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CONFIRMING THE LANCHESTRIAN LINEAR-LOGARITHMIC MODEL OF ATTRITION

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ABSTRACT

This paper is the fourth in a series of reports on the breakthrough research in historical validation of attrition in conflict. Significant defense policy decisions, including weapons acquisition and arms reduction, are based in part on models of conflict. Most of these models are driven by their attrition algorithms, usually forms of the Lanchester square and linear laws. None of these algorithms have been validated.

The results of this paper confirm the results of earlier papers, using a large database of historical results. The homogeneous linear-logarithmic Lanchestrian attrition model is validated to the extent possible with current initial and final force size data and is consistent with the Iwo Jima data. A particular differential linear-logarithmic model is described that fits the data very well. A version of Helmbold's victory predicting parameter is also confirmed, with an associated probability function.

The implications of these findings are potentially far-reaching. Two-sided daily attrition data on a large number of battles is needed to absolutely confirm these results. Such a confirmation will require that numerous computer conflict models containing square and linear law based attrition algorithms be reexamined. It is conceivable that complex mixed, heterogeneous, square plus linear law algorithms may produce the same results as a homogenous mixed linear-logarithmic law algorithm; however, such an occurrence is by no means assured. Even without such absolute confirmation, the results of this research allow the analysis of combat data for the effects of training, weather, leadership, and other human factors, unencumbered by the force size effects.

The first report in the series was Historical Support for a Mixed Law Lanchestrian Attrition Model: Helmbold's Ratio, K/DSRD-113, D. S. Hartley III and K. L. Kruse. The second report was The Constraint Model of Attrition, K/DSRD-114, D. S. Hartley III. The third report was Historical Validation of an Attrition Model, K/DSRD-115, D. S. Hartley III.

1. INTRODUCTION

This paper is the fourth in a series of reports on research into the attrition mechanism of warfare. On the personal level, the attrition mechanisms are clear: one is killed or wounded by a bullet, shell fragment, or vehicle when in the wrong place at the wrong time; or one is captured by locally superior forces. On the battle or campaign level, the forces in action are deterministic, but appear essentially random in selection of the individuals affected. Further, the proper methodology for computing the number of casualties to be expected in a given battle is unknown. The attrition mechanism sought here is analogous to the Gas Laws that describe the effects of temperature and pressure on volumes of gases. The individual gas molecules are allowed random motion, yet the statistical statements concerning the gas as a whole are extremely accurate.

To place the search for a valid attrition mechanism in perspective, the historical situation and the reasons for desiring such a mechanism must be understood. Throughout recorded history, military philosophers, historians, and generals have proposed various principles of war. Notable among these are Sun Tsu, Von Clausewitz, Machiavelli, Mao Tse Tung, and Napoleon. These principles are stated as precepts with victory as the goal. Generally speaking, killing many of the enemy and avoiding friendly losses is not a stated precept; however, having more and better troops than the enemy is usually regarded as a positive factor. By implication, for a war of more than one battle, killing many of the enemy and avoiding friendly losses can contribute to victory by producing increasingly favorable circumstances in succeeding battles. It is important to recognize that these precepts and their implications are qualitative and not quantitative in nature.

One of the important concepts for increasing the likelihood of victory that has been developed, starting at least with Napoleon, is that of war gaming. War gaming is used here in the sense of identifying alternative strategies and tactics for both oneself and the enemy and analyzing the probable outcomes with the goal of determining the best choices. Two principal benefits of war gaming are the avoidance of bad choices at the outset and having prepared oneself with thought-out courses of action for the inevitable surprises that occur in battle.

With the advent of computers, refined simulations of warfare are possible; however, the production of probable outcomes rests on unvalidated models of combat activities. These models are mathematical algorithms that operate on state-space variables, such as force levels and supply levels, and input data such as weapons' effectiveness data and consumption rates, to produce either a class result, such as "victory" or "loss," or a numeric result, such as 10.2 kilometers advance. Many of these simulations use the attrition algorithm as the driver for algorithms to determine advance rates and victory.

Computer simulations of warfare are used in many different ways, including training, weapons systems procurement choices, strategic positioning of forces, sizing and force mix of national forces, and disarmament decisions. Fortunately, the general impact of simulation results is advisory in nature, rather than conclusive. This means that gross errors in results are identified and modified; however, the impact of more subtle errors can not be determined. Because of the pervasive influence of attrition algorithms, their validation is important.

A validated attrition algorithm does not exist. A lucid description of the problem of validating attrition algorithms in computer models is given by Helmbold [22].) A cursory reading of history reveals thousands of wars and battles and historians warn us repeatedly that we should understand the past in order to avoid its mistakes in the future. Surely the data to understand attrition exist!

Several problems with historical data appear on closer examination. First, history is usually written by the victors. Second, many of the data are qualitative and difficult to analyze quantitatively. Third, different historians record the results differently. Fourth, the numbers must be the proper numbers (e.g., in recording the number of participants in a battle, should the cooks be included, or the reserve that was never committed?). Fifth, to validate differential models of attrition, intermediate force and casualty levels for both sides, not just starting and ending forces, are required. This level of detail, if it exists, is not readily available. Sixth, complex attrition algorithms evaluate the effects of different weapon systems on each side against the weapon systems and supplies of the other side. This requires an order of magnitude increase in detail. Seventh, it appears intuitively obvious that other factors besides numbers influence attrition (e.g., training levels, leadership, weather, terrain, and random factors). The random factors alone require replications of each set of factor levels over many battles. Undoubtedly, there are other problems. This listing suffices to make clear the almost insurmountable difficulty in finding a valid attrition algorithm.

The approach of the present research has been to regard all factors other than numbers of personnel as essentially random factors and examine existing data for patterns implying a relationship between attrition and starting force sizes. Given such a pattern, the remaining variance can be examined for the impact of other factors. Thus, these results can clear the way for examinations such as attempted by Dupuy [5].

1.1 EARLIER RESULTS

Helmbold [19] discovered a relationship that was common both to a set of land battles and a set of air battles. Helmbold [15, 16] interpreted this relationship under the assumption that the battles obeyed the homogeneous Lanchester square law [differential equations, Eq. (1), and state equation, Eq. (2)] and derived a statement concerning the differential equation coefficients, Eq. (3). (See Lanchester [25] for a reprint of Lanchester's original work and Taylor [34, 35] for a detailed explication of the variations and ramifications of Lanchestrian theory.) Helmbold found that the constants in Eq. (3) for the air battles were very close to those for the land battles. In these equations, x and y refer to the force sizes of the two sides in a battle, x_0 and y_0 refer to the initial force sizes, and D, A, α, and β are constants. In Helmbold's work, the attacking side is labeled x and the defender is y.

$$dx/dt = -Dy \qquad dy/dt = -Ax \tag{1}$$

$$D/A = (x_0^2 - x^2)/(y_0^2 - y^2) \tag{2}$$

$$\ln(D/A) = \alpha \ln(x_0/y_0) + \beta \tag{3}$$

Although Helmbold has discussed more general forms of the Lanchestrian equations [18, 21], my understanding of his current position is that the coefficients D and A of the square law must be functions of the initial force ratio, x_0/y_0, as shown in Eq. (4).

$$dx/dt = -f(x_0/y_0)y$$
$$dy/dt = -g(x_0/y_0)x \quad (4)$$

The first paper in the series [11] showed that Helmbold's relationship could be interpreted as a statement about the more fundamental form of the Lanchestrian attrition observed in combat. The values of x_0 and y_0 for the historical battle data are the force sizes before the start of the battle. Because each battle has data only on the beginning and end, no other choice is possible for representing the previous state of the battle in Eq. (4). However, this means that for the available data, x_0 and y_0, can be replaced by, x and y, with equal validity. The result is shown in Eq. (5).

$$dx/dt = -f(x/y)y$$
$$dy/dt = -g(x/y)x \quad (5)$$

Eq. (5) no longer represent a form of the square law. Because Eq. (2) is only true for the square law, Eq. (3) is no longer correct. Actually, Helmbold did not show directly that Eq. (3) held; he showed that Eq. (6) held true and used Eq. (2) to convert to Eq. (3).

$$\ln((x_0^2-x^2)/(y_0^2-y^2)) = \alpha\ln(x_0/y_0)+\beta \quad (6)$$

The right hand side of Eq. (2) has been named Helmbold's ratio and is important because Eq. (6) fits the historical data and does not depend on any hypothetical attrition law.

Hartley and Kruse showed that each of the standard Lanchestrian laws, square, linear, and logarithmic, have characteristic α values in Eq. (6). The square law has an α value of 0.0, the linear law has $\alpha = 1.0$, and the logarithmic law has $\alpha = 2.0$. The data fit had $\alpha = 1.3$ for the land battles and $\alpha = 1.5$ for the air battles, implying that the functions f and g could not be constant functions (resulting in the square law). The only simple Lanchestrian attrition law that will produce the historical α values is a mixed linear-logarithmic law.

Willard analyzed almost 1500 land battles that took place between 1618 and 1905 using a similar technique, with similar results [37]. Fain [8] analyzed 60 World War II battles using a similar technique, with similar results. These results appear to have had no impact on the modeling community.

Helmbold [20] objected to the techniques of Willard and Fain on the grounds of the "constant fallacy". He maintained that the technique was flawed because the D and A constants are particular, not universal, constants. They vary from battle to battle and cannot be solved for over a spectrum of battles. In the analyses of this series of papers, this argument is not germane, because the regression is not viewed as solving for D and A (or D/A), but for the exponent α, which is proposed to be a universal constant (or at least a close cousin, that is a very stable average of particular constants). The other constant of the regression equation, β, is not inferred to relate to the value of D/A for any given battle, but is the "average" of the particular β values for the set of battles.

The conclusions for the first paper were carefully stated because there was no proof that the historical battles were the results of a linear-logarithmic law, only that such a law did describe the results when sufficient battle-to-battle variation of the coefficients was permitted. The second paper [12] considered an alternate explanation for the observed results. A constraint theory of attrition was proposed. The essence of a constraint theory is that any battle result is possible, but because of human nature, military training and doctrine, etc., some results are avoided. In terms of Helmbold space, a two-dimensional space spanned by the lforrat and lhelmrat variables, these constraints on human actions result in mathematical constraints restricting observed battles to a narrow region in Helmbold space.

The second paper showed how some conventional military doctrines could produce mathematical constraints in Helmbold space and how these constraints could produce the observed historical results. The constraint theory places no requirements on the mechanism of attrition in battle; rather, it describes the observed battles in terms of rules for starting and stopping battle. These rules are functions of initial force sizes and friendly and enemy casualties.

The third paper [13] tested implied data distributions of both the linear-logarithmic law of the first paper and the constraint law of the second paper against the observed distributions of the original data and a second set of land battles. The results favored the distributions implied by a linear-logarithmic law. A key point was that without some kind of constraint mechanism to select actual battles from potential battles, neither the square law nor the linear law is capable of producing the observed slope of the data in Helmbold space. Thus the evidence against a constraint law is evidence for a linear-logarithmic law. Helmbold's initial force ratio dependent constants explanation fits the observed data equally well; however, it seems unlikely that these constants should be dependent on original force ratios. If the attrition on each side is dependent on a function of both the opposite and its own force sizes, it is much more likely that future attrition should depend on current sizes rather than those obtaining yesterday or the day before.

The paper also detailed results that allowed determination of the differential form of the attrition equations, in addition to the state equation form implied by the α value. Eq. (7) shows the form of the equations.

$$\begin{aligned} dx/dt &= -e^{C} X_0^{D} Y_0^{E} \\ dy/dt &= -e^{F} X_0^{G} Y_0^{H} \end{aligned} \tag{7}$$

In order for the equations to produce the desired linear-logarithmic law, D-G must equal H-E and each must equal $\alpha+1$.

The problem of predicting victory was also discussed. A parameter was developed that succeeded in predicting victory better for the data being analyzed slightly better than Helmbold's v parameter [15, 16, 17]; however, the difference was not statistically significant and Helmbold's v parameter has a better theoretical basis.

1.2 DESCRIPTION OF THE DATA

Eight datasets are included in the total dataset. The first four datasets, helm92, bbritn, helm83, and helmcw, were developed by Helmbold [15, 16, 19]. The fifth dataset, inchon, was developed by Busse [3]. The last three datasets were developed by Dupuy [6] and his company HERO. Helm92, bbritn, and helm83 used in the first three papers of this series to develop the concepts that are tested here on independently derived data. (The helmcw data may be regarded as independent, as it contains alternate values for the variables of several battles in the earlier Helmbold datasets.) A ninth dataset is used only in the detailed analysis of Section 4. This last dataset contains the available daily force strengths for the World War II Iwo Jima battle. The complete contents of the entire database are given in Appendix A.

The dataset named helm92 consists of 92 land battles occurring between AD 1741 and 1945, with the majority between 1757 and 1877. These data were collected by Helmbold. The principal components of the data consist of combatant identification, identification of attacker and victor, initial force sizes, and resulting casualties. Sixteen countries were involved as combatants, with the bulk of the battles involving France, Prussia or Germany, Austria, the United States (and the Confederacy), and Russia. Most of the battles were fought in the Eurasian area, with a fair number in North America. The size of the battles range from 2000 total combatants to almost 500,000 combatants. The duration of the battles range from two hours to 36 days.

The bbritn dataset consists of 18 air battles from the Battle of Britain in 1940 between the German Air Force and the British Fighter Command. These data were also collected by Helmbold. Except for identification of a victor for each battle, the data components listed above are included in this dataset. Two potentially significant differences exist. The force sizes for the Battle of Britain data are numbers of airplane sorties, rather than numbers of troops, and the casualties are aircraft losses, rather than troop losses. One of the battles is omitted as uncharacteristic because one side only lost one airplane (out of 335 sorties) in that battle.

The helm83 dataset consists of 83 land battles occurring between 280 BC and AD 1944. These battles were collected by Helmbold and contain the same components as helm92. The battles are all different from those included in helm92; however, the distributions in space and among combatants are similar to the distributions in helm92. The size and duration ranges are also similar.

The helmcw dataset, collected by Helmbold, contains conscious replications of United States Civil War battles included in helm92. The 19 entries comprise data on 7 separate battles, as reported by several historians, with differing values for the components, including disputes over the victor.

The inchon dataset consists of 19 days of battle of the Inchon-Seoul Campaign of the Korean War in 1950. These data were collected by Busse. Daily initial force sizes and casualties are given. No daily victory results are assigned; however, the United States side was victorious over the North Korean side at the end of the campaign and the daily advancement by the United

States was continuous. Readers interested in more information concerning the Inchon-Seoul campaign are referred to [1, 14, 26, 27, 29, 30, 31, 33].

The three datasets, lwdb01, lwdb02, and lwdb03, contain the contents of the HERO Land Warfare Database. Parts 1 and 2 were complete as of 1 December 1987, while part 3 was produced in 1989. Lwdb01 contains 263 battles, lwdb02 contains 340 battles, and lwdb03 contains 24 battles. The battle dates range from AD 1600 through 1973. The distributions are similar to those of the Helmbold datasets, though with wider ranges. This collection of data includes significantly more data components than do the Helmbold datasets; however, only the components that correspond to those already mentioned are used here. Although there is a significant number of battles in the HERO database that duplicate battles in the Helmbold datasets, most of them are different.

The Iwo Jima data used here comes most directly from Helmbold [20]. However, it is approximately the same as that used by Engel [7] and Samz [32]. Readers interested in more details are referred to [2, 4, 24, 28].

Each of the datasets above suffers from the types of data problems listed in Section 1. In addition, the replication of several of the battles causes analysis problems, as described in section 1.3.

1.3 ANALYSIS TECHNIQUES

The basic linear-logarithmic law was developed on two sets of historical data (helm92 and bbritn) and validated on a third (helm83). A larger database is used here to confirm and refine the law. Section 2 of this paper is concerned with this dataset segmentation and the commonalities and differences found within this segmentation.

No physical mechanism is proposed as the cause of a linear-logarithmic law. The supposed validity of the law is based on empirical results, an observed average of unknown mechanisms. The question arises concerning the stability of this average over time. Section 3 of this paper addresses this concern.

A second area in which variations of the observed average might be seen is the segmentation by combatant. Is the same average observed in Germany's battles with the United States as that in Japan's battles with the United States? To the extent possible, this concern is examined in Section 4.

A third area in which variations of the observed average might occur is the segmentation by battle size. Do small battles show different results from large battles? Section 5 addresses this question.

Three basic statistical analysis techniques are used, linear regression, distribution tests, and chi square tests. The distribution tests are used to check for normality, or approximate normality, of the distributions of the variables to be used in the regressions and to check whether the assumptions of the constraint model of warfare are met. Linear regression is used to make the estimates of α and β of Eq. (6) for each of the segmentations. Linear regression and multivariate analysis of variance are used to make the estimates of C, D, E, F, G, and H of Eq. (7). Linear regression is also used to check for long term trends over time of lforrat, lhelmrat, and β. Chi square and similar tests are used to test for significance of the v parameters prediction of victory. All of these statistical tests performed in SAS, which provides extensive facilities for making tests under varying assumptions.

The replicated battles presented an interesting analysis problem. The parameter estimates in a regression are produced by minimizing the squared differences between a proposed regression line and the positions of the data points. Four or five data points for a single battle would increase the influence that battle has on the overall regression line. This effect could be removed by increasing the number of representations of all other battles by identical replications of the original data so that each battle is represented by five data points, identical ones where there is no contrary evidence and different ones where there is conflicting data. This presents problems in assessing the statistical uncertainties concerning the estimates of the parameters, because identical results achieved with larger datasets are more reliable than those achieved with small datasets.

Another solution would be to omit all battles with contradictory data. This solution is unsatisfactory, because there is reasonable doubt about each of the battles, whether contradictory data is available or not, and thus the average of the contradictory data may be more believable than the single point data. This leads to a third solution, averaging the conflicting data, and using the average as the single data point. There are problems with determining the correct averaging method; however, the problems become moot when the fact of differing assignment of victory arises. The assignment of the victor data cannot be averaged.

The solution that was chosen depends on the availability of statistical analyses with fractional weights. Weights are chosen so that each battle has a total weight of 1.0. If there are five estimates for a battle, each has a weight of 0.2. Thus battles with multiple estimates are not overweighted and the reliability of the parameter estimates is not overstated. At the same time the bracketing effects of multiple estimates of a battle are not lost.

2. GENERAL ANALYSES AND SEGMENTATION BY DATASET

Section 2.1 describes the overall analyses of the database, confirming the general results of the third paper. Section 2.2 performs individual analyses on each of the eight datasets comprising the database to check the stability of the results.

2.1 GENERAL ANALYSES OF THE DATA

Figure 1 displays the entire database in Helmbold space. The diagonal line that bisects the data along the major axis of the elliptical shape of the data is a reference line through the origin with slope 1.35. This slope has been chosen as the best representation of α. This same reference line appears in all but one of the Helmbold space figures in this paper.

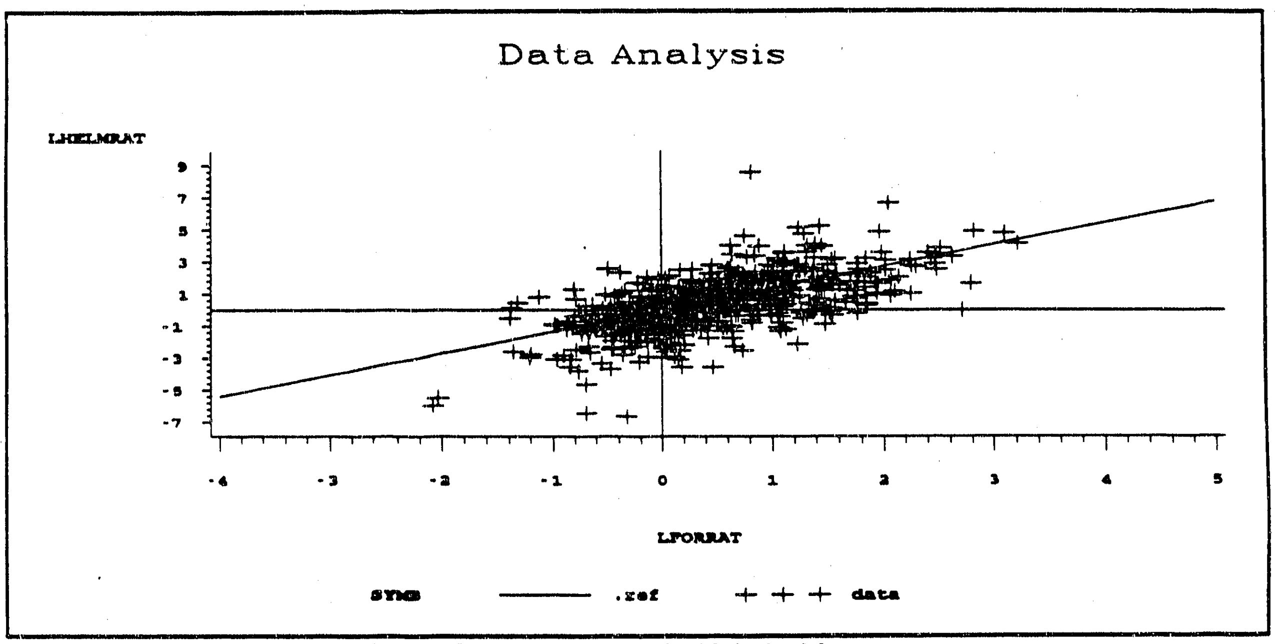

Fig. 1. Total database in Helmbold space.

Figure 2 shows a bar chart of the distribution of data points along the regression line for the entire database. The slope of the line is 1.35 and its intercept is 0.22 (not visibly different from the reference line in Fig. 1). Although the distribution is bell-shaped, the test for normality indicates that the distribution is not normal (it is tail-heavy, high kurtosis).

Figure 3 shows a bar chart of the distribution of data points across (perpendicular to) the regression line for the entire database. The distribution is bell-shaped, but not normal. Tests of the distributions of lforrat and lhelmrat values show the same behavior. These distributions fit a homogeneous mixed linear-logarithmic Lanchester attrition model better than a constraint model, as explained in Hartley [13].

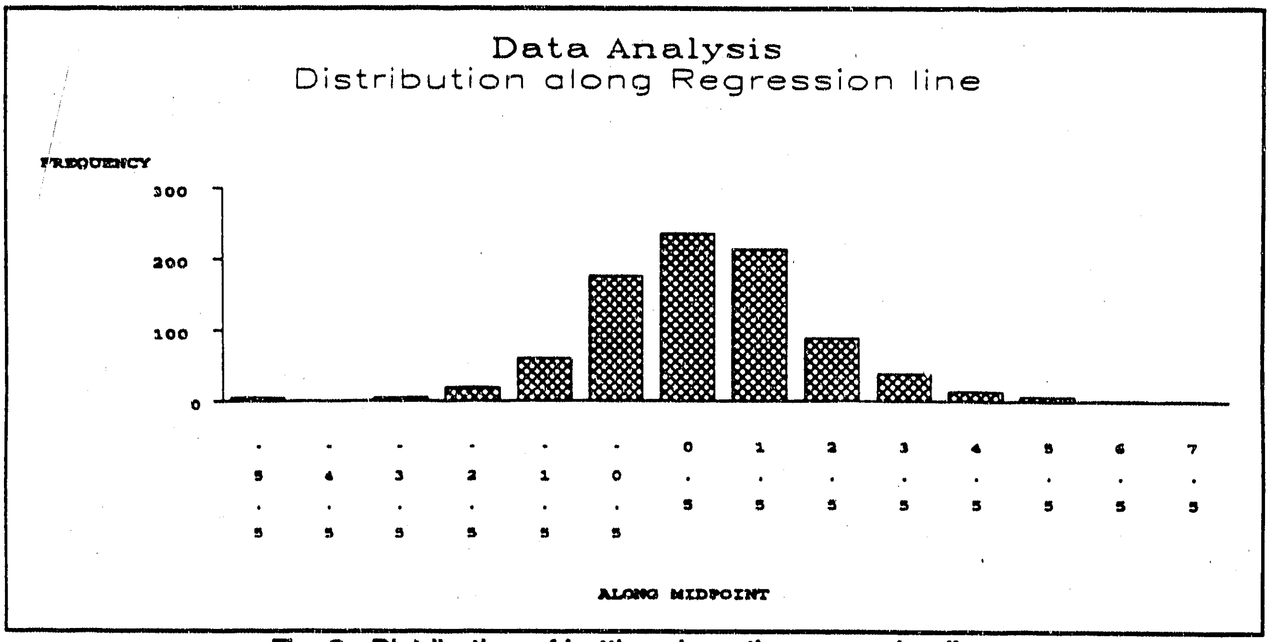

Fig. 2. Distribution of battles along the regression line.

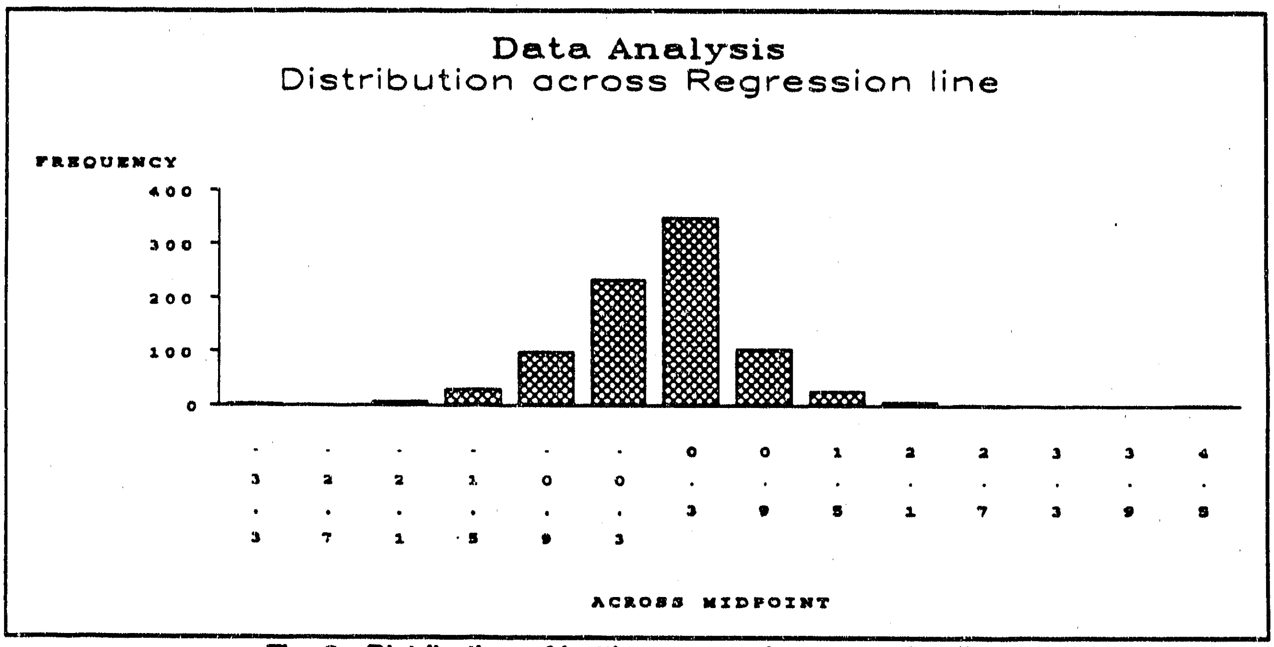

Fig. 3. Distribution of battles across the regression line.

Figure 4 shows a bar chart of the distribution of β values for the entire database (under the assumption of a linear-logarithmic law with $\alpha = 1.35$). This is equivalent to the vertical distribution of the battles, collapsed along the regression line. Again the distribution is bell-shaped, but not normal. This distribution gives the distribution of the presumptive effects of the non-force size factors affecting attrition under the linear-logarithmic assumption.

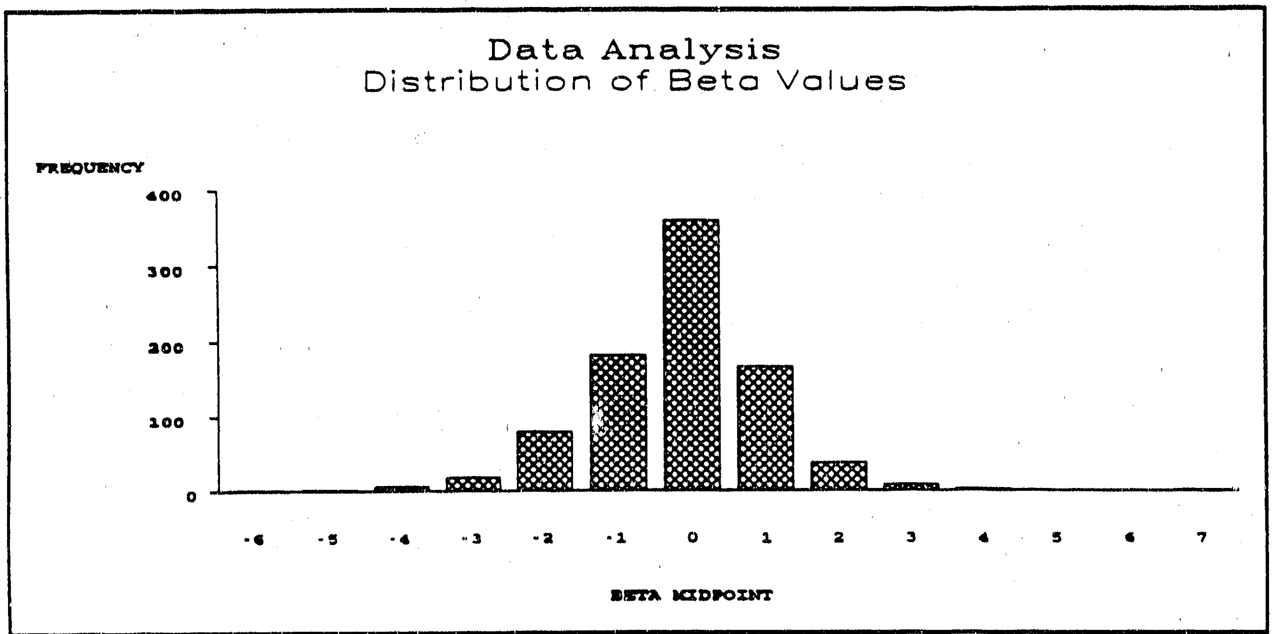

Fig. 4. Distribution of β values (assuming $\alpha = 1.35$).

Figure 5 shows the distribution of C values (under the assumption of a differential linear-logarithmic law with $\alpha = 1.35$ and $D = H = 0.75$, $E = G = 0.40$). The distribution is distinctly skewed and not normal. In a sense, this distribution is half of the β distribution, because $\beta = C - F$.

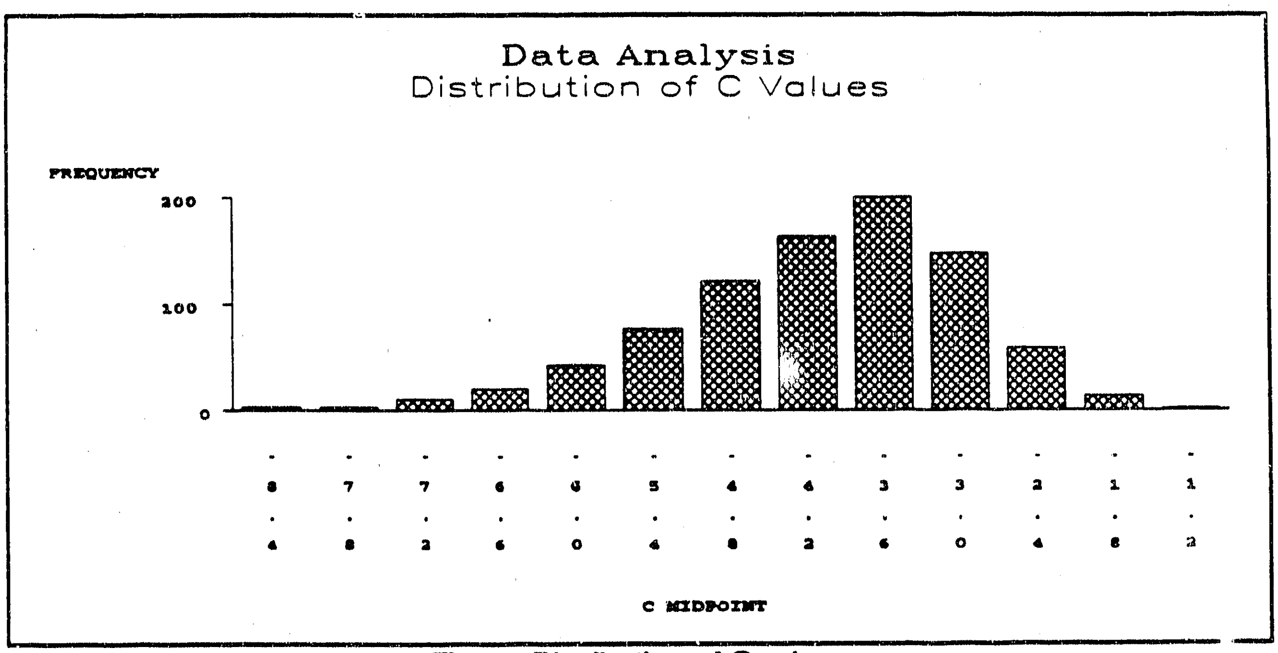

Fig. 5. Distribution of C values.

Figure 6 shows the distribution of F values (under the same assumptions as Fig. 5). This distribution is also skewed and not normal. This is the other half of the β distribution.

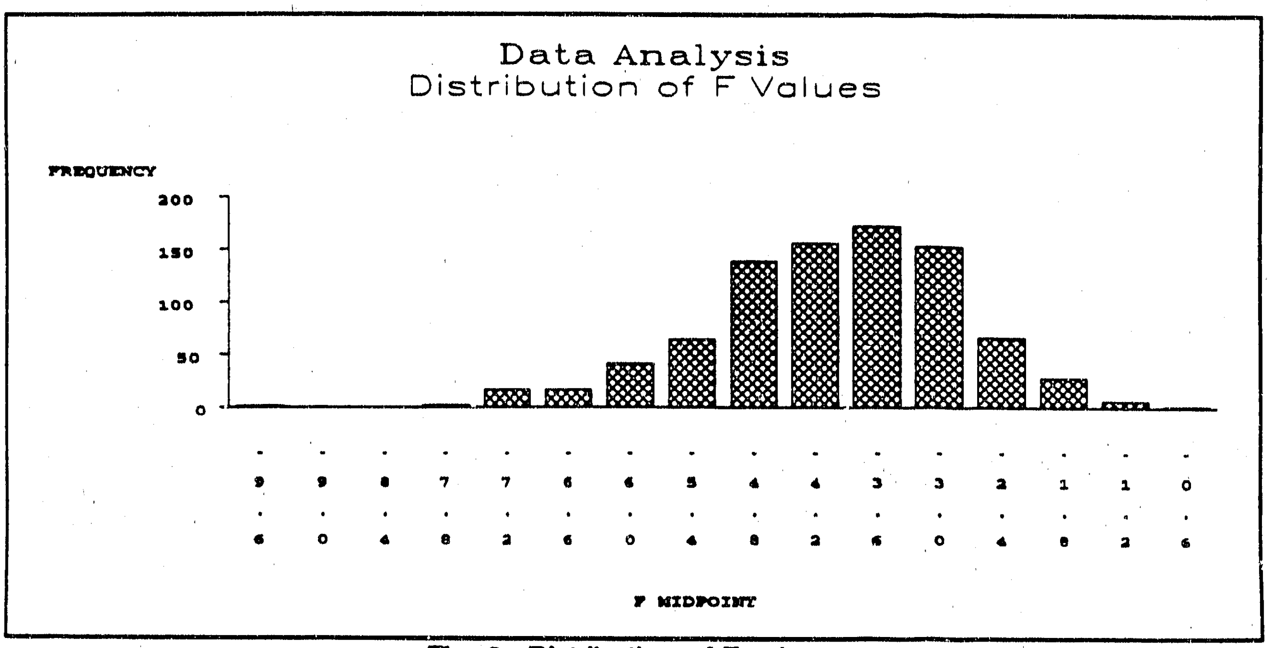

Fig. 6. Distribution of F values.

2.2 ANALYSIS OF THE DATASET SEGMENTS

Figure 7 shows the distribution of the helm92 data (with the reference line of slope 1.35). The striking pattern of this data distribution was the first key to the discovery that the same pattern is widespread.

Figure 8 shows the bbritn dataset. Helmbold observed that the slope of the regression for this dataset was close to that of the helm92 data, despite the fact that these data related to aircraft duels rather than land battles.

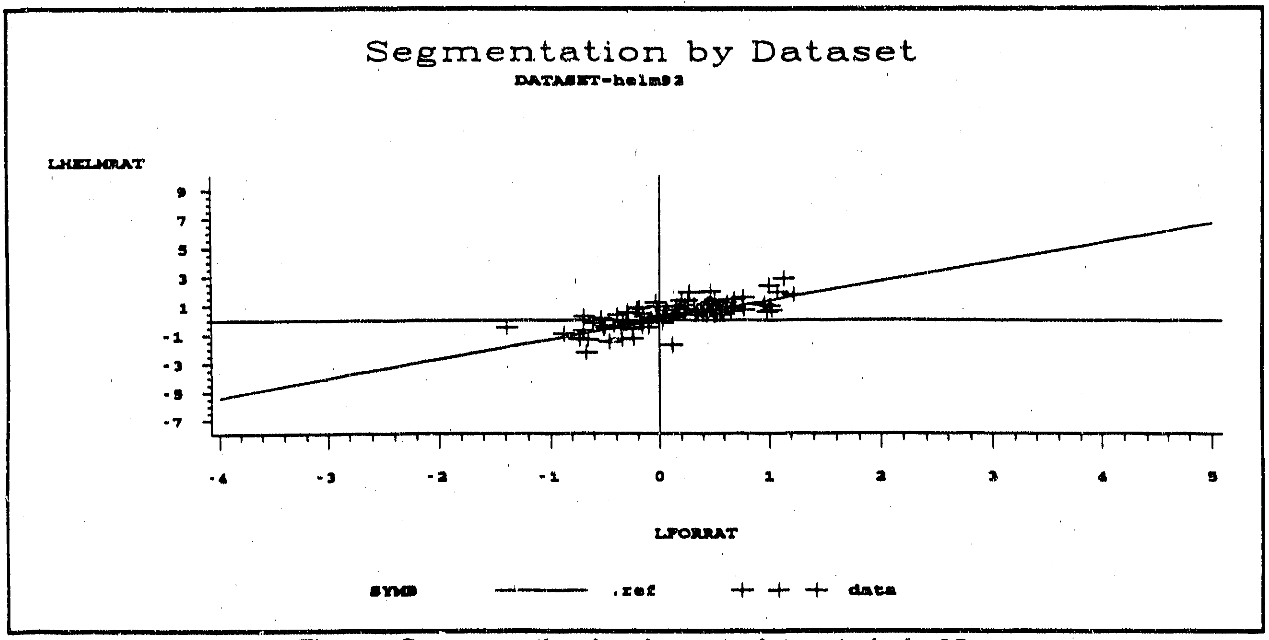

Fig. 7. Segmentation by dataset, dataset=helm92.

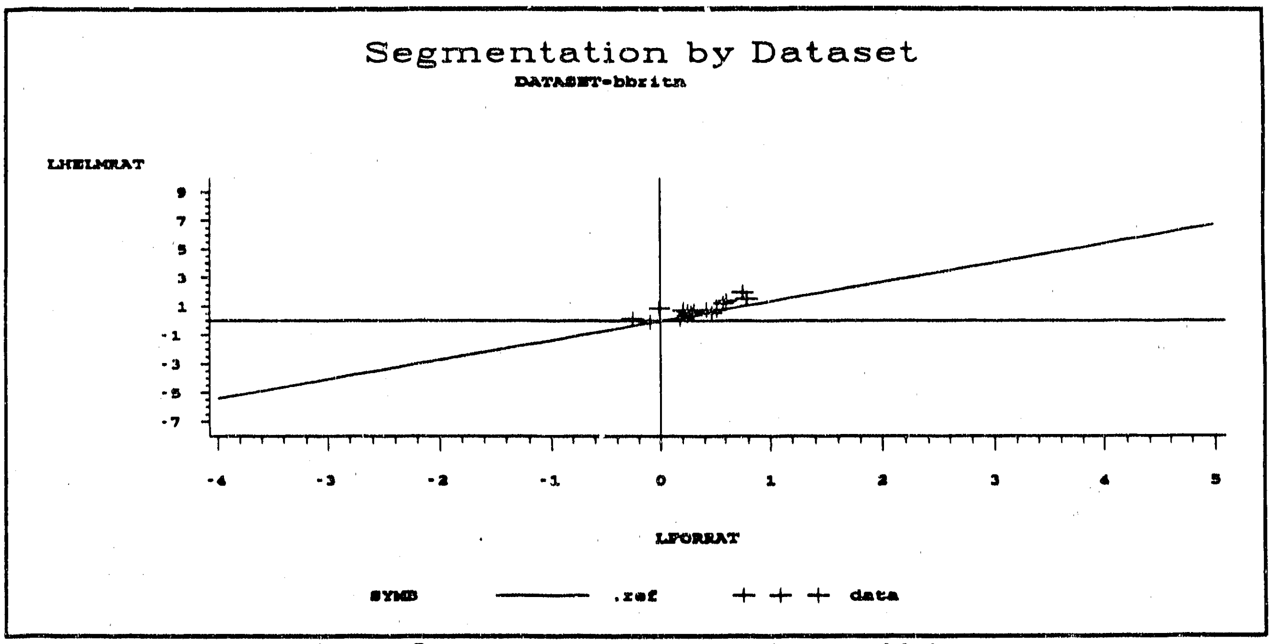

Fig. 8. Segmentation by dataset, dataset=bbritn.

Figure 9 shows the helm83 dataset. Two battles are marked with diamonds as outliers. Helmbold noted their apparent breaking of the pattern and questioned the reliability of the data concerning them.

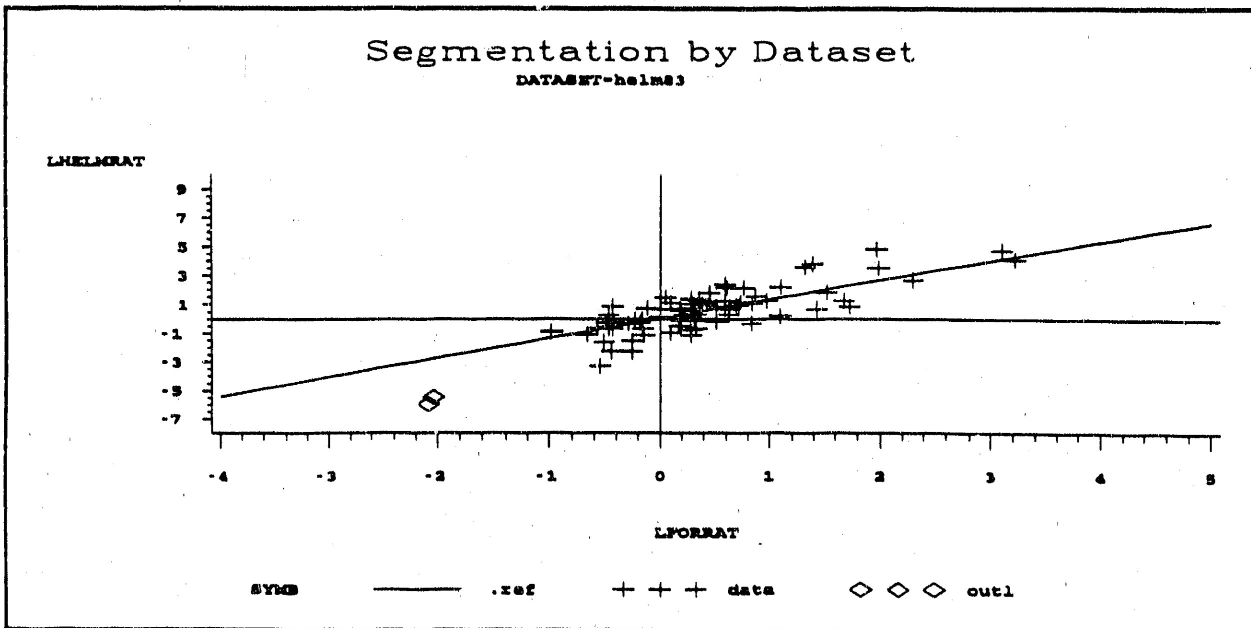

Fig. 9. Segmentation by dataset, dataset=helm83.

Figure 10 shows the helmcw dataset. Note that although the differing reports of the seven Civil War battles produce distinct points in Helmbold space, the differences merely shift the data points (roughly) in one direction or the other parallel to the reference line.

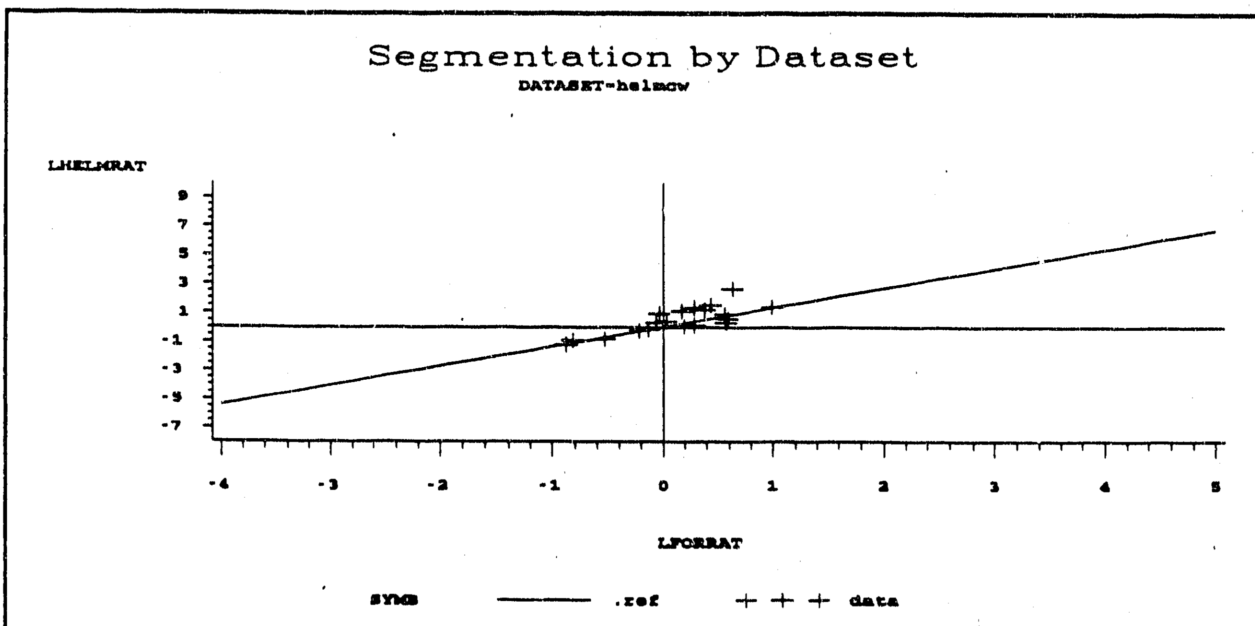

Fig. 10. Segmentation by dataset, dataset=helmcw.

