluation of the conduct of current small arms testing and the facilities and equipment for it at CDEC-HLMR and USAIB.

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