Figure 11 shows the inchon dataset. The regression line for this dataset has nearly the same slope as the reference line; however, this must be regarded as coincidental. The data are so nearly a perfectly circular scatter plot that they could easily be random. Although these data are the best we have representing the ideal of daily attrition results of a single battle, they give no support to any attrition law formulation [9, 10].

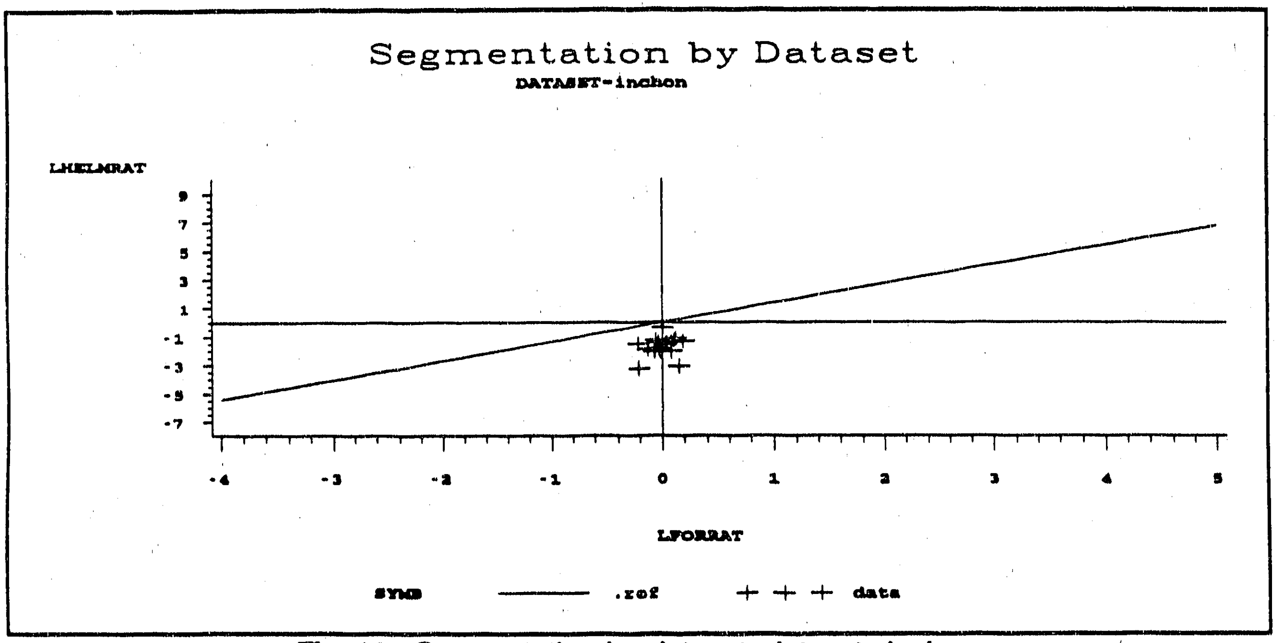

Fig. 11. Segmentation by dataset, dataset=inchon.

Figure 12 shows the lwdb01 dataset. This dataset contains the earlier 40% of the HERO database. Although the data were independently collected and concern different battles for the most part, the same pattern shown by the Helmbold data is evident. The increased number of battles increases both the lateral and the vertical spread of the data.

Figure 13 shows the lwdb02 dataset. This dataset contains the later 60% of the HERO database. The pattern persists!

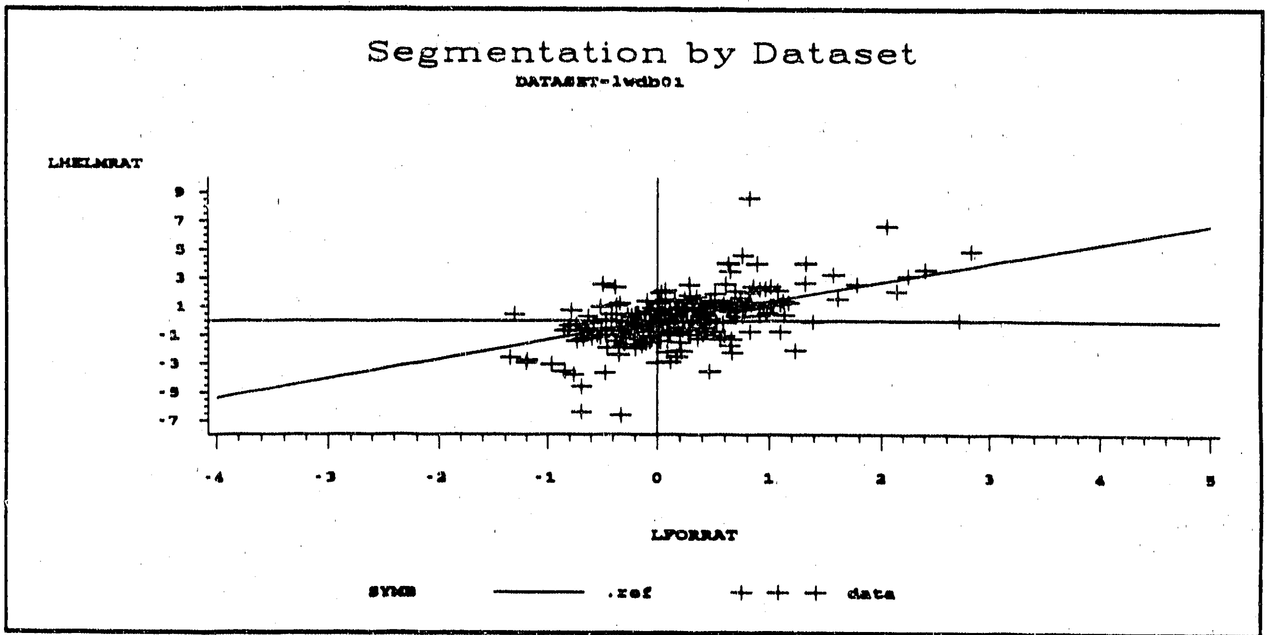

Fig. 12. Segmentation by dataset, dataset=lwdb01.

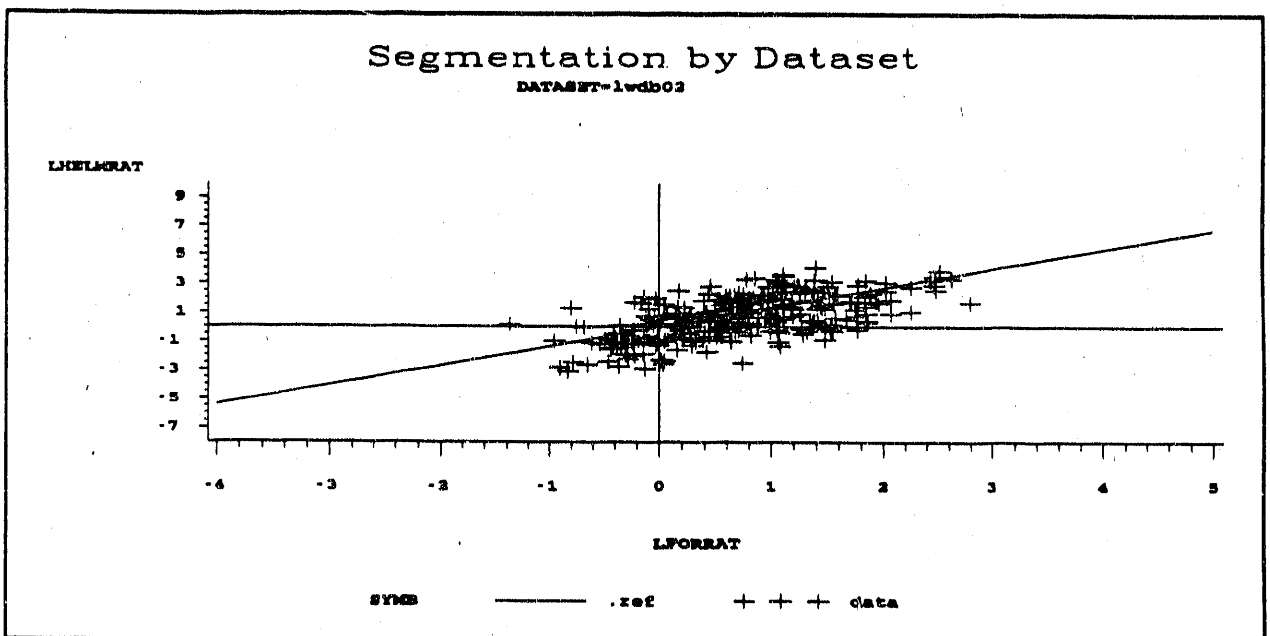

Fig. 13. Segmentation by dataset, dataset=lwdb02.

Figure 14 shows the lwdb03 dataset. This dataset contains 24 additions to the HERO database, collected in 1989. Although the definition of the pattern is weak, it is still evident.

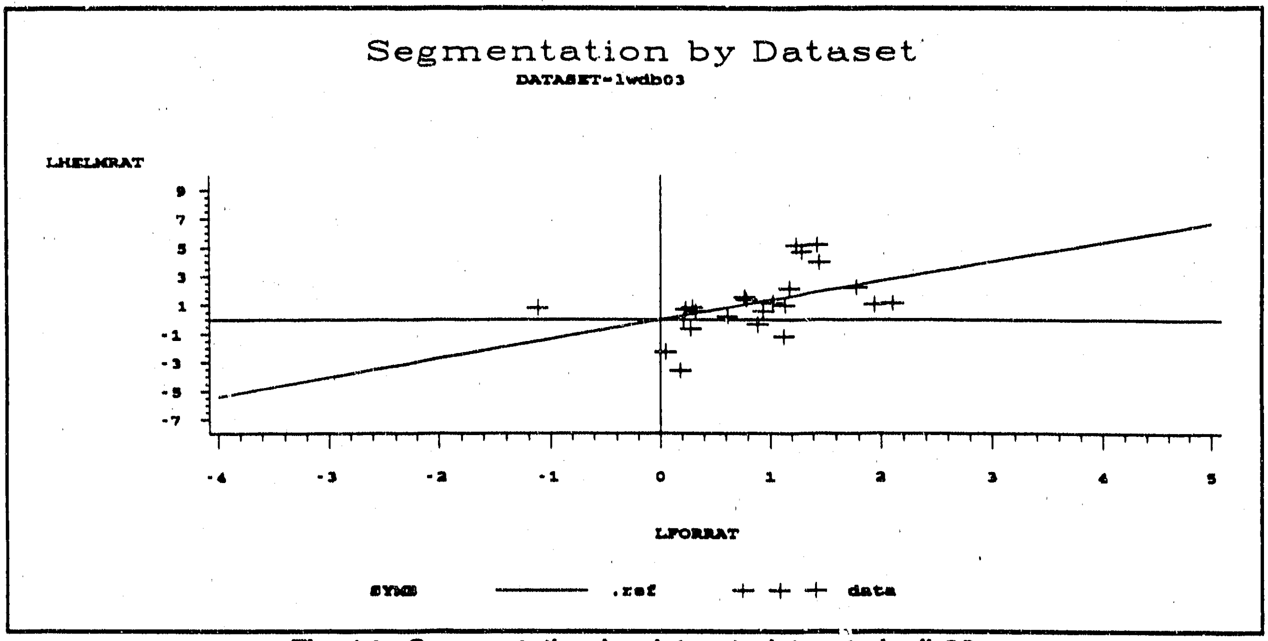

Fig. 14. Segmentation by dataset, dataset=lwdb03.

Table 1 displays the significant regression parameters and statistics for the dataset segmentation analysis and compares the individual dataset results to the results for the entire database. Each dataset is listed along with the α value from the regression, the standard error associated with the estimate of the α value, an estimated minimum supportable α value, an estimated maximum supportable α value, the R^2 value for the regression and the number of data points in the dataset.

The estimated minimum and maximum α values are calculated by subtracting and adding twice the standard error to the estimated α values. If the underlying lforrat population distribution were normal, the calculations that produced the standard error terms, which include the size of the sample, would produce good estimates using this procedure. As was noted above, the distributions do not appear to be really normal, the tails are too heavy. This may be a product of the database researchers' efforts to extend the database beyond the more "average" battles to allow broader ranges of predictability from any analysis results. Alternatively, the true population of battles may indeed include more numerous outliers than would be found in a normal distribution. The effect of this can be seen in the swing in the estimated α value and minimum and maximum values that result from removing two of the 83 data points in helm83 to produce helm83-.

With the exception of the helm83 dataset, each regression could allow α values from 1.26 to 1.36 (the maximum minimum and minimum maximum, shown in bold face in the table). With the removal of two data points Helmbold regarded as outliers from helm83, that range is also supported by helm83-. Thus a choice of 1.35, which is supported by the dataset as a whole (including the suspect battles) is not negated by the segmentation. We conclude that the α value is stable over broad segmentations of the database.

Table 1. Dataset segmentation regression parameters and statistics

Dataset	α	Err	Minα	Maxα	R^2	#
HELM92	1.23	0.12	0.99	1.47	0.55	92
BBRITN	1.54	0.28	0.94	2.10	0.67	17
HELM83	1.70	0.12	1.46	1.94	0.72	83
HELM83-	1.49	0.12	1.25	1.63	0.65	81
HELMCW	1.60	0.27	1.06	2.14	0.67	19
INCHON	1.37	1.38	-1.39	4.13	0.05	19
LWDB01	1.54	0.14	*1.26*	1.82	0.32	263
LWDB02	1.20	0.08	1.04	*1.36*	0.38	340
LWDB03	1.44	0.55	0.34	2.54	0.23	24
TOTAL	1.38	0.06	1.26	1.50	0.41	857

3. SEGMENTATION BY BATTLE DATE

A second consideration is the stability or instability of the results with regard to time. If the results are merely the "average" of differing values over time, we might be justified in using these as descriptive parameters for the changes in warfare; but, their predictive value for future conflicts is reduced. However, if the results are relatively stable over time, then we may regard them as identifying a consistent factor in a theory of attrition. Weiss [36] had some cogent remarks on the problem of drawing conclusions about future wars from historical wars.

Figures 15 and 16 show the very minor trend in lforrat and lhelmrat. These trends are calculated for the data from AD 1600 onward because the small number of battles before that time and their great distance from the remainder of the data produce excessive leverage on the regression lines. The vertical lines depict the date segmentation that is used in the analyses below.

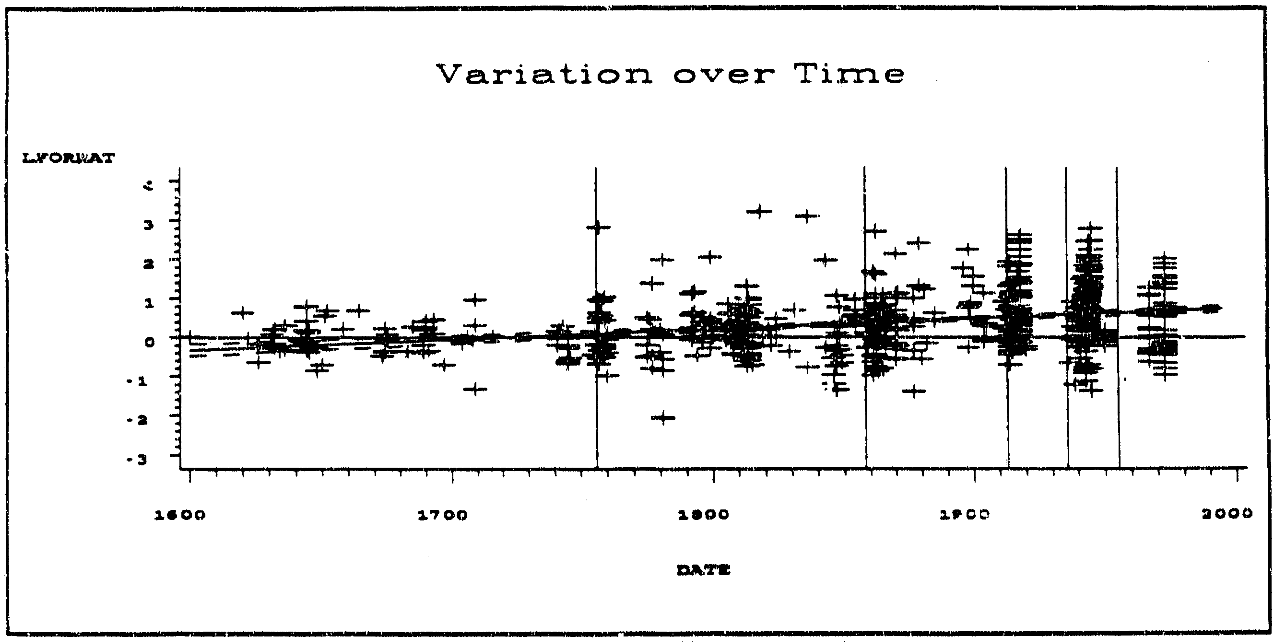

Fig. 15. Trend-line of lforrat over time.

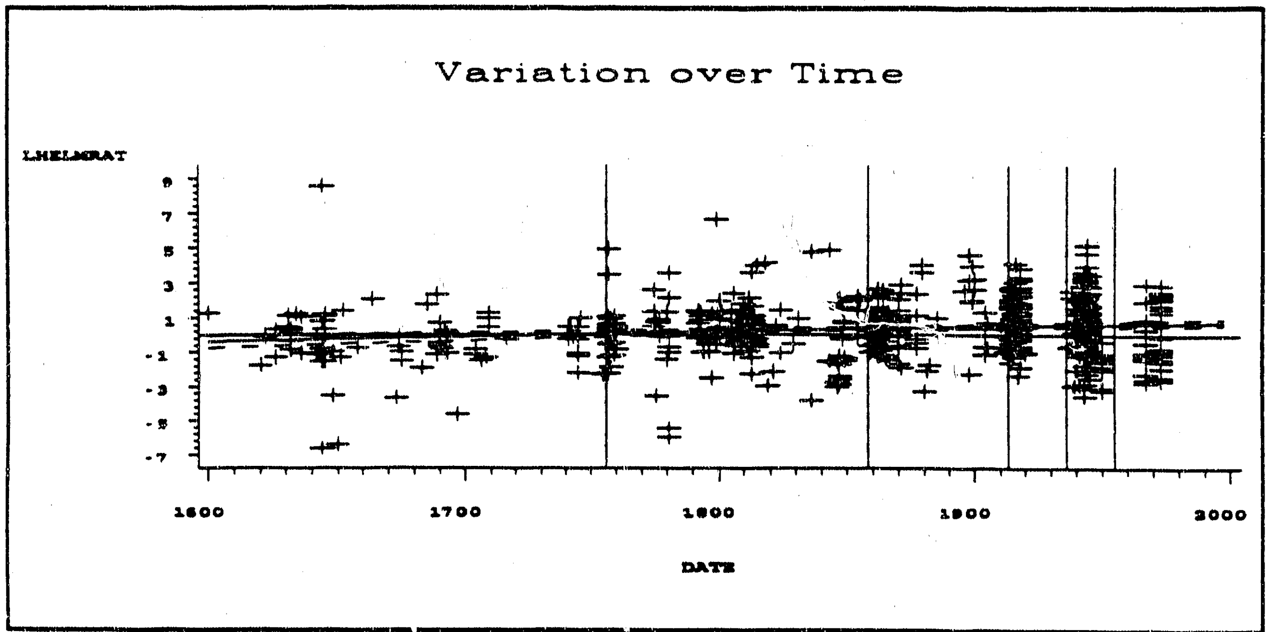

Fig. 16. Trend-line of lhelmrat over time.

Eq. (6) connects lforrat and lhelmrat. Assuming α to be constant (α = 1.35), β values can be calculated for each battle. Figure 17 shows that the trends of the two variables, lforrat and

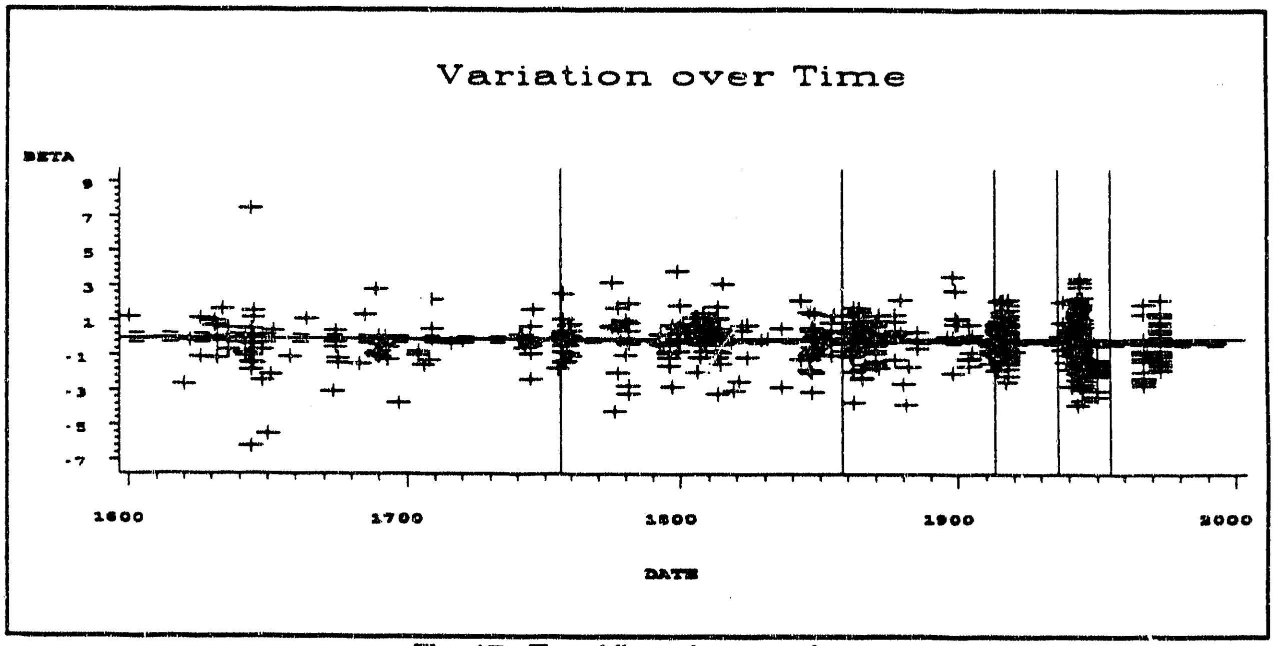

Fig. 17. Trend-line of β over time.

lhelmrat, are almost perfectly in step, because the trend in β is almost exactly zero. This supports the assumption that α is constant.

3.1 BASIC DATE SEGMENTATION

There are no absolute standards to use in dividing the history of warfare into periods; however, there are some relatively good divisions. The bases for the choice of segments for this analysis are numbers of battles in each segment and military historical events. Figures 15 through 17 show the chosen segmentation and the discussion below further describes the segmentation.

The period of early warfare ranges from 200 BC to AD 1756. Although several subdivisions of this period are reasonable, there are not enough data to support analysis in a finer segmentation. The choice of the precise date of 1756 is based on where the battles thin out in this database.

The second segment is centered on the Napoleonic wars and runs up to the time of the American Civil War. The third segment includes the Civil War and the period up to World War I. The fourth segment covers World War I. The fifth segment covers the time from World War II to the end of the Korean War. The sixth segment covers recent wars (in this database, two Arab-Israeli wars).

Table 2 shows the regression parameters and statistics for the date segmentation and compares these values to the overall values for the entire database. Although there appears to be general agreement that the proper α value is greater than 1.0 and less than 2.0, there is variation among the segments. In the next section, the separation of the outliers clarifies the situation.

Table 2. Date segmentation regression parameters and statistics

Dataset	α	Err	Minα	Maxα	R^2	#
-200 - 1756	1.97	0.38	1.19	2.75	0.25	83
1757 - 1858	1.72	0.11	1.50	1.94	0.56	188
1859 - 1913	1.18	0.12	0.94	1.42	0.36	169
1914 - 1936	1.27	0.11	1.05	1.49	0.50	126
1937 - 1955	1.18	0.12	0.94	1.42	0.29	238
1956 - 1989	1.81	0.20	1.41	2.21	0.62	53
TOTAL	1.38	0.06	1.26	1.50	0.41	857

3.2 SEPARATING OUTLIERS

Figures 18 through 23 show the time segments in Helmbold space. In several segments there appear to be outliers, data points at the periphery of the collection of points that don't follow the general trend of the rest of the data. These points are shown with diamond markers in the figures. Such points have greater leverage on the regression results for the data than do internal points. In analyses where the trend is known a priori, outliers may be discarded. In this case, the major point of the analysis is to discover the trend and so the outliers can not be discarded.

In a certain sense, the individual battles that are in the entire database are a random sample of all the historical battles and of all the possible historical battles. Thus, for a given time segment, the outliers might be in one position in one sample and in another position in a second sample. For this reason, the "basic" parameters for the given time segment may be better approximated by removing the outliers.

Because the influence of an outlier is greater in a small dataset than in a large dataset, all of the outliers are collected into one segment. This allows the comparison of statistics for each time segment and a comparison of the statistics for the outliers with the time segments.

Figure 18 shows the distribution in Helmbold space of the battles in the early warfare segment. The central cluster is nebulous, with no clear directional tendency. Notice the large change in α value in the '1756' segment when the outliers are removed (Table 3) as compared to the value when the outliers are present (Table 2). The value without the outliers is 0.69 and with the outliers is 1.97. The correct value for this segment may lie somewhere between the two values.

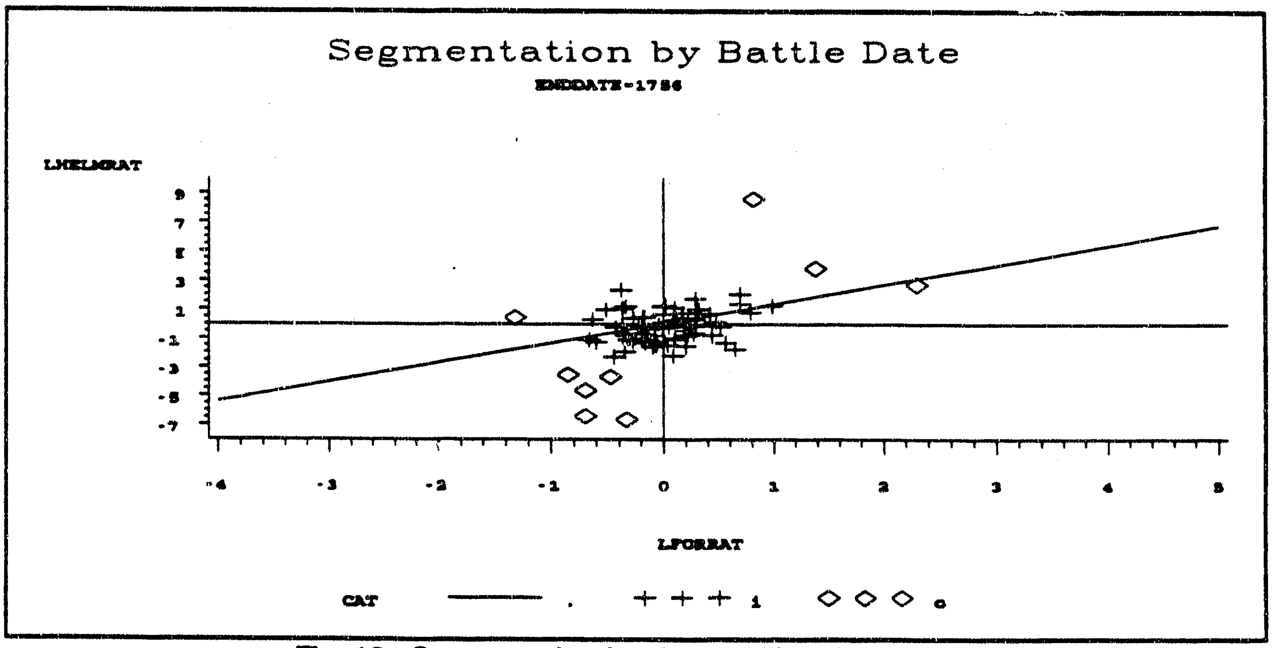

Fig. 18. Segmentation by date, ending date=1756.

Table 3. Date segmentation regressions, with outliers separated

Dataset	α	Err	Minα	Maxα	R^2	#
-200 - 1756	0.69	0.35	-.01	*1.39*	0.05	74
1757 - 1858	1.35	0.16	1.03	1.67	0.30	180
1859 - 1913	1.28	0.14	1.00	1.56	0.37	154
1914 - 1936	1.30	0.14	1.02	1.58	0.42	120
1937 - 1955	1.20	0.13	0.92	1.48	0.28	230
1956 - 1989	1.81	0.20	1.41	2.21	0.62	53
Outliers	1.69	0.25	*1.19*	2.19	0.51	46
TOTAL	1.38	0.06	1.26	1.50	0.41	857

Figure 19 shows the distribution in Helmbold space of the pre-Civil War battles. There are more than twice as many battles in this period than in the early wars segment and a clearer directional tendency. Removal of the outliers reduces the α value from 1.72 to 1.35.

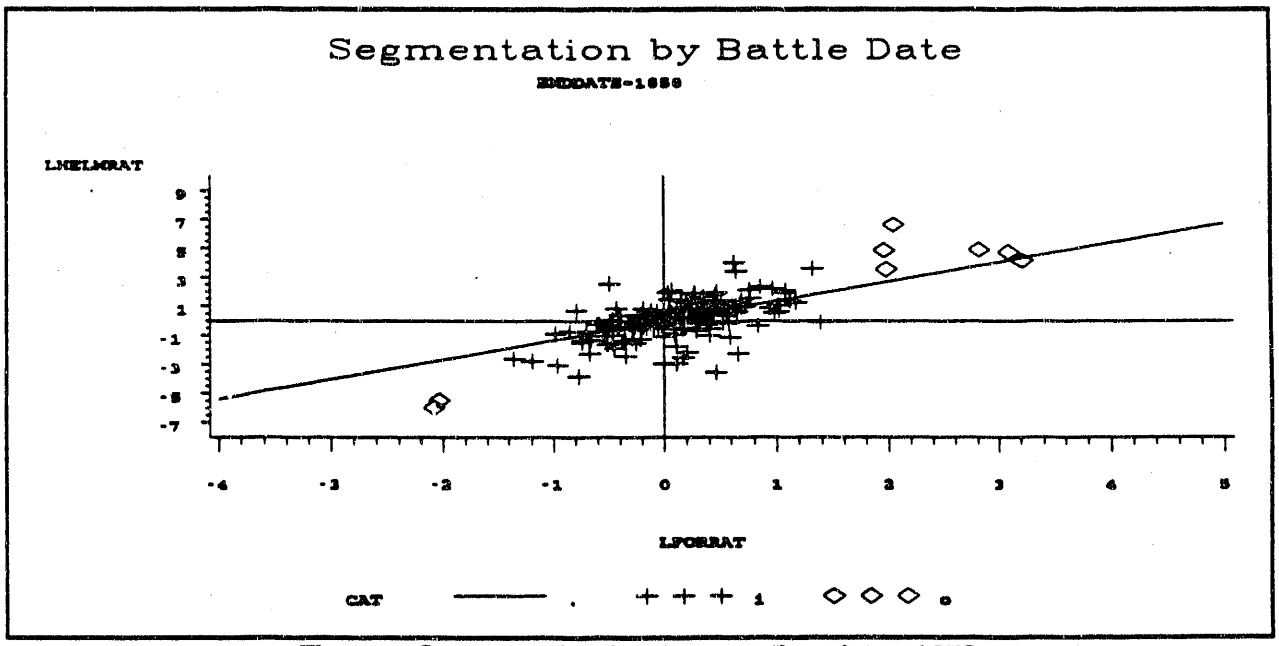

Fig. 19. Segmentation by date, ending date=1858.

Figure 20 shows the distribution in Helmbold space of the pre-World War I battles. The number of battles in this segment is comparable to the number in the pre-Civil War group. Removal of its outliers raises the α value from 1.18 to 1.28. Figure 21 shows the distribution of the World War I era battles. Its α value is virtually unchanged by removal of the outliers.

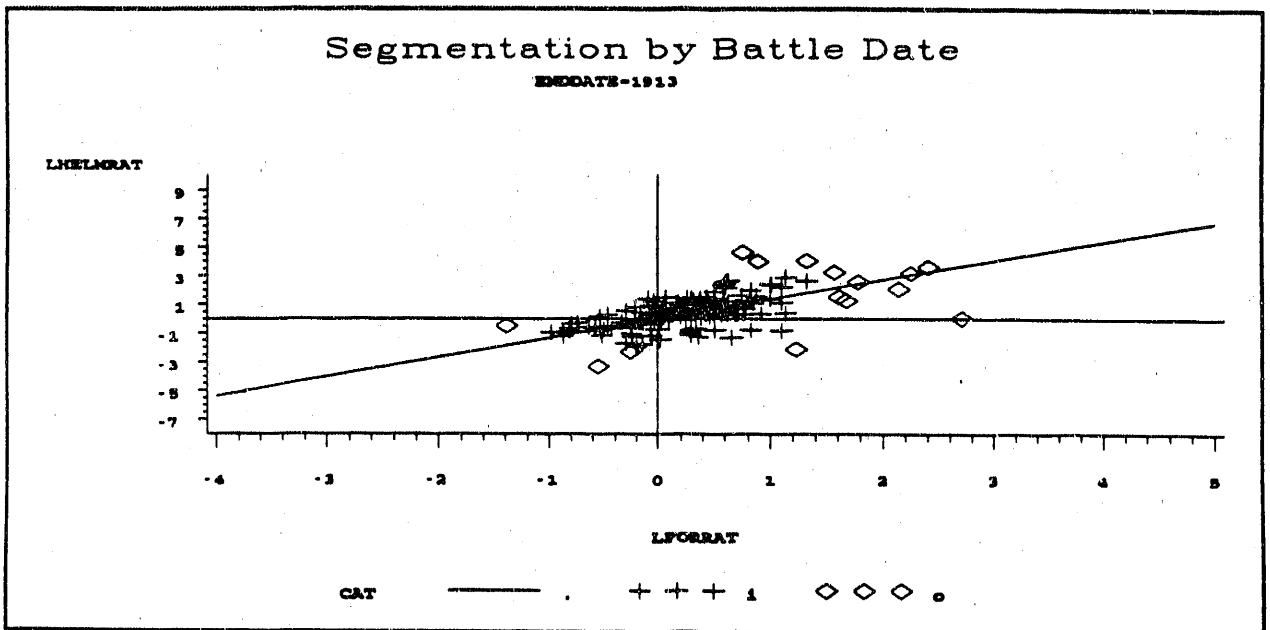

Fig. 20. Segmentation by date, ending date=1913.

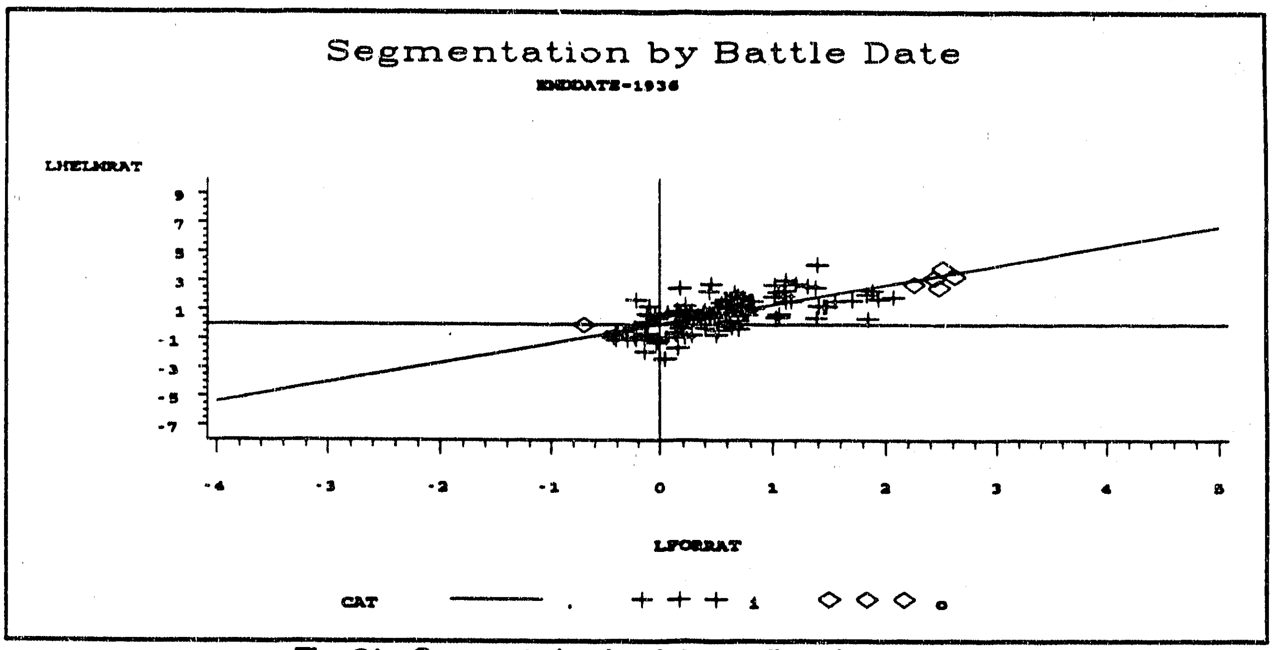

Fig. 21. Segmentation by date, ending date=1936.

Figure 22 shows the World War II through Korea era battles. As in the World War I era battles, removal of the outliers makes little difference.

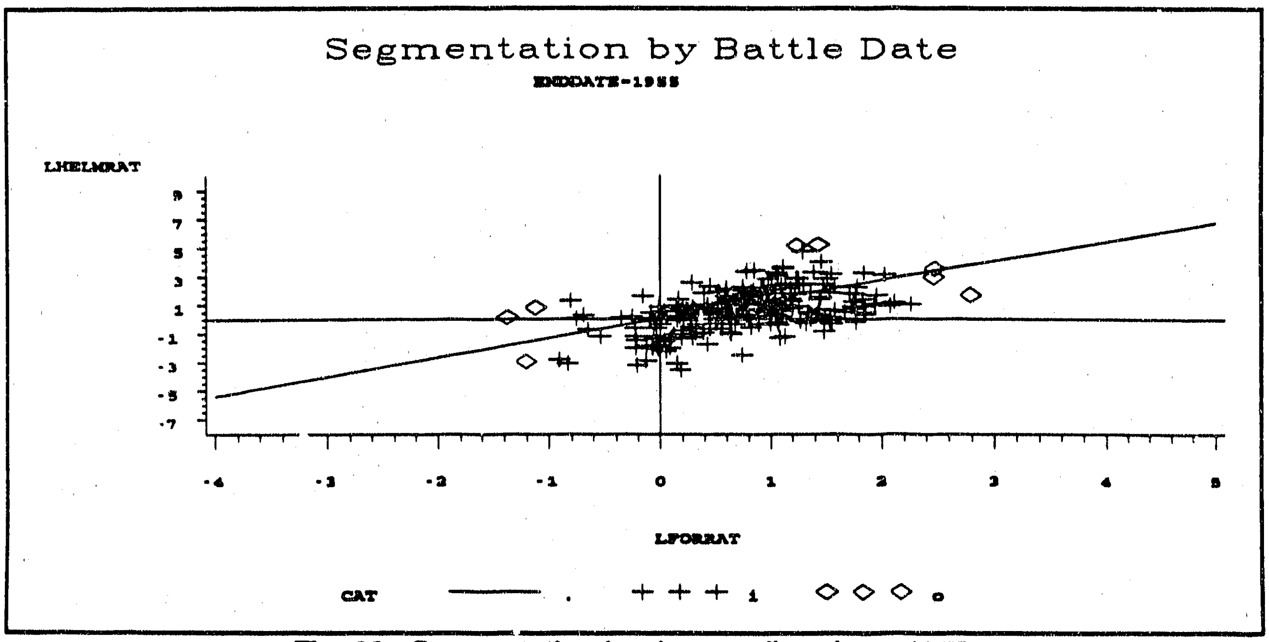

Fig. 22. Segmentation by date, ending date=1955.

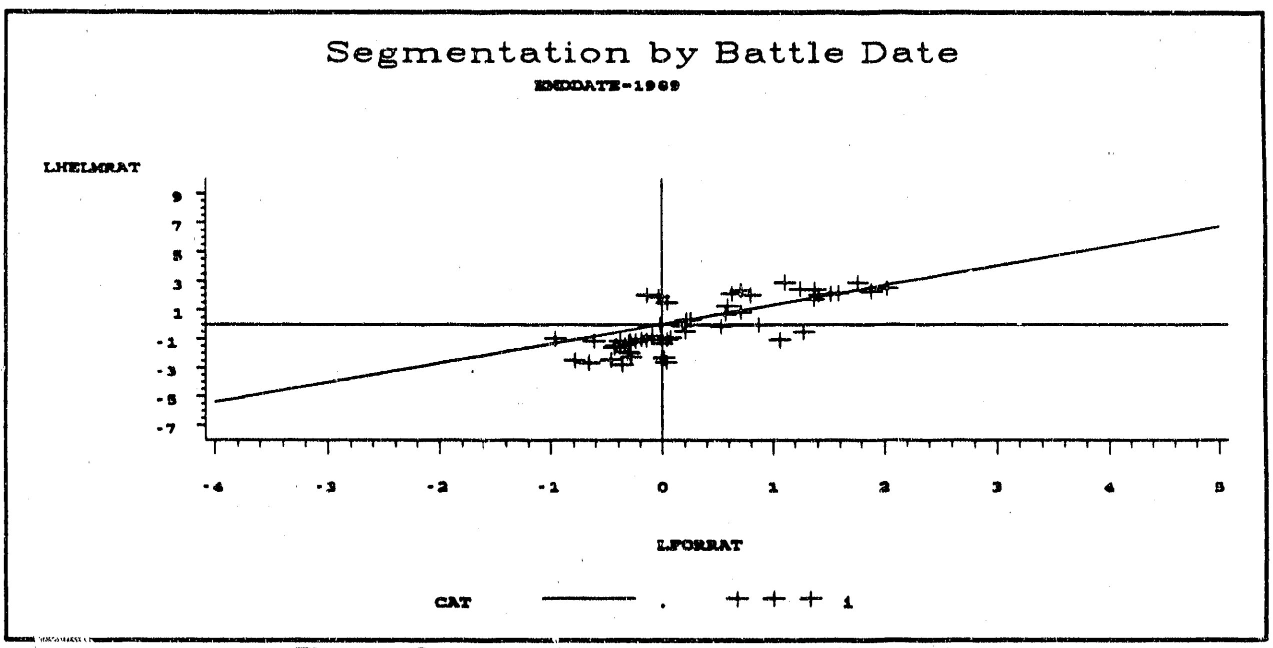

Fig. 23. Segmentation by date, ending date=1989.

Figure 23 shows the dataset of "modern" battles. There are no clear choices for outliers in this segment. Although it is small in number of battles (53), it has a relatively high R^2 value, reflecting the clear concentration and directional tendency depicted in Fig. 23. What is not shown in the figure is that its high α value of 1.81 is the result of the 1973 Arab-Israeli war. Its 1967 Arab-Israeli war component has an α value in consonance with the rest of the time segments. Further, as will be seen in Section 4, the high value for the '73 war is a result of the spacial positioning of two separate components of the war, and (apparently) not characteristic of the war itself.

Figure 24 shows that the outliers do form a less distorted picture when collected. The set forms a "halo" surrounding the space that would be occupied by the non-outlier battles. The α estimate of 1.69 and the minimum and maximum α estimates of 1.19 and 2.19 tend to confirm the proposition that the outliers are proper members of the total population, occupying such a small proportion of the whole that their random appearance in a small segment can distort its statistics.

As with the dataset segmentation, the maximum minimum and the minimum maximum are

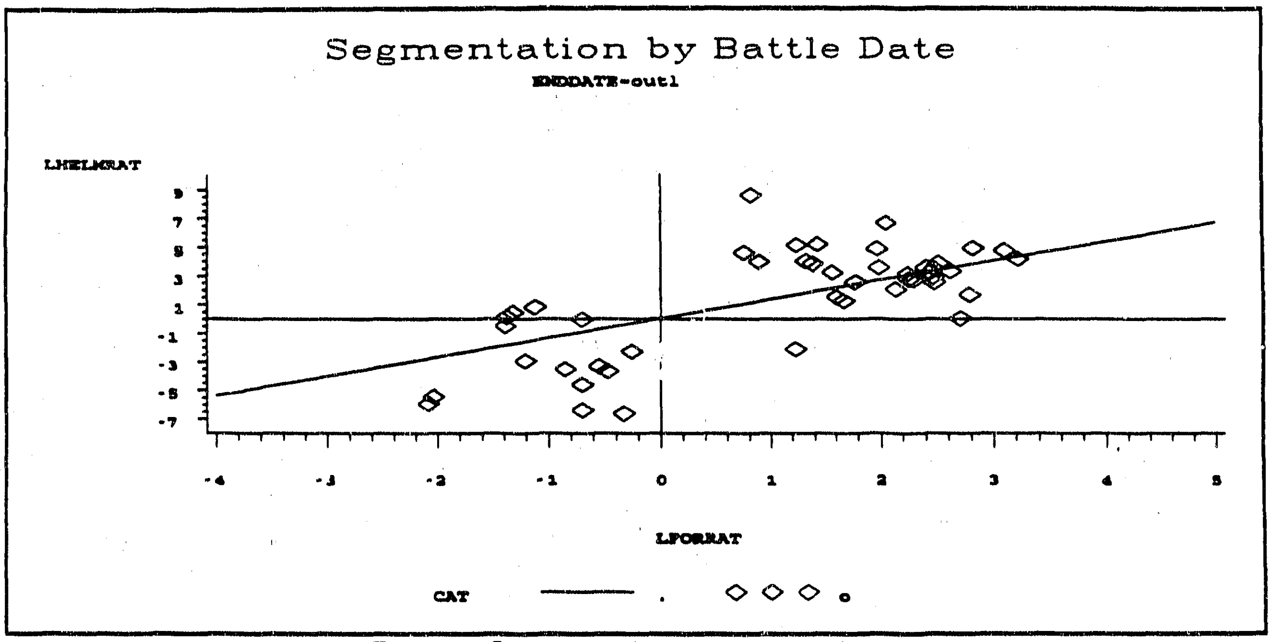

Fig. 24. Segmentation by date, outliers.

calculated and shown in bold in Table 3 (omitting the 1956-1989 time segment for the reasons given above). Each regression could allow α values from 1.19 to 1.39. Thus a choice of 1.35, which is supported by the dataset as a whole is not negated by the date segmentation. We conclude that the α value is stable over time.

4. SEGMENTATION BY BATTLE SIZE

It is certainly conceivable that the dynamics of warfare differ according to the size of the battle. Within the framework of general homogeneous Lanchestrian attrition, this proposition takes the form of varying the α value with the size of the battle. One might expect that square law effects ($\alpha = 0$), based on aimed fire would be most prominent in small battles. Linear law effects ($\alpha = 1$), based on increasing area fire would have increasing impact as the battles grow larger. Finally, logarithmic law effects ($\alpha = 2$) would predominate as the battles grow to their greatest size, perhaps representing increased amounts of the "friction of war."

The data have been segmented into five size categories to test this proposition. Because the proper measure of a battle's size is not entirely clear, the segmentation has actually been done under three definitions of size. The first definition equates size to the size of the attacking force. The second definition equates size to the size of the defending force. The final definition uses the average of the attacker's and defender's forces as the size criterion.

Tables 4, 5, and 6 present the results of the regression analyses. The α and β values, their error values, the R^2 values, and the number of battles in each category are shown.

Table 4. Battle size based on attacker's size

	Attacker, X, meets size criterion					
Force Size Criterion	α	α Err	β	β Err	R^2	#
1. < 5K	1.18	0.19	-.16	0.16	0.28	100
2. 5K-15K	1.82	0.17	-.30	0.14	0.45	148
3. 15K-40K	1.17	0.09	-.28	0.08	0.38	285
4. 40K-100K	1.55	0.10	-.15	0.08	0.56	193
5. >= 100K	1.51	0.14	-.15	0.10	0.49	131
Total Database	1.38	0.06	-.22	0.05	0.41	857

Table 5. Battle size based on defender's size

Force Size Criterion	Attacker, Y, meets size criterion					
	α	α Err	β	β Err	R^2	#
1. < 5K	1.10	0.14	0.03	0.17	0.26	186
2. 5K-15K	1.48	0.14	-.25	0.12	0.38	179
3. 15K-40K	1.57	0.13	-.35	0.08	0.39	236
4. 40K-100K	1.79	0.12	-.16	0.08	0.59	154
5. >= 100K	1.56	0.17	-.17	0.09	0.46	102
Total Database	1.38	0.06	-.22	0.05	0.41	857

Table 6. Battle size based on average of attacker's and defender's sizes

Force Size Criterion	Average, (X+Y)/2, meets size criterion					
	α	α Err	β	β Err	R^2	#
1. < 5K	1.50	0.19	-.09	0.18	0.35	113
2. 5K-15K	1.02	0.12	-.06	0.13	0.26	207
3. 15K-40K	1.67	0.10	-.47	0.08	0.53	230
4. 40K-100K	1.60	0.11	-.10	0.07	0.55	188
5. >= 100K	1.52	0.13	-.19	0.09	0.53	119
Total Database	1.38	0.06	-.22	0.05	0.41	857

Figure 25 plots the α values against the size categories for the attacker force size. The low value for the "< 5K" category is discredited by the succeeding very high and very low values. The implication is that the results are a product of chance. No trend is visible.

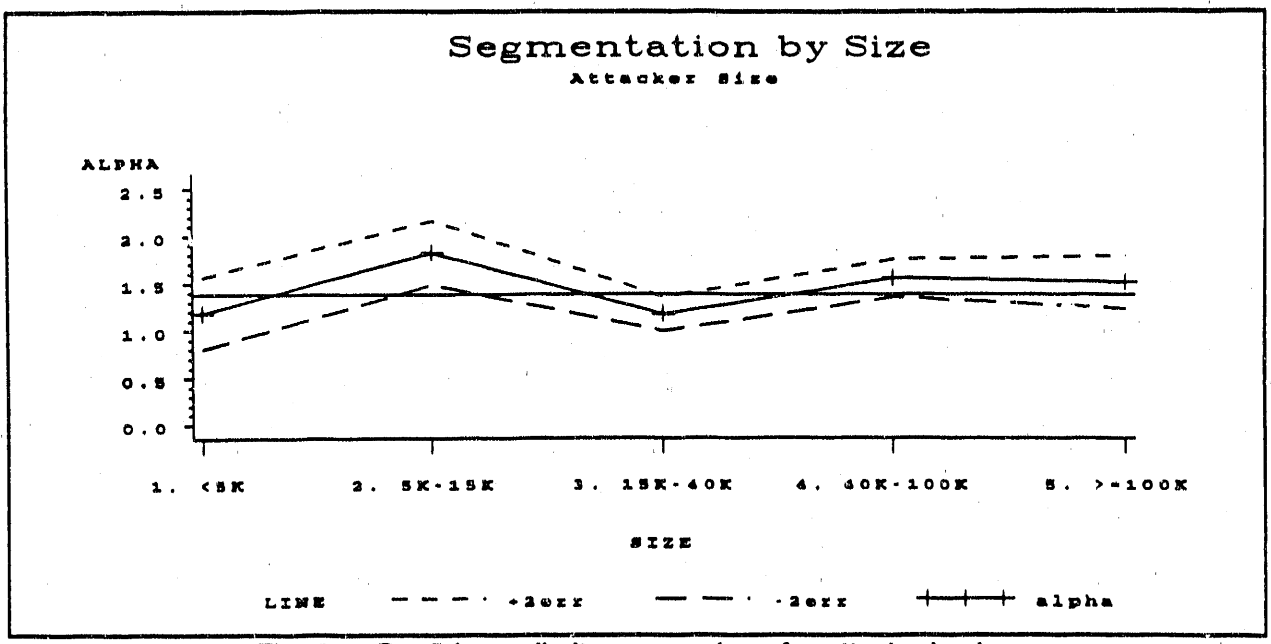

Fig. 25. Confidence limits on α values for attacker's size.

Figure 26 contains the corresponding plot for the defender force size categories. A clear trend is visible in this case. However, the size of the standard error of α ranges from 0.12 to 0.17, so the significance of the trend is doubtful.

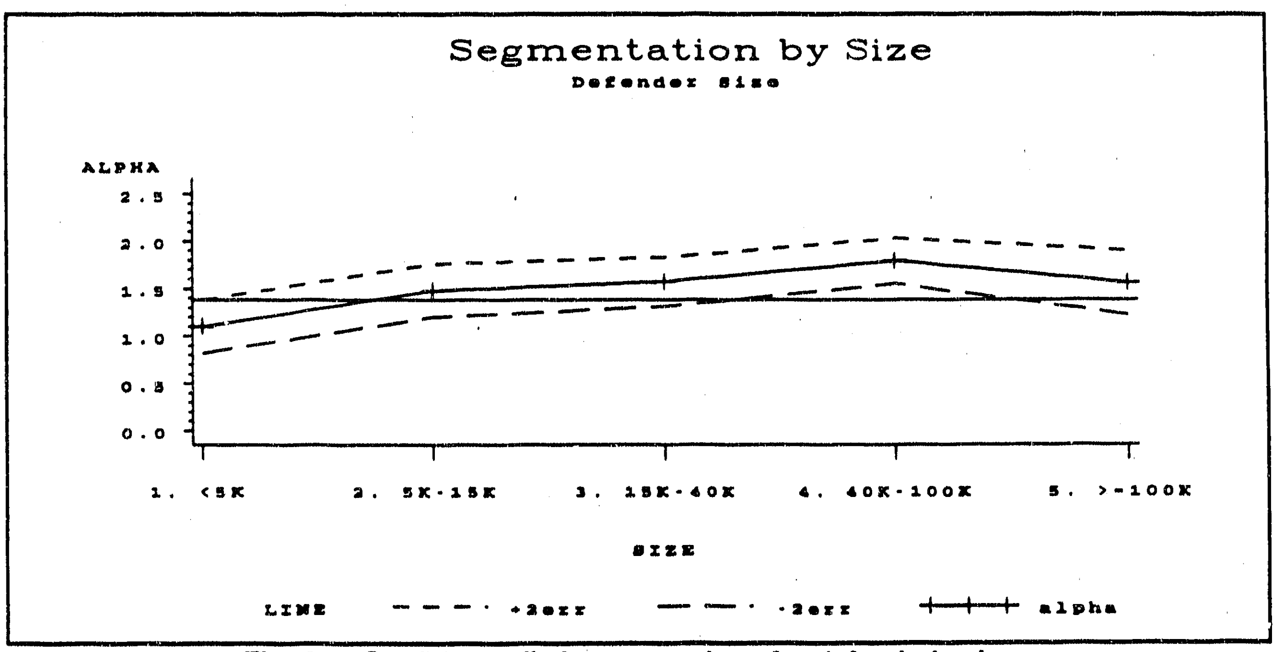

Fig. 26. Confidence limits on α values for defender's sizes.

Figure 27 contains the corresponding plot for the average force size categories. Under this definition, the smallest category has an α value higher than for the total database, followed by a very low α for the next larger category. No trend is visible.

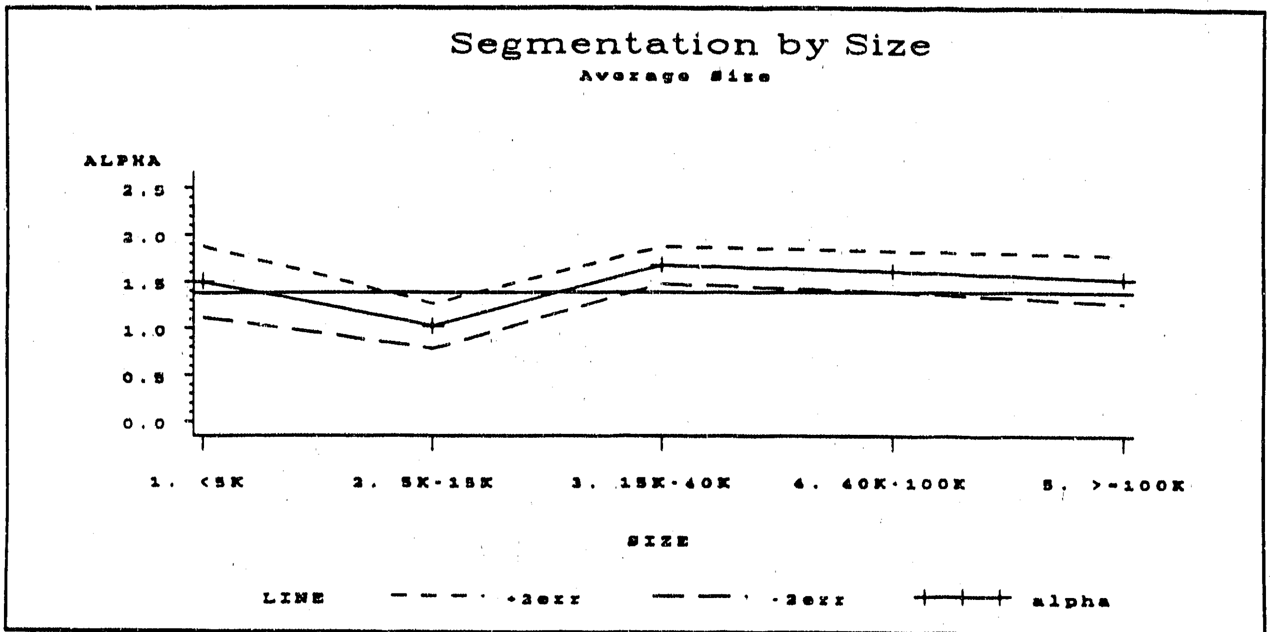

Fig. 27. Confidence limits on α values for battle sizes.

Several, more detailed, analyses of the data were conducted (continuous-nesting-class and continuous-by-class effects), in which it was determined that there are no statistically significant linear trends in these three cases. Thus, there is no evidence that the size of the battle makes a difference in the choice of a homogeneous Lanchester law. It is possible that under the definition of defender's size there is a difference; however, the data are not sufficient to make a strong case for this proposition.

Because the smallest category is battles with fewer than 5000 men on one side or the other, no inferences can be made about the dynamics of battles within that category. Hence, it still might be true that Platoon and Company sized battles might conform to the Square Law. There are too few battles in the very smallest size range in these data to investigate such a contention.

5. SEGMENTATION BY CAMPAIGN

The database containing all of the datasets is large enough to have a significant number of battles that are connected as members of the same military campaign. The expectation is that battles within a campaign are more likely to be fought under similar conditions, with similar attrition mechanisms and attrition coefficients than would be found in random collections of battles. Section 4.1 investigates the effects of segmentations of the database into campaigns.

Dupuy [5] and others have speculated on the existence of consistent differences in the effectiveness shown by the forces of various nations. Section 4.2 investigates this possibility as it might affect the proposed linear-logarithmic attrition law. Because greater consistency might be found in those battles in campaigns with the same attacker/defender identities, the campaigns of section 4.1 are collected into attacker defender pairs. Those pairs involved in multiple campaigns are analyzed.

Section 4.3 carries the campaign segmentation to the limits of this database with a segmentation of the Okinawa campaign into national unit pairs.

The final part of Section 4 is a review of Engel's work with the Iwo Jima battle. Engel's demonstration that the data are consistent with a square law is compared to a demonstration that the data are also consistent with the proposed mixed linear-logarithmic law.

5.1 SELECTED CAMPAIGNS

Each of the campaigns has at least one set of three or more battles with the same attacker/defender identity, all of the battles taking place in a relatively short time span. Two analyses are performed. One is of the campaign as a whole and the other is of each attacker/defender pair in the campaign.

Table 7 is organized by war and campaign. Within each campaign, each attacker/defender pair (with more than one battle) is listed. For those campaigns with more than one listed attacker/defender pair, a "combined" line is also present. Each attacker/defender pair line shows the α estimate, the standard error of the estimate, the R^2 for the regression and the number of battles considered (the R^2 and err values are not computed for groups of two battles. The "combined" line shows the same parameters and statistics for the combination of the battles (note the number of battles equals the sum of the defender/attacker pair battles listed). Because the number of battles in each regression is so small, the values listed for parameters and statistics must be regarded as indicative, not conclusive of anything.

Notice that the campaign results for the Israel 73/Suez campaign have a higher R^2 (0.82 vs 0.13 and 0.12), smaller error (0.23 vs 0.14 and 0.72), and α closer to the mean for the total database (1.88 vs 0.11 and 0.75) than do either of the individual attacker/defender pair results (within that campaign), while the campaign results for WWII/Okinawa exhibit almost the opposite tendency (R^2: 0.08 vs missing and 0.68, err: 0.21 vs missing and 0.26, α: 0.31 vs 2.05 and 1.86). The relevant figures illustrate the reasons.

Table 7. Campaign segmentation regression parameters and statistics

War/Campaign	Attack	Defend	α	Err	R^2	#
Franco-Prussia/Metz	Germany	France	0.85	0.23	0.81	5
WWI/Belleau Wood	USA	Germany	0.88	0.94	0.08	13
WWI/Isonzo	Italy	Austria	1.89	0.75	0.51	8
WWI/Meuse-Argonne	France	Germany	1.72			2
	USA	Germany	1.40	0.22	0.76	15
		Combined	1.42	0.20	0.77	17
WWI/Soissons	USA	Germany	1.63	0.15	0.97	6
WWI/The Marne	France	Germany	2.11	0.22	0.99	3
	Germany	France	1.76	0.15	0.99	4
		Combined	1.74	0.09	0.99	7
WWII/Anzio	England	Germany	2.09			2
	Germany	England	0.19	0.48	0.05	5
	Germany	USA	1.59	0.45	0.76	6
		Combined	0.83	0.43	0.25	13
WWII/Ardennes	Germany	USA	1.26	0.53	0.38	11
WWII/Battle-Britain	Germany	England	1.54	0.28	0.67	17
WWII/Kursk	Germany	Russia	1.94	0.29	0.96	4
	Russia	Germany	1.87	0.13	0.99	3
		Combined	2.41	0.30	0.93	7
WWII/Okinawa	Japan	USA	2.05			2
	USA	Japan	1.86	0.26	0.68	26
		Combined	0.31	0.21	0.08	28
WWII/Rome	England	Germany	0.75	0.93	0.25	4
	USA	Germany	1.73	0.44	0.48	19
		Combined	1.43	0.38	0.40	23
WWII/Saar	USA	Germany	2.41	0.68	0.53	13
WWII/Volturno	England	Germany	1.24	0.72	0.29	9
	USA	Germany	-.42	0.90	0.03	10
		Combined	1.38	0.61	0.08	19
Korea/Inchon-Seoul	USA	NKorea	1.37	1.38	0.05	19
Israel 67/Golan	Israel	Syria	1.38	0.34	0.94	3
Israel 67/Sinai	Israel	Egypt	1.37	0.83	0.23	11
Israel 67/West Bank	Israel	Jordan	1.23	0.02	1.00	5
Israel 73/Golan	Israel	Syria	1.20	0.24	0.83	7
	Syria	Israel	0.95	0.37	0.57	7
		Combined	2.00	0.22	0.87	14
Israel 73/Suez	Egypt	Israel	0.11	0.14	0.13	6
	Israel	Egypt	0.75	0.72	0.12	10
		Combined	1.88	0.23	0.82	16
Combined Campaigns			1.25	0.10	0.38	255
Combined Campaigns	Each Centered		1.31	0.10	0.41	255
Total Database			1.38	0.06	0.41	857

Figure 28 shows the distribution of battles in the Israel 73/Suez campaign in Helmbold space. Those battles in which Egypt was the attacker and Israel the defender are marked in the legend as AD (for attacker/defender) = 'EI.' Those battles with Israel attacking and Egypt defending are marked as AD = 'IE.' The line through the centers of the two sets of battles in the attacker/defender groupings has roughly the same slope as that of the total database regression line.

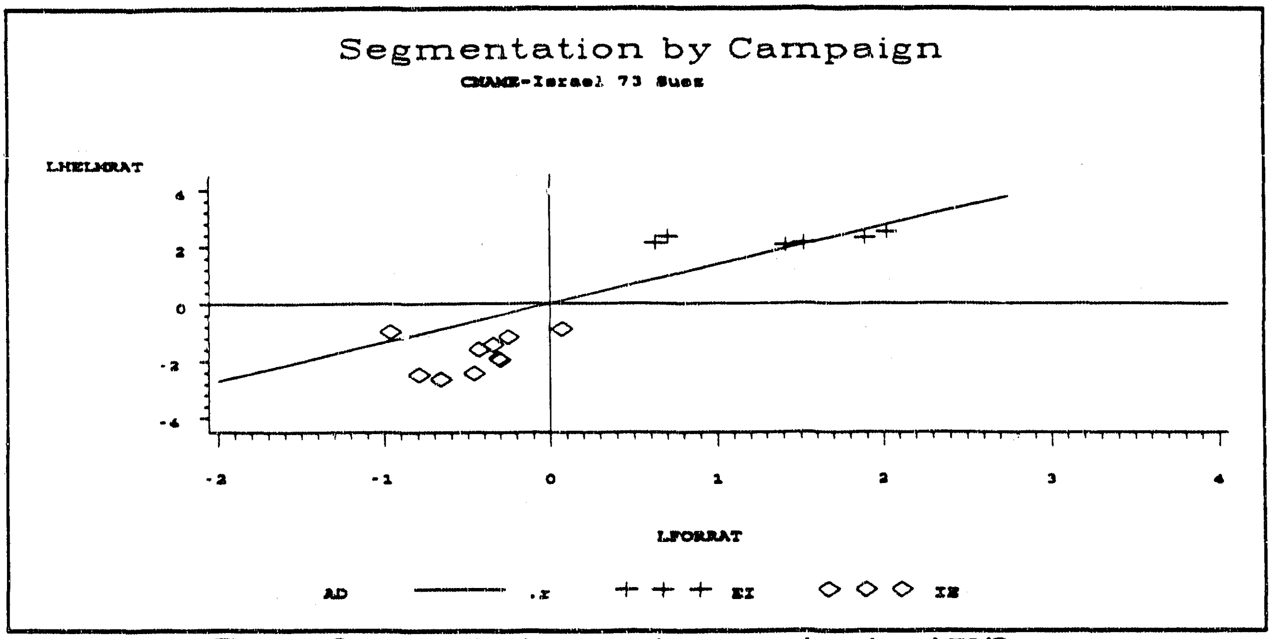

Fig. 28. Segmentation by campaign, campaign=Israel 73/Suez.

Figure 29 shows the distribution of battles in the WWII/Okinawa campaign. In the AD legend, 'J' and 'U' are used for Japan and the United States, respectively. Although each group individually appears to have activity parallel to the total regression line, the line between the two groups has an almost zero slope.

The implications of this effect are discussed at the end of this section. The large size of the WWII/Okinawa campaign set of battles allows more detailed analyses, which are discussed in Section 4.3.

In spite of the small statistical value of any single campaign analysis, the collection of analyses shows enough persistence of a distinct pattern of α values between 1.0 and 2.0 to be significant. The figures illustrating the distribution of the battles in Helmbold space do more than reinforce the impression of this pattern. In many cases, there are stronger hints of the pattern visible (in the figures) in subsets of the data, obscured in the regressions by "stray" points.

Figure 30 shows the Franco-Prussian War/Metz campaign battles distributed in Helmbold space. The battles are labeled 'GF,' indicating Germany as the attacker and France as the defender. The α value is lower than that of the total database but, considering the error value, reasonably close. Although the number of battles is small, the separation of the force ratios and the matching of the Helmbold ratio values to the slope of the reference line is impressive.

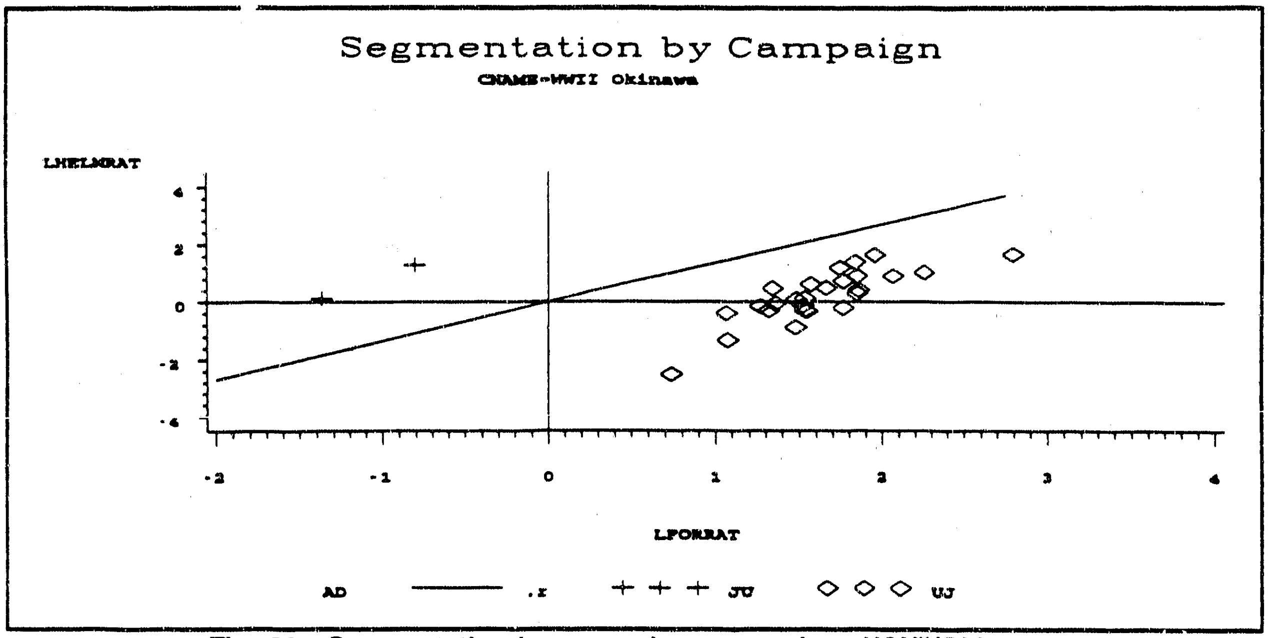

Fig. 29. Segmentation by campaign, campaign=WWII/Okinawa.

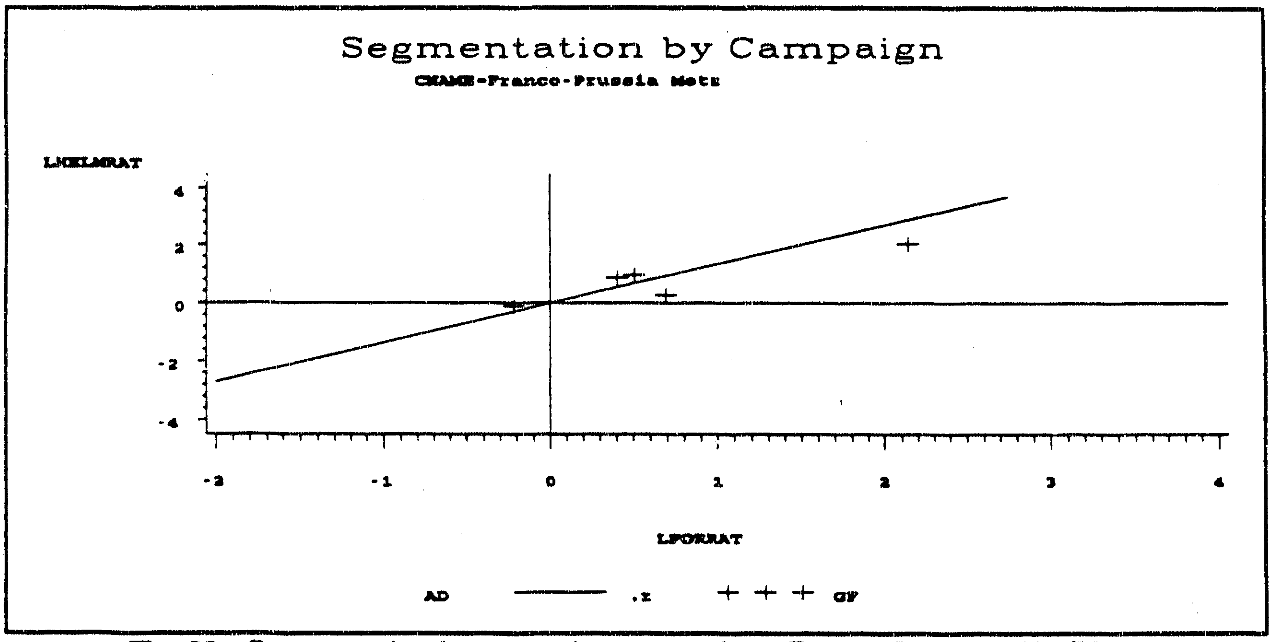

Fig. 30. Segmentation by campaign, campaign=Franco Prussian War/Metz.

Figure 31 shows the WWI/Belleau Wood campaign data in Helmbold space. The battles are labeled 'UG,' indicating the United States as the attacker and Germany as the defender. The spread of lforrat values is not as great in this campaign as in the Metz data and the spread of lhelmrat values is larger; however, the general run of the data appears to follow the reference

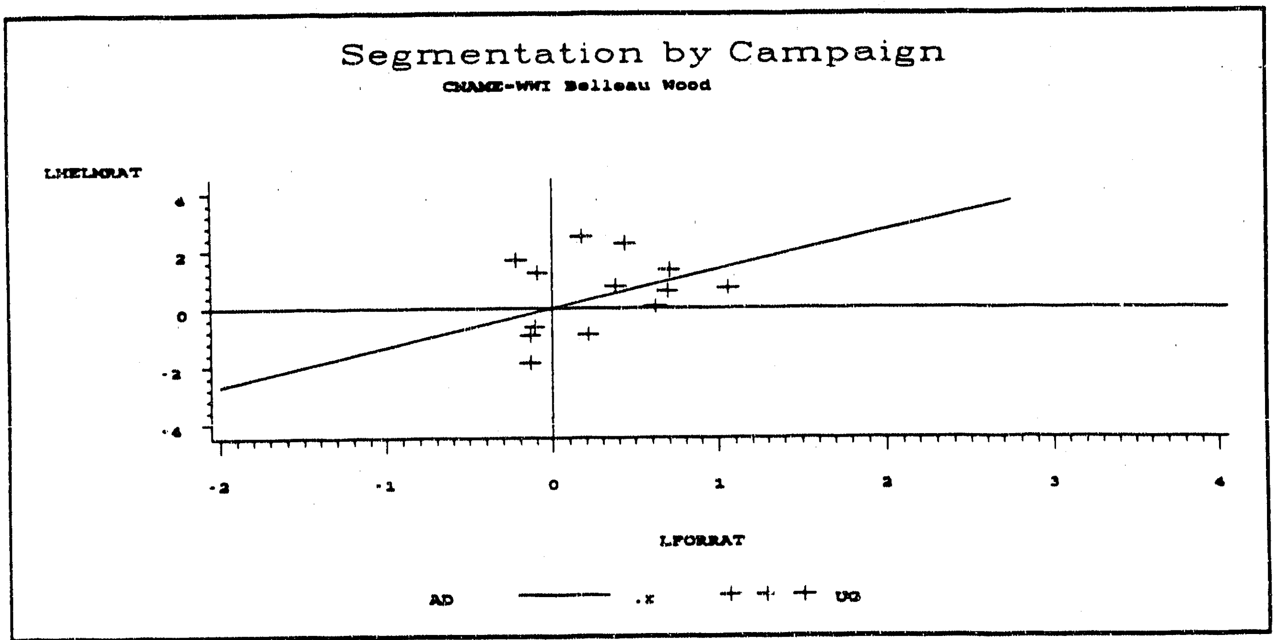

Fig. 31. Segmentation by campaign, campaign=WWI/Belleau Wood.

line. This is an instance where the visual pattern is more suggestive than are the regression results. The α and error values allow a reasonable match to the total database results; but the R^2 value shows a very poor fit.

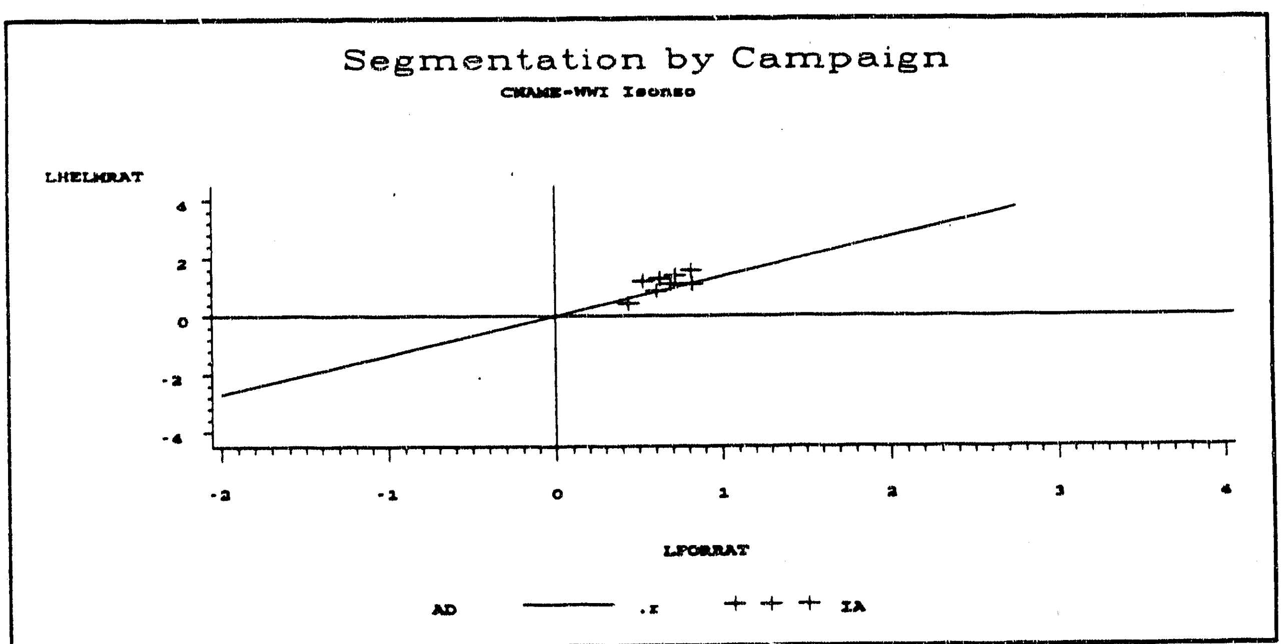

Fig. 32. Segmentation by campaign, campaign=WWI/Isonzo.

Figure 32 shows the WWI/Isonzo campaign data. Italy ('I') was the attacker and Austria ('A') was the defender. The data are clustered together, but still show a distinct trend along the reference line. In this case, the α value is larger than that of the total database, with a large enough error to account for the difference.

Figure 33 shows the WWI/Meuse-Argonne campaign data. In the battles marked 'FG,' France was the attacker and Germany the defender. In those marked 'UG,' the United States was the attacker and Germany the defender. The relatively large number of battles in this campaign (17)

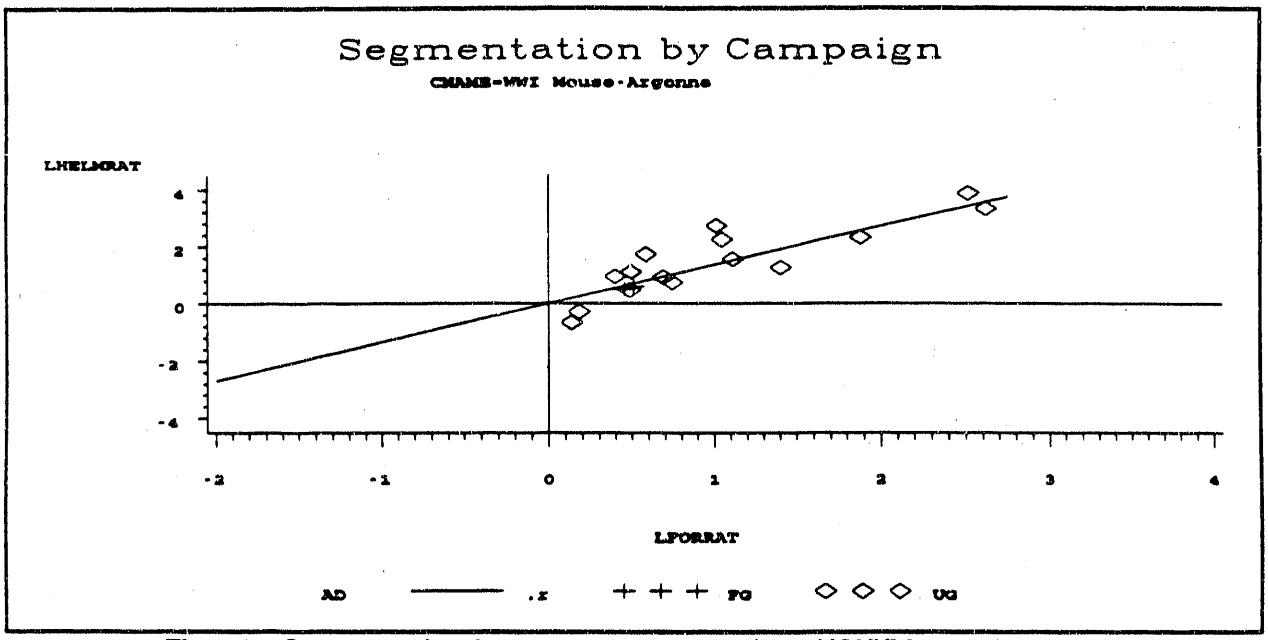

Fig. 33. Segmentation by campaign, campaign=WWI/Meuse-Argonne.

produce both good fits and good agreement with the total database, as shown in Table 7. The visual perception is in accord.

Figure 34 shows the WWI/Soissons campaign data. The battles are labeled 'UG,' indicating the United States as the attacker and Germany as the defender. The slope of this data is higher than that of the total database, but within twice the relatively small error of 0.15. These data illustrate the heart of the linear-logarithmic law proposition. The slope of the data roughly parallels the slope for the total database, but a line through the data would be plotted distinctly below that for the total database. The interpretation is that the same law is in effect, but that the "average" Lanchestrian coefficients are different.

Figure 35 shows the WWI/Marne campaign data. In the battles marked 'FG,' France was the attacker and Germany the defender. In those marked 'GF,' Germany was the attacker and France the defender. The parameters and statistics for these battles indicate a larger α value than that of the total database; however, the number of battles is small.

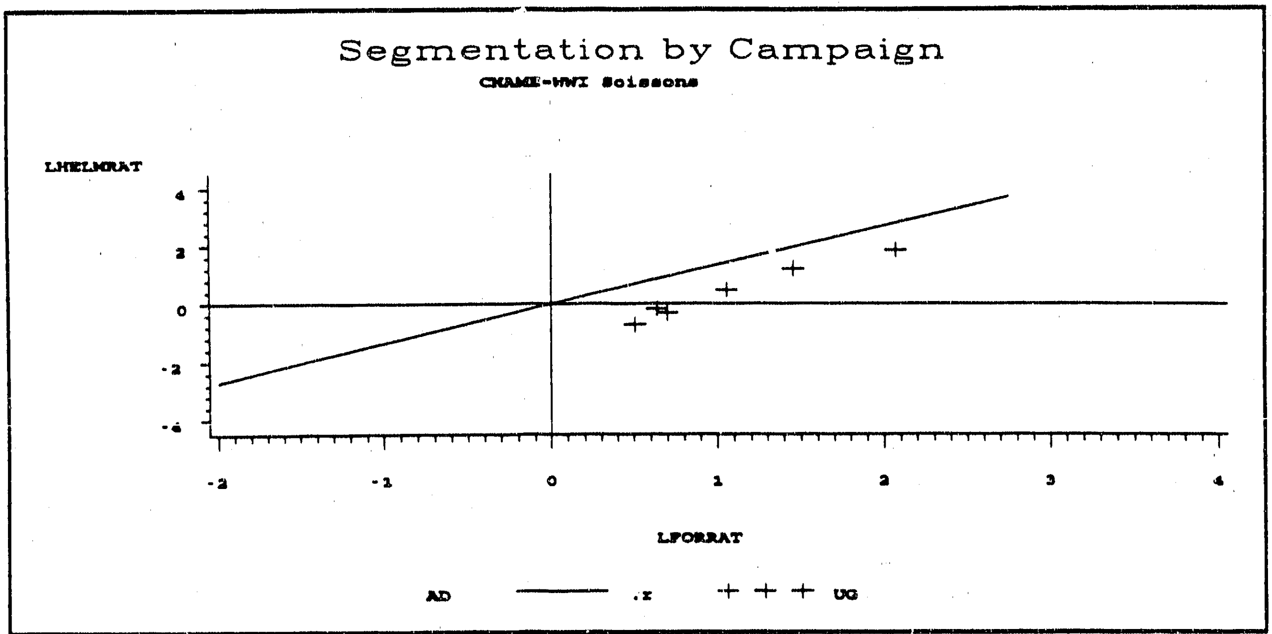

Fig. 34. Segmentation by campaign, campaign=WWI/Soissons.

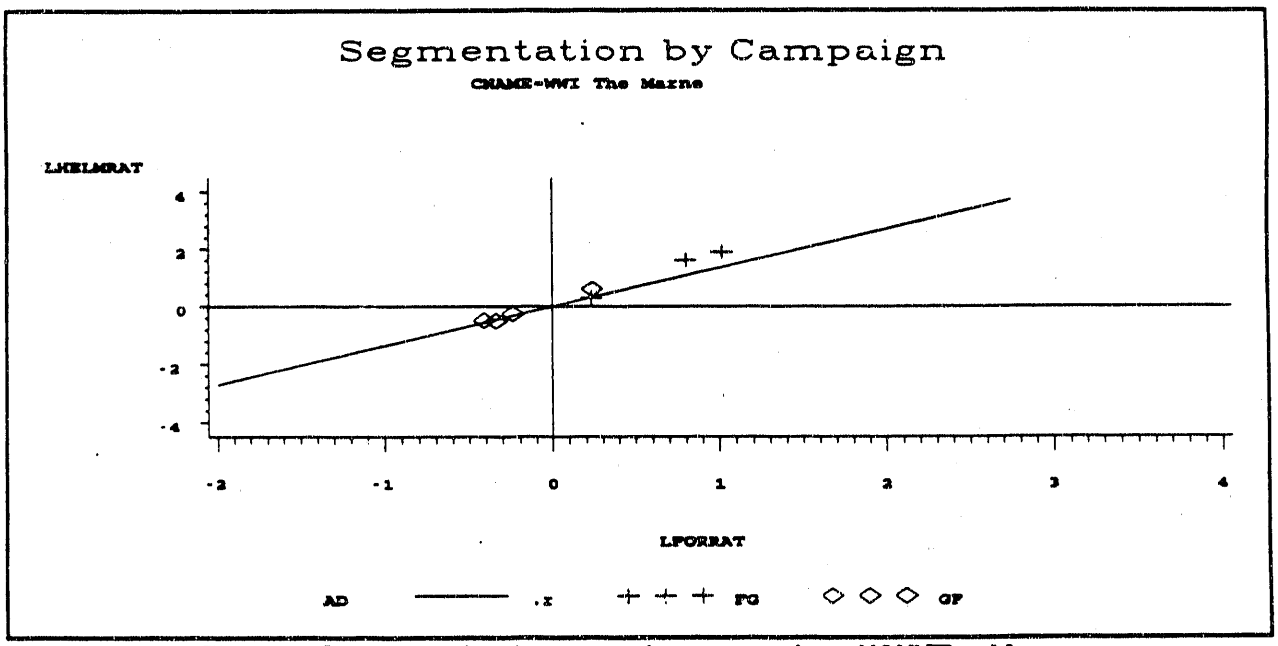

Fig. 35. Segmentation by campaign, campaign=WWI/The Marne.

Figure 36 shows the WWII/Anzio campaign data. This campaign has three attacker/defender pairs. The England attacking Germany pair ('EG,' with two battles) has a high slope. The Germany attacking United States forces ('GU,' with six battles) pair has a slope that basically matches the total database slope. The Germany attacking English forces ('GE,' with five battles) has a low slope. Overall, the campaign shows a slope that is on the low side; but one that basically matches the total database slope. Notice (in the figure) the influence that the

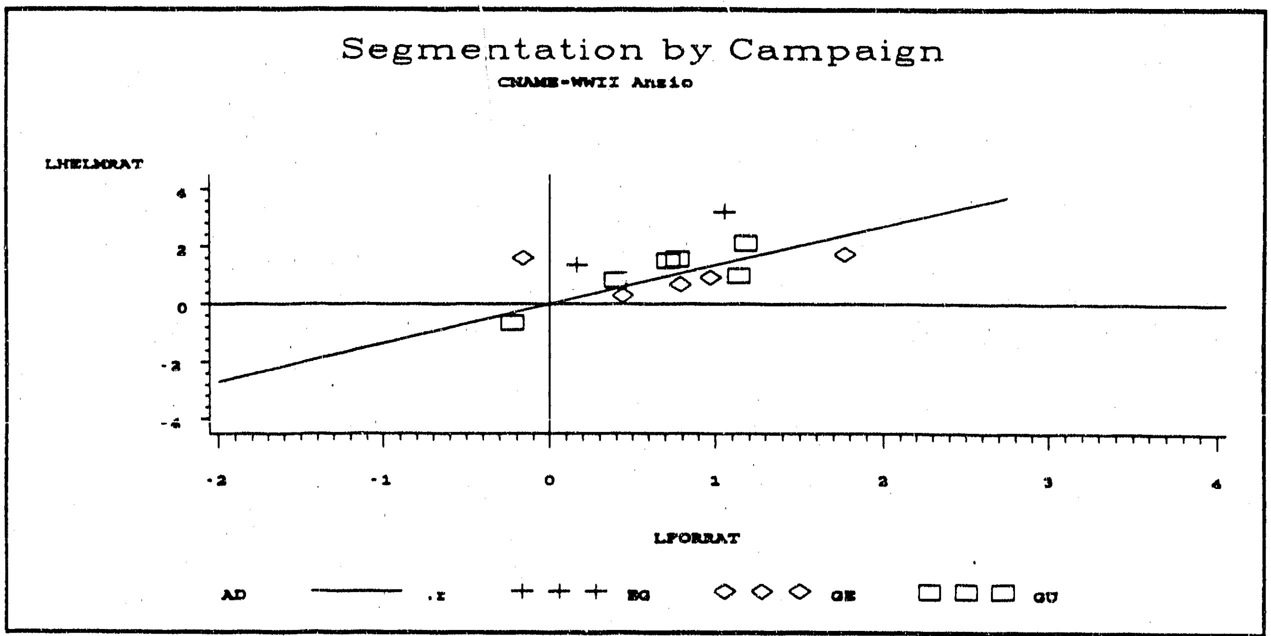

Fig. 36. Segmentation by campaign, campaign=WWII/Anzio.

German/England data point with the lowest lforrat value has on the slope of that attacker/defender pair.

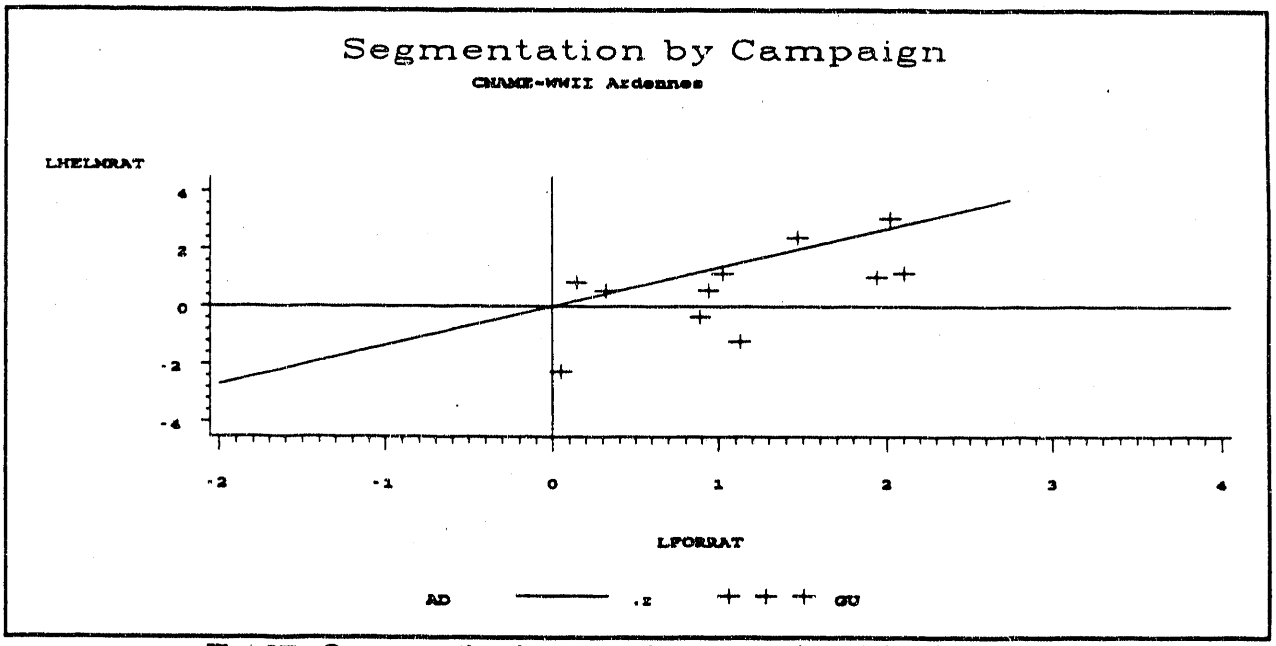

Fig. 37. Segmentation by campaign, campaign=WWII/Ardennes.

Figure 37 shows the WWII/Ardennes campaign data. The 'GU' label indicates that Germany was attacking United States forces. The 11 battles of this group are comfortably close to the total database results according to the parameters, although the R^2 value is small.

Figure 38 shows the WWII/Battle of Britain data. The 'GE' label indicates Germany attacking England. These data have appeared before in the dataset segmentation. Recall that these data represent air battles, in which the conditions would be expected to be replicated more closely than in land battles. It is therefore not surprising that the fit is good; however, the Meuse-Argonne campaign also had 17 battles and as good a fit.

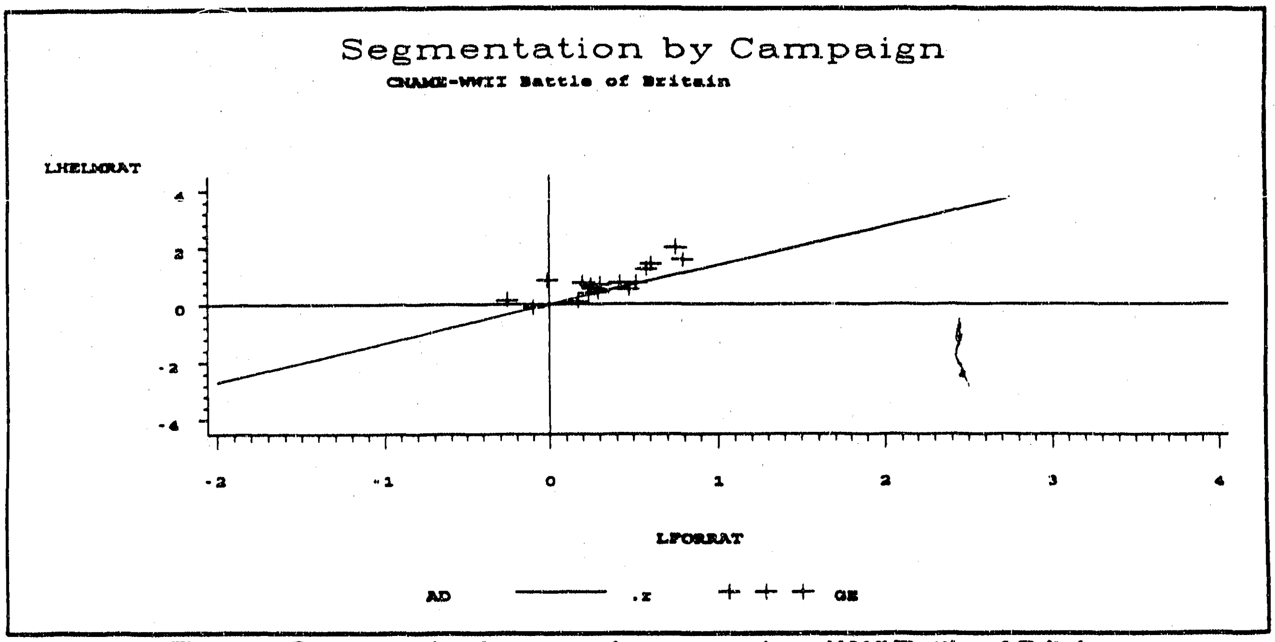

Fig. 38. Segmentation by campaign, campaign=WWI/Battle of Britain.

Figure 39 shows the WWII/Kursk campaign data. The Kursk campaign contained a German attack against the Russians ('GR') followed by a counter-attack ('RG') twenty days later, so the two attacker/defender pairs are moderately coupled. The slopes are on the high side, but not excessively in the individual attacker/defender pairs. The larger combined slope may be explained by the relative positions of the two sides of the campaign.

Figure 40 shows the WWII/Rome campaign data. The English attack on the Germans is labeled 'EG' and the United States attack on the Germans is labeled 'UG.' The statistics show good agreement with the total database results. The coincidence of the English and United States battles in the figure leave the impression that the actions were similar for the two allied forces.

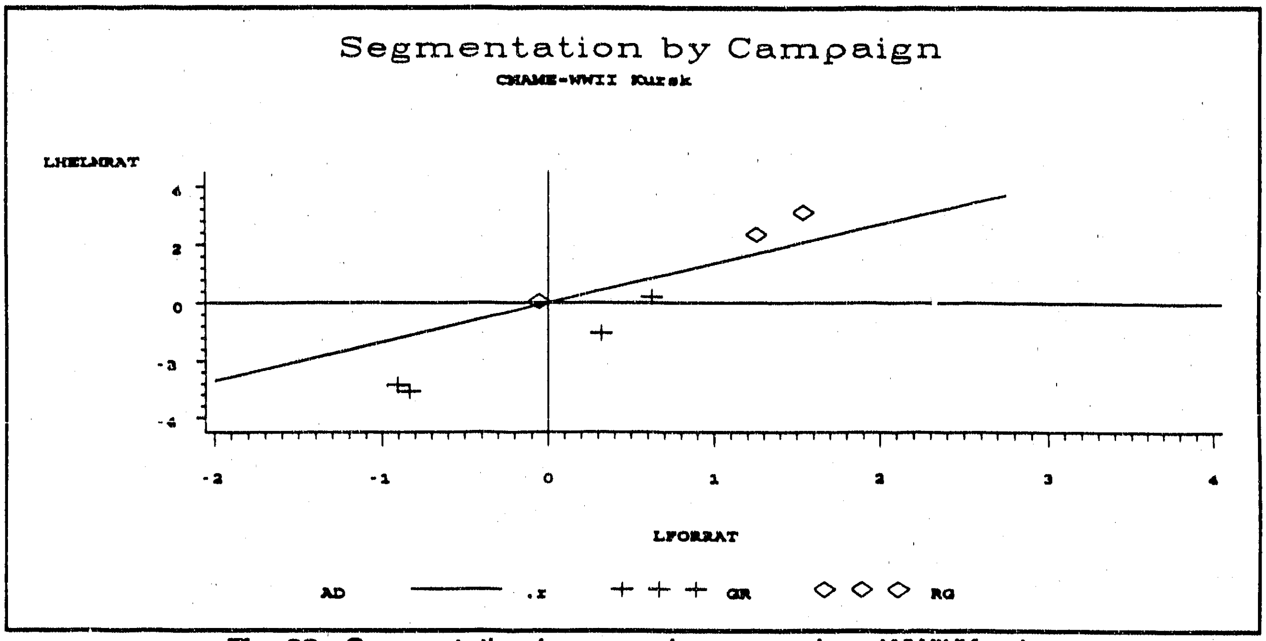

Fig. 39. Segmentation by campaign, campaign=WWII/Kursk.

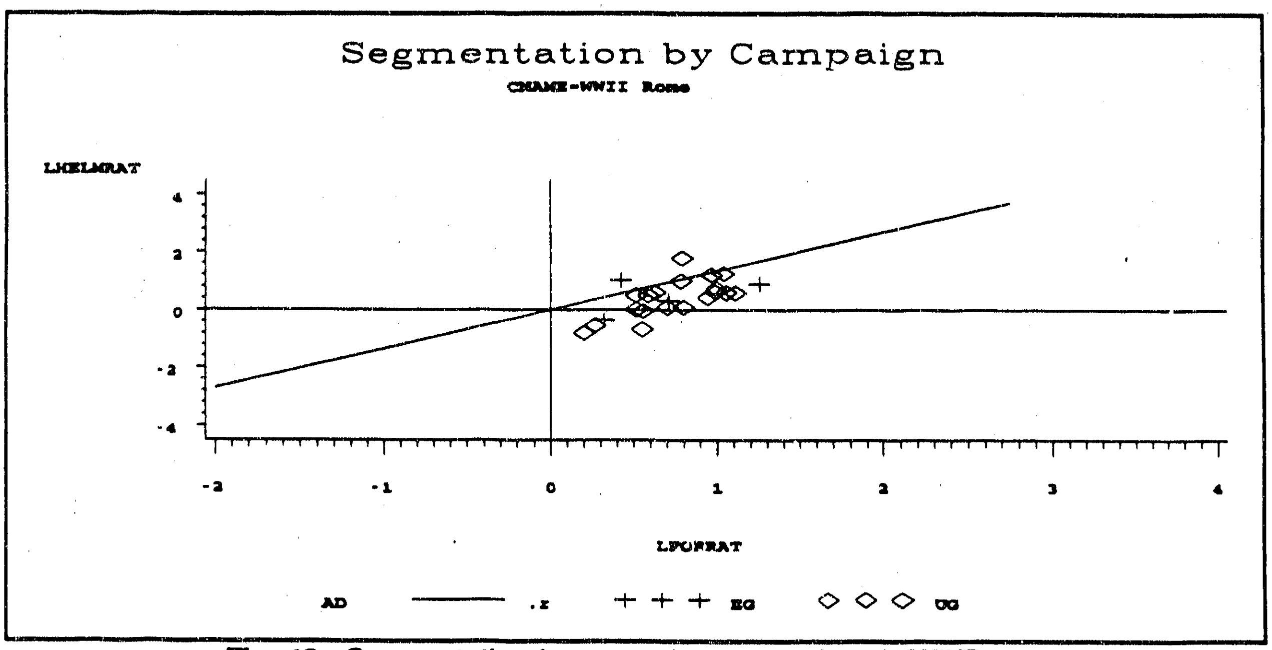

Fig. 40. Segmentation by campaign, campaign=WWII/Rome.

Figure 41 shows the WWII/Saar campaign data. This campaign shows 13 battles with the United States attacking the Germans ('UG'). The α value of 2.41 is considerably larger than the 1.38 value for the total database; however, the large error of 0.68 compensates for the difference. The data in the figure could be interpreted as supporting an even larger α value, however.

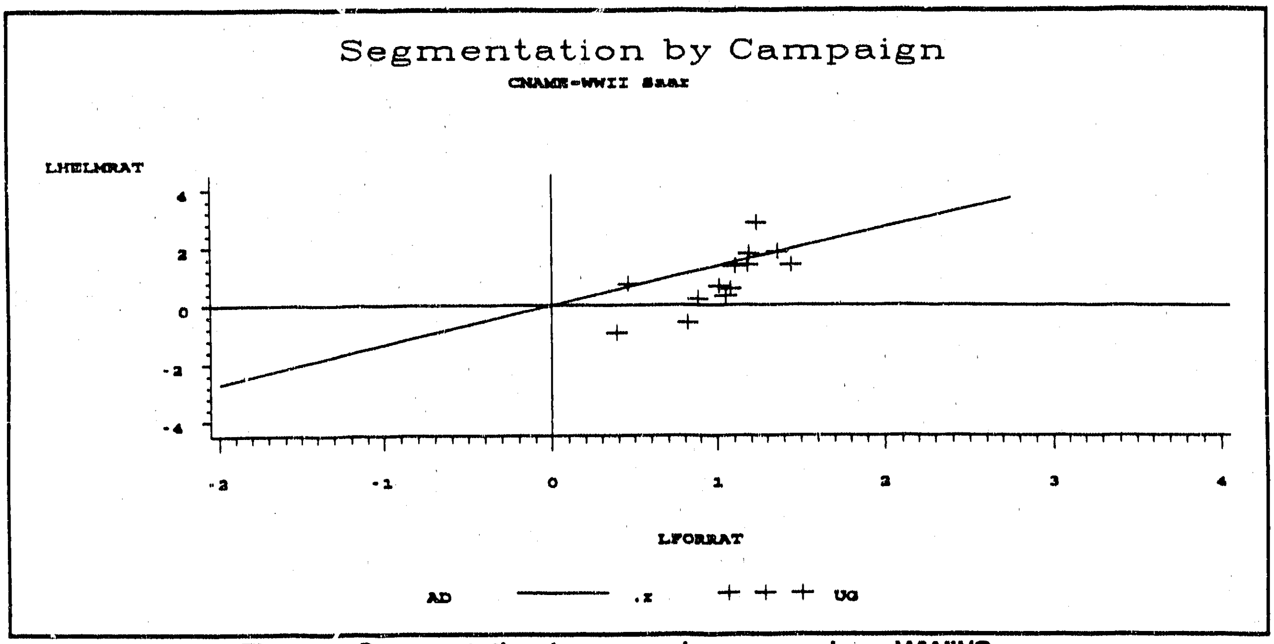

Fig. 41. Segmentation by campaign, campaign=WWII/Saar.

Figure 42 shows the WWII/Volturno campaign data. The nine battles in which England was the attacker and Germany the defender are labeled 'EG.' The ten battles in which the United States was the attacker and Germany the defender are labeled 'UG.' The EG battles fit the total data well. The UG battles show a negative slope and a zero fit in Table 7. The combination shows

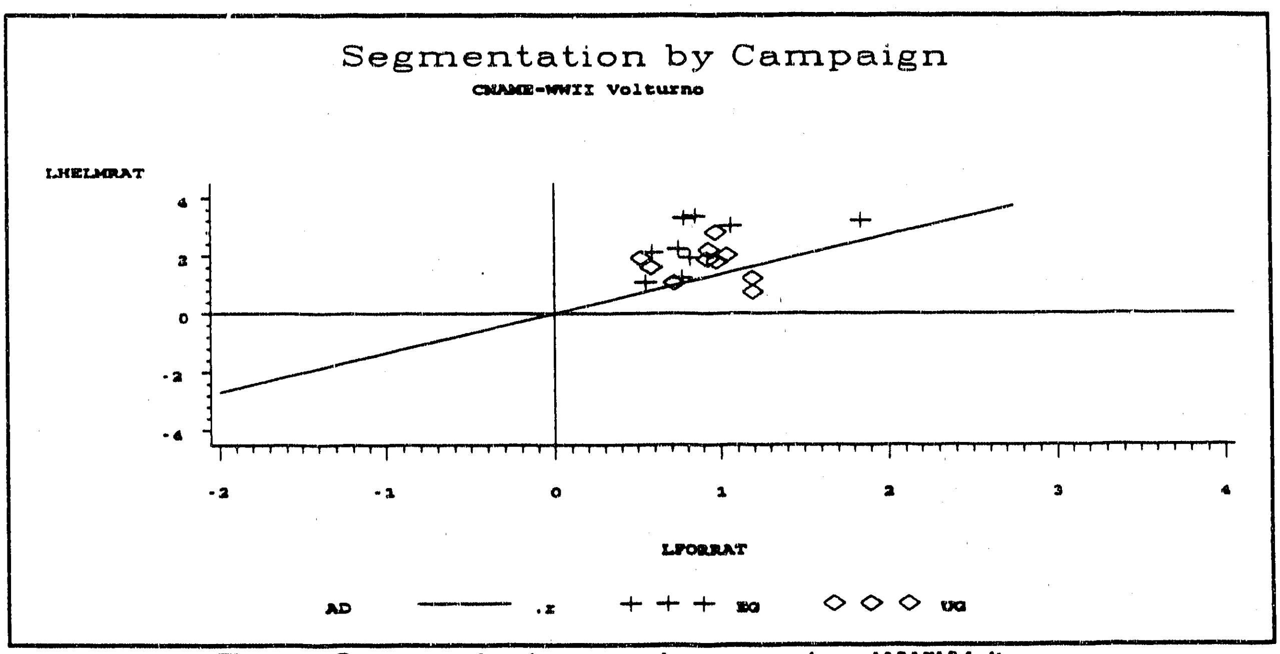

Fig. 42. Segmentation by campaign, campaign=WWII/Volturno.

an identical slope to the total database, but a zero R^2. The figure confirms the lack of direction for these data.

Figure 43 shows the Korean War/Inchon-Seoul campaign data. These data, with the United States attacking the North Koreans ('UK') has been discussed before in the dataset segmentation. Like the Volturno campaign data, no pattern is apparent.

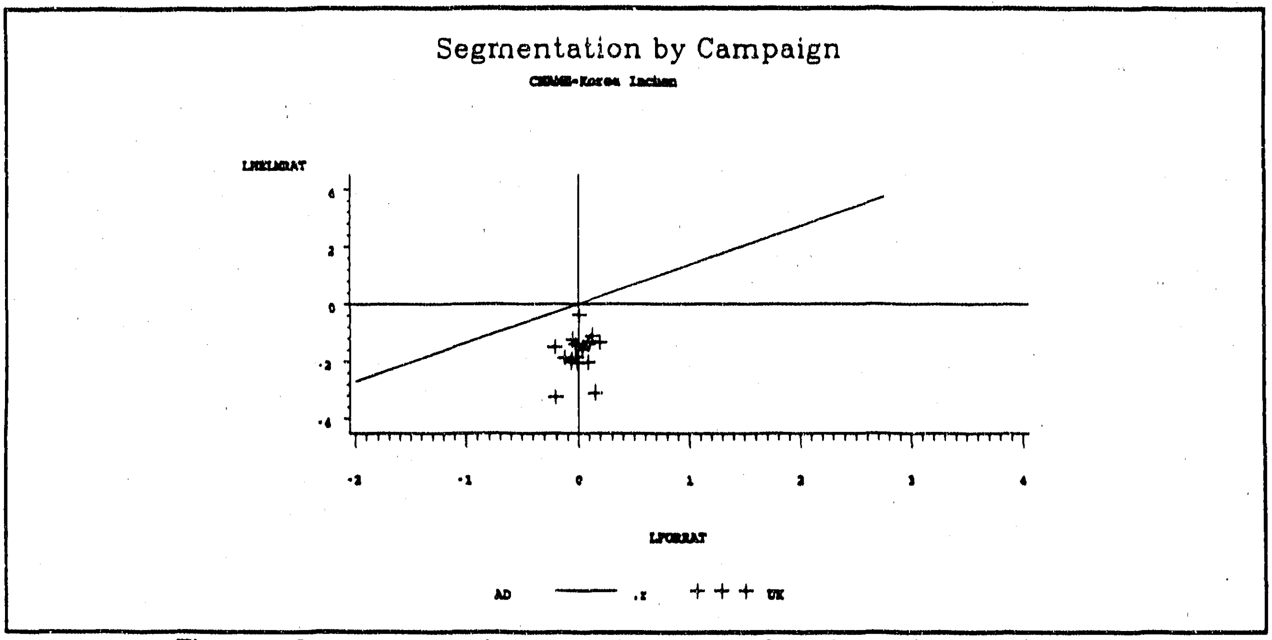

Fig. 43. Segmentation by campaign, campaign=Korea/Inchon-Seoul.

Figure 44 shows the Arab-Israeli 1967 War/Golan Heights campaign data. The 'IS' label indicates the Israelis attacked the Syrians. Although the α value matches that of the total database and the R^2 is a very high 0.94, the number of battles (3) shows that the implications are supportive but not significant by themselves.

Figure 45 shows the Arab-Israeli 1967 War/Sinai campaign data. The 11 battles of this campaign, with Israel attacking Egypt ('IE'), give more significant support to the linear-logarithmic law than do the data of the Golan campaign. The spread of the data is relatively large, as shown in the figure, but does show a trend.

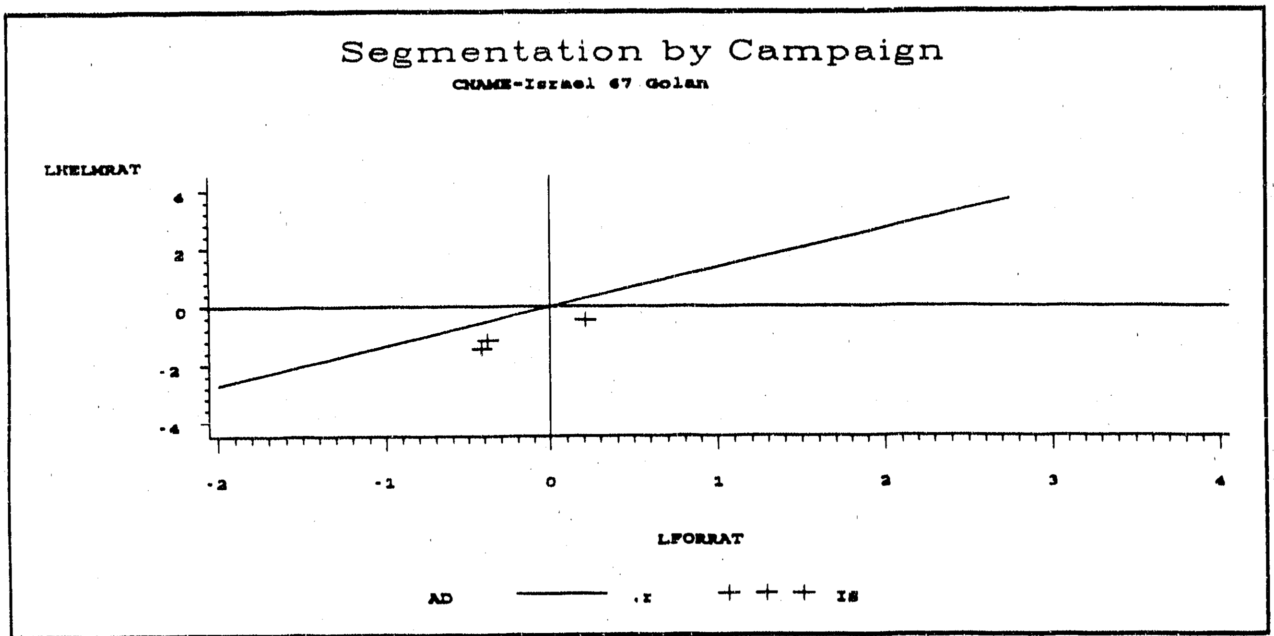

Fig. 44. Segmentation by campaign, campaign=Israel 67/Golan.

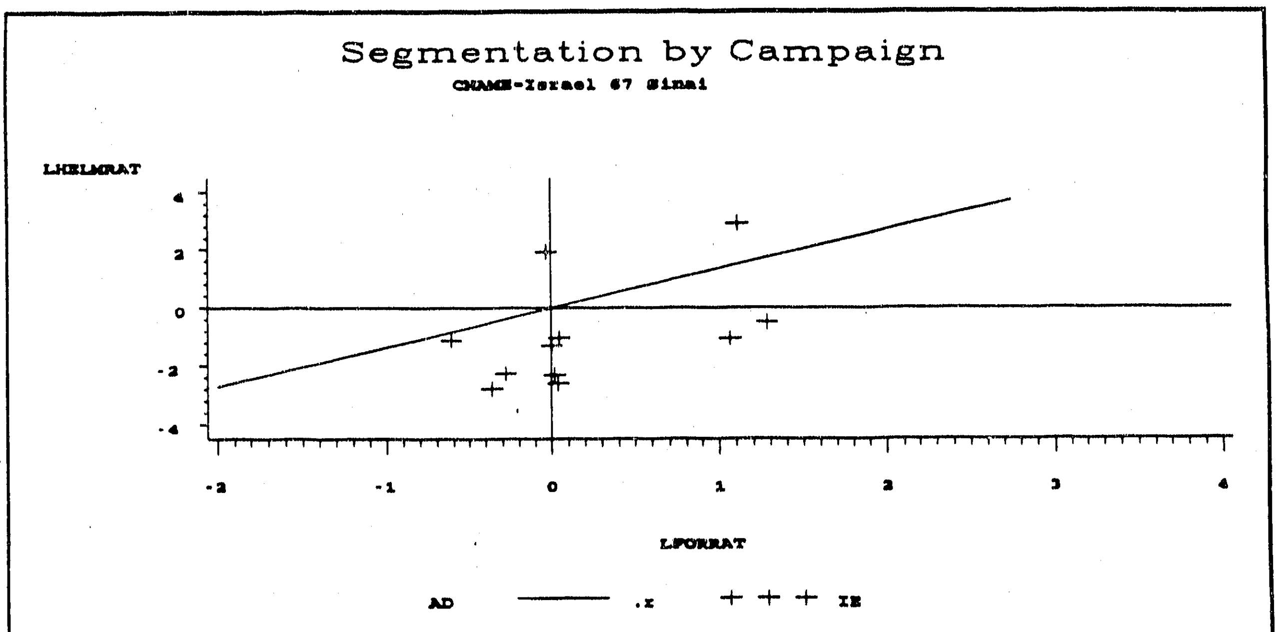

Fig. 45. Segmentation by campaign, campaign=Israel 67/Sinai.

Figure 46 shows the Arab-Israeli 1967 War/West Bank campaign data. The five battles, with Israel attacking Jordan ('IJ'), are certainly supportive; however, the R^2 of 1.00 is due, at least in part, to the small number of battles.

Figure 47 shows the Arab-Israeli 1973 War/Golan Heights campaign data. These data are similar to the Israel 73/Suez campaign data discussed earlier in this section. The Israel attacking Syria

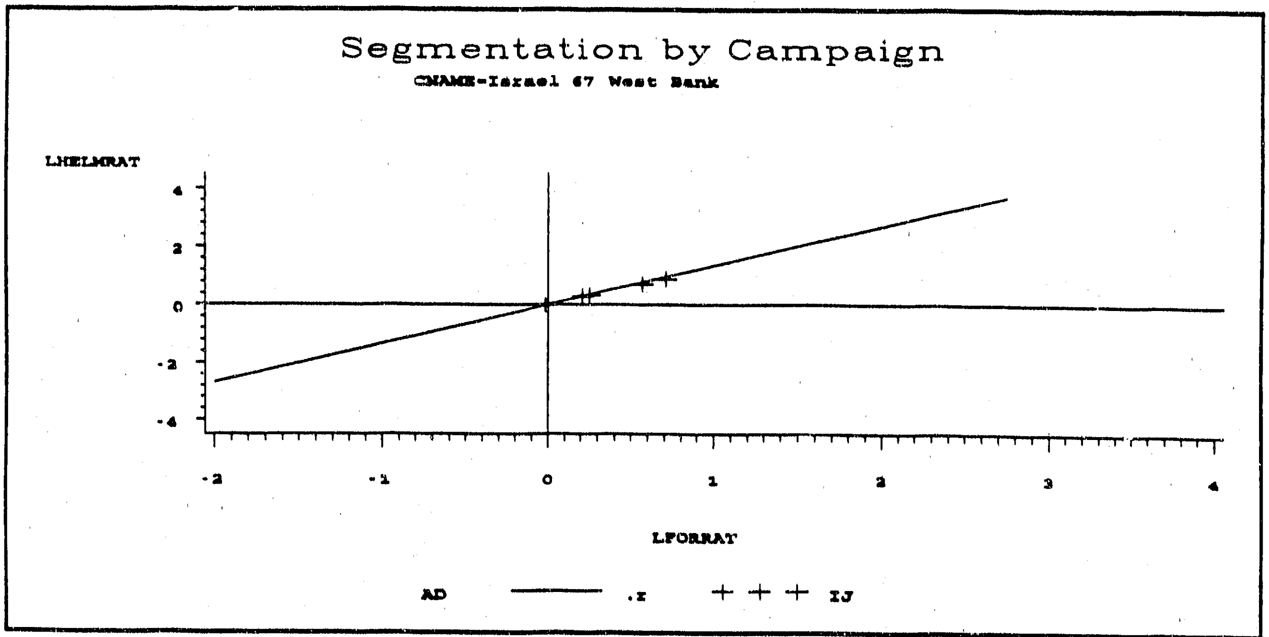

Fig. 46. Segmentation by campaign, campaign=Israel 67/West Bank.

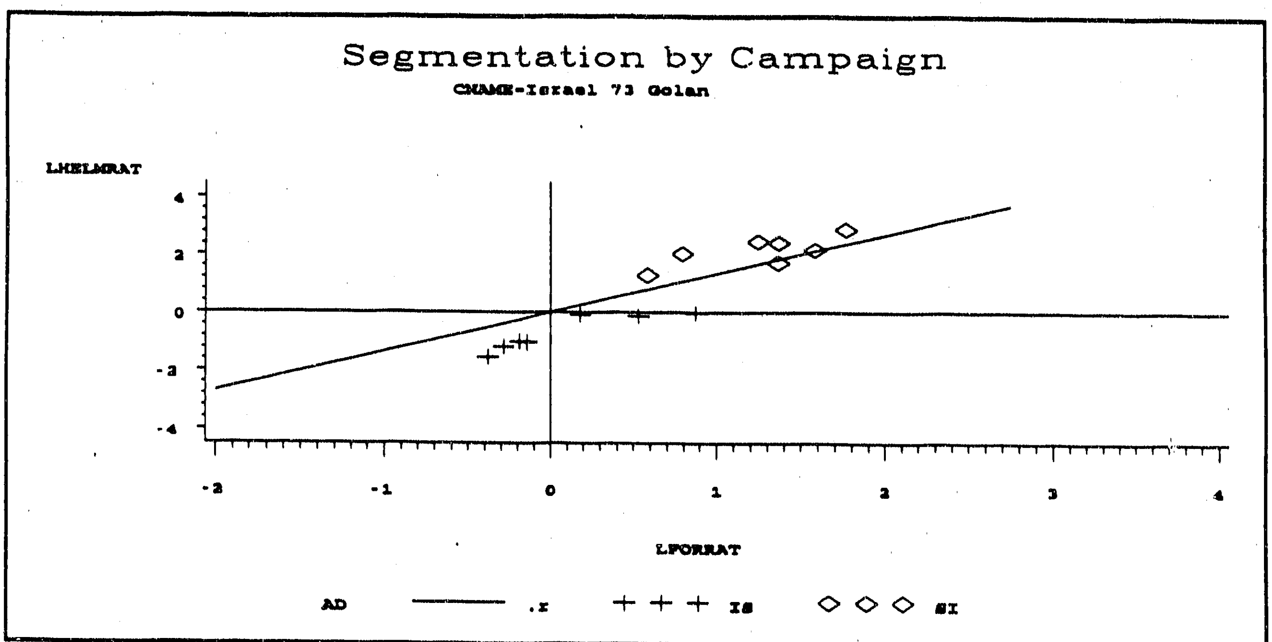

Fig. 47. Segmentation by campaign, campaign=Israel 73/Golan.

('IS') and Syria attacking Israel ('SI') combination appears to be caused by the relative positions of the sets of data.

While the regression for the subset of the total database that is used in these campaign investigations is close to that for the entire database (α = 1.25 vs α = 1.38 for the entire database), the effect identified in the discussions of the Israel 73/Suez campaign and the WWII/Okinawa campaign at the beginning of this section, casts doubt on the value of this

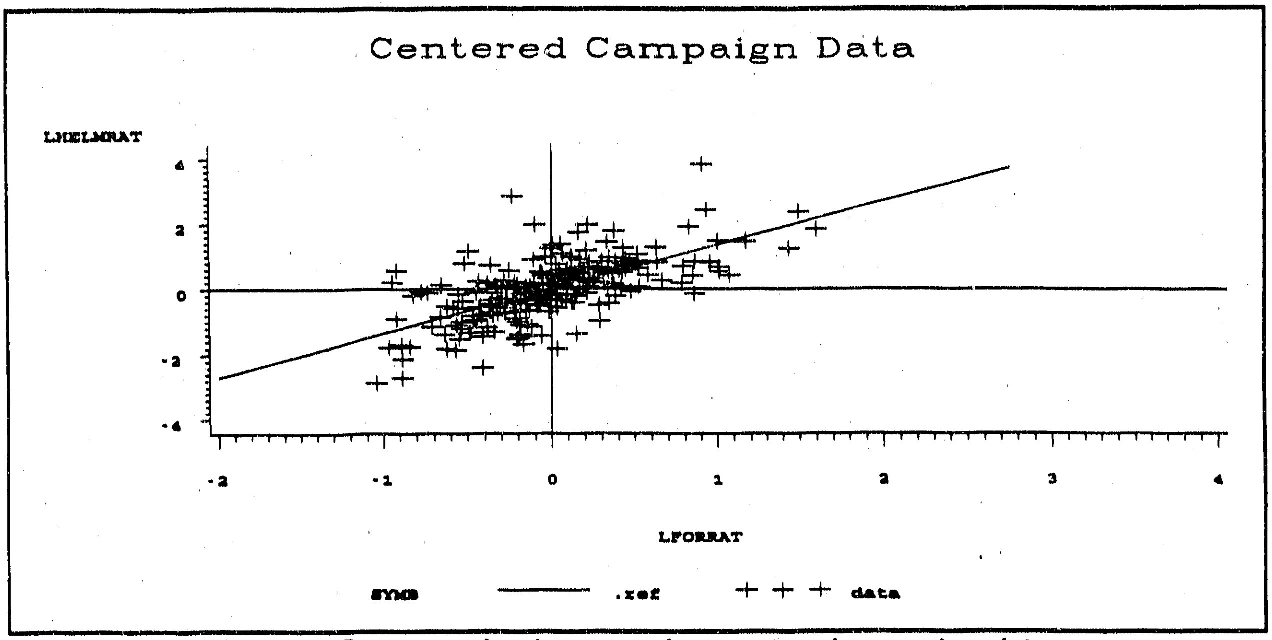

Fig. 48. Segmentation by campaign, centered campaign data.

closeness. The resolution of the question is achieved by modifying the data to center each attacker/defender dataset within each campaign at the origin. Figure 48 depicts the results of this modification. The regression of this modified dataset will not contain a bias introduced by the relative positions of the subsets. The result (α = 1.31) is even closer to the result for the entire database, indicating that the database is large enough that this effect is self cancelling.

The importance of the campaign segmentation analyses lies not so much in the relative distance of the individual campaign α values from the total database value, but in the fact that most of these small segments show similar patterns to that of the total database. This consistency makes it easier to see the data as patterned rather than random.

5.2 ATTACKER/DEFENDER PAIRS FROM SELECTED CAMPAIGNS

Although the attacker/defender pairs within campaigns are close to the ideal of identical conditions, the number of battles within each set is too small to draw strong conclusions from any one set. A possible enlargement of the number of battles is drawn from statements such as, some "armies have always been inferior and always will be." The attacker/defender pairs that appear in more than one of the campaigns above are collected into multi-campaign attacker/defender sets and analyzed.

Figure 49 shows the distribution of the 15 battles in which England was the attacker and Germany the defender in Helmbold space. Each battle is labeled with the campaign from which it is taken. The data appear to follow the common pattern.

Figure 50 shows the distribution in Helmbold space of the 5 battles in which France was the attacker and Germany the defender. Each battle is labeled with the campaign from which it is

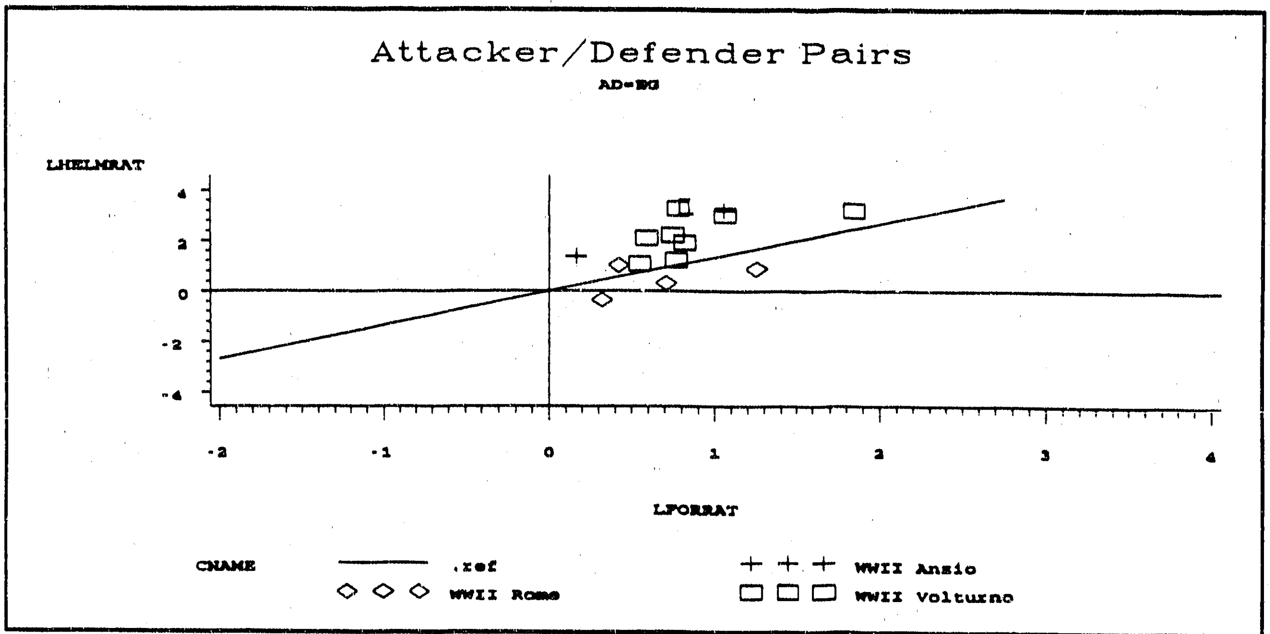

Fig. 49. Segmentation by attacker/defender pair, pair=England/Germany.

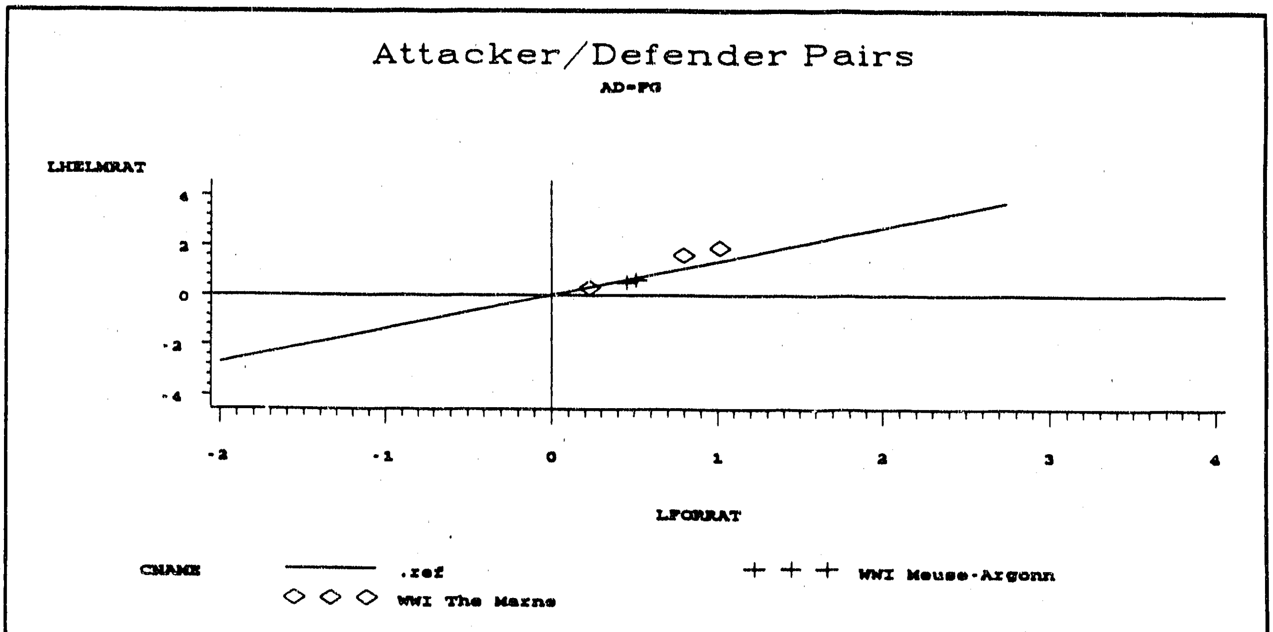

Fig. 50. Segmentation by attacker/defender pair, pair=France/Germany.

taken. There appears to be less variability than in the England/Germany data; however, the number of battles is too small to judge accurately.

Figure 51 shows the distribution in Helmbold space of the 22 battles in which Germany was the attacker and England the defender. Each battle is labeled with the campaign from which it is taken. Again the data appear to follow the common pattern and no significant differences between these data and either the England/Germany or the France/Germany data.

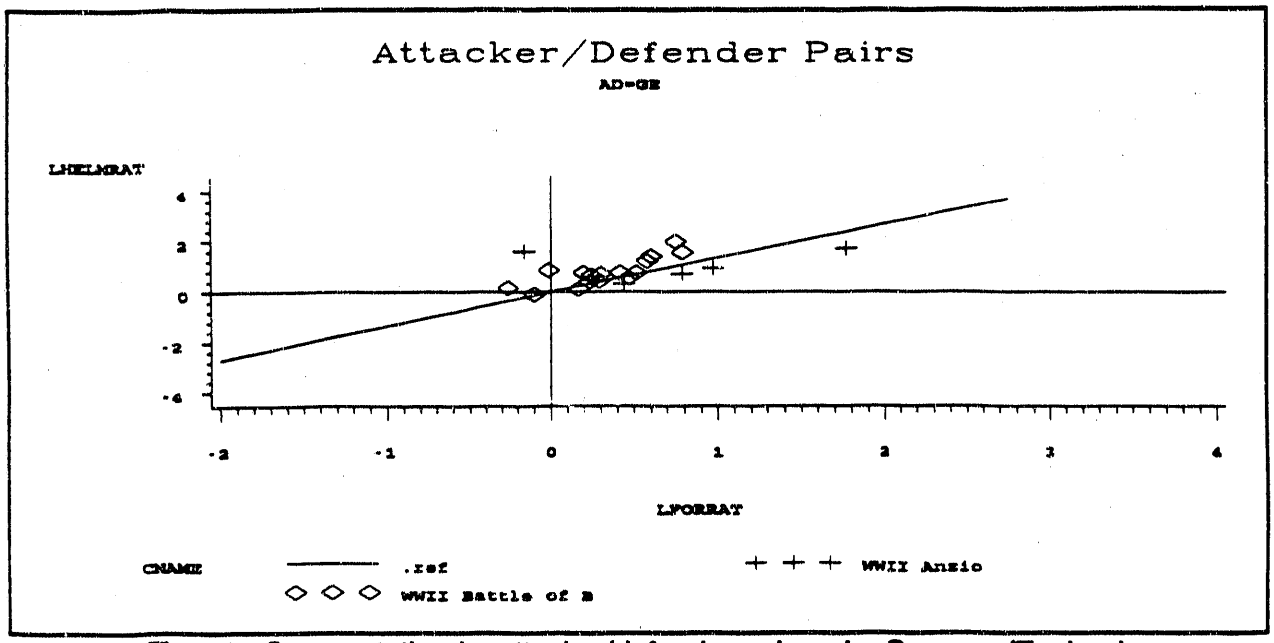

Fig. 51. Segmentation by attacker/defender pair, pair=Germany/England.

Figure 52 shows the distribution in Helmbold space of the 9 battles in which Germany was the attacker and France the defender. Each battle is labeled with the campaign from which it is

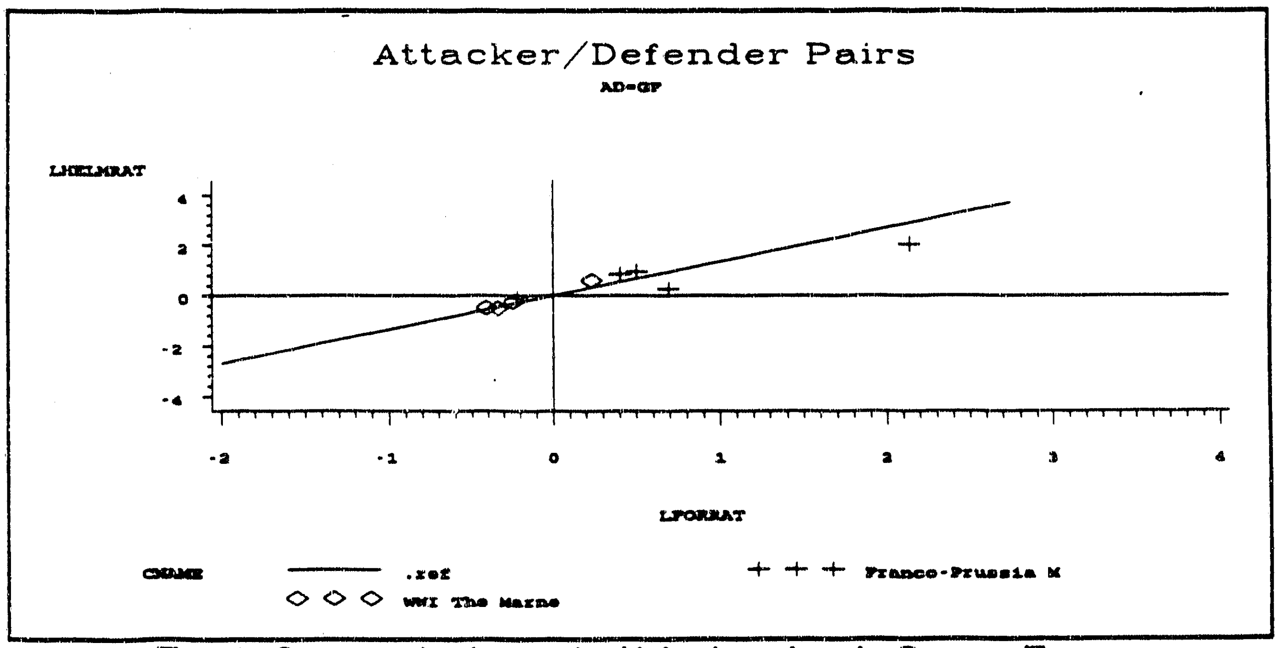

Fig. 52. Segmentation by attacker/defender pair, pair=Germany/France.

taken.

Figure 53 shows the distribution in Helmbold space of the 17 battles in which Germany was the attacker and the United States the defender. Each battle is labeled with the campaign from which it is taken. These data appear to show a lower intercept (β) value than the other

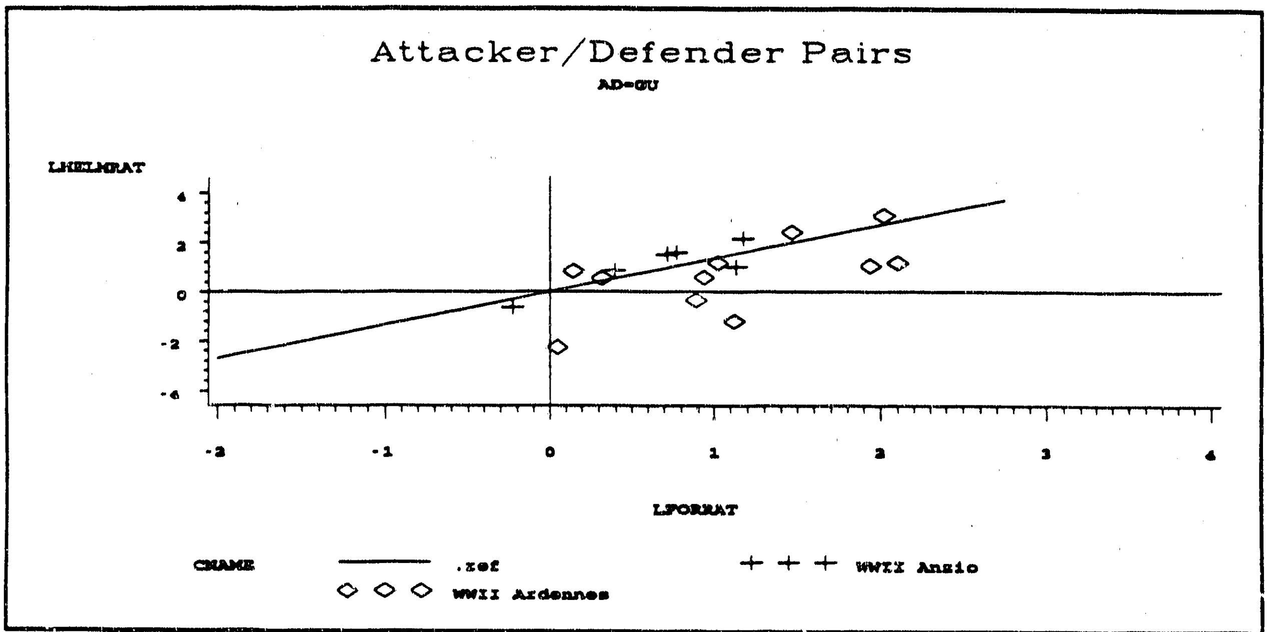

Fig. 53. Segmentation by attacker/defender pair, pair=Germany/USA.

attacker/defender pairs; however, it all appears to come from one campaign. Thus, viewing this as a national difference is not strongly supported.

Figure 54 shows the distribution in Helmbold space of the 21 battles in which Israel was the attacker and Egypt the defender. Each battle is labeled with the campaign from which it is taken.

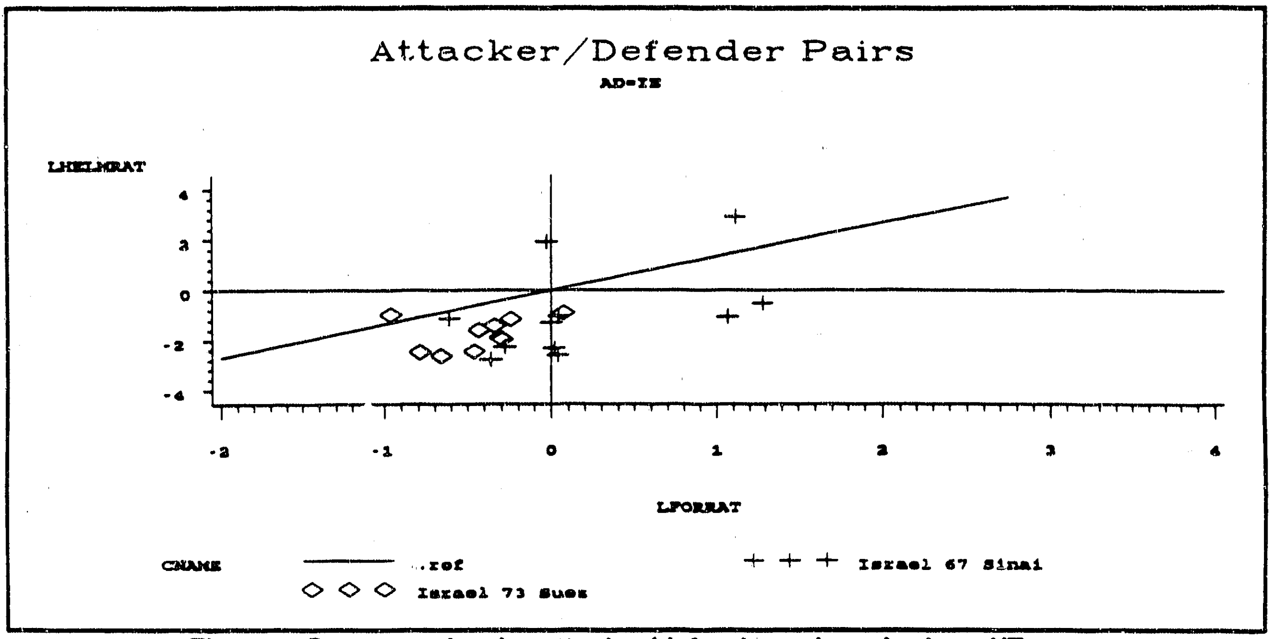

Fig. 54. Segmentation by attacker/defender pair, pair=Israel/Egypt.

Figure 55 shows the distribution of the 10 battles in which Israel was the attacker and Syria the defender. Each battle is labeled with the campaign from which it is taken.

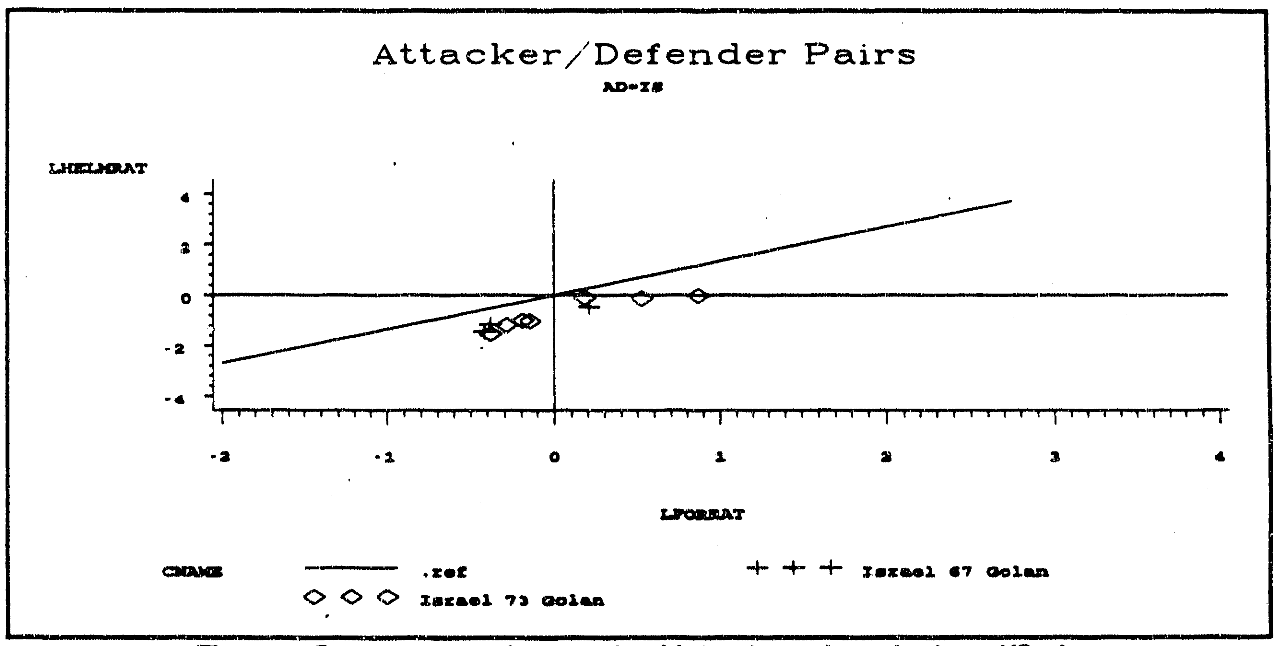

Fig. 55. Segmentation by attacker/defender pair, pair=Israel/Syria.

Figure 56 shows the distribution of the 76 battles in which the United States was the attacker and Germany the defender. Each battle is labeled with its campaign identification.

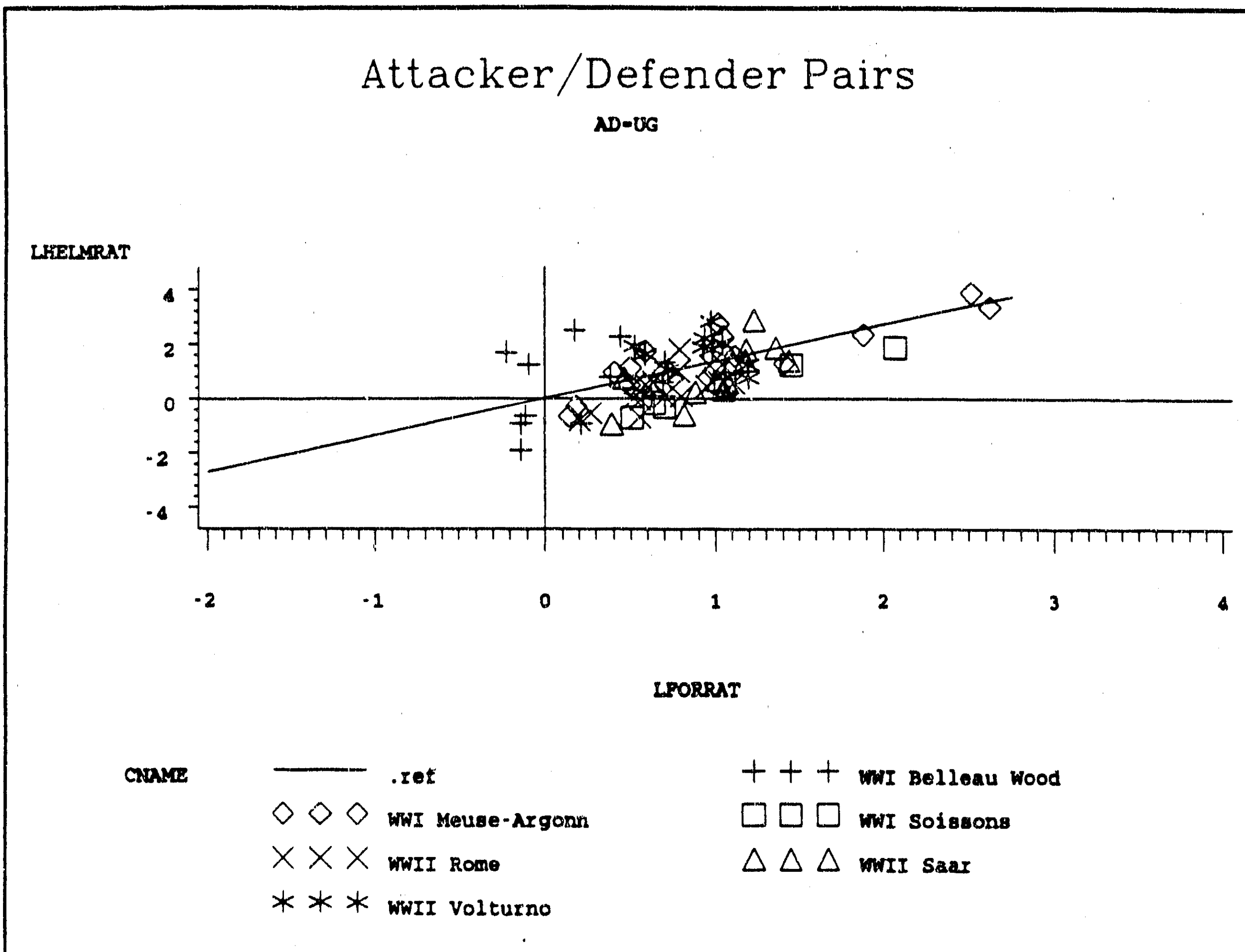

Fig. 56. Segmentation by attacker/defender pair, pair=USA/Germany.

Table 8 displays the parameters and statistics for each of the groups shown in the figures. Of the three groups with α values much higher or lower than that of the entire database, France/Germany, Germany/England, and Germany/France, two have very low numbers of battles. The Germany/England group is composed of the Battle of Britain data, with a reasonable α value of 1.54, and the five very scattered battles of WWII/Anzio, as seen in Table 7. The rest of the groups show no significant α value differences. The comparison of the β values, in which differences in national warfighting capabilities might be expected to be found, reveals only that Israel managed to achieve better β values than Egypt or Syria and that the United States and Germany were each marginally better than the other when they chose to attack.

Table 8. Attacker/defender pair segmentation regression parameters and statistics

Attack	Defend	α	Errα	R^2	β	Errβ	#
England	Germany	1.57	0.68	0.29	0.61	0.61	15
France	Germany	2.29	0.31	0.95	-.41	0.20	5
Germany	England	0.72	0.23	0.32	0.51	0.14	22
Germany	France	0.98	0.14	0.87	0.07	0.12	9
Germany	USA	1.10	0.41	0.33	-.25	0.47	17
Israel	Egypt	1.27	0.46	0.28	-1.18	0.27	21
Israel	Syria	1.21	0.18	0.86	-.81	0.07	10
USA	Germany	1.28	0.19	0.37	-.14	0.19	76
Total Database		1.38	0.06	0.41	-.22	0.05	857

5.3 INTERNAL CAMPAIGN ANALYSIS AND THE WORLD WAR II - OKINAWA CAMPAIGN

Only the United States attacking the Japanese portion of the WWII/Okinawa campaign in this database has a large enough set of battles within one attacker/defender pair to permit internal analysis. The analyses are similar to the campaign analyses, with the difference that the attacker/defender pairs are based on division-regiment-battalion identifications rather than national identifications.

The desired segmentation into a string of successive battles between the same pairs of units is not fulfilled in this data. The largest such grouping found contained five battles.

Figure 57 displays the detailed segmentation into attacker/defender pairs. For clarity, those pairs with multiple battles are labeled with unique symbols, while all pairs with only a single battle use the same '+' symbol. Clearly, the overall pattern of the Okinawa campaign is not accidental, as most of the attacker/defender pairs show similar patterns.

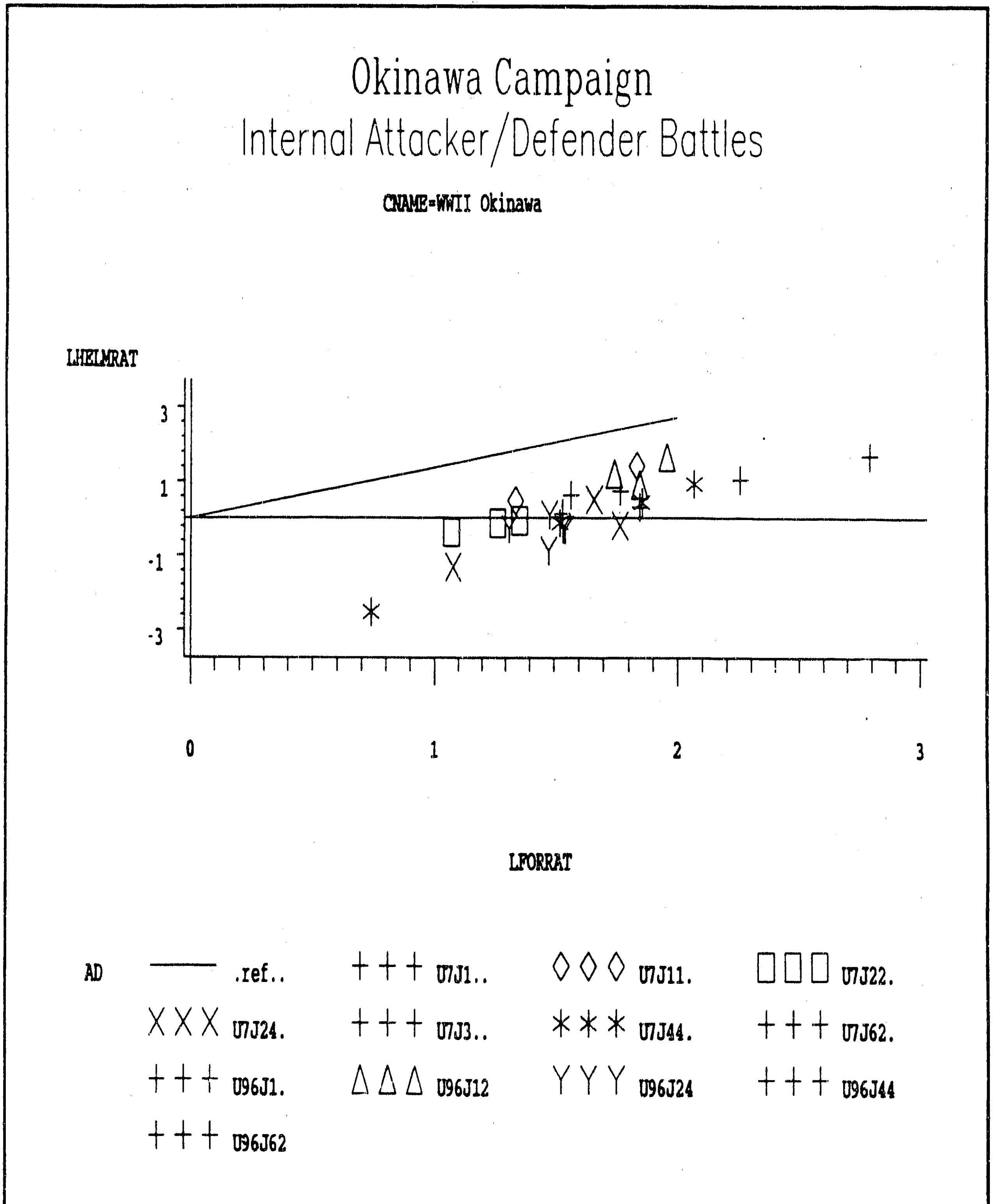

Fig. 57. Okinawa campaign internal segmentation.

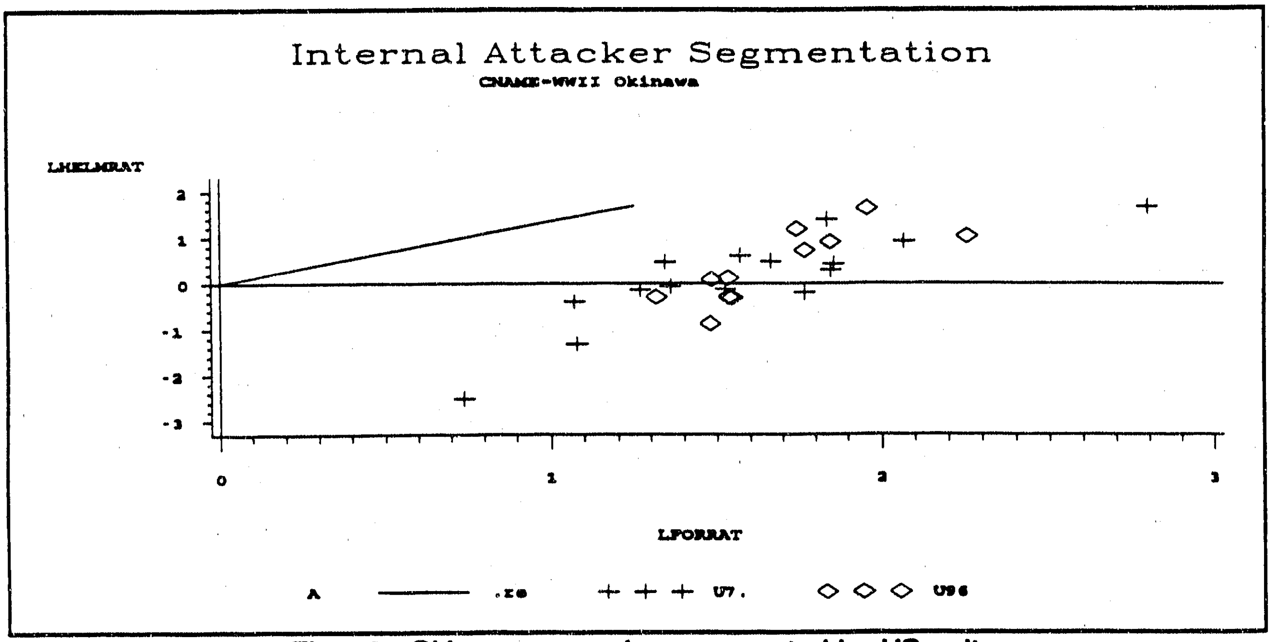

Fig. 58. Okinawa campaign, segmented by US unit.

Figure 58 shows the grouping of each attacking United States unit against the Japanese units it faced. The data do not appear to show any difference between the two United States units. Figure 59 shows the grouping of each defending Japanese unit against the United States units it faced.

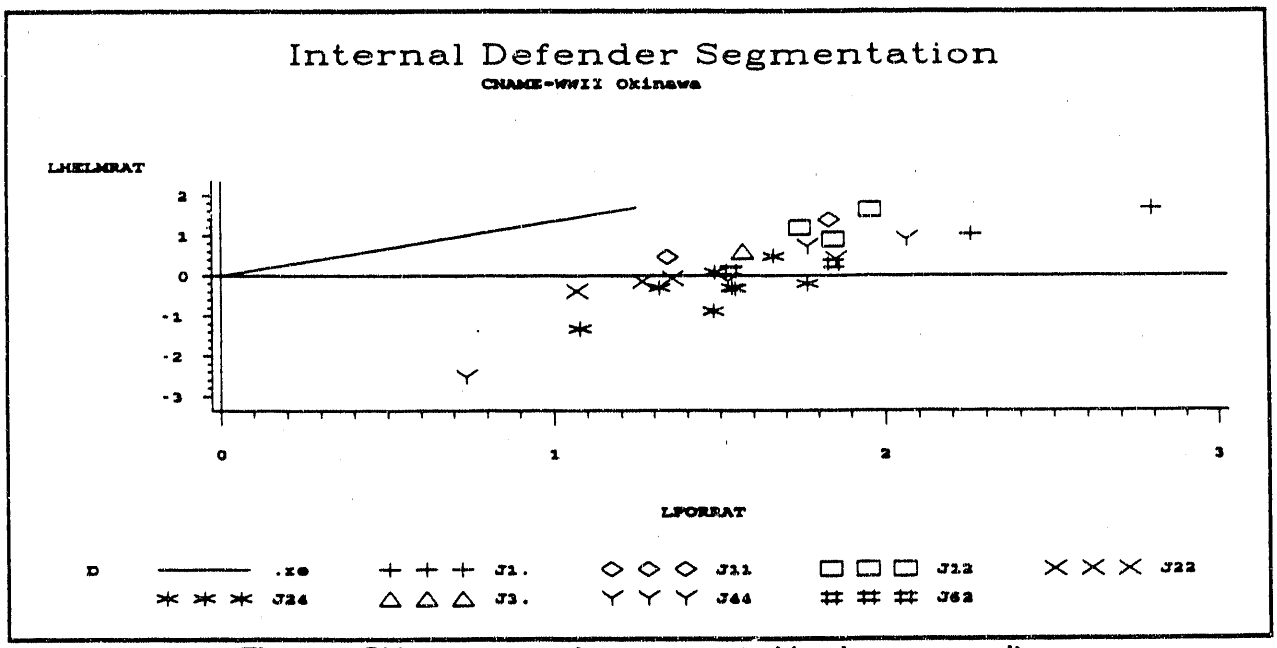

Fig. 59. Okinawa campaign, segmented by Japanese units.

Table 9 shows the individual attacker/defender pair results, as well as the combined results for each United States unit against all the Japanese units it faced, the combined results for each Japanese unit against all of the United States units it faced, and the combined results for all of the United States units against all of the Japanese units. Most of the attacker/defender pairs have too few battles to produce reliable statistics. [Note the influence on the results of the United States 96th's battles of the three battles with the Japanese 12th (triangles in Fig. 57). The

Table 9. Okinawa campaign internal segmentation regression parameters and statistics

Attack	Defend	α	Errα	R^2	β	Errβ	#
7th Inf Div	1st SE Rgt	.	.	.	.	.	1
	11 Inf Bn	1.87	.	.	-2.05	.	2
	22 Inf Rgt	1.14	0.11	0.99	-1.61	0.13	3
	24 Div	2.13	1.23	0.75	-3.54	1.89	3
	3rd SE Rgt	.	.	.	.	.	1
	44 Mix Bde	2.59	0.21	0.99	-4.34	0.34	4
	62 Div	.	.	.	.	.	1
	Japan	1.75	0.32	0.70	-2.68	0.52	15
96 Inf Div	1st SE Rgt	.	.	.	.	.	1
	12 Inf Bn	2.16	2.75	0.38	-2.75	5.09	3
	24 Div	0.02	2.16	0.00	-.31	3.19	5
	44 Mix Bde	.	.	.	.	.	1
	62 Div	.	.	.	.	.	1
	Japan	2.33	0.59	0.63	-3.55	1.01	11
USA	1st SE Rgt	1.19	.	.	-1.65	.	2
	11 Inf Bn	1.87	.	.	-2.05	.	2
	12 Inf Bn	2.16	2.75	0.38	-2.75	5.09	3
	22 Inf Rgt	1.14	0.11	0.99	-1.61	0.14	3
	24 Div	1.88	0.75	0.51	-3.13	1.12	8
	3rd SE Rgt	.	.	.	.	.	1
	44 Mix Bde	2.67	0.29	0.97	-4.38	0.48	5
	62 Div	0.55	.	.	-.73	.	2
	Japan	1.86	0.26	0.68	-2.83	0.44	26
Total Database		1.38	0.06	0.41	-.22	0.05	857

five battles with the Japanese 24th ('Y's in Fig. 57) are below and to the left of the battles with the 12th. The impact is a, perhaps false, steep trend.] In spite of the overall higher slope than that of the total database, the perception of a pattern with a slope somewhere between 1.0 and

2.0 persists. The overall conclusion that may be drawn from these analyses is that the hypothesis that the attrition follows a mixed linear-logarithmic law is not disproved. "Not disproved" is not the same as "proved;" however, the results are consistent with the supposition that the linear-logarithmic law describes reality.

5.4 INTERNAL BATTLE ANALYSIS AND THE WORLD WAR II - IWO JIMA BATTLE

Engel analyzed the available data on the Iwo Jima battle of World War II and found that the data were consistent with the square law attrition equations. The available data included daily United States casualties, approximate United States landing schedules on the island, and starting and ending Japanese strengths. Unfortunately, the data did not include daily Japanese casualties, so a sharper analysis was not possible.

The technique Engel used involved the solution of the Lanchester square law equations with reinforcements on one side, Eq. (8).

$$\begin{aligned} dx/dt &= R(t) - Ay \\ dy/dt &= -Bx \end{aligned} \tag{8}$$

He solved for the coefficient B, obtaining Eq. (9), where y(0) and y(T) are the starting and ending strengths for the Japanese and x(t) are the daily United States strengths (x(0) is taken to be zero, with all United States forces accounted for in the reinforcement schedule).

$$B = (y(0) - y(T)) / \sum_{t=1}^{T} x(t) \tag{9}$$

Engel then obtained an approximation, y'(t), for the daily Japanese strengths, shown in Eq. (10).

$$\begin{aligned} y'(0) &= y(0) \\ y'(t) &= y(0) - B\sum_{s=1}^{t} x(s), \text{ for } t>0 \end{aligned} \tag{10}$$

He calculated the value of the coefficient A from Eq. (11) using S=28.

$$A = \sum_{t=0}^{S} P(t) \,/\, \sum_{t=0}^{S} y'(t) \tag{11}$$

The values he obtained were B=0.0106 and A=0.0544.

Engel published the United States reinforcement schedule he used, but did not publish the casualty schedule he used. Samz's paper uses a different reinforcement schedule (arriving at essentially the same result as Engel). Helmbold [20] mentions differences in starting and ending force strengths for both sides, depending on source, and differences in the United States attrition history. The ranges of the total force size differences for the United States and Japan are about 2000 and 1000 respectively. Clearly, there is a limit to the accuracy that can be expected of a theoretical prediction based solely on the uncertainty of the historical data. In addition, the expected variability of battle conditions would be expected further to limit the accuracy of a theoretical prediction.

The analysis that is reported below is based on Engel's landing schedule and Helmbold's daily United States casualty data and ending force strength for the Japanese at day 28. Figure 60 shows the predictions of Engel's coefficient values plotted for the United States daily force strengths used here. The saw-toothed effect is caused by the addition of manpower, following the landing schedule, and the reduction is due to attrition. The Engel's curve matches the data points rather well.

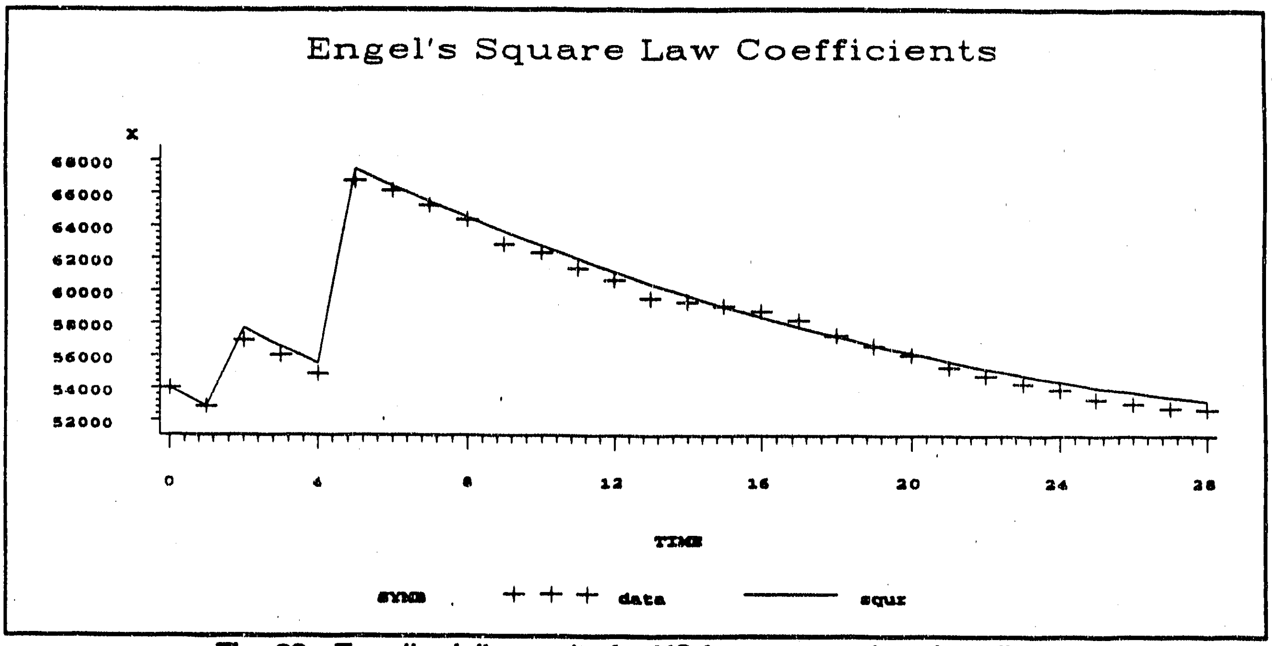

Fig. 60. Engel's daily results for US force strength at Iwo Jima.

Figure 61 is similar to Fig. 60 except that it shows the corresponding Japanese daily strengths. Only two data points are given, the starting figure and the day 28 ending figure. Notice the difference at day 28 between Engel's prediction and Helmbold's data point. Engel used an ending force strength for the Japanese of zero on day 35 in his calculations. This and possible differences in the daily United States casualties impact the correctness of Engel's coefficient values for the data used here.

These differences in data necessitated recalculating the B and A values. The results were marginally different; B was found to be 0.01161 and A was 0.0623. Figure 62 and 63 compare

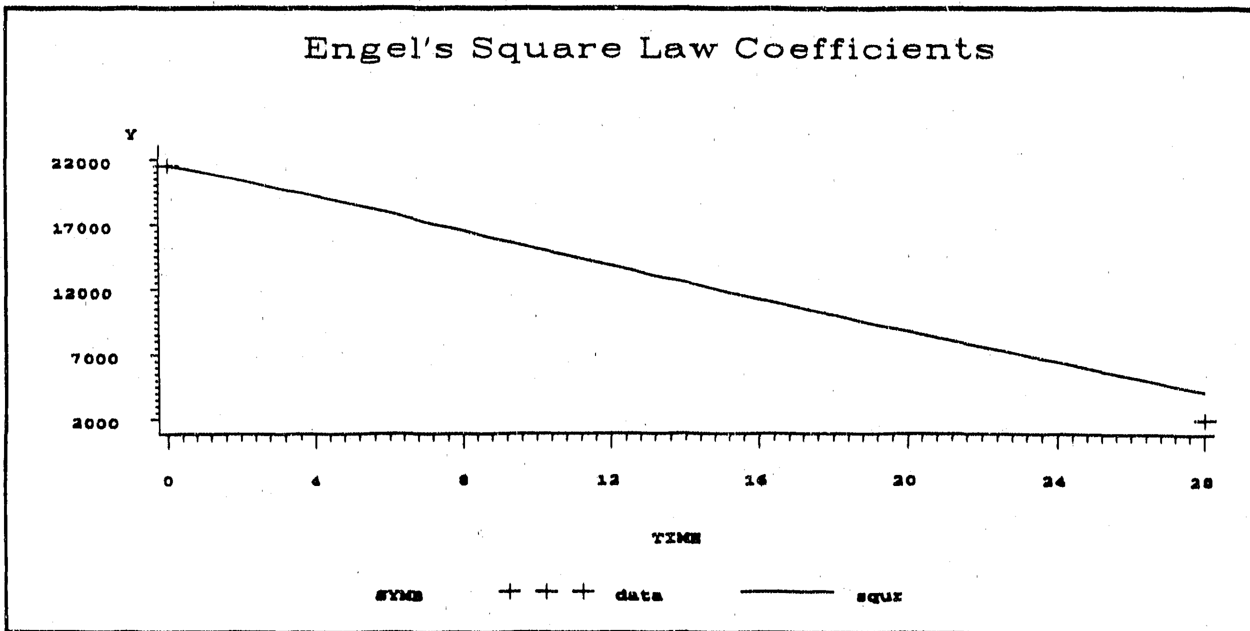

Fig. 61. Engel's results for the Japanese at Iwo Jima.

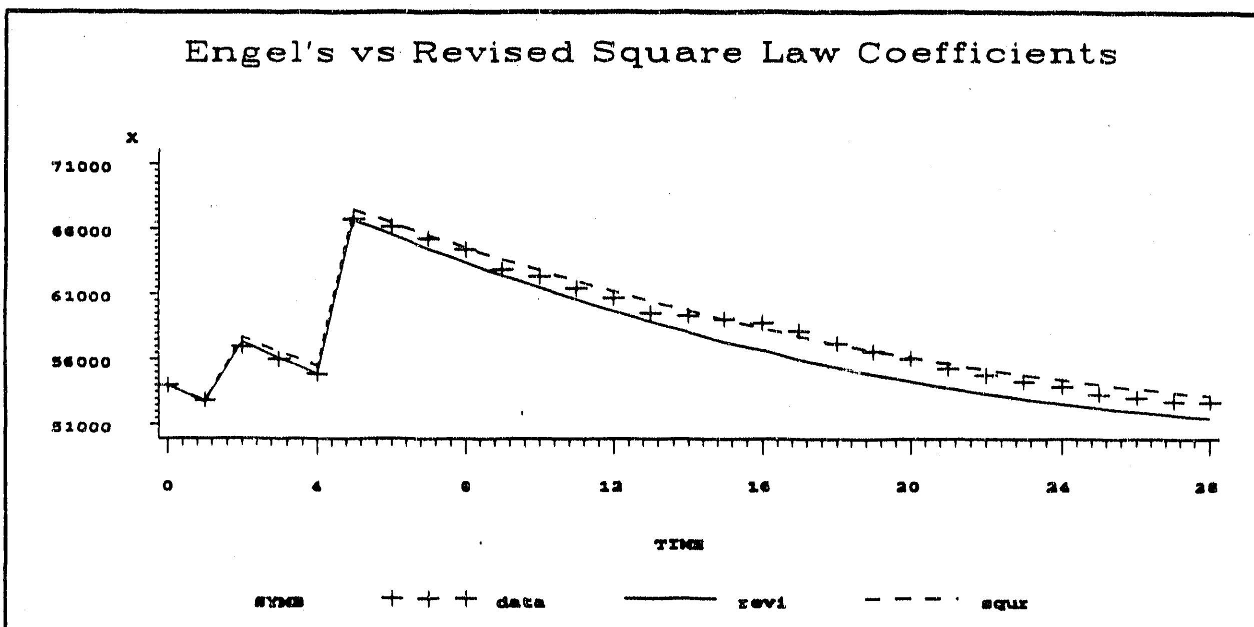

Fig. 62. Revised square law results for the US at Iwo Jima.

the resulting force size prediction with those using Engel's coefficients. Engel's original results are shown by the dashed line, labeled 'squr,' and the revised square law results are shown by the solid line, labeled 'revi.' The revised results exhibit slightly more attrition. The United States results err on the high side for attrition (low side for remaining force size), but, the Japanese results are closer to the data value at day 28.

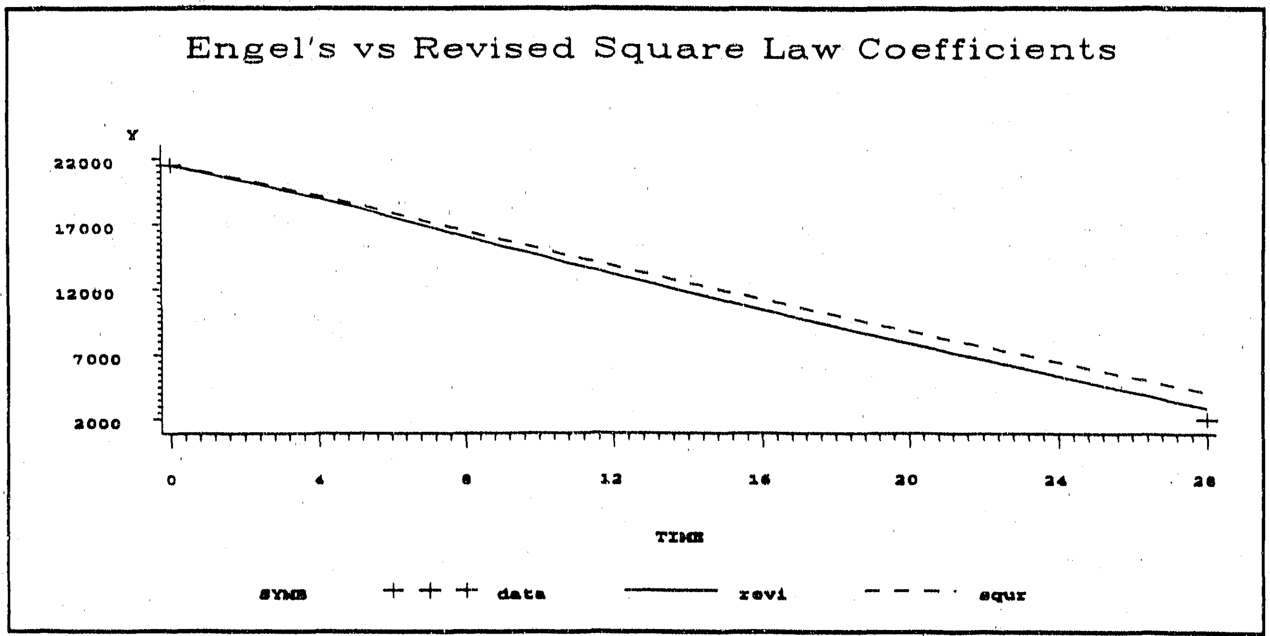

Fig. 63. Revised square law results for the Japanese at Iwo Jima.

Engel showed that the data were consistent with a square law attrition law, but not that the square law is the only law with which the data are consistent. The results discussed in the earlier sections of this paper support a mixed linear-logarithmic law. The question arises as to whether this mixed linear-logarithmic law is consistent with the Iwo Jima data.

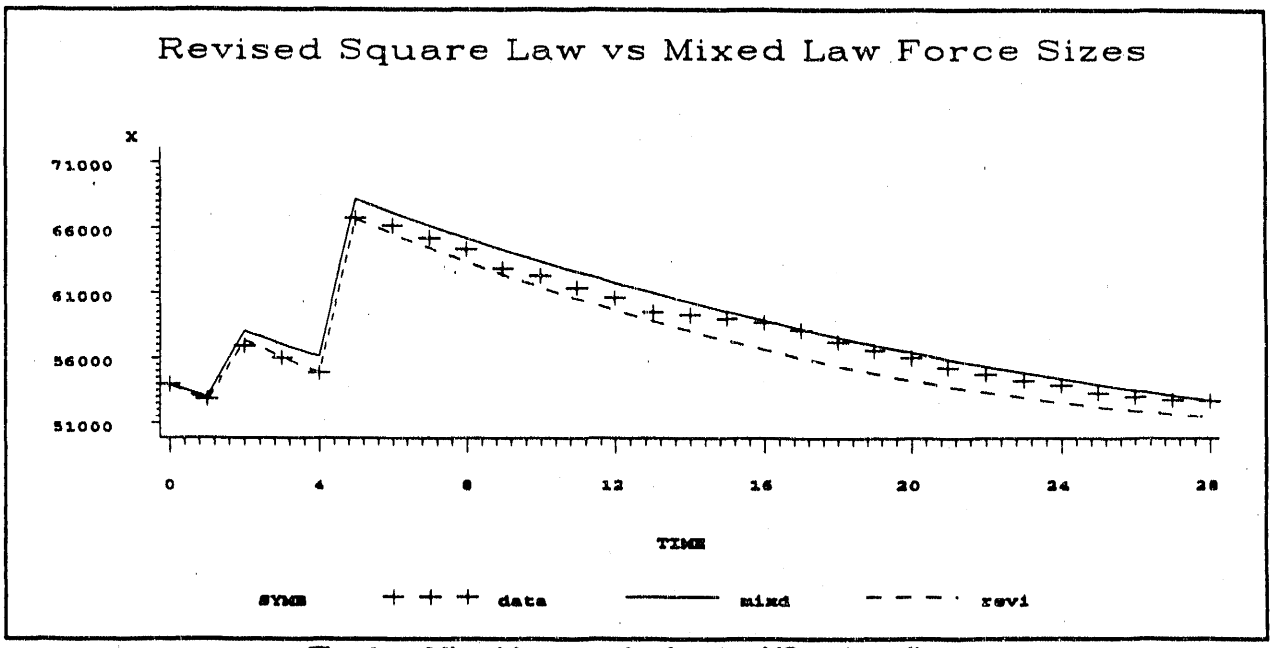

Fig. 64. Mixed law results for the US at Iwo Jima.

Figures 64 and 65 show that there are coefficient values for the mixed linear-logarithmic law described above that are visually consistent with the data and are comparable to the revised square law coefficients. The coefficients were obtained by an iterative process that ensured the total predicted casualties for both the United States and the Japanese forces agreed with the data. Notice that the force levels following the landing, as predicted for the United States, by the mixed law are too high, but the final force level on day 28 matches the prediction. This process does not guarantee the best fit (as defined below) of the linear-logarithmic law to the casualty data; however, it does provide a reasonable starting point for comparing the potential fit of the linear-logarithmic law to the fit of the square law.

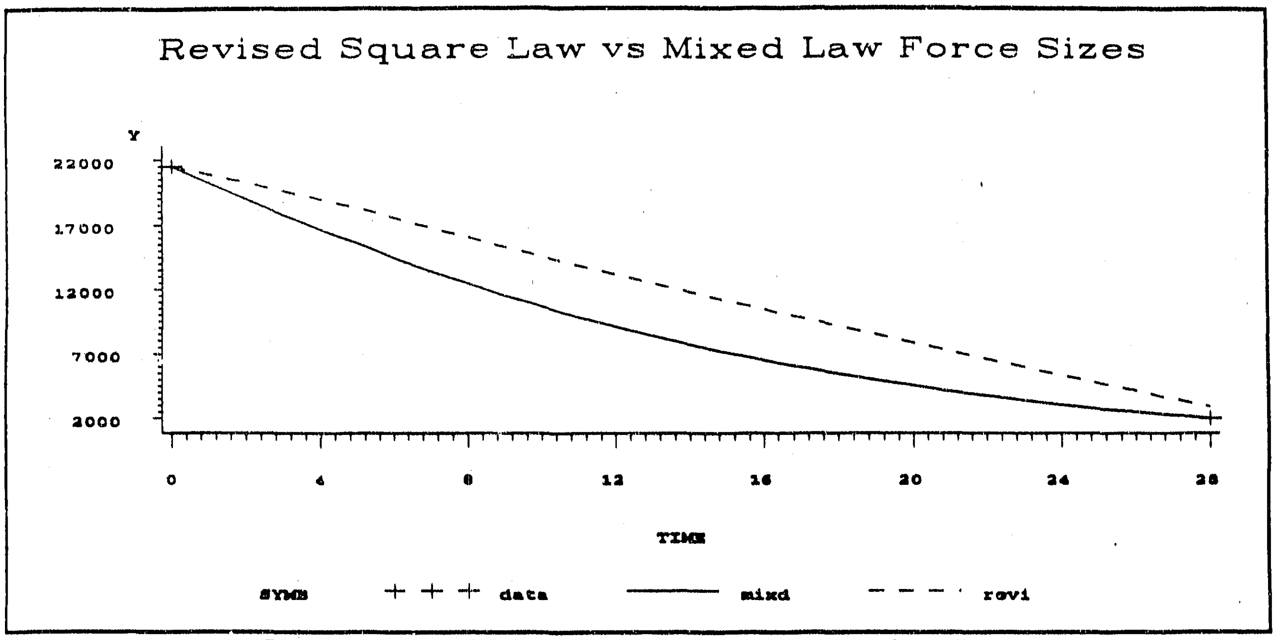

Fig. 65. Mixed law results for the Japanese at Iwo Jima.

The differences in the predicted force level trajectories for the square law and the mixed law reflect the differences in their mathematical formulations. The square law equations have only the opposing force size represented. Thus the United States casualties of the square law are independent of the number on the beach. However, the mixed law equations have both sides represented, meaning the casualties must remain at a lower level until all the United States forces are engaged. The Japanese force level trajectory of the mixed law in Fig. 65 is more highly curved than that of the square law because the Japanese casualty levels of the square law must remain low until all the United States forces are engaged and because the Japanese casualty levels of the mixed law are reduced as the Japanese force level is reduced.

Although the force strength plots are useful for visualizing the progress of a battle, they only indirectly reflect the nature of the predictions of the attrition laws. The attrition laws are meant to predict casualty rates, or in a practical sense, daily casualties. Figures 66 and 67 show the available casualty data, and the revised square law and the mixed law predictions.

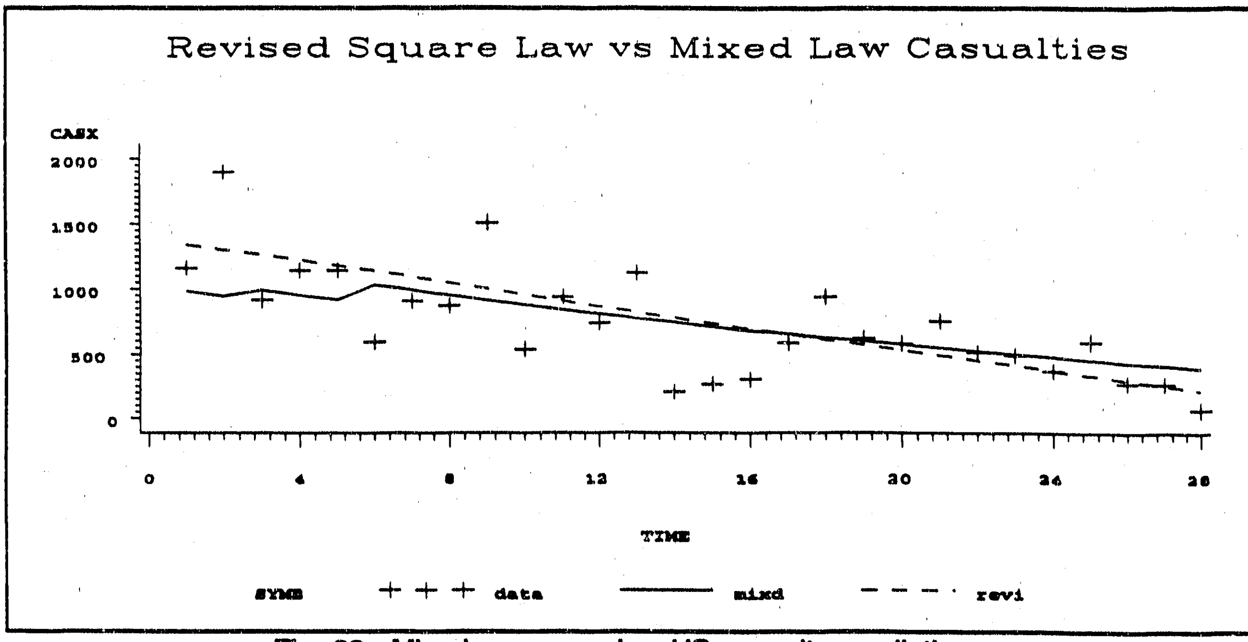

Fig. 66. Mixed vs square law US casualty predictions.

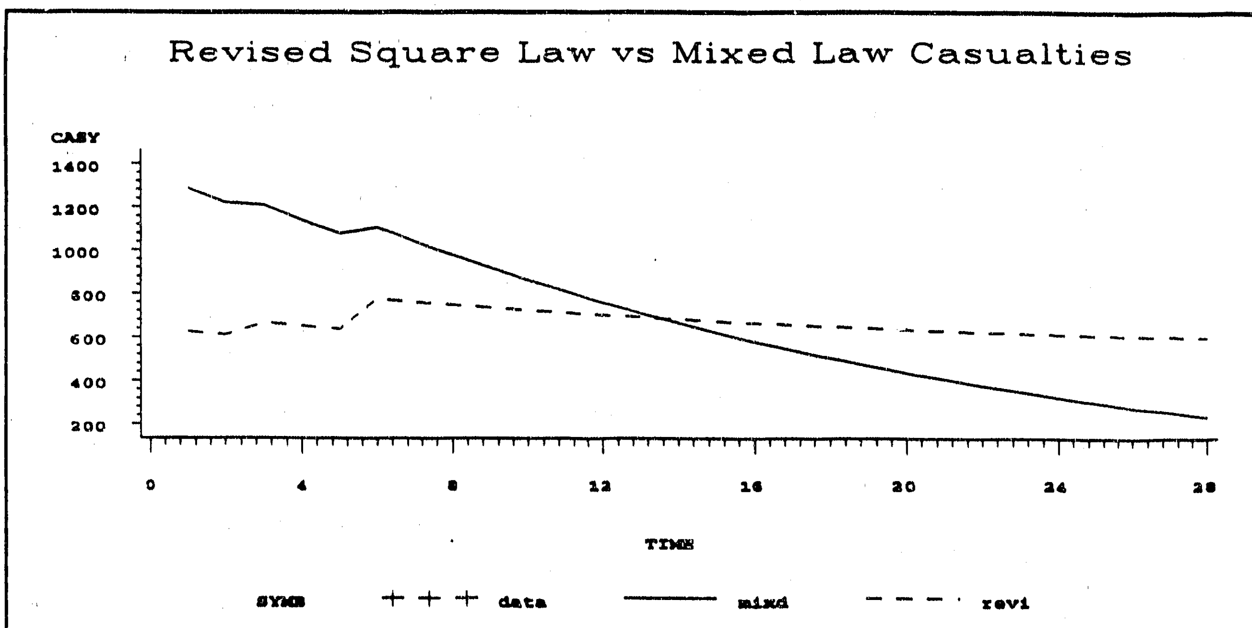

Fig. 67. Mixed vs square law Japanese casualty predictions.

Two different statistics are calculated to give a rough sense of the goodness of fit of the two predictions. Because the predictions are really joint predictions of the casualties for the United States and the Japanese, the common statistical concepts of R^2 and the Theil statistic are modified. The modifications make sense statistically; however, other modifications also make sense and give somewhat different values. Therefore, the results cannot be interpreted as firmly as the original statistics might be in a more usual setting.

The Theil statistic, as modified, is computed using Eq. (12).

$$mtheil = \sqrt{SSE_x + SSE_y} \; / \; (\sqrt{A_x + A_y} + \sqrt{P_x + P_y}) \tag{12}$$

where,

SSE_x = $\sum$(predicted United States casualties - actual casualties)^2
SSE_y = 28((total predicted Japanese casualties - actual casualties)/28)^2
A_x = $\sum$(actual United States casualties)^2
P_x = $\sum$(predicted United States casualties)^2
A_y = 28(total actual Japanese casualties/28)^2
P_y = 28(total predicted Japanese casualties/28)^2

This statistic compares the errors of the predicted values against the sizes of the values. If the prediction were perfect, all the errors would be zero and Theil would be zero. A worst case value of the Theil statistic is 1.0. A value of 0.5 for Theil would indicate a poor fit. The results for the modified statistic are similar, though not guaranteed. For these data, the revised square law coefficients produce a value of 0.14 and the mixed law produces a value of 0.15. The interpretation is that the fits are comparable.

The modified R^2 statistic, was computed using Eq. (13).

$$mR^2 = 1 - (SSE_x + SSE_y)/TV \tag{13}$$

where,

TV = $\sum(USV_i)^2 + 28(JV)^2$
USV_i = United States casualties on day i - average of all daily casualties
JV = average Japanese daily casualties - average of all daily casualties

This statistic compares the error that is explained by the predicting model to the total variance of the data. A value of 1.0 for R^2 indicates a perfect fit and a value of 0.0 indicates no fit. The results for the modified statistic are similar, though not guaranteed. For this data, the revised square law coefficients produce a value of 0.48 and the mixed law produces a value of 0.41. The interpretation is that the fits are comparable, but neither fit is exceptionally good.

Figure 68 illustrates the fit in much the same way it is computed for mtheil and mR^2. The differences between the predicted and actual United States casualties are shown for days one through 28. The total difference for the Japanese casualties is shown on day zero (solely to place all the data on one plot).

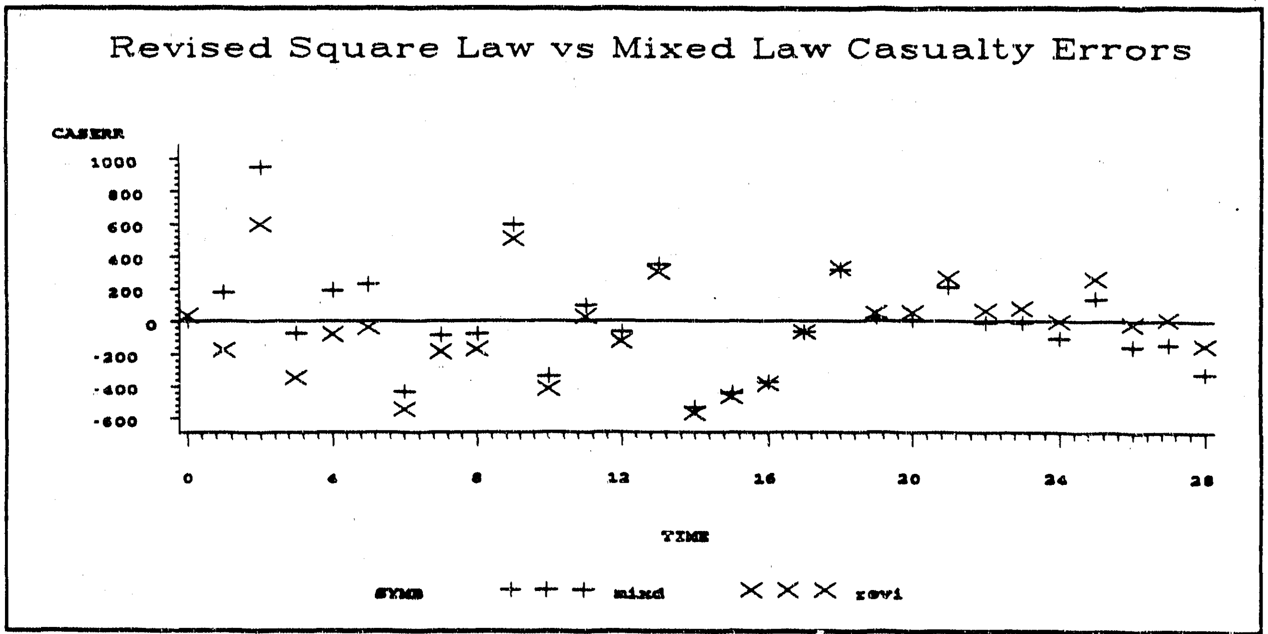

Fig. 68. Errors in predicting casualties at Iwo Jima.

6. "PREDICTING" VICTORY

The "prediction" that is discussed in this section is not a forecast type prediction, but rather a statistical type prediction in which one variable is related to a set of variables, hence its value may be predicted by a function of the values of the other variables. In this instance, the predicted variable is two valued, indicating whether the attacker or the defender was victorious in a given battle. The variables used in the prediction are the starting force sizes of the two sides and the casualties sustained by each side in the battle.

The relationship between victory and these variables is neither simple nor completely consistent. The expression of this relationship that was determined in [13] for the Helmbold data was a probabilistic function, Eq. (14).

$$\begin{aligned} &prob = 1 - 1/(1.01 + 1.28e^{-2.75v}) \\ &\text{where,} \\ &\quad v = lhelmrat - 2\ lforrat \end{aligned} \tag{14}$$

The basic discriminator is the v function. Chi square tests were performed on the data investigated here in which it was confirmed that v is a statistically significant discriminator of the victory value. Figure 69 shows the actual distribution of the attacker and defender victories along with the presumably neutral v=0, or lhelmrat=2*lforrat, reference line. The plus marks represent attacker victories and the diamonds represent defender victories. Although, the separation exists, there are so many data points that the overlap obscures the separation.

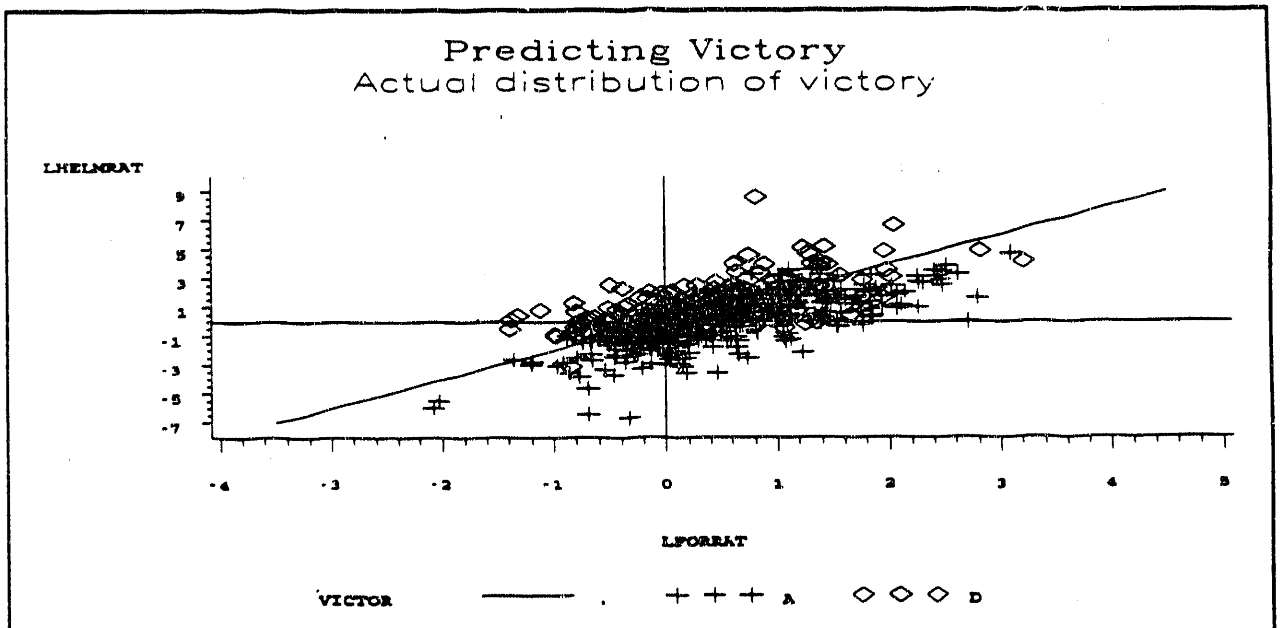

Fig. 69. Distribution of attacker and defender victories in Helmbold space.

If victory is often decided by comparative fractional attrition rates, then the v parameter has a clear connection to victory. The quantities $(1/X_0)*dx/dt$ and $(1/Y_0)*dy/dt$ represent the fractional attrition rates for each side, that is, the casualty rate as a fraction of each force. A comparative fractional attrition rate decision is simply a decision based on which side is loosing a larger fraction of its forces.

Eq. (7), with D - G = H - E, represent a general attrition expression from which fractional attrition rate expressions may be derived, Eq. (15).

$$\begin{aligned} dx/dt &= e^{\beta} X_0^{D-G} Y_0^{-(D-G)} dy/dt \\ (1/X_0)dx/dt &= e^{\beta} X_0^{D-G-1} Y_0^{-(D-G-1)} (1/Y_0)dy/dt \end{aligned} \qquad (15)$$

If the two fractional attrition rates are equal, the two sides will reach zero force sizes simultaneously; otherwise, the side with the larger fraction will be annihilated first. Eq. (16) are derived by substitutions using $\alpha=1+D\text{-}G$, $\beta=C\text{-}F$, and the Helmbold relationship.

$$\begin{aligned} (1/X_0)dx/dt &= e^{\beta} forrat^{\alpha-2} (1/Y_0)dy/dt \\ (1/X_0)dx/dt &= e^{\beta+(\alpha-2)\mathrm{lforrat}} (1/Y_0)dy/dt \\ (1/X_0)dx/dt &= e^{\mathrm{lhelmrat}-2\,\mathrm{lforrat}} (1/Y_0)dy/dt \\ (1/X_0)dx/dt &= e^{v} (1/Y_0)dy/dt \end{aligned} \qquad (16)$$

The exponent, v, of e compensates for the relative sizes of the fractions in question. If the v is zero, the two are equal; if v is positive, the defender's fraction (side Y) must be smaller and the attacker could be annihilated; and if v is negative, the defender's fraction must be larger and the defender could be annihilated.

Figure 70 illustrates the overlap with a bar chart of the distribution of actual victory values over the range of v values. The left-most bars and the lower portions of the split bars represent actual attacker victories and the right-most bars and the upper portions of the split bars represent actual defender victories. Figure 71 presents the same data, split into two bar charts. The majority of the attacker victories have a v value less than zero and the majority of the defender victories have a v value greater than zero.

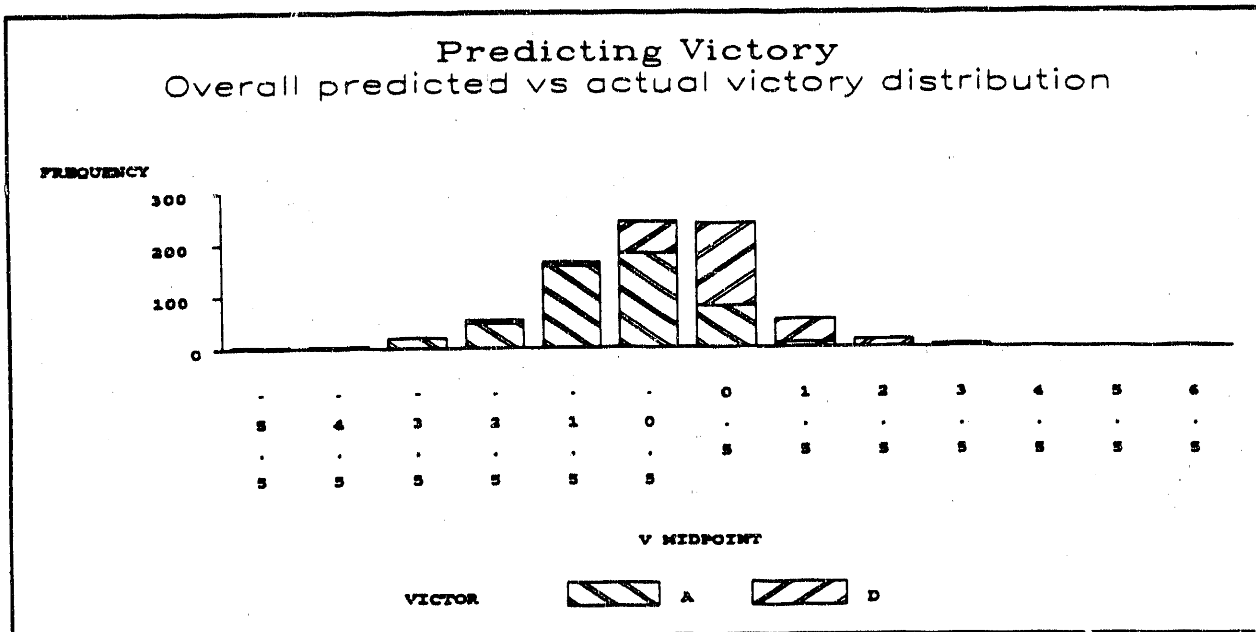

Fig. 70. Bar chart of distribution of victory vs 'v' value.

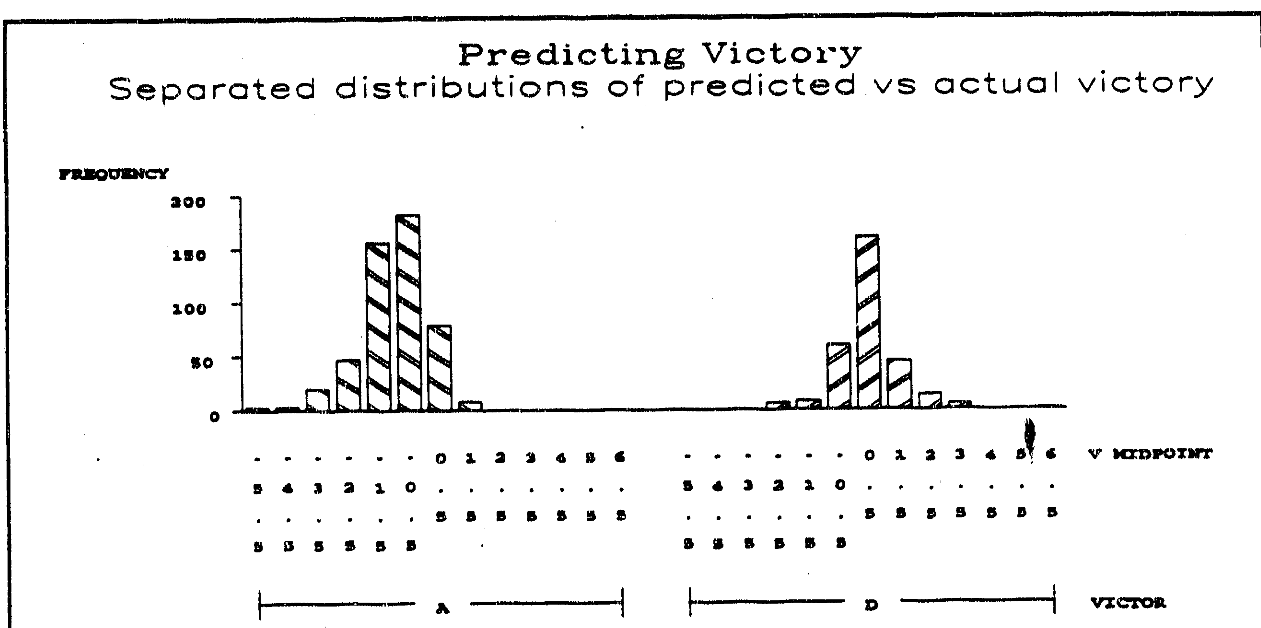

Fig. 71. Bar charts of attacker and defender distributions vs 'v' values.

Figure 72 presents the data in a way that emphasizes success or failure of the prediction. A high (positive) value of v, labeled "H", is a prediction of victory for the defender and a low (negative) value of v, labeled "L", is a prediction of victory for the attacker. The left hand pair of bars show the frequency of high predictions that were incorrect because the attacker (A) actually won and the frequency of high predictions that were correct because the defender (D) did win. The right

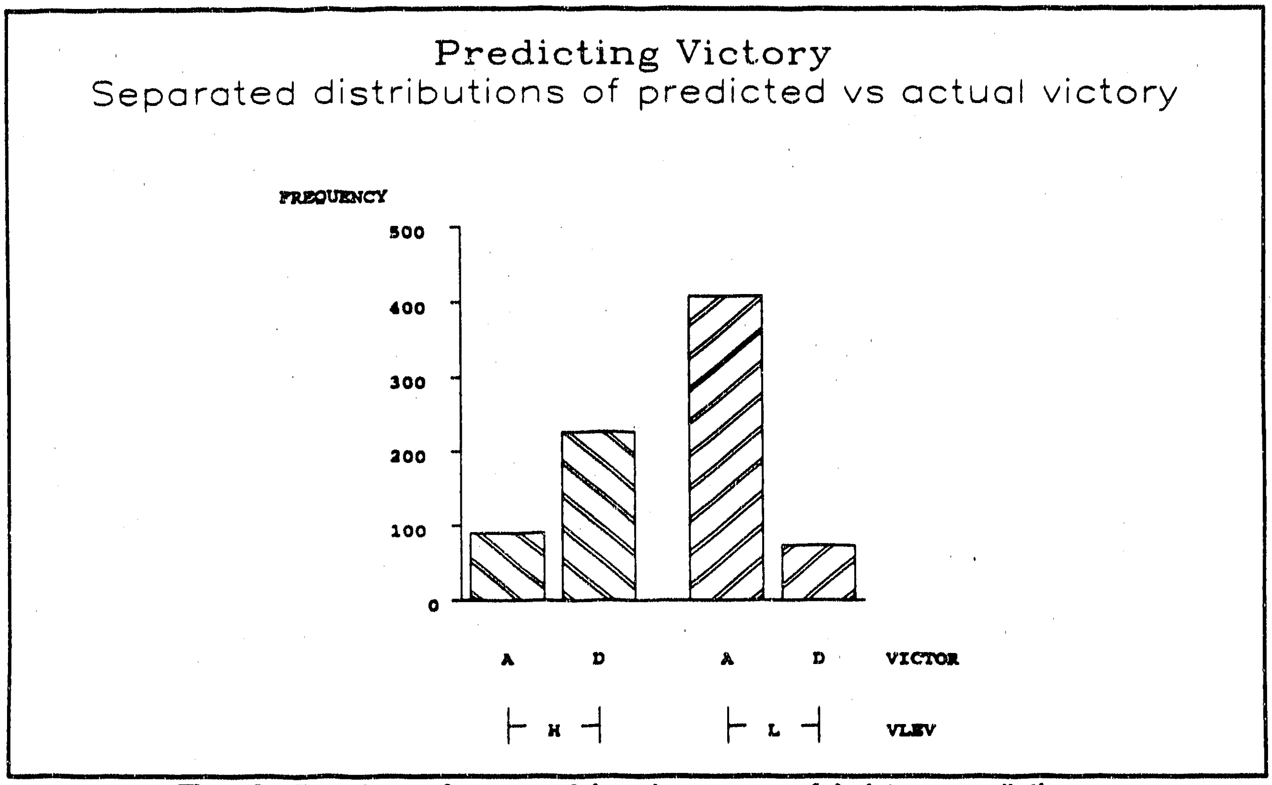

Fig. 72. Bar chart of successful and unsuccessful victory predictions.

hand pair of bars show the results of the low predictions. The v parameter is confirmed as a predictor of victory, although an imperfect predictor.

The overlap of the attacker and defender victory distributions along the axis of v values means that v is not an absolute predictor of victory. However, the separation of the means of the distributions implies that the greater the absolute value of v, the greater the presumption that the victor implied by the v parameter was the actual victor. Figure 73 displays this by showing the fraction of the battles within an interval of v values for which the attacker was the victor (plus marks). (The values from helm92 and helm83 are also shown, with x marks.)

The data fall into a pattern that requires a sigmoid curve for a fit. There are many general sigmoid curves and no really good ways to provide best fit; however, because of roughness of the data, a reasonable fit is all that is required. Figure 73 also compares the fit of Eq. (14) to a new one based on the total database. The curves are used as predictors of the probability that the raw v parameter prediction is correct.

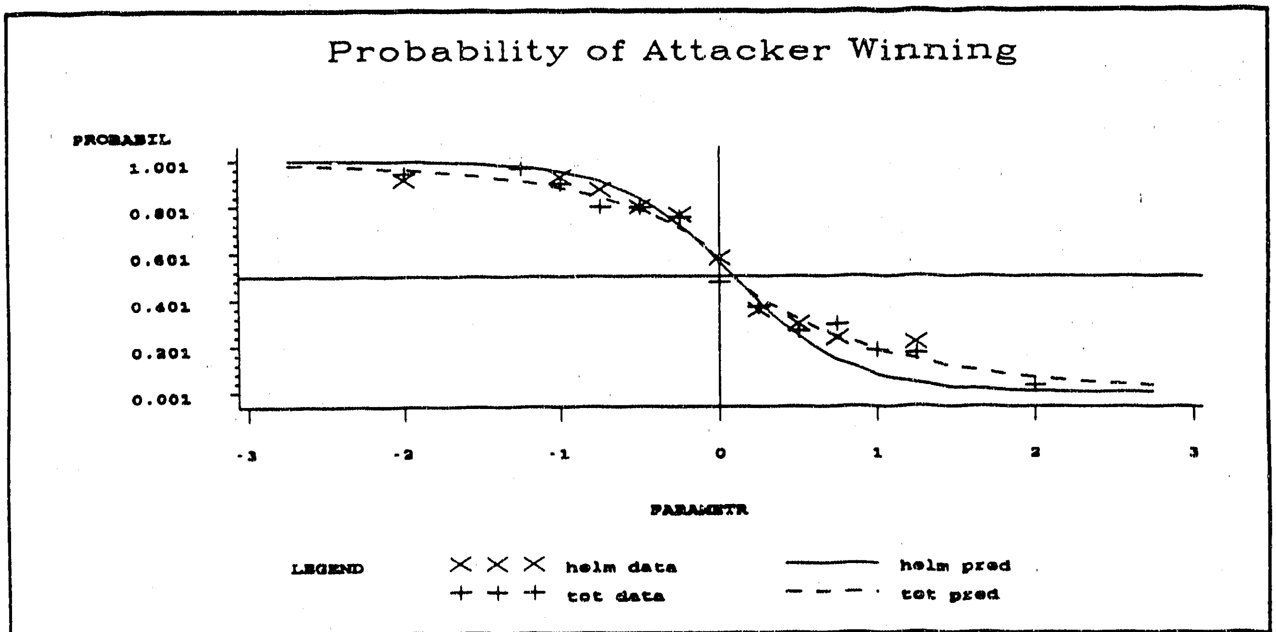

Fig. 73. Probabilistic prediction of victory.

The refined curve appears to fit both sets of data better than the old curve. The most important difference is that the refined curve shows a higher probability of error at each end than does the earlier curve. The refined curve is stated in Eq. (17).

$$
\begin{aligned}
&prob = 1 - 1/(1 + e^{t}) \\
&\text{where,} \\
&t = -1.75\ \mathrm{sign}(v)\ (\mathrm{abs}(v))^{0.75}
\end{aligned}
\tag{17}
$$

Table 10 shows the probability data upon which the curves are built. With the exception of a few points, the fractions in the table represent the number of attacker victories found in the interval centered on the v value divided by the total number of attacker and defender victories having v values in that interval. The exceptions consist of combinations of two intervals near the ends of the range because the sparse natures of the two distributions resulted in excessive swings in the fractions.

Table 10. Victory prediction data

	Fraction of Data with Attacker Victorious	
V	helm92+bbritn+helm92	total database
-2.75	1.	.929
-2.50	.	.909
-2.25	1.	.905
-2.00	.	1.000
-1.75	1.	.939
-1.50	1.	.978
-1.25	1.	.957
-1.00	.750	.900
-0.75	.875	.800
-0.50	.800	.797
-0.25	.765	.754
0.00	.579	.474
0.25	.333	.369
0.50	.294	.265
0.75	.429	.293
1.00	.125	.182
1.25	.	.100
1.50	.000	.222
1.75	.000	.143
2.00	.	.000
2.25	.000	.000

7. TOWARD A THEORY OF WAR

The theory of attrition proposed here is not a causally based theory as are the Lanchester square and linear laws, which propose acquisition and firing rules that imply the laws. What is proposed here is inherently an average of processes, an average that has been shown to be stable over time and over combatant segmentations.

The simple regressions described above lead to a state (or integral) equation with α approximately equal to 1.35. There are a large number of possible pairs of differential equations consistent with this state equation. Regressions on the logarithms of the initial force sizes against the logarithms of the casualty data produce an estimate of the exponents for X and Y in the differential equations, as shown in Table 11. The results of this analysis permits a simplification of Eq. (7), shown in Eq. (18).

$$dx/dt = -e^{C} X_0^{D} Y_0^{G}$$
$$dy/dt = -e^{F} X_0^{G} Y_0^{D} \qquad (18)$$

The exponents are symmetric and thus the restriction becomes D-G=1+α.

Table 11. Estimating exponents of the mixed law differential equations

Coefficients	Constants	XO	Err	YO	Err	
dx/dt	C=-4.3	D=0.75	0.06	E=0.41	0.05	R^2=0.68
dy/dt	F=-3.5	G=0.43	0.06	H=0.71	0.06	R^2=0.66
D - G, H - E		0.32		0.30		α=1.3
Modified Coefficients		D=0.75		E=0.40		
		G=0.40		H=0.75		
D - G, H - E		0.35		0.35		α=1.35

The differences of the exponents are shown in the third line of Table 11, with the correspondingly implied α value to the right. The error values for the exponent estimates allow the modifications shown in the lower half of the table.

Table 12 shows the frequency distribution of β=C-F. This distribution is basic to the data, given D and G. Table 13 shows the frequency distribution of C and Table 14 shows the frequency distribution of F. These two distributions are based on substituting the values for D and G from Table 11 into the difference equations corresponding to Eq. (18) and solving for C and F in each battle.

Table 12. Frequency distribution of β values

FREQUENCY OF BETA

BETA MIDPOINT	FREQ	CUM FREQ	PERCENT	CUM PERCENT
-6	1	1	0.12	0.12
-5	1	2	0.12	0.23
-4	6	8	0.70	0.93
-3	18	26	2.10	3.03
-2	78	104	9.10	12.14
-1	181	285	21.12	33.26
0	359	644	41.89	75.15
1	165	809	19.25	94.40
2	37	846	4.32	98.72
3	8	854	0.93	99.65
4	2	856	0.23	99.88
5	0	856	0.00	99.88
6	0	856	0.00	99.88
7	1	857	0.12	100.00

Table 13. Frequency distribution of C values

FREQUENCY OF C

C MIDPOINT	FREQ	CUM FREQ	PERCENT	CUM PERCENT
-8.4	3	3	0.35	0.35
-7.8	3	6	0.35	0.70
-7.2	10	16	1.17	1.87
-6.6	20	36	2.33	4.20
-6.0	42	78	4.90	9.10
-5.4	76	154	8.87	17.97
-4.8	121	275	14.12	32.09
-4.2	163	438	19.02	51.11
-3.6	200	638	23.34	74.45
-3.0	147	785	17.15	91.60
-2.4	58	843	6.77	98.37
-1.8	13	856	1.52	99.88
-1.2	1	857	0.12	100.00

Table 14. Frequency distribution of F values

FREQUENCY OF F

F MIDPOINT	FREQ	CUM FREQ	PERCENT	CUM PERCENT
-9.6	1	1	0.12	0.12
-9.0	0	1	0.00	0.12
-8.4	0	1	0.00	0.12
-7.8	2	3	0.23	0.35
-7.2	16	19	1.87	2.22
-6.6	16	35	1.87	4.08
-6.0	41	76	4.78	8.87
-5.4	64	140	7.47	16.34
-4.8	138	278	16.10	32.44
-4.2	155	433	18.09	50.53
-3.6	171	604	19.95	70.48
-3.0	152	756	17.74	88.21
-2.4	66	822	7.70	95.92
-1.8	28	850	3.27	99.18
-1.2	6	856	0.70	99.88
-0.6	1	857	0.12	100.00

The inferences drawn from the data may be collected into a series of statements, as shown below. These statements form the initial propositions and corollaries for a theory of war. The statements are not labeled as theorems because no mathematical proof is available. The statistical results are strong, but not absolutely conclusive.

PROPOSITION 0. There is a "law" of attrition.

PROPOSITION 1. Attrition in sufficiently large battles follows a homogeneous linear-logarithmic Lanchestrian law, with α approximately equal to 1.35 and β approximately normally distributed about -0.22 with standard deviation 0.7, the value of β depending on the specifics of the battle.

PROPOSITION 2. The differential equations for the attrition are stated in Eq. (18), where D=0.75 and G=0.40 and C and F depend on the specifics of the battle.

COROLLARY 1. Attrition in battle may be separated into two components: one is the contribution of the sizes of the forces in the battle; the second is the contribution of all other factors, responsible for the variance in the Helmbold relationship.

PROPOSITION 3. The impact of attrition on victory in battle is mediated by comparative fractional attrition rates, expressed by the v parameter.

PROPOSITION 4. The factors impacting victory, other than attrition, are most influential when the absolute value of the v parameter is small. The effect of these parameters may be estimated by using Eq. (17) to produce a probability that the inference about victory from the v parameter is correct.

It is hoped that further analysis of the available data concerning other factors that may influence attrition in battle will be simplified by the application of Corollary 1 and that significant results will be found. These anticipated results will form the basis for additional propositions and corollaries.

8. BUILDING AND VALIDATING COMPUTER CONFLICT SIMULATIONS

Validating a model of war is not simple. A computer model may be supplied with the state space data for an historical battle (with great difficulty in some cases). Suppose that all of the required computer variables are defined by the historical data and the model, when run, produces the exact historical results. Can we say that the model has been validated? The answer is "no," because that battle may have been an aberration, leaving open the question of the model's validity. If the same process were repeated for all historical battles, with the corresponding correct results, could we then say that the model has been validated? The answer to this question is also "no," because weapon system X, to be introduced next year might change the entire nature of war. How then do we validate a computer simulation of conflict?

First, let us note that the first condition is unlikely to be met. Most models capable of replicating a battle of any size have more variables than there is data about any historical battle. This leaves a (possibly large) number of variables that are free to take on any value desired in rerunning the battle. If the model produces the historical result after these free variables are modified slightly ('tweaked'), the model is less nearly validated than in the first case above. If the model reproduces all historical battles correctly with the tweaked variables held constant at the initially successful values, the model is less nearly validated than in the second case above. If the tweaked variables must be re-tweaked for each battle, the validity is still more doubtful.

The question raised by the final condition in the first paragraph in this section is the critical one. The history of warfare is only relevant to the future, to the extent that the nature of war is constant. Clearly some things about war change, e.g., weapons and doctrines. The question becomes, is there a constant core to the nature of warfare, and if so, what is it?

The propositions of Section 6 give a partial answer to this question. The answer is that there is a constant core to the nature of warfare and that part of the attrition law is constant. It is possible that more of the observed variation in attrition can be explained by historically observed factors. The implication is that most new weapon systems may change a part of the nature of warfare, but not unrecognizably. Global thermonuclear war may be considered an exception so long as we have only one planet to waste.

Historical validation of computer models is, therefore, conceivable and desirable. Is it practicable? In the absolute sense, the answer is no. However, in a relative sense, historical validation is possible. The replication of historical battles described above does not lead to absolute validation; however, it does perform a debugging function. That is, if the model cannot be made to replicate a presumably normal battle, there is probably something wrong with the model.

Another type of historical validation has been made possible by the results of this research. Any model that produces the results of a large number of separably identified battles produces a dataset that should be comparable in Helmbold space to a sample of historical battles. It is even conceivable that a model that uses heterogeneous square and linear laws, plus individually directed artillery and air attacks, such as the Joint Theater Level Simulation (JTLS), may effectively produce linear-logarithmic law results when the combatants and casualties are counted in the same way they would be done for historical battles. Statistical analysis of the Helmbold relationship for the model produced battles will allow a comparison to be made with historical results.

Assuming that the current complex, heterogeneous, mixed square and linear law attrition algorithms fail to produce valid attrition results, changes will be required in models of warfare. These algorithms have developed as refinements to the original homogenous laws to permit analyses of weapons systems performances and to achieve what have been hoped to be more accurate results. The justifications for the square and linear laws permitted easy extensions to diverse weapons and the matrix algebra of the heterogeneous methodology provided easily implemented coupling mechanisms.

The philosophical underpinnings of a homogeneous mixed linear-logarithmic law are non-existent. Although a heterogeneous extension is easily made, it has not yet been justified. The validity of the mixed linear-logarithmic law is solely based on the fact that it fits the observed data for total force sizes. However, the fact that the mixed linear-logarithmic law explains both battle data consisting of numbers of men and the Battle of Britain data in which force sizes are numbers of weapons systems (airplanes) permits speculation that a heterogeneous model is plausible.

At this point the data only support models that compute attrition for battles comparable in size to those in the database. The model is also restricted in its scope. The differential equations provide a form for computing the attrition of the manpower base, but do not address non-uniform losses to weapons systems. The differential equations also do not address the specific question of the amount of attrition. A stochastic model might be built that incorporates the observed distribution of C and F values. Each battle produced by such a model would have a defined amount of attrition and a large set of battles produced by the model would have a distribution of attrition results similar to those in the database; however, such a random selection might have limited usefulness. Further investigation of the relationships between the C and F values implied by the differential equations, Eq. (18), and other variables in the Hero database may produce more useful results.

Given a model battle and its attrition results, a probable victor can also be selected. However, the larger implications regarding ensuing events, movement of forces, subsequent battles, etc., are not addressed by the results of this research. The areas in which the v parameter has its poorest predictive power and the estimate of its predictive power in each of these areas may afford researchers with better bounds on what other predictors of victory should predict. For example, when the absolute value of v is large, the failure of a given factor to accurately predict victory may be understood as that factor being overridden by the attrition factor.

Clearly, only a poor model of warfare can be constructed using only what has been discovered from this research. However, such a model has the advantage over other models in its demonstrated adherence to known results. Further, the stability of those results over recorded history and the changes in warfare in that history means that confidence may be placed in the value of this adherence with regard to future battles, another advantage over other models. Further advances in the research of the operations of warfare will lead to extensions of the justifiable theory and modeling of warfare. Helmbold [23] continues to provide some of this classical operations research.

9. CONCLUSIONS

Significant defense policy decisions, including weapons acquisition and arms reduction, are based in part on models of conflict. Most of these models are driven by their attrition algorithms, usually forms of the Lanchester square and linear laws. None of these algorithms has been validated.

Using data from more than 850 battles, we have determined:

The data confirm the earlier proposition of a Helmbold relationship with α between 1.0 and 2.0, that is intermediate between the Lanchester linear and logarithmic laws.

2. This result is consistent across different collections of data (dataset segmentation).

3. This result is consistent over time (battle date segmentation).

4. This result is consistent over variations in battle size (battle size segmentation).

5. This result is consistent over connected groups of battles (campaign segmentation).

6. Any differences in national battle abilities are of secondary importance to this result.

7. The internal battle results of the Okinawa Campaign are consistent with this result.

8. The historical data for the Iwo Jima Campaign are as consistent with this result as they are with a square law assumption.

9. The data confirm that the Helmbold v parameter is a good predictor of victory.

In short, the results in this paper confirm the results of earlier papers, using a large database of historical results. The homogeneous linear-logarithmic Lanchestrian attrition model is validated to the extent possible with current initial and final force size data and is consistent with the Iwo Jima data. A particular differential linear-logarithmic model is described that fits the data very well. A version of Helmbold's victory predicting parameter is also confirmed, with an associated probability function.

The implications of these findings are potentially far-reaching. Two-sided daily attrition data on a large number of battles are needed to absolutely confirm these results. Such a confirmation will require that numerous computer conflict models containing square and linear law based attrition algorithms be reexamined. It is conceivable that complex m[illegible]d, heterogeneous, square plus linear law algorithms may produce the same results as a homogenous mixed linear-logarithmic law algorithm; however, such an occurrence is by no means assured.

Even without such absolute confirmation, the results of this research allow the analysis of combat data for the effects of training, weather, leadership, and other human factors, unencumbered by the force size effects. Further, the analysis of combat data for factors that impact the decision of which side is victorious may proceed, unencumbered by the affect of attrition. The analyses discussed in this paper contribute to the development of a true "Military Science" and theory of warfare.

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APPENDIX A: DATA

The entire set of data used in this research is included in the tables of the appendix because the significance of the results is so great. The availability of the data will allow independent confirmation of these results.

The data are arranged in page-sized tables for maximum readability. The first set of tables includes the total database and is arranged in dataset order. This order allows replication of the analyses by dataset. The Enddate values (ending date of the date segment containing the battle) and outlier indications are included to allow replication of the analyses by time period.

The second set of tables contains the campaign data that were used in the campaign analyses. The required data are reproduced because adding the appropriate variables to the original data would unnecessarily complicate the first set of tables.

A.1 TOTAL DATABASE DATA

Each table is divided into an upper and lower section to encompass all of the data variables. The upper section contains the variables BATTLE, DATE, YEAR, ATT, DEF, V, X0, Y0, and CASX. BATTLE contains the first 16 characters of the battle name taken from the original data source. The contents of DATE and YEAR depend on the data source. Where only the year of the battle is available, DATE contains a '.', indicating a missing value. If the complete date of the battle was available, it is shown in DATE. ATT contains the first seven characters from the attacker identification from the data source and DEF contains the first seven characters from the defender identification. V contains the letter "A" if the source credits the victory to the attacker, "D" if the source credits the victory to the defender, and a blank if the source labeled the battle a draw or did not identify a victor. X0 contains the initial force size for the attacker and Y0 contains the initial force size for the defender. CASX contains the attacker casualties.

The lower section of each table contains the variables BATTLE, CASY, DAYS, HOURS, WGT, ENDDATE, OUT, NUMB, and NOTE. BATTLE contains the same data as in the upper half of the table, allowing a connection between the two halves. CASY contains the defender casualties from the battle. Either DAYS or HOURS contains the length of the battle, depending on the units contained in the data source. WGT contains the weighting value used in these analyses. For battles given by only one source, the value is 1.0. For battles with multiple sources, the values from all sources add to 1.0. (The battles in dataset=helmcw are replications of battles in dataset=helm92. Helmbold chose one of the entries in helmcw as the most likely and used it in helm92. Thus this choice has twice the weight of the others, as it has its weight in helm92 and its weight in helmcw; however, the total is still 1.0.) ENDDATE contains the period ending date used in these analyses to segment the data by time period. OUT contains the letter 'o', indicating those battles considered as outliers within a given time period, or the letter 'i', for the rest. NUMB contains the engagement number from the HERO land warfare database. Those battles in the other datasets identified as referring to a battle within the lwdb are also given the corresponding engagement number. NOTE contains the identification of the Battle of Britain battle that is deleted ("del"), the two suspect battles ("sus") in the helm83 dataset, and "drop" on the Iwo Jima data.

Table 15. Dataset=helm92 data

BATTLE	DATE	YEAR	ATT	DEF	V	X0	Y0	CASX
Mollwitz	.	1741	Prussia	Austria	A	22500	19000	3930
Prague	.	1757	Prussia	Austria	A	64000	61000	11740
Kolin	.	1757	Austria	Prussia	A	53500	36000	6470
Rossbach	.	1757	Prussia	France	A	22000	43000	540
Breslau	.	1757	Austria	Prussia	A	80000	30000	5270
Leuthen	.	1757	Prussia	Austria	A	43000	72000	6200
Zorndorf	.	1758	Prussia	Austria	A	36000	42000	12000
Hochkirk	.	1758	Austria	Prussia	A	65000	37000	5300
Kunersdorf	.	1759	Prussia	Russia	D	43000	71000	18670
Quebec	.	1759	France	England	D	5000	3200	650
Liegnitz	.	1760	Austria	Prussia	D	30000	30000	3790
Torgau	.	1760	Prussia	Austria	A	44000	65000	9020
Bunker Hill	.	1775	England	USA	A	2500	1500	1054
Cowpens	.	1780	England	USA	D	1100	900	230
Marengo	.	1800	Austria	France	D	28000	28500	6500
Hohenlinden	.	1800	Austria	France	D	57000	49000	5460
Caldiero	.	1805	France	Austria	D	45750	49200	6300
Austerlitz	.	1805	Austria	France	D	82500	45000	12200
Eylan	.	1807	Russia	France	D	65000	70000	18000
Friedland	.	1807	France	Russia	A	86000	46000	11670
Talavera	.	1809	France	Spain	D	56000	54000	8210
Aspern	.	1809	France	Austria	D	90000	75000	42080

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Mollwitz	2980	.	5.0	0.50	1756	i	550	
Prague	9050	.	10.0	0.50	1858	i	650	
Kolin	6710	.	5.5	0.50	1858	i	670	
Rossbach	2700	.	2.0	0.50	1858	i	690	
Breslau	9000	.	5.0	1.00	1858	i	.	
Leuthen	6510	.	6.0	0.50	1858	i	700	
Zorndorf	18000	.	12.0	0.50	1858	i	720	
Hochkirk	7110	.	4.0	0.50	1858	i	730	
Kunersdorf	15700	.	6.0	0.50	1858	i	760	
Quebec	644	.	.	0.50	1858	i	770	
Liegnitz	3270	.	3.0	0.50	1858	i	800	
Torgau	4040	.	8.0	0.50	1858	i	810	
Bunker Hill	420	.	.	0.50	1858	i	820	
Cowpens	71	.	.	0.50	1858	i	920	
Marengo	4700	.	12.0	0.50	1858	i	1150	
Hohenlinden	2500	.	6.0	0.50	1858	i	1160	
Caldiero	5672	.	7.0	1.00	1858	i	.	
Austerlitz	6800	.	12.0	0.50	1858	i	1170	
Eylan	15000	.	13.0	0.50	1858	i	1200	
Friedland	10000	.	12.0	0.50	1858	i	1210	
Talavera	6860	.	10.0	0.50	1858	i	1280	
Aspern	22520	.	21.0	0.50	1858	i	1250	

Table 16. Dataset=helm92 data (part 2)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Wagram	.	1809	France	Austria	A	181700	128600	23000
Borodino	.	1812	France	Russia	A	110000	121000	23500
Salamanca	.	1812	France	England	D	47000	44000	10000
Vittoria	.	1813	France	England	D	60000	80000	6000
Lutzen	.	1813	France	Prussia	A	116000	69000	13000
Bautzen	.	1813	France	Prussia	A	163000	96500	20000
Dresden	.	1813	France	Austria	A	96000	200000	10000
Kulm	.	1813	Russia	France	A	103200	37000	3310
Katzbach	.	1813	France	Prussia	D	79000	95000	10000
Gross-Beeren	.	1813	France	Prussia	D	17200	31500	1500
Dennewitz	.	1813	France	Prussia	D	58000	54000	10000
Leipzig	.	1813	Russia	France	A	301500	171000	48000
LaRothiere	.	1814	Austria	France	A	79300	41000	4660
Laon	.	1814	France	Prussia	D	52000	60000	12000
Lundy's Lane	.	1814	USA	England	D	2000	3045	743
Waterloo	.	1815	France	Prussia	D	72250	145200	24000
Kulewtscha	.	1829	Russia	Turkey	A	28000	40000	2500
Palo Alto	.	1846	Mexico	USA	D	3000	2288	1000
Buena Vista	.	1847	Mexico	USA	D	14000	4757	1700
Cerro Gordo	.	1847	USA	Mexico	A	8500	12000	431
Contreras	.	1847	USA	Mexico	A	4500	4000	100
St. Lucia	.	1848	Piedmon	Austria	D	41000	19000	760

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	CUT	NUMB	NOTE
Wagram	19110	.	14.0	0.50	1858	i	1270	
Borodino	37500	.	15.0	0.50	1858	i	1340	
Salamanca	5160	.	.	0.50	1858	i	1320	
Vittoria	5000	.	.	0.50	1858	i	1330	
Lutzen	10000	.	8.0	0.50	1858	i	1350	
Bautzen	13500	.	15.0	0.50	1858	i	1360	
Dresden	18000	.	15.0	0.50	1858	i	1370	
Kulm	5000	.	15.0	1.00	1858	i	.	
Katzbach	3400	.	6.0	1.00	1858	i	.	
Gross-Beeren	1000	.	3.0	1.00	1858	i	.	
Dennewitz	7300	.	7.0	1.00	1858	i	.	
Leipzig	45500	.	72.0	0.50	1858	i	1380	
LaRothiere	5000	.	7.0	0.50	1858	i	1400	
Laon	8000	.	10.0	0.50	1858	i	1410	
Lundy's Lane	643	.	5.0	0.50	1858	i	1480	
Waterloo	22100	.	10.0	0.50	1858	i	1450	
Kulewtscha	3000	.	6.0	1.00	1858	i	.	
Palo Alto	170	.	12.0	0.50	1858	i	1570	
Buena Vista	756	.	12.0	0.50	1858	i	1590	
Cerro Gordo	1200	.	.	0.50	1858	i	1600	
Contreras	700	.	.	0.50	1858	i	1610	
St. Lucia	350	.	7.0	1.00	1858	i	.	

Table 17. Dataset=helm92 data (part 3)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Custozza	.	1848	Austria	Piedmon	A	55000	75000	900
Mortara	.	1849	Austria	Piedmon	A	15960	25240	190
Novara	.	1849	Sardini	Austria	D	60000	41000	2940
Komorn	.	1849	Hungary	Austria	D	50000	34000	1200
Temesvar	.	1849	Austria	Hungary	A	28000	54000	200
Alma	.	1854	France	Russia	A	57000	33600	4310
Inkermann	.	1854	Russia	England	D	36000	18000	8770
Tschernaja	.	1855	Russia	France	D	63000	39360	8270
Magenta	.	1859	France	Austria	A	48090	61620	3880
Solferino	.	1859	France	Austria	A	151200	133250	14420
First Bull Run	.	1861	USA-N	USA-S	D	18500	18000	1584
Gaines's Mill	.	1862	USA-S	USA-N	A	65000	30000	6000
Seven Day's Batt	.	1862	USA-S	USA-N	A	90000	105000	19195
Second Bull Run	.	1862	USA-S	USA-N	A	55000	70000	3474
Antietam	.	1862	USA-N	USA-S	A	70000	39200	15029
Fredericksburg	.	1862	USA-N	USA-S	D	122000	78500	10208
Stone River	.	1862	USA-S	USA-N	D	37712	44800	9239
Chancellorsville	.	1863	USA-S	USA-N	A	55000	132000	10960
Chickamaugua	.	1863	USA-S	USA-N	A	71551	56965	15000
Chattanooga	.	1863	USA-N	USA-S	A	56359	40929	5465
Duppler Schanzen	.	1864	Prussia	Denmark	A	25000	18000	1200
Wilderness	.	1864	USA-N	USA-S	A	101895	61025	14283

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Custozza	870	.	10.0	1.00	1858	i	.	
Mortara	550	.	2.5	1.00	1858	i	.	
Novara	2260	.	9.0	1.00	1858	i	.	
Komorn	800	.	6.0	1.00	1858	i	.	
Temesvar	400	.	7.0	1.00	1858	i	.	
Alma	5065	.	3.5	0.50	1858	i	1650	
Inkermann	4240	.	9.0	0.50	1858	i	1660	
Tschernaja	1750	.	4.0	1.00	1858	i	.	
Magenta	5730	.	9.0	0.50	1913	i	1670	
Solferino	13100	.	11.5	0.50	1913	i	1680	
First Bull Run	1982	.	10.0	0.20	1913	i	1710	
Gaines's Mill	6837	.	7.0	0.50	1913	i	1850	
Seven Day's Batt	9796	.	70.0	1.00	1913	i	.	
Second Bull Run	10199	.	30.0	0.50	1913	i	1890	
Antietam	11305	.	10.0	0.20	1913	i	1910	
Fredericksburg	5209	.	10.0	0.20	1913	i	1940	
Stone River	9220	.	20.0	1.00	1913	i	.	
Chancellorsville	11128	.	24.0	0.20	1913	i	1960	
Chickamaugua	11700	.	16.0	0.50	1913	i	2000	
Chattanooga	2541	.	17.0	0.25	1913	i	2010	
Duppler Schanzen	1210	.	3.5	1.00	1913	i	.	
Wilderness	7750	.	16.0	0.50	1913	i	2020	

Table 18. Dataset=helm92 data (part 4)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Franklin	.	1864	USA-S	USA-N	D	27000	28000	4550
Langensalza	.	1866	Hannove	Prussia	A	16180	8640	1430
Nachod	.	1866	Austria	Prussia	D	31000	24000	3646
Trautenau	.	1866	Austria	Prussia	A	26000	32000	3611
Skalitz	.	1866	Austria	Prussia	D	22300	30000	3290
Jicin	.	1866	Austria	Prussia	D	44000	28000	2970
Koniggratz	.	1866	Austria	Prussia	D	215134	220982	23598
Worth	.	1870	Germany	France	A	82100	48500	9270
Spichern	.	1870	Germany	France	A	34700	27600	4500
Mars-La-Tour	.	1870	France	Germany	D	113500	63000	11460
Gravelotte	.	1870	Germany	France	A	187600	112900	19640
Beaumont	.	1870	France	Germany	D	58700	67700	3500
Sedan	.	1870	France	Germany	D	90000	154000	17000
Beaune-La-Roland	.	1870	France	Germany	D	61500	41000	1300
Orleans	.	1870	Germany	France	A	93700	60700	1750
Colombey-Borny	.	1870	France	Germany	A	50700	30500	3600
Sevigny	.	1870	France	Germany	D	120000	60000	3500
Lisaine	.	1871	France	Germany	A	140000	45000	7500
Plevna I	.	1877	Russia	Turkey	D	10000	14000	2850
Plevna II	.	1877	Russia	Turkey	D	32500	20000	7330
Plevna III	.	1877	Russia	Turkey	D	95000	35000	16000
Plevna	.	1877	Turkey	Russia	D	30000	120000	5000

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Franklin	1222	.	7.0	0.20	1913	i	2130	
Langensalza	810	.	.	1.00	1913	i	.	
Nachod	1122	.	6.0	1.00	1913	i	.	
Trautenau	1252	.	13.0	1.00	1913	i	.	
Skalitz	1369	.	4.0	1.00	1913	i	.	
Jicin	1559	.	8.0	1.00	1913	i	.	
Koniggratz	8894	.	8.0	0.50	1913	i	1690	
Worth	8000	.	8.5	0.50	1913	i	2210	
Spichern	1980	.	8.5	0.50	1913	i	2220	
Mars-La-Tour	14800	.	10.0	0.50	1913	i	2230	
Gravelotte	7850	.	9.0	0.50	1913	i	2240	
Beaumont	3350	.	7.5	1.00	1913	i	.	
Sedan	8220	.	12.5	0.50	1913	i	2250	
Beaune-La-Roland	900	.	8.0	1.00	1913	i	.	
Orleans	2000	.	.	0.50	1913	i	2270	
Colombey-Borny	4800	.	4.0	1.00	1913	i	.	
Sevigny	3000	.	12.0	1.00	1913	i	.	
Lisaine	1310	.	.	1.00	1913	i	.	
Plevna I	2500	.	4.0	1.00	1913	i	.	
Plevna II	3800	.	10.0	1.00	1913	i	.	
Plevna III	4000	.	144.0	1.00	1913	i	.	
Plevna	1900	.	2.0	1.00	1913	o	.	

Table 19. Dataset=helm92 data (part 5)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Driniumor River	.	1944	Japan	USA	D	20000	40000	10000
Guam	.	1944	USA	Japan	A	54891	20000	7083
Siapan	.	1944	USA	Japan	A	67500	26000	16500
Iwo Jima	.	1945	USA	Japan	A	73000	21500	20860

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Driniumor River	3000	.	720.0	1.00	1955	i	.	
Guam	9000	.	480.0	1.00	1955	i	.	
Siapan	24000	.	600.0	1.00	1955	i	.	
Iwo Jima	21500	.	864.0	1.00	1955	i	5181	

Table 20. Dataset=bbritn data

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Battle of Britain	13AUG1940	1940	Germany	England		1485	700	45
Battle of Britain	14AUG1940	1940	Germany	England		489	494	19
Battle of Britain	15AUG1940	1940	Germany	England		1786	974	75
Battle of Britain	16AUG1940	1940	Germany	England		1715	776	45
Battle of Britain	24AUG1940	1940	Germany	England		1200	981	38
Battle of Britain	25AUG1940	1940	Germany	England		880	524	20
Battle of Britain	26AUG1940	1940	Germany	England		1088	829	41
Battle of Britain	27AUG1940	1940	Germany	England		225	335	9
Battle of Britain	28AUG1940	1940	Germany	England		976	761	30
Battle of Britain	29AUG1940	1940	Germany	England		940	526	17
Battle of Britain	30AUG1940	1940	Germany	England		1605	1054	36
Battle of Britain	31AUG1940	1940	Germany	England		1620	1007	41
Battle of Britain	01SEP1940	1940	Germany	England		820	690	14
Battle of Britain	02SEP1940	1940	Germany	England		1047	780	35
Battle of Britain	03SEP1940	1940	Germany	England		676	745	16
Battle of Britain	04SEP1940	1940	Germany	England		947	698	25
Battle of Britain	05SEP1940	1940	Germany	England		903	712	23
Battle of Britain	06SEP1940	1940	Germany	England		797	1031	35

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Battle of Britain	13	1	.	1.00	1955	i	.	
Battle of Britain	8	1	.	1.00	1955	i	.	
Battle of Britain	34	1	.	1.00	1955	i	.	
Battle of Britain	21	1	.	1.00	1955	i	.	
Battle of Britain	22	1	.	1.00	1955	i	.	
Battle of Britain	16	1	.	1.00	1955	i	.	
Battle of Britain	31	1	.	1.00	1955	i	.	
Battle of Britain	1	1	.	1.00	1955	i	.	del
Battle of Britain	20	1	.	1.00	1955	i	.	
Battle of Britain	9	1	.	1.00	1955	i	.	
Battle of Britain	26	1	.	1.00	1955	i	.	
Battle of Britain	39	1	.	1.00	1955	i	.	
Battle of Britain	15	1	.	1.00	1955	i	.	
Battle of Britain	31	1	.	1.00	1955	i	.	
Battle of Britain	16	1	.	1.00	1955	i	.	
Battle of Britain	17	1	.	1.00	1955	i	.	
Battle of Britain	20	1	.	1.00	1955	i	.	
Battle of Britain	23	1	.	1.00	1955	i	.	

Table 21. Dataset=helm83 data

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Heraclea	.	-280	Greece	Rome	A	30000	35000	4000
Asculum	.	-279	Rome	Greece	D	45000	45000	6000
Mursa	.	351	Byzanti	Rome	A	80000	100000	30000
Indus	.	1221	Mongol	India	A	300000	30000	20000
Sempach	.	1386	Austria	Swiss	D	6000	1500	1500
Ravena	.	1512	France	Spain	A	20000	12000	3000
Marignano	.	1515	Swiss	France	D	30000	46000	5000
Dreux	.	1562	England	France	A	16000	12000	3000
Leipzig	.	1631	German	Sweden	D	44000	40000	8000
Altendorf	.	1632	Sweden	German	D	40000	40000	2300
Lutzen	.	1632	Sweden	German	A	15000	12000	5000
Wittstock	.	1636	German	Sweden	D	30000	22000	11000
Nordingen	.	1645	France	German	A	17000	14000	4000
Fleurus	.	1690	France	German	A	45000	37000	2500
Blenheim	.	1704	England	France	A	52000	60000	11000
Lesno	.	1709	Russia	Sweden	A	40000	15000	10000
Sohr	.	1745	Prussia	Austria	A	18000	35000	4000
Monogahela	.	1755	France	England	A	900	1400	100
Ste. Foy	.	1760	England	France	D	3000	8000	1000
Pollicore	.	1781	India	England	D	80000	11000	2000
Porto Novo	.	1781	England	India	A	8500	65000	306
Sholingur	.	1781	England	India	A	10000	80000	100

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Heraclea	7000	.	.	1.00	1756	i	.	
Asculum	3000	.	.	1.00	1756	i	.	
Mursa	24000	.	.	1.00	1756	i	.	
Indus	19000	.	.	1.00	1756	o	.	
Sempach	120	.	.	1.00	1756	o	.	
Ravena	9000	.	7.0	1.00	1756	i	.	
Marignano	4000	.	7.0	1.00	1756	i	.	
Dreux	3000	.	.	1.00	1756	i	.	
Leipzig	2700	.	.	0.50	1756	i	60	
Altendorf	2070	.	.	1.00	1756	i	.	
Lutzen	5000	.	10.0	0.50	1756	i	90	
Wittstock	5000	.	240.0	0.50	1756	i	110	
Nordingen	6000	.	.	0.50	1756	i	180	
Fleurus	5000	.	10.0	0.50	1756	i	420	
Blenheim	40000	.	.	0.50	1756	i	500	
Lesno	10000	.	120.0	1.00	1756	i	.	
Sohr	6000	.	.	0.50	1756	i	600	
Monogahela	877	.	3.0	1.00	1756	i	.	
Ste. Foy	800	.	.	1.00	1858	i	.	
Pollicore	421	.	8.0	1.00	1858	o	.	
Porto Novo	10000	.	12.0	1.00	1858	o	.	sus
Sholingur	5000	.	.	1.00	1858	o	.	sus

Table 22. Dataset=helm83 data (part 2)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Jemappes	.	1792	France	Austria	A	45000	25000	7000
Wattignies	.	1793	France	Austria	A	43000	23000	3000
Alexandria	.	1801	France	England	D	20000	14000	4160
Rolica	.	1808	England	France	A	4000	3000	400
Vimiero	.	1808	France	England	D	13000	20000	3000
Abensburg	.	1809	Austria	France	D	80000	90000	7000
Coruna	.	1809	France	England	D	20000	14000	2000
Eckmuhl	.	1809	France	Austria	A	90000	76000	2500
Bussaco	.	1810	France	England	D	80000	51000	5000
Mohilev	.	1812	Russia	France	D	60000	28000	4000
Malo-Jaroslawetz	.	1812	France	Russia	D	15000	24000	5000
Polotsk	.	1812	France	Russia	A	33000	30000	1000
Smolensk	.	1812	France	Russia	A	50000	60000	9000
Valutinagora	.	1812	France	Russia	A	30000	40000	7000
Sauroren	.	1813	France	England	D	25000	12000	3000
Wartemburg	.	1813	Prussia	France	A	60000	16000	5000
Brienne	.	1814	German	France	D	30000	18000	4000
Craonne	.	1814	France	German	A	55000	90000	9000
Rheims	.	1814	France	Prussia	A	30000	13000	1500
Toulouse	.	1814	England	France	A	24000	38000	4659
Korygaom	.	1818	India	England	D	25000	1000	600
Warsaw	.	1831	Russia	Poland	A	60000	30000	10508

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Jemappes	7000	.	8.0	0.50	1858	i	970	
Wattignies	2500	.	20.0	0.50	1858	i	1000	
Alexandria	1468	.	5.0	1.00	1858	i	.	
Rolica	500	.	.	1.00	1858	i	.	
Vimiero	750	.	.	0.50	1858	i	1220	
Abensburg	3000	.	.	1.00	1858	i	.	
Coruna	800	.	.	0.50	1858	i	1230	
Eckmuhl	5000	.	.	0.50	1858	i	1240	
Bussaco	1300	.	8.0	0.50	1858	i	1290	
Mohilev	1000	.	.	1.00	1858	i	.	
Malo-Jaroslawetz	6000	.	.	1.00	1858	i	.	
Polotsk	3000	.	2.0	1.00	1858	i	.	
Smolensk	10000	.	.	1.00	1858	i	.	
Valutinagora	7000	.	.	1.00	1858	i	.	
Sauroren	2000	.	12.0	1.00	1858	i	.	
Wartemburg	500	.	4.5	1.00	1858	i	.	
Brienne	3000	.	.	1.00	1858	i	.	
Craonne	7000	.	.	1.00	1858	i	.	
Rheims	6000	.	.	1.00	1858	i	.	
Toulouse	5000	.	.	1.00	1858	i	.	
Korygaom	275	.	12.0	1.00	1858	o	.	
Warsaw	9000	.	.	1.00	1858	i	.	

Table 23. Dataset=helm83 data (part 3)

BATTLE	DATE	YEAR	ATT	DEF	V	X0	Y0	CASX
Alamo	.	1836	Mexico	Texas	A	4000	180	500
Maharajpur	.	1843	England	India	A	14000	18000	787
Meeanee	.	1843	Persia	England	D	20000	2800	5000
Sobraon	.	1846	England	India	A	15000	25000	2383
Boomplats	.	1848	England	Boer	A	1050	1000	60
Kineyri	.	1848	India	India	A	11000	8000	300
Calafat	.	1854	Russia	Turkey	D	40000	30000	20000
Lexington	.	1861	USA-S	USA-N	A	15000	2800	100
Wilson's Creek	.	1861	USA-N	USA-S	D	6000	16000	1236
Cedar Mountain	.	1862	USA-N	USA-S	D	20000	15000	2800
La Puebla	.	1862	France	Mexico	D	7500	12000	456
Pea Ridge	.	1862	USA-N	USA-S	A	16000	16000	1000
Perryville	.	1862	USA-N	USA-S	A	22000	16000	4211
Seccessionsville	.	1862	USA-N	USA-S	D	6000	2000	600
Setlingen Hill	.	1862	USA-S	USA-N	A	6000	2500	500
Shiloh	.	1862	USA-S	USA-N	D	40000	61500	10700
Gettysburg	.	1863	USA-S	USA-N	D	75000	88000	28000
Vicksburg	.	1863	USA-N	USA-S	A	71000	51000	9300
Atlanta	.	1864	USA-N	USA-S	A	100000	49000	6000
Cold Harbor	.	1864	USA-N	USA-S	D	108000	59000	7000
Kennesaw Mt.	.	1864	USA-N	USA-S	D	90000	50000	3000
Nashville	.	1864	USA-N	USA-S	A	49000	31000	3100

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Alamo	175	.	312.0	1.00	1858	o	.	
Maharajpur	3000	.	.	1.00	1858	i	.	
Meeanee	256	.	.	1.00	1858	o	.	
Sobraon	8000	.	.	1.00	1858	i	.	
Boomplats	14	.	.	1.00	1858	i	.	
Kineyri	500	.	.	1.00	1858	i	.	
Calafat	12000	.	.	1.00	1858	i	.	
Lexington	159	.	32.0	1.00	1913	o	.	
Wilson's Creek	1095	.	.	0.50	1913	i	1720	
Cedar Mountain	900	.	5.0	0.50	1913	i	1880	
La Puebla	215	.	.	1.00	1913	i	.	
Pea Ridge	1000	.	48.0	0.50	1913	i	1760	
Perryville	3396	.	.	0.50	1913	i	1930	
Seccessionsville	200	.	.	1.00	1913	i	.	
Setlingen Hill	250	.	4.0	1.00	1913	i	.	
Shiloh	13700	.	48.0	0.50	1913	i	1780	
Gettysburg	23000	.	48.0	0.50	1913	i	1990	
Vicksburg	10000	.	1800.0	1.00	1913	i	.	
Atlanta	5000	.	1008.0	0.50	1913	i	2080	
Cold Harbor	1500	.	1.0	0.50	1913	i	2050	
Kennesaw Mt.	500	.	.	0.50	1913	i	2060	
Nashville	1500	.	24.0	0.50	1913	i	2140	

Table 24. Dataset=helm83 data (part 4)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Ocean Pond	.	1864	USA-N	USA-S	D	6000	5000	1200
Spotsylvania	.	1864	USA-N	USA-S	A	90000	50000	17000
Five Forks	.	1865	USA-N	USA-S	A	28000	19000	1000
Custozza	.	1866	Italy	Austria	D	140000	60000	4650
Hallue	.	1870	Germany	France	D	22500	40000	927
St. Quentin	.	1871	France	Germany	D	40000	33000	3500
Loftcha	.	1877	Russia	Turkey	A	20000	15000	1500
Bronkhurst Sprui	.	1880	Boer	England	A	150	259	7
Fish Creek	.	1885	Canada	Canada	D	430	280	50
Slivnitza	.	1885	Serbia	Bulgari	D	28000	15000	2000
Atbara	.	1898	England	India	A	14000	18000	570
Kiuliencheng	.	1904	Japan	Russia	A	40000	30000	898
Telissa	.	1904	Japan	Russia	A	35000	25000	1200
Attu	.	1943	USA	Japan	A	11000	2400	1800
Kwajalein South	.	1944	USA	Japan	A	21342	5112	1214
Kwajalein North	.	1944	USA	Japan	A	20104	3563	740
Eniwetok	.	1944	USA	Japan	A	10269	3431	716

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Ocean Pond	700	.	.	1.00	1913	i	.	
Spotsylvania	9000	.	240.0	0.50	1913	i	2030	
Five Forks	500	.	48.0	0.50	1913	i	2170	
Custozza	3832	.	.	0.50	1913	i	1700	
Hallue	1000	.	.	1.00	1913	i	.	
St. Quentin	2400	.	.	1.00	1913	i	.	
Loftcha	5200	.	.	1.00	1913	i	.	
Bronkhurst Sprui	155	.	.	1.00	1913	o	.	
Fish Creek	29	.	.	1.00	1913	i	.	
Slivnitza	3000	.	72.0	1.00	1913	i	.	
Atbara	5000	.	.	1.00	1913	o	.	
Kiuliencheng	4000	.	.	1.00	1913	i	.	
Telissa	3600	.	48.0	0.50	1913	i	2430	
Attu	2400	.	528.0	1.00	1955	i	.	
Kwajalein South	4400	.	144.0	1.00	1955	i	.	
Kwajalein North	3500	.	72.0	1.00	1955	i	.	
Eniwetok	3431	.	144.0	1.00	1955	i	.	

Table 25. Dataset=helmcw data

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
First Bull Run	.	1861	USA-N	USA-S	D	30000	32000	2900
First Bull Run	.	1861	USA-N	USA-S	D	40000	30000	1492
First Bull Run	.	1861	USA-N	USA-S	D	18500	18000	2896
Antietam	.	1862	USA-N	USA-S	A	70000	39000	12350
Antietam	.	1862	USA-N	USA-S		95000	35000	12460
Antietam	.	1862	USA-N	USA-S	D	70000	40000	12000
Fredericksburg	.	1862	USA-N	USA-S	D	106000	72500	12000
Fredericksburg	.	1862	USA-N	USA-S	D	150000	80000	13771
Fredericksburg	.	1862	USA-N	USA-S	D	122000	79000	12650
Stone River	.	1862	USA-S	USA-N	D	38000	47000	12000
Stone River	.	1862	USA-S	USA-N	D	35000	40000	8000
Chancellorsville	.	1863	USA-S	USA-N	A	43000	73000	13000
Chancellorsville	.	1863	USA-S	USA-N	A	53000	120000	10000
Chancellorsville	.	1863	USA-S	USA-N	A	55000	132000	12000
Chattanooga	.	1863	USA-N	USA-S	A	56000	46000	5800
Chattanooga	.	1863	USA-N	USA-S	A	60000	34000	6000
Franklin	.	1864	USA-S	USA-N	A	38000	32000	6250
Franklin	.	1864	USA-S	USA-N	D	40000	30000	4500
Franklin	.	1864	USA-S	USA-N		27000	28000	6500

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
First Bull Run	2000	.	10.0	0.20	1913	i	1710	
First Bull Run	1752	.	10.0	0.20	1913	i	1710	
First Bull Run	1982	.	10.0	0.20	1913	i	1710	
Antietam	13700	.	10.0	0.20	1913	i	1910	
Antietam	9000	.	10.0	0.20	1913	i	1910	
Antietam	9000	.	10.0	0.20	1913	i	1910	
Fredericksburg	5300	.	10.0	0.20	1913	i	1940	
Fredericksburg	1800	.	10.0	0.20	1913	i	1940	
Fredericksburg	4200	.	10.0	0.20	1913	i	1940	
Stone River	12000	.	20.0	1.00	1913	i	.	
Stone River	8000	.	20.0	1.00	1913	i	.	
Chancellorsville	17000	.	24.0	0.20	1913	i	1960	
Chancellorsville	10350	.	24.0	0.20	1913	i	1960	
Chancellorsville	16000	.	24.0	0.20	1913	i	1960	
Chattanooga	6600	.	17.0	0.25	1913	i	2010	
Chattanooga	8684	.	17.0	0.25	1913	i	2010	
Franklin	2300	.	7.0	0.20	1913	i	2130	
Franklin	1500	.	7.0	0.20	1913	i	2130	
Franklin	2236	.	7.0	0.20	1913	i	2130	

Table 26. Dataset=inchon data

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Inchon-Seoul	15SEP1950	1950	USA	North K	A	25040	22150	196
Inchon-Seoul	16SEP1950	1950	USA	North K	A	24844	21350	26
Inchon-Seoul	17SEP1950	1950	USA	North K	A	24818	20500	76
Inchon-Seoul	18SEP1950	1950	USA	North K	A	24742	22750	102
Inchon-Seoul	19SEP1950	1950	USA	North K	A	24640	22600	72
Inchon-Seoul	20SEP1950	1950	USA	North K	A	24568	22100	147
Inchon-Seoul	21SEP1950	1950	USA	North K	A	24421	27675	231
Inchon-Seoul	22SEP1950	1950	USA	North K	A	24190	25975	165
Inchon-Seoul	23SEP1950	1950	USA	North K	A	24025	24375	143
Inchon-Seoul	24SEP1950	1950	USA	North K	A	23882	25305	289
Inchon-Seoul	25SEP1950	1950	USA	North K	A	23593	24290	276
Inchon-Seoul	26SEP1950	1950	USA	North K	A	23317	22390	203
Inchon-Seoul	27SEP1950	1950	USA	North K	A	23114	24640	189
Inchon-Seoul	28SEP1950	1950	USA	North K	A	22925	23250	43
Inchon-Seoul	29SEP1950	1950	USA	North K	A	22882	22710	69
Inchon-Seoul	30SEP1950	1950	USA	North K	A	22813	22100	61
Inchon-Seoul	01OCT1950	1950	USA	North K	A	22752	23465	19
Inchon-Seoul	02OCT1950	1950	USA	North K	A	22733	28265	97
Inchon-Seoul	03OCT1950	1950	USA	North K	A	22636	27835	38

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Inchon-Seoul	675	1	.	1.00	1955	i	.	
Inchon-Seoul	675	1	.	1.00	1955	i	.	
Inchon-Seoul	350	1	.	1.00	1955	i	.	
Inchon-Seoul	450	1	.	1.00	1955	i	.	
Inchon-Seoul	600	1	.	1.00	1955	i	.	
Inchon-Seoul	600	1	.	1.00	1955	i	.	
Inchon-Seoul	1350	1	.	1.00	1955	i	.	
Inchon-Seoul	1200	1	.	1.00	1955	i	.	
Inchon-Seoul	900	1	.	1.00	1955	i	.	
Inchon-Seoul	950	1	.	1.00	1955	i	.	
Inchon-Seoul	1750	1	.	1.00	1955	i	.	
Inchon-Seoul	950	1	.	1.00	1955	i	.	
Inchon-Seoul	1252	1	.	1.00	1955	i	.	
Inchon-Seoul	332	1	.	1.00	1955	i	.	
Inchon-Seoul	102	1	.	1.00	1955	i	.	
Inchon-Seoul	305	1	.	1.00	1955	i	.	
Inchon-Seoul	75	1	.	1.00	1955	i	.	
Inchon-Seoul	350	1	.	1.00	1955	i	.	
Inchon-Seoul	800	1	.	1.00	1955	i	.	

Table 27. Dataset=lwdb01 data

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Nieuport	02JUL1600	1600	Sp Neth	Du Army	D	11500	11300	4000
White Mountain	08NOV1620	1620	Imp/Hol	Boh Reb	A	40000	21000	400
Wimpfen	06MAY1622	1622	Holy Le	Prot Un	A	20000	20000	5000
Dessau Bridge	25APR1626	1626	Prot Un	Imp Arm	D	8500	16000	3000
Lutter	27AUG1626	1626	Holy Le	Dan Arm	A	17000	20000	2000
Breitenfeld I	17SEP1631	1631	Imp/Hol	Sw/Sax	D	32000	37850	13600
The Lech	15APR1632	1632	Sw Army	Imp Arm	A	33000	27000	1000
Alte Veste	03SEP1632	1632	Sw Army	Imp Arm	D	46000	60000	4000
Luetzen	16NOV1632	1632	Sw Army	Imp Arm	A	18996	21770	4000
Noerdlingen	06SEP1634	1634	Sw Army	Sp/Imp	D	25000	35000	12000
Wittstock	04OCT1636	1636	Sw Army	Imp/Sax	A	22000	30000	7000
Breitenfeld II	02NOV1642	1642	Sw Army	Imp Arm	A	25000	30000	5000
Rocroi	19MAY1643	1643	Fr Army	Sp Neth	A	23000	26000	4000
Tuttlingen	24NOV1644	1644	Imp Arm	Fr Army	A	22000	18000	1000
Freiburg	03AUG1644	1644	Fr Army	Imp Arm	A	19000	16000	8000
Jankau	06MAR1645	1645	Imp Arm	Sw Army	D	15000	15000	8500
Mergentheim	02MAY1645	1645	Imp Arm	Fr Army	A	10000	11000	700
Allerheim (Nordl	03AUG1645	1645	Fr Army	Imp Arm	A	18000	16000	7500
Lens	10AUG1648	1648	Fr Army	Imp Arm	A	14000	18000	4000
Edgehill	23OCT1642	1642	Eng Roy	Eng Par	A	14300	14870	2500
Marston Moor	02JUL1644	1644	Eng Par	Eng Roy	A	27000	17500	1500
Tippermuir	01SEP1644	1644	Scot Co	Scot Ro	D	6800	3000	3000

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Nieuport	1000	1	.	1.00	1756	i	10	
White Mountain	5000	1	.	1.00	1756	i	20	
Wimpfen	5800	1	.	1.00	1756	i	30	
Dessau Bridge	1000	1	.	1.00	1756	i	40	
Lutter	7000	1	.	1.00	1756	i	50	
Breitenfeld I	6100	1	.	0.50	1756	i	60	
The Lech	3000	2	.	1.00	1756	i	70	
Alte Veste	2000	2	.	1.00	1756	i	80	
Luetzen	5000	1	.	0.50	1756	i	90	
Noerdlingen	2000	1	.	1.00	1756	i	100	
Wittstock	18000	1	.	0.50	1756	i	110	
Breitenfeld II	15000	1	.	1.00	1756	i	120	
Rocroi	14000	1	.	1.00	1756	i	130	
Tuttlingen	7000	1	.	1.00	1756	i	140	
Freiburg	4000	3	.	1.00	1756	i	150	
Jankau	2000	1	.	1.00	1756	i	160	
Mergentheim	3500	1	.	1.00	1756	i	170	
Allerheim (Nordl	6000	1	.	0.50	1756	i	180	
Lens	10000	1	.	1.00	1756	i	190	
Edgehill	2500	1	.	1.00	1756	i	200	
Marston Moor	6000	1	.	1.00	1756	i	210	
Tippermuir	1	1	.	1.00	1756	o	220	

Table 28. Dataset=lwdb01 data (part 2)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Steenkerke	03AUG1692	1692	Allied	Fr Army	D	63000	57000	8000
Neerwinden (Land	29JUL1693	1693	Fr Army	Allied	A	80000	50000	9000
Marsaglia	04OCT1693	1693	Fr Army	Allied	A	40000	36000	3000
Zenta	11SEP1697	1697	Aus Arm	Tk Army	A	50000	100000	500
Poltava	28JUN1709	1709	Sw Army	Russ Ar	D	21500	80000	9600
Blenheim	13AUG1704	1704	Allied	Fr/Bav	A	52000	56000	12883
Ramillies	23MAY1706	1706	Allied	Fr/Bav	A	62000	60000	3620
Oudenarde	11JUL1708	1708	Allied	Fr/Bav	A	80000	85000	4000
Malplaquet	11SEP1709	1709	Allied	Fr/Bav	A	110000	80000	24000
Peterwardein	05AUG1716	1716	Aus Arm	Turk Ar	A	63000	60000	4500
Mollwitz	10APR1741	1741	Aus Arm	Pr Army	D	18100	22000	4551
Chotusitz	27MAY1742	1742	Aus Arm	Pr Army	D	29000	24500	6332
Dettingen	27JUN1743	1743	Br-Han	Fr Army	A	35000	26000	2500
Fontenoy	11MAY1745	1745	Br Alli	Fr Army	D	50000	60000	12000
Hohenfriedberg	04JUN1745	1745	Pr Army	Aus-Sax	A	50000	66000	4737
Sohr	30SEP1745	1745	Pr Army	Aus-Sax	A	22562	41000	3876
Kesselsdorf	14DEC1745	1745	Pr Army	Sax Arm	A	31000	31200	5000
Prestonpans	21SEP1745	1745	Scot Re	Br Army	A	2400	2200	110
Culloden	16APR1746	1746	Scot Re	Br Army	D	5400	9000	1558
Lobositz	01OCT1756	1756	Pr Army	Aus Arm	A	29000	34500	2906
Prague	06MAY1757	1757	Pr Army	Aus Arm	A	65000	62000	14300
Plassey	23JUN1757	1757	Bengali	Br Army	D	50050	2975	500

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Steenkerke	7000	1	.	1.00	1756	i	450	
Neerwinden (Land	14000	1	.	1.00	1756	i	460	
Marsaglia	11000	1	.	1.00	1756	i	470	
Zenta	30000	1	.	1.00	1756	o	480	
Poltava	1300	1	.	1.00	1756	o	490	
Blenheim	34190	1	.	0.50	1756	i	500	
Ramillies	19000	1	.	1.00	1756	i	510	
Oudenarde	15000	1	.	1.00	1756	i	520	
Malplaquet	12000	1	.	1.00	1756	i	530	
Peterwardein	6000	1	.	1.00	1756	i	540	
Mollwitz	4850	1	.	0.50	1756	i	550	
Chotusitz	4819	1	.	1.00	1756	i	560	
Dettingen	4000	1	.	1.00	1756	i	570	
Fontenoy	6000	1	.	1.00	1756	i	580	
Hohenfriedberg	13176	1	.	1.00	1756	i	590	
Sohr	7444	1	.	0.50	1756	i	600	
Kesselsdorf	6630	1	.	1.00	1756	i	610	
Prestonpans	1800	1	.	1.00	1756	i	620	
Culloden	309	1	.	1.00	1756	i	630	
Lobositz	2873	1	.	1.00	1756	i	640	
Prague	13400	1	.	0.50	1858	i	650	
Plassey	63	1	.	1.00	1858	o	660	

Table 29. Dataset=lwdb01 data (part 3)

BATTLE	DATE	YEAR	ATT	DEF	V	X0	Y0	CASX
Kolin	18JUN1757	1757	Pr Army	Aus Arm	D	32000	44000	13768
Hastenbeck	26JUL1757	1757	Fr Army	Br Army	A	60000	36000	2500
Rossbach	05NOV1757	1757	Fr-Ger	Pr Army	D	42000	22000	10150
Leuthen	05DEC1757	1757	Pr Army	Aus Arm	A	33000	65000	11589
Crefeld	23JUN1758	1758	Br Alli	Fr Army	A	32000	50000	1800
Zorndorf	25AUG1758	1758	Pr Army	Russ Ar	A	36000	43300	12797
Hochkirch	14OCT1758	1758	Aus Arm	Pr Army	A	80000	31000	7587
Bergen	13APR1759	1759	Pr Alli	Fr Army	D	24000	30000	2800
Minden	01AUG1759	1759	Pr Alli	Fr Army	A	45000	60000	2762
Kunersdorf	12AUG1759	1759	Pr Army	Russ-Au	D	50900	59500	19100
Plains of Abraha	13SEP1759	1759	Fr Army	Br Army	D	4500	4800	1500
Maxen	20NOV1759	1759	Aus Arm	Pr Army	A	38000	13500	1000
Warburg	31JUL1760	1760	Pr Alli	Fr Army	A	19000	17000	1300
Liegnitz	15AUG1760	1760	Aus-Rus	Pr Army	D	30000	30000	6000
Torgau	03NOV1760	1760	Pr Army	Aus Arm	A	50000	53400	16670
Bunker Hill	17JUN1775	1775	Br Army	Am Patr	A	2650	3200	1054
Quebec	31DEC1775	1775	Am Army	Br Army	D	1100	1800	486
White Plains	28OCT1776	1776	Br Army	Am Army	A	13000	13000	313
Trenton	26DEC1776	1776	Am Army	Rall's	A	2420	1520	12
Princeton	03JAN1777	1777	Am Army	Br Army	A	4800	1200	44
Freeman's Farm	19SEP1777	1777	Br Army	Am Army		4400	7000	556
Germantown	04OCT1777	1777	Am Army	Br Army	D	11200	9000	1090

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Kolin	9000	1	.	0.50	1858	i	670	
Hastenbeck	1500	1	.	1.00	1858	i	680	
Rossbach	548	1	.	0.50	1858	i	690	
Leuthen	22000	1	.	0.50	1858	i	700	
Crefeld	8200	1	.	1.00	1858	i	710	
Zorndorf	18500	1	.	0.50	1858	i	720	
Hochkirch	9097	1	.	0.50	1858	i	730	
Bergen	1800	1	.	1.00	1858	i	740	
Minden	7086	1	.	1.00	1858	i	750	
Kunersdorf	15500	1	.	0.50	1858	i	760	
Plains of Abraha	650	1	.	0.50	1858	i	770	
Maxen	1000	1	.	1.00	1858	i	780	
Warburg	3700	1	.	1.00	1858	i	790	
Liegnitz	3600	1	.	0.50	1858	i	800	
Torgau	15697	1	.	0.50	1858	i	810	
Bunker Hill	479	1	.	0.50	1858	i	820	
Quebec	18	1	.	1.00	1858	i	830	
White Plains	150	1	.	1.00	1858	i	840	
Trenton	996	1	.	1.00	1858	i	850	
Princeton	215	1	.	1.00	1858	i	860	
Freeman's Farm	316	1	.	1.00	1858	i	870	
Germantown	551	1	.	1.00	1858	i	880	

Table 30. Dataset=lwdb01 data (part 4)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Bemis Heights	07OCT1777	1777	Br Army	Am Army	D	5000	11000	600
Monmouth Court H	28JUN1778	1778	Br Army	Am Army		13000	11000	358
Camden	16AUG1780	1780	Br Army	Am Army	A	2100	3050	324
Cowpens	17JAN1781	1781	Br Army	Am Army	D	1100	1025	929
Guilford Court H	15MAR1781	1781	Br Army	Am Army	A	1900	4449	532
Hobkirk's Hill	25APR1781	1781	Br Army	Am Army	A	900	1551	258
Eutaw Springs	08SEP1781	1781	Am Army	Br Army	D	2200	2000	554
Valmy	20SEP1792	1792	Allied	Fr Armi	D	34000	36000	350
Jemappes	06NOV1792	1792	Fr Army	Allied	A	40000	13000	3000
Neerwinden	18MAR1793	1793	Fr Army	Aus Arm	D	45000	43000	4000
Hondschoote	06SEP1793	1793	Fr Army	Br-Han	A	42000	13000	3000
Montenotte	12APR1796	1796	Fr Army	Aus Arm	A	9000	6000	500
Dego	14APR1796	1796	Fr Army	Aus Arm	A	15000	10000	1000
Wattignies	15OCT1793	1793	Fr Army	Aus Arm	A	44000	23000	4500
Fleurus	26JUN1794	1794	Aus Arm	Fr Army	D	46000	73000	4000
Lodi	10MAY1796	1796	French	Aus Arm	A	17000	10000	900
Castiglione	05AUG1796	1796	French	Aus Arm	A	30000	25000	1500
Neresheim	11AUG1796	1796	Aus Arm	Fr Army	A	40000	45000	3000
Wuerzburg	03SEP1796	1796	Aus Arm	Fr Army	A	44000	30000	1500
Arcola	15NOV1796	1796	Fr Army	Aus Arm	A	17300	12700	4500
Rivoli	14JAN1797	1797	Aus Arm	Fr Army	D	28000	20500	14000
Pyramids	21JUL1797	1797	Fr Army	Mameluk	A	25000	21000	300

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Bemis Heights	130	1	.	1.00	1858	i	890	
Monmouth Court H	362	1	.	1.00	1858	i	900	
Camden	1050	1	.	1.00	1858	i	910	
Cowpens	72	1	.	0.50	1858	i	920	
Guilford Court H	420	1	.	1.00	1858	i	930	
Hobkirk's Hill	420	1	.	1.00	1858	i	940	
Eutaw Springs	693	1	.	1.00	1858	i	950	
Valmy	400	1	.	1.00	1858	i	960	
Jemappes	2500	1	.	0.50	1858	i	970	
Neerwinden	3000	1	.	1.00	1858	i	980	
Hondschoote	3000	1	.	1.00	1858	i	990	
Montenotte	2500	1	.	1.00	1858	i	998	
Dego	3000	2	.	1.00	1858	i	999	
Wattignies	3000	2	.	0.50	1858	i	1000	
Fleurus	7000	1	.	1.00	1858	i	1010	
Lodi	1850	1	.	1.00	1858	i	1020	
Castiglione	3000	1	.	1.00	1858	i	1030	
Neresheim	3000	1	.	1.00	1858	i	1040	
Wuerzburg	3000	1	.	1.00	1858	i	1050	
Arcola	7000	3	.	1.00	1858	i	1060	
Rivoli	5000	2	.	1.00	1858	i	1070	
Pyramids	5000	1	.	1.00	1858	i	1080	

Table 31. Dataset=lwdb01 data (part 5)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Stockach I	25MAR1799	1799	Fr Army	Aus Arm	D	38000	50000	4500
Mt. Tabor	17APR1799	1799	Tk Army	Fr Army	D	35000	4500	6500
Zurich I	04JUN1799	1799	Aus Arm	Fr Army	D	40000	25000	3400
Novi	15AUG1799	1799	Allied	Fr Army	A	50000	35000	9000
Zurich III	25SEP1799	1799	Fr Army	Allied	A	35000	23000	4000
Moeskirch	05MAY1800	1800	Fr Army	Aus Arm	A	60000	60000	4000
Marengo	14JUN1800	1800	Aus Arm	Fr Army	D	31000	29000	11000
Hohenlinden	03DEC1800	1800	Aus Arm	Fr Army	D	57000	55000	20000
Austerlitz	02DEC1805	1805	Allied	Fr Army	D	85400	73200	27500
Jena	14OCT1806	1806	Fr Army	Pr Army	A	96000	53000	4000
Auerstadt	14OCT1806	1806	Pr Army	Fr III	D	63500	27000	20000
Eylau	08FEB1807	1807	Fr Army	Russ Ar		78000	80000	18500
Friedland	14JUN1807	1807	Fr Army	Russ Ar	A	80000	60000	8000
Vimeiro	21AUG1808	1808	Fr Army	Br-Port	D	13050	19600	1800
Corunna	16JAN1809	1809	Fr Army	Br Army	D	20600	14800	1600
Eckmuehl	22APR1809	1809	Aus Arm	Fr Army	D	7[illegible]000	66000	12000
Aspern-Essling	21MAY1809	1809	Aus Arm	Fr Army	A	99000	66000	23000
The Raab	14JUN1809	1809	Fr Army	Aus Arm	A	35000	37000	4000
Wagram	05JUL1809	1809	Fr Army	Aus Arm	A	140000	140000	34000
Talavera	28JUL1809	1809	Fr Army	Br, Sp	D	46000	54550	7300
Bussaco	27SEP1810	1810	Fr Army	Br, Por	D	65900	51910	4500
Fuentes de Onoro	05MAY1811	1811	Fr Army	Br, Por	D	48260	37360	2700

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Stockach I	6000	1	.	1.00	1858	i	1090	
Mt. Tabor	60	1	.	1.00	1858	o	1100	
Zurich I	1600	1	.	1.00	1858	i	1110	
Novi	11000	1	.	1.00	1858	i	1120	
Zurich III	8000	2	.	1.00	1858	i	1130	
Moeskirch	5000	1	.	1.00	1858	i	1140	
Marengo	7000	1	.	0.50	1858	i	1150	
Hohenlinden	2500	1	.	0.50	1858	i	1160	
Austerlitz	7000	1	.	0.50	1858	i	1170	
Jena	30000	1	.	1.00	1858	i	1180	
Auerstadt	4000	1	.	1.00	1858	i	1190	
Eylau	28000	1	.	0.50	1858	i	1200	
Friedland	25000	1	.	0.50	1858	i	1210	
Vimeiro	750	1	.	0.50	1858	i	1220	
Corunna	1000	1	.	0.50	1858	i	1230	
Eckmuehl	6000	1	.	0.50	1858	i	1240	
Aspern-Essling	21000	2	.	0.50	1858	i	1250	
The Raab	6211	1	.	1.00	1858	i	1260	
Wagram	45000	2	.	0.50	1858	i	1270	
Talavera	6700	1	.	0.50	1858	i	1280	
Bussaco	1300	1	.	0.50	1858	i	1290	
Fuentes de Onoro	1800	1	.	1.00	1858	i	1300	

Table 32. Dataset=lwdb01 data (part 6)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Albuera	16MAY1811	1811	Fr Army	Br, Por	D	23000	30000	8000
Salamanca	22JUL1812	1812	Br Alli	Fr Army	A	46000	42000	6000
Vittoria	21JUN1812	1812	Br Alli	Fr Army	A	79062	68024	5148
Borodino	07SEP1812	1812	Fr Army	Russ Ar	A	120000	120000	28000
Luetzen	02MAY1813	1813	Russ, P	Fr Army	D	93000	120000	18000
Bautzen	20MAY1813	1813	Fr Army	Pr, Rus	A	199000	97000	25000
Dresden	26AUG1813	1813	Allied	Fr Arm	D	170000	120000	40000
Leipzig	16OCT1813	1813	Allied	Fr Army	A	365000	196200	65000
Hanau	30OCT1813	1813	Fr Army	Bav Arm	A	60000	40000	5000
La Rothiere	01FEB1814	1814	Allied	Fr Army	A	110000	40000	6000
Laon	09MAR1814	1814	Fr Army	Allied	D	47600	85000	6000
Arcis-sur-Aube	20MAR1814	1814	Allied	Fr Army	A	80000	30000	3000
Ligny	16JUN1815	1815	Fr Army	Pr Army	A	67567	82895	12000
Quatre Bras	16JUN1815	1815	Fr Army	Br-Du A	D	26741	33765	4500
Waterloo	18JUN1815	1815	Fr Army	Allied	D	68265	137547	25000
The Thames	05OCT1813	1813	US Army	Br Army	A	3500	1800	29
Chippewa	05JUL1814	1814	Br Army	US Army	D	2100	2650	604
Lundy's Lane	25JUL1814	1814	US Army	Br Army	D	2000	3000	860
New Orleans	08JAN1815	1815	Br Army	US Army	D	6000	3200	2600
Boyaca	07AUG1819	1819	Patriot	Sp Army	A	3000	3000	66
Carabobo	25JUN1821	1821	Patriot	Sp Army	A	6400	5180	200
Bombona	07APR1822	1822	Patriot	Sp Army	A	1800	2200	531

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Albuera	7500	1	.	1.00	1858	i	1310	
Salamanca	13000	1	.	0.50	1858	i	1320	
Vittoria	7000	1	.	0.50	1858	i	1330	
Borodino	40000	1	.	0.50	1858	i	1340	
Luetzen	22000	1	.	0.50	1858	i	1350	
Bautzen	20000	2	.	0.50	1858	i	1360	
Dresden	10000	2	.	0.50	1858	i	1370	
Leipzig	60000	4	.	0.50	1858	i	1380	
Hanau	15000	2	.	1.00	1858	i	1390	
La Rothiere	6000	1	.	0.50	1858	i	1400	
Laon	4000	2	.	0.50	1858	i	1410	
Arcis-sur-Aube	5000	2	.	1.00	1858	i	1420	
Ligny	18000	1	.	1.00	1858	i	1430	
Quatre Bras	4500	1	.	1.00	1858	i	1440	
Waterloo	22500	1	.	0.50	1858	i	1450	
The Thames	668	1	.	1.00	1858	i	1460	
Chippewa	335	1	.	1.00	1858	i	1470	
Lundy's Lane	878	1	.	0.50	1858	i	1480	
New Orleans	71	1	.	1.00	1858	i	1490	
Boyaca	1800	1	.	1.00	1858	i	1500	
Carabobo	2908	1	.	1.00	1858	i	1510	
Bombona	250	1	.	1.00	1858	i	1520	

Table 33. Dataset=lwdb01 data (part 7)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Pichincha	24MAY1822	1822	Sp Army	Patriot	D	2500	2400	590
Junin	06AUG1824	1824	Patriot	Sp Army	A	2000	2000	145
Ayacucho	09DEC1824	1824	Sp Army	Patriot	D	9310	5780	2500
San Jacinto	21APR1836	1836	Texan V	Mex Arm	A	743	1600	39
Palo Alto	08MAY1846	1846	US Army	Mex Arm	A	2288	6000	48
Resaca de la Pal	09MAY1846	1846	US Army	Mex Arm	A	1700	5600	122
Buena Vista	22FEB1847	1847	Mex Arm	US Army	D	14000	4759	2000
Cerro Gordo	17APR1847	1847	US Army	Mex Arm	A	8500	12000	431
Contreras	20AUG1847	1847	US Army	Mex Arm	A	4500	4000	60
Churubusco	20AUG1847	1847	US Army	Mex Arm	A	8497	10500	996
Molino del Rey	08SEP1847	1847	US Army	Mex Arm	A	3100	12000	792
Chapultepec	13SEP1847	1847	US Army	Mex Arm	A	7180	15000	863
The Alma	20SEP1854	1854	Br, Fr,	Russ Ar	A	65000	36400	2562
Inkerman	05NOV1854	1854	Russ Ar	Br and	D	42000	16000	15187
Magenta	04JUN1859	1859	Fr and	Aus Arm	A	48090	61618	4530
Solferino	24JUN1859	1859	Fr and	Aus Arm	A	143000	130000	17400
Sadowa (Koeniggr	03JUL1866	1866	Pr Army	Aus and	A	220000	215000	9200
Custozza II	24JUN1866	1866	It Army	Aus Arm	D	90000	75000	8100
First Bull Run (	21JUL1861	1861	US Army	CS Army	D	35000	32500	2896
Wilson's Creek	10AUG1861	1861	US Army	CS Army	D	5400	10175	1235
Belmont	07NOV1861	1861	US Army	CS Army	A	3144	5000	607
Mill Springs	19JAN1862	1862	CS Army	US Army	D	4000	4000	533

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Pichincha	340	1	.	1.00	1858	i	1530	
Junin	464	1	.	1.00	1858	i	1540	
Ayacucho	919	1	.	1.00	1858	i	1550	
San Jacinto	1600	1	.	1.00	1858	i	1560	
Palo Alto	400	1	.	0.50	1858	i	1570	
Resaca de la Pal	600	1	.	1.00	1858	i	1580	
Buena Vista	746	2	.	0.50	1858	i	1590	
Cerro Gordo	4000	2	.	0.50	1858	i	1600	
Contreras	1513	1	.	0.50	1858	i	1610	
Churubusco	3124	1	.	1.00	1858	i	1620	
Molino del Rey	2700	1	.	1.00	1858	i	1630	
Chapultepec	1800	1	.	1.00	1858	i	1640	
The Alma	5709	1	.	0.50	1858	i	1650	
Inkerman	4105	1	.	0.50	1858	i	1660	
Magenta	10236	1	.	0.50	1913	i	1670	
Solferino	21800	1	.	0.50	1913	i	1680	
Sadowa (Koeniggr	44300	1	.	0.50	1913	i	1690	
Custozza II	5600	1	.	0.50	1913	i	1700	
First Bull Run (	1982	1	.	0.20	1913	i	1710	
Wilson's Creek	1095	1	.	0.50	1913	i	1720	
Belmont	642	1	.	1.00	1913	i	1730	
Mill Springs	262	1	.	1.00	1913	i	1740	

Table 34. Dataset=lwdb01 data (part 8)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Fort Donelson	15FEB1862	1862	CS Army	US Army	D	21000	27000	2000
Pea Ridge	07MAR1862	1862	CS Army	US Army	D	16202	10500	1300
Kernstown	23MAR1862	1862	CS Army	US Army	D	3087	7000	718
Shiloh	06APR1862	1862	CS Army	US Armi	D	40335	66812	10699
Front Royal	23MAY1862	1862	CS Vall	US 1st	A	16000	1063	35
First Wincester	25MAY1862	1862	CS Vall	US V Co	A	16000	7000	365
Cross Keys	08JUN1862	1862	US Army	CS Vall	D	10500	5000	684
Port Republic	09JUN1862	1862	CS Vall	US V Co	A	15000	3000	800
Seven Pines (Fai	31MAY1862	1862	CS Army	US Army	D	41816	41797	6100
Mechanicsville	26JUN1862	1862	CS Army	US Army	D	16808	15631	1484
Gaine's Mill	27JUN1862	1862	CS Army	US Army	D	57018	34214	8751
Glendale-Frayser	29JUN1862	1862	CS Army	US Army	D	86748	83345	4241
Malvern Hill	01JUL1862	1862	CS Army	US Army	D	82507	78902	5355
Cedar Mountain	09AUG1862	1862	US Army	CS Army	D	8030	16848	2353
Second Bull Run	29AUG1862	1862	US Army	CS Army	D	75696	48527	14462
South Mountain	14SEP1862	1862	US Army	CS Army	A	28480	17852	1813
Antietam (Sharps	17SEP1862	1862	US Army	CS Army	D	90000	46000	12410
Corinth	03OCT1862	1862	CS Army	US Army	D	22000	21147	4233
Perryville	08OCT1862	1862	US Army	CS Army		36940	16000	4211
Fredericksburg	13DEC1862	1862	US Army	CS Army	D	106007	72497	12653
Murfreesboro (St	31DEC1862	1862	CS Army	US Army		34732	41400	11739
Chancellorsville	01MAY1863	1863	US Army	CS Army	D	113000	60892	17278

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Fort Donelson	2609	1	.	1.00	1913	i	1750	
Pea Ridge	1384	2	.	0.50	1913	i	1760	
Kernstown	590	1	.	1.00	1913	i	1770	
Shiloh	13047	2	.	0.50	1913	i	1780	
Front Royal	904	1	.	1.00	1913	o	1790	
First Wincester	2126	1	.	1.00	1913	i	1800	
Cross Keys	288	1	.	1.00	1913	i	1810	
Port Republic	1018	1	.	1.00	1913	o	1820	
Seven Pines (Fai	5000	2	.	1.00	1913	i	1830	
Mechanicsville	361	1	.	1.00	1913	i	1840	
Gaine's Mill	6837	1	.	0.50	1913	i	1850	
Glendale-Frayser	4443	2	.	1.00	1913	i	1860	
Malvern Hill	3214	1	.	1.00	1913	i	1870	
Cedar Mountain	1338	1	.	0.50	1913	i	1880	
Second Bull Run	9474	2	.	0.50	1913	i	1890	
South Mountain	2685	1	.	1.00	1913	i	1900	
Antietam (Sharps	13700	1	.	0.20	1913	i	1910	
Corinth	2520	2	.	1.00	1913	i	1920	
Perryville	3396	1	.	0.50	1913	i	1930	
Fredericksburg	4656	1	.	0.20	1913	i	1940	
Murfreesboro (St	12906	2	.	1.00	1913	i	1950	
Chancellorsville	12821	4	.	0.20	1913	i	1960	

Table 35. Dataset=lwdb01 data (part 9)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Champion's Hill	16MAY1863	1863	US Army	CS Army	A	29373	20000	2441
Brandy Station	09JUN1863	1863	US Cav	CS Cav	A	12000	10000	900
Gettysburg	01JUL1863	1863	CS Army	US Army	D	75054	83289	28063
Chickamauga	19SEP1863	1863	CS Army	US Army	A	66326	58222	18454
Chattanooga	24NOV1863	1863	US Army	CS Army	A	61000	40000	5824
The Wilderness	05MAY1864	1864	US Army	CS Army	D	101895	61025	17666
Spotsylvania	08MAY1864	1864	US Army	CS Army	D	90000	50000	18399
New Market	15MAY1864	1864	CS Army	US Army	A	5000	5150	577
Cold Harbor	03JUN1864	1864	US Army	CS Army	D	107907	59000	11000
Kenesaw Mountain	27JUN1864	1864	US Army	CS Army	D	16225	17733	2051
Peachtree Creek	20JUL1864	1864	CS Army	US Army	D	18832	20139	2746
Atlanta	22JUL1864	1864	CS Army	US Army	D	36934	30477	8000
Petersburg	15JUN1864	1864	US Army	CS Pete	D	63797	41499	8150
Globe Tavern	18AUG1864	1864	US V Co	CS III	A	20289	14787	4455
Opequon Creek (T	19SEP1864	1864	US Army	CS II C	A	37711	17103	5018
Cedar Creek	19OCT1864	1864	CS II C	US Army	D	18410	30829	2910
Franklin	30NOV1864	1864	CS Army	US IV,	D	26897	27939	6252
Nashville	15DEC1864	1864	US Army	CS Army	A	49773	23207	3061
Bentonville	19MAR1865	1865	CS Army	US Army	D	27000	60000	2606
Dinwiddie Court	29MAR1865	1865	US Army	CS Army		45247	20030	2781
Five Forks	01APR1865	1865	US V Co	CS Pick	A	30000	10000	634
Selma	02APR1865	1865	US Cav	CS Cav	A	13500	7000	400

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Champion's Hill	3851	1	.	1.00	1913	i	1970	
Brandy Station	500	1	.	1.00	1913	i	1980	
Gettysburg	23049	3	.	0.50	1913	i	1990	
Chickamauga	16170	2	.	0.50	1913	i	2000	
Chattanooga	6667	2	.	0.25	1913	i	2010	
The Wilderness	7750	2	.	0.50	1913	i	2020	
Spotsylvania	10000	7	.	0.50	1913	i	2030	
New Market	831	1	.	1.00	1913	i	2040	
Cold Harbor	1500	1	.	0.50	1913	i	2050	
Kenesaw Mountain	442	1	.	0.50	1913	i	2060	
Peachtree Creek	1600	1	.	1.00	1913	i	2070	
Atlanta	3722	1	.	0.50	1913	i	2080	
Petersburg	4752	4	.	1.00	1913	i	2090	
Globe Tavern	1619	4	.	1.00	1913	i	2100	
Opequon Creek (T	3921	1	.	1.00	1913	i	2110	
Cedar Creek	5665	1	.	1.00	1913	i	2120	
Franklin	2326	1	.	0.20	1913	i	2130	
Nashville	5350	2	.	0.50	1913	i	2140	
Bentonville	1646	3	.	1.00	1913	i	2150	
Dinwiddie Court	1800	3	.	1.00	1913	i	2160	
Five Forks	6000	1	.	0.50	1913	i	2170	
Selma	4000	1	.	1.00	1913	i	2180	

Table 36. Dataset=lwdb01 data (part 10)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Sayler's Creek	06APR1865	1865	US VI C	CS Army	A	30000	21000	1180
Weissenburg	04AUG1870	1870	Ger Thi	Fr I Co	A	51000	6000	1600
Froeschwiller (W	06AUG1870	1870	Ger Thi	Fr Army	A	82000	41000	10700
Spichern	06AUG1870	1870	Ger Fir	Fr II C	A	42000	28000	4900
Mars la Tour	16AUG1870	1870	Ger Fir	Fr Army	A	91000	113000	16000
Gravelotte-St. P	18AUG1870	1870	Ger Fir	Fr Army	A	187000	113000	20200
Sedan	01SEP1870	1870	Ger Sec	Fr Army	A	200000	120000	9000
Coulmiers	09NOV1870	1870	Fr Army	Bav I C	A	60000	20000	1800
Orleans	02DEC1870	1870	Ger Sec	Fr Army	A	86000	116000	6300
Le Mans	11JAN1871	1871	Ger Sec	Fr Army	A	72000	88000	4000
Belfort	15JAN1871	1871	Fr Army	Ger Arm	D	110000	40000	8000
Isandhlwana	22JAN1879	1879	Zulu Ar	Br 24th	A	20000	1800	3000
Ulundi	04JUL1879	1879	Zulu Ar	Br Army	D	20000	5317	1500
Majuba Hill	27FEB1881	1881	Boer Ar	Br Army	A	1200	350	6
Tel el-Kebir	13SEP1882	1882	Br Army	Eg Army	A	17401	20000	469
Omdurman	01SEP1898	1898	Mahdist	Br Army	D	55000	25800	30700
Adowa	01MAR1896	1896	Eth Arm	It Army	A	120000	20251	17000
Modder River	28NOV1899	1899	Br Army	Boer Ar	A	8000	3500	468
Magersfontein	11DEC1899	1899	Br Army	Boer Ar	D	15000	9000	948
Colenso	15DEC1899	1899	Br Army	Boer Ar	D	13411	5500	1126
Spion Kop	04JAN1900	1900	Br Army	Boer Ar	D	24000	5000	1734
Paardeberg	18FEB1900	1900	Br Army	Boer Ar		15000	4000	1270

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Sayler's Creek	7000	1	.	1.00	1913	i	2190	
Weissenburg	2100	1	.	1.00	1913	o	2200	
Froeschwiller (W	20300	1	.	0.50	1913	i	2210	
Spichern	3100	1	.	0.50	1913	i	2220	
Mars la Tour	14000	1	.	0.50	1913	i	2230	
Gravelotte-St. P	12800	1	.	0.50	1913	i	2240	
Sedan	38000	1	.	0.50	1913	i	2250	
Coulmiers	1800	1	.	1.00	1913	i	2260	
Orleans	28000	3	.	0.50	1913	i	2270	
Le Mans	26000	2	.	1.00	1913	i	2280	
Belfort	2000	3	.	1.00	1913	i	2290	
Isandhlwana	1445	1	.	1.00	1913	o	2300	
Ulundi	100	1	.	1.00	1913	o	2310	
Majuba Hill	284	1	.	1.00	1913	o	2320	
Tel el-Kebir	2500	1	.	1.00	1913	i	2330	
Omdurman	482	1	.	1.00	1913	o	2340	
Adowa	9678	1	.	1.00	1913	o	2350	
Modder River	150	1	.	1.00	1913	i	2360	
Magersfontein	236	1	.	1.00	1913	i	2370	
Colenso	50	1	.	1.00	1913	o	2380	
Spion Kop	335	1	.	1.00	1913	o	2390	
Paardeberg	350	1	.	1.00	1913	i	2400	

Table 37. Dataset=lwdb01 data (part 11)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
San Juan-El Cane	01JUL1898	1898	US V Co	Sp Army	A	15065	1592	1572
The Yalu	30APR1904	1904	Jap Fir	Russ Ar	A	56000	18000	1100
Telissu	14JUN1904	1904	Jap Sec	Russ Ar	A	36000	38000	1200
Liaoyang	25AUG1904	1904	Jap Arm	Russ Ar	A	135000	150000	17500
The Sha-Ho	05OCT1904	1904	Russ Ar	Jap Arm	D	210000	145000	46000
Sandepu	26JAN1905	1905	Russ Ar	Jap Arm	D	58000	40000	13000
Mukden	21FEB1905	1905	Jap Arm	Russ Ar	A	314000	310000	41000
Kumanovo	23OCT1912	1912	Serb Fi	Tk Army	A	103000	110000	5000
Lule' Burgas	28OCT1912	1912	Bul Arm	Tk Army	A	140000	110000	20000
Prelip	01NOV1912	1912	Serb Fi	Tk Army	A	50000	20000	3000
Monastir	16NOV1912	1912	Serb Ar	Tk Army	A	120000	90000	5000
Adrianople	23MAR1913	1913	Bul Sec	The Adr	A	152000	75000	9300
Warsaw	14AUG1920	1920	Pol Arm	Sov Arm	A	160000	200000	50000
The Nieman	23SEP1920	1920	Pol Arm	Sov Arm	A	80000	108500	20000
Guadalajara-Brih	11MAR1937	1937	It Vol	Sp Rep	D	52000	100000	6460
Changkufeng/Shac	30JUL1938	1938	Jap I/7	Sov 59t	A	1410	1460	178
Hill 52/Shachaof	02AUG1938	1938	Sov 40t	Jap 19t	D	4000	3010	400
Changkufeng/Hill	06AUG1938	1938	Sov Spe	Jap 19t	D	20000	8000	4000
Nomonhan: Openin	28MAY1939	1939	Jap 64t	Sov 11t		1300	1228	278
Nomonhan: Soviet	20AUG1939	1939	Sov Fir	Jap Six	A	57000	30000	10000
Suomussalmi	11DEC1939	1939	Fin 9th	Sov 163	A	9000	29954	2670

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
San Juan-El Cane	850	1	.	1.00	1913	o	2410	
The Yalu	2500	2	.	1.00	1913	i	2420	
Telissu	3800	2	.	0.50	1913	i	2430	
Liaoyang	16500	10	.	1.00	1913	i	2440	
The Sha-Ho	17000	14	.	1.00	1913	i	2450	
Sandepu	9400	2	.	1.00	1913	i	2460	
Mukden	96500	18	.	1.00	1913	i	2470	
Kumanovo	10000	2	.	1.00	1913	i	2480	
Lule' Burgas	30000	5	.	1.00	1913	i	2490	
Prelip	6000	2	.	1.00	1913	i	2500	
Monastir	20000	3	.	1.00	1913	i	2510	
Adrianople	15000	3	.	1.00	1913	i	2520	
Warsaw	150000	12	.	1.00	1936	i	2530	
The Nieman	50000	6	.	1.00	1936	i	2540	
Guadalajara-Brih	6660	5	.	1.00	1955	i	2550	
Changkufeng/Shac	350	1	.	1.00	1955	i	2560	
Hill 52/Shachaof	41	2	.	1.00	1955	i	2570	
Changkufeng/Hill	1100	5	.	1.00	1955	i	2580	
Nomonhan: Openin	250	2	.	1.00	1955	i	2590	
Nomonhan: Soviet	11500	12	.	1.00	1955	i	2600	
Suomussalmi	19600	29	.	1.00	1955	o	2610	

Table 38. Dataset=lwdb02 data

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Alsace-Lorraine	15AUG1914	1914	Fr Firs	Ger Six	D	457000	345000	65340
Alsace-Lorraine	20AUG1914	1914	Ger Six	Fr Firs	A	350000	400000	11000
The Ardennes	22AUG1914	1914	Fr Thir	Ger Fou	D	360000	400000	17196
The Sambre	22AUG1914	1914	Ger Sec	Fr Fift	A	440000	254000	21018
Mons	23AUG1914	1914	Ger Fir	Br Expe	A	260000	70000	6210
Le Cateau	26AUG1914	1914	Ger Fir	Br Expe	A	250000	40000	8970
Guise	29AUG1914	1914	Ger Sec	Fr Fift		260000	200000	12000
Heights of Nancy	03SEP1914	1914	Ger Six	Fr Firs	D	350000	276000	75000
Ourcq I	05SEP1914	1914	Fr Sixt	Ger IV		100000	45000	5600
Ourcq II	06SEP1914	1914	Fr Sixt	Ger Fir		198000	157000	40000
Petit Morin	06SEP1914	1914	Fr Fift	Ger Sec	A	227000	82000	45000
Two Morins	06SEP1914	1914	Br Expe	Ger Fir	A	90000	13000	2500
Marshes of St. G	06SEP1914	1914	Ger Sec	Fr Nint	D	101000	141000	25000
Vitry le Francoi	06SEP1914	1914	Ger Thi	Fr Four	D	113000	170000	26000
Gap of Revigny	06SEP1914	1914	Ger Fif	Fr Thir	D	142000	180000	29000
The Aisne	13SEP1914	1914	Fr Fift	Ger Fir	D	343000	290000	50000
Stalluponen	17AUG1914	1914	Russ II	Ger I C	D	50000	40000	3500
Gumbinnen	20AUG1914	1914	Ger Eig	Russ Fi		120000	150000	20000
Tannenberg	26AUG1914	1914	Ger Eig	Russ Fi	A	187000	160000	13212
Masurian Lakes	09SEP1914	1914	Ger Eig	Russ Fi	A	288600	273000	40000
Krasnik	23AUG1914	1914	Aus Fir	Russ Fo	A	350000	260000	50000
Komarov	26AUG1914	1914	Aus Fou	Russ Fi	A	300000	260000	40000

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Alsace-Lorraine	32880	5	.	1.00	1936	i	2620	
Alsace-Lorraine	21780	2	.	1.00	1936	i	2630	
The Ardennes	12720	2	.	1.00	1936	i	2640	
The Sambre	8000	2	.	1.00	1936	i	2650	
Mons	1638	1	.	1.00	1936	i	2660	
Le Cateau	7800	1	.	1.00	1936	i	2670	
Guise	8000	1	.	1.00	1936	i	2680	
Heights of Nancy	52000	5	.	1.00	1936	i	2690	
Ourcq I	2500	1	.	1.00	1936	i	2700	
Ourcq II	39000	4	.	1.00	1936	i	2710	
Petit Morin	19000	4	.	1.00	1936	i	2720	
Two Morins	3500	4	.	1.00	1936	i	2730	
Marshes of St. G	29000	4	.	1.00	1936	i	2740	
Vitry le Francoi	27000	4	.	1.00	1936	i	2750	
Gap of Revigny	29000	4	.	1.00	1936	i	2760	
The Aisne	30000	6	.	1.00	1936	i	2770	
Stalluponen	2000	1	.	1.00	1936	i	2780	
Gumbinnen	20000	1	.	1.00	1936	i	2790	
Tannenberg	120000	4	.	1.00	1936	i	2800	
Masurian Lakes	125000	5	.	1.00	1936	i	2810	
Krasnik	50000	3	.	1.00	1936	i	2820	
Komarov	90000	5	.	1.00	1936	i	2830	

Table 39. Dataset=lwdb02 data (part 2)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Gnila Lipa	26AUG1914	1914	Aus Thi	Russ Th	D	240000	480000	76000
Rava Russka	03SEP1914	1914	Aus Sec	Russ Th	D	900000	936000	180000
Lodz	12NOV1914	1914	Ger Nin	Russ No	A	260000	400000	60000
The Jadar	12AUG1914	1914	Aus Sec	Serb Fi	D	200000	200000	34000
The Kolubra	03DEC1914	1914	Serb Fi	Aus Fif	A	200000	300000	45000
Eastern Champagn	15FEB1915	1915	Fr Four	Ger Thi	D	163182	85220	42820
Neuve Chapelle	10MAR1915	1915	Br Firs	Ger Six	D	87000	40000	12892
Ypres II	22APR1915	1915	Ger Fou	Br Seco	D	150000	190000	35000
Festubert	16MAY1915	1915	Br Firs	Ger Six	D	90365	30000	16648
Loos	25SEP1915	1915	Br Firs	Ger Six	D	298437	75000	61713
Winter Battle	07FEB1915	1915	Ger Eig	Russ Te	A	650000	300000	135000
Gorlice-Tarnow (	02MAY1915	1915	Ger Ele	Russ Th	A	216000	219000	36000
First Isonzo	23JUN1915	1915	It Seco	Aus Fif	D	200000	100000	14947
Second Isonzo	18JUL1915	1915	It Seco	Aus Fif	D	200000	128500	41866
Third Isonzo	18OCT1915	1915	It Seco	Aus Fif	D	356000	157000	67008
Fourth Isonzo	10NOV1915	1915	It Seco	Aus Fif	D	311000	136000	48967
First Dardanelle	25APR1915	1915	Allied	Tk Fift		32000	10000	5400
Suvla Bay	07AUG1915	1915	Br 7th,	Tk 7th	D	25000	15800	9000
Kut-el-Amara	27SEP1915	1915	Br Mes	Tk Army	A	11000	11300	1230
Ctesiphon	22NOV1915	1915	Br Mes	Tk Army	D	13756	20400	4593
First Somme	22NOV1915	1915	Br Four	Ger Sec	D	600000	300000	670000
Somme, Fourth Ar	01JUL1916	1916	Br Four	Ger Sec	D	290000	95000	57450

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Gnila Lipa	35000	5	.	1.00	1936	o	2840	
Rava Russka	62000	8	.	1.00	1936	i	2850	
Lodz	95000	13	.	1.00	1936	i	2860	
The Jadar	18000	8	.	1.00	1936	i	2870	
The Kolubra	92000	7	.	1.00	1936	i	2880	
Eastern Champagn	23050	30	.	1.00	1936	i	2890	
Neuve Chapelle	12000	4	.	1.00	1936	i	2900	
Ypres II	70000	33	.	1.00	1936	i	2910	
Festubert	5000	11	.	1.00	1936	i	2920	
Loos	19836	20	.	1.00	1936	i	2930	
Winter Battle	210000	15	.	1.00	1936	i	2940	
Gorlice-Tarnow (	153654	3	.	1.00	1936	i	2950	
First Isonzo	9958	15	.	1.00	1936	i	2960	
Second Isonzo	46640	17	.	1.00	1936	i	2970	
Third Isonzo	31474	18	.	1.00	1936	i	2980	
Fourth Isonzo	40217	23	.	1.00	1936	i	2990	
First Dardanelle	3900	1	.	1.00	1936	i	3000	
Suvla Bay	750	4	.	1.00	1936	i	3010	
Kut-el-Amara	5300	2	.	1.00	1936	i	3020	
Ctesiphon	6188	3	.	1.00	1936	i	3030	
First Somme	500000	116	.	1.00	1936	i	3040	
Somme, Fourth Ar	8000	1	.	1.00	1936	i	3050	

Table 40. Dataset=lwdb02 data (part 3)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Somme, Ovillers	01JUL1916	1916	Br 8th	Ger 180	D	11300	2800	5121
Somme, Bazentin	14JUL1916	1916	Br Four	Ger 3d		45000	15000	9000
Somme, Flers-Cou	15SEP1916	1916	Br Four	Ger Fir	A	190000	90000	3500
Caucasus Winter	10JAN1916	1916	Russ Ar	Tk Thir	A	103000	61000	8000
Lake Narotch	18MAR1916	1916	Russ Se	Ger Ten	D	350000	180000	100000
1916 Brusilov Of	04JUN1916	1916	Russ So	Aus Sec	A	600000	500000	495000
Fifth Isonzo	11MAR1916	1916	It Seco	Aus Fif	D	300000	160000	3800
Asiago	15MAY1916	1916	Aus Thi	It Firs	A	213000	118000	41264
Trentino Counter	16JUN1916	1916	It Fift	Aus Thi	A	200000	172000	72000
Sixth Isonzo (Go	06AUG1916	1916	It Seco	Aus Fif	A	308000	168000	51232
Arras	09APR1917	1917	Br Firs	Ger Six		276000	120000	83379
Aisne II	16APR1917	1917	Fr Fift	Ger Fir	D	1000000	480000	118000
Messines	07JUN1917	1917	Br Seco	Ger Fou	A	180000	100000	17000
Ypres III	31JUL1917	1917	Br Seco	Ger Fou	D	380000	200000	399821
Cambrai I	20NOV1917	1917	Br Thir	Ger Sec	A	90000	75000	15000
Cambrai II	30NOV1917	1917	Ger Sec	Br Thir	A	130000	90000	28000
Tenth Isonzo	12MAY1917	1917	It Seco	Aus Fif	A	280000	165000	157000
Eleventh Isonzo	18AUG1917	1917	It Seco	Aus Fif	A	518000	252000	166000
Caporetto	24OCT1917	1917	Aus Fif	It Seco	A	602000	574000	20000
Tigris Crossing	22FEB1917	1917	Br I, I	Tk U/I	A	46000	10500	2750
Gaza I	26MAR1917	1917	Br Army	Tk Eigh	D	25000	26000	4000
Gaza II	17APR1917	1917	Br Army	Tk Army	D	25000	20000	6400

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Somme, Ovillers	281	1	.	1.00	1936	i	3060	
Somme, Bazentin	4000	1	.	1.00	1936	i	3070	
Somme, Flers-Cou	3000	1	.	1.00	1936	i	3080	
Caucasus Winter	25000	7	.	1.00	1936	i	3090	
Lake Narotch	20000	9	.	1.00	1936	i	3100	
1916 Brusilov Of	260000	34	.	1.00	1936	i	3110	
Fifth Isonzo	1985	5	.	1.00	1936	i	3120	
Asiago	74887	27	.	1.00	1936	i	3130	
Trentino Counter	29000	24	.	1.00	1936	i	3140	
Sixth Isonzo (Go	41835	12	.	1.00	1936	i	3150	
Arras	75000	15	.	1.00	1936	i	3160	
Aisne II	40000	15	.	1.00	1936	i	3170	
Messines	32500	8	.	1.00	1936	i	3180	
Ypres III	270710	130	.	1.00	1936	i	3190	
Cambrai I	25000	7	.	1.00	1936	i	3200	
Cambrai II	29000	4	.	1.00	1936	i	3210	
Tenth Isonzo	75700	25	.	1.00	1936	i	3220	
Eleventh Isonzo	85000	29	.	1.00	1936	i	3230	
Caporetto	305000	31	.	1.00	1936	i	3240	
Tigris Crossing	4300	3	.	1.00	1936	i	3250	
Gaza I	2450	2	.	1.00	1936	i	3260	
Gaza II	2000	3	.	1.00	1936	i	3270	

Table 41. Dataset=lwdb02 data (part 4)

BATTLE	DATE	YEAR	ATT	DEF	V	X0	Y0	CASX
Gaza III	31OCT1917	1917	Br Army	Tk Seve	A	72000	34400	2696
Junction Station	13NOV1917	1917	Br Army	Tk Eigh	A	85000	15500	4000
Second Somme: Ph	21MAR1918	1918	Ger Sec	Br Firs	A	800000	400000	70000
Second Somme: Ph	27MAR1918	1918	Ger Sec	Br Firs		700000	600000	133000
Lys	09APR1918	1918	Ger Fou	Br Firs	A	500000	400000	175000
Yvonne & Odette	13APR1918	1918	Ger Spe	US Cos.	A	3072	650	71
Chemin des Dames	27MAY1918	1918	Ger Fir	Fr Sixt	D	250000	75000	118000
Cantigny	21MAY1918	1918	US 1st	Ger 1/2	A	8679	725	300
Belleau Wood	06JUN1918	1918	US 4th	Ger IV		9437	6436	1087
Hill 142	06JUN1918	1918	US 5th	Ger 2/2	A	2913	1458	383
West Wood I	06JUN1918	1918	US 3/5t	Ger 1/4	D	1740	1121	361
Bouresches I	06JUN1918	1918	US 6th	Ger 2/4		2733	1352	343
Hill 192	06JUN1918	1918	US 23d	Ger 1/4	D	3608	3955	340
West Wood II	11JUN1918	1918	US 2/5t	Ger 1/4	A	3343	1798	279
North Wood I, "H	12JUN1918	1918	US 2/5t	Ger 2/1	A	1747	1952	167
Bouresches II	13JUN1918	1918	Ger 109	US 3/5t	D	3690	2629	138
North Wood II	21JUN1918	1918	US 1/7t	Ger 3/3	D	1697	1428	192
North Wood III	23JUN1918	1918	US 3/5t	Ger 1/3	D	1256	1565	133
North Wood IV	25JUN1918	1918	US 3/5t	Ger 1/3	A	4453	1546	273
Vaux	01JUL1918	1918	US 3d B	Ger 201	A	12812	10358	336
La Roche Wood Ea	01JUL1918	1918	US 2/9t	Ger 1/4	A	4515	5182	94
La Roche Wood We	01JUL1918	1918	US 3/23	Ger 2/4	A	4508	5177	223

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Gaza III	2950	7	.	1.00	1936	i	3280	
Junction Station	4800	2	.	1.00	1936	i	3290	
Second Somme: Ph	120000	6	.	1.00	1936	i	3300	
Second Somme: Ph	140000	14	.	1.00	1936	i	3310	
Lys	152500	22	.	1.00	1936	i	3320	
Yvonne & Odette	72	1	.	1.00	1936	i	3330	
Chemin des Dames	128000	8	.	1.00	1936	i	3340	
Cantigny	386	1	.	1.00	1936	o	3350	
Belleau Wood	730	1	.	1.00	1936	i	3360	
Hill 142	471	1	.	1.00	1936	i	3370	
West Wood I	54	1	.	1.00	1936	i	3380	
Bouresches I	186	1	.	1.00	1936	i	3390	
Hill 192	87	1	.	1.00	1936	i	3400	
West Wood II	541	1	.	1.00	1936	i	3410	
North Wood I, "H	293	1	.	1.00	1936	i	3420	
Bouresches II	107	1	.	1.00	1936	i	3430	
North Wood II	18	1	.	1.00	1936	i	3440	
North Wood III	19	1	.	1.00	1936	i	3450	
North Wood IV	437	1	.	1.00	1936	i	3460	
Vaux	1074	1	.	1.00	1936	i	3470	
La Roche Wood Ea	568	1	.	1.00	1936	i	3480	
La Roche Wood We	506	1	.	1.00	1936	i	3490	

Table 42. Dataset=lwdb02 data (part 5)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Noyon-Montdidier	09JUN1918	1918	Ger Eig	Fr Thir	D	275000	300000	80000
Champagne-Marne	15JUL1918	1918	Ger Sev	Fr Sixt	D	400000	450000	100000
Aisne-Marne I	18JUL1918	1918	Fr Tent	Ger Nin	A	750000	450000	55000
Missy aux Bois R	18JUL1918	1918	US 26th	Ger 13t	A	5004	3013	393
Breuil	18JUL1918	1918	US 28th	Ger 22d	A	5039	2663	448
St. Amand Farm	18JUL1918	1918	US 2/28	Ger 2/3	A	1150	400	120
Beaurepaire Farm	18JUL1918	1918	US 2/23	Ger 3/2	A	4480	565	125
Cravancon Ferme-	18JUL1918	1918	US 1st	Ger 3d	A	10345	2420	895
Chaudun	18JUL1918	1918	US 3/18	Ger 2/1	A	1611	800	130
Aisne-Marne II	20JUL1918	1918	Fr Fift	Ger Sev	A	725000	400000	195000
Berzy le Sec	21JUL1918	1918	US 28th	Ger 109	A	4000	350	210
Buzancy Ridge	21JUL1918	1918	US 18th	Ger 2/5	A	5300	554	350
Picardy 1918, Ph	08AUG1918	1918	Br Firs	Ger Sec	A	225000	170000	10000
Picardy 1918, Ph	21AUG1918	1918	Br Firs	Ger Sec	A	300000	200000	35000
St. Mihiel	12SEP1918	1918	US Firs	Ger Arm	A	400000	100000	7000
Lahayville-Bois	12SEP1918	1918	US 2d I	Ger 47t	A	13208	2090	185
Meuse-Argonne, P	26SEP1918	1918	US Firs	Ger Thi	A	300000	190000	22128
Blanc-Mont I	03OCT1918	1918	US 2d D	Ger XII	A	26000	13000	4700
Medeah Farm	03OCT1918	1918	US 2/9t	Ger 1/2	A	1921	155	247
Essen Hook	03OCT1918	1918	US 1/5t	Ger 2d	A	1420	216	140
Blanc Mont Ridge	03OCT1918	1918	US 2/6t	Ger 2/1	A	1400	458	308
Sommepy Wood	03OCT1918	1918	US 4th	Ger 2/2	A	9230	670	620

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Noyon-Montdidier	35466	5	.	1.00	1936	i	3500	
Champagne-Marne	40000	3	.	1.00	1936	i	3510	
Aisne-Marne I	50000	2	.	1.00	1936	i	3520	
Missy aux Bois R	1853	1	.	1.00	1936	i	3530	
Breuil	1243	1	.	1.00	1936	i	3540	
St. Amand Farm	400	1	.	1.00	1936	i	3550	
Beaurepaire Farm	181	1	.	1.00	1936	i	3560	
Cravancon Ferme-	1610	1	.	1.00	1936	i	3570	
Chaudun	500	1	.	1.00	1936	i	3580	
Aisne-Marne II	170000	13	.	1.00	1936	i	3590	
Berzy le Sec	116	1	.	1.00	1936	o	3600	
Buzancy Ridge	276	1	.	1.00	1936	o	3610	
Picardy 1918, Ph	30000	4	.	1.00	1936	i	3620	
Picardy 1918, Ph	80000	15	.	1.00	1936	i	3630	
St. Mihiel	20000	4	.	1.00	1936	i	3640	
Lahayville-Bois	1076	1	.	1.00	1936	i	3650	
Meuse-Argonne, P	21448	8	.	1.00	1936	i	3660	
Blanc-Mont I	4000	4	.	1.00	1936	i	3670	
Medeah Farm	83	1	.	1.00	1936	o	3680	
Essen Hook	120	1	.	1.00	1936	i	3690	
Blanc Mont Ridge	241	1	.	1.00	1936	i	3700	
Sommepy Wood	450	1	.	1.00	1936	o	3710	

Table 43. Dataset=lwdb02 data (part 6)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Blanc Mont II	08OCT1918	1918	US 36th	Ger 213		18000	10000	1589
Meuse-Argonne, P	04OCT1918	1918	Fr Four	Ger Thi	A	500000	300000	77448
Exermont-Montref	04OCT1918	1918	US 18th	Ger 3d		5336	3245	352
Mayache Ravine	04OCT1918	1918	US 26th	Ger 2/1		5427	1899	376
La Neuville le C	04OCT1918	1918	US 28th	Ger 1/1	A	5365	1940	340
Ferme des Grange	04OCT1918	1918	US 16th	Ger 3d	A	5461	2587	242
Hill 212	05OCT1918	1918	US 26th	Ger 170	A	5022	3355	301
Bois de Boyon-Mo	05OCT1918	1918	US 18th	Ger 150	A	4778	2925	132
Hill 272	09OCT1918	1918	US 1/16	Ger 147	A	2950	2563	109
Meuse-Argonne, P	01NOV1918	1918	Fr Four	Ger Thi	A	600000	380140	30426
Remilly-Allicour	06NOV1918	1918	US 1/16	Ger 6th	A	1210	296	25
Hill 252-Pont Ma	07NOV1918	1918	US 16th	Ger 14t	A	1989	1655	110
The Piave	15JUN1918	1918	Aus Con	It Army	D	840000	784000	150000
Megiddo	19SEP1918	1918	Br XXI	Tk Eigh	A	51170	18250	3378
Alam Halfa	31AUG1942	1942	Ger-It	Br Eigh	D	124000	120000	2940
El Alamein II	23OCT1942	1942	Br Eigh	Ger-It	A	220476	105223	13560
Operation "Light	23OCT1942	1942	Br Eigh	Ger-It	A	220476	105223	6140
Alamein Bridgehe	26OCT1942	1942	Br Eigh	Ger-It	A	214336	101528	3000
Operation "Super	02NOV1942	1942	Br Eigh	Ger-It	A	211000	97000	4420
Chouigui Pass	26NOV1942	1942	Ger 190	US 1st	D	465	188	27
El Guettar	23MAR1943	1943	Ger 10t	US 1st	D	10300	22019	450
Sedjenane-Bizert	23APR1943	1943	US 9th	Ger von	A	24098	5000	1120

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Blanc Mont II	500	1	.	1.00	1936	i	3720	
Meuse-Argonne, P	75068	28	.	1.00	1936	i	3730	
Exermont-Montref	192	1	.	1.00	1936	i	3740	
Mayache Ravine	114	1	.	1.00	1936	i	3750	
La Neuville le C	61	1	.	1.00	1936	i	3760	
Ferme des Grange	250	1	.	1.00	1936	i	3770	
Hill 212	173	1	.	1.00	1936	i	3780	
Bois de Boyon-Mo	136	1	.	1.00	1936	i	3790	
Hill 272	250	1	.	1.00	1936	i	3800	
Meuse-Argonne, P	29491	11	.	1.00	1936	i	3810	
Remilly-Allicour	30	1	.	1.00	1936	i	3820	
Hill 252-Pont Ma	182	1	.	1.00	1936	i	3830	
The Piave	69079	8	.	1.00	1936	i	3840	
Megiddo	7000	2	.	1.00	1936	i	3850	
Alam Halfa	1750	3	.	1.00	1955	i	3860	
El Alamein II	15995	13	.	1.00	1955	i	3870	
Operation "Light	3695	3	.	1.00	1955	i	3880	
Alamein Bridgehe	4500	7	.	1.00	1955	i	3890	
Operation "Super	7800	3	.	1.00	1955	i	3900	
Chouigui Pass	21	1	.	1.00	1955	i	3910	
El Guettar	203	1	.	1.00	1955	i	3920	
Sedjenane-Bizert	605	11	.	1.00	1955	i	3930	

Table 44. Dataset=lwdb02 data (part 7)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Amphitheater	09SEP1943	1943	Br 56th	Ger 16t	A	12917	4250	1154
Port of Salerno	09SEP1943	1943	Br 46th	Ger 16t	A	12917	4250	1530
Sele-Calore Corr	11SEP1943	1943	US 45th	Ger 16t	D	12447	8390	251
Battipaglia I	12SEP1943	1943	Ger 16t	Br 56th	D	14730	11230	1112
Vietri I	12SEP1943	1943	Ger Her	Br 46th	D	15000	12917	900
Tobacco Factory	13SEP1943	1943	Ger 16t	US 45th	D	14733	12691	702
Battipaglia II	17SEP1943	1943	Br 56th	Ger 26	A	14730	6995	300
Eboli	17SEP1943	1943	US 45th	Ger 26t	A	15576	6702	386
Vietri II	17SEP1943	1943	Ger Her	Br 46th	D	13300	18912	400
Grazzanise	12OCT1943	1943	Br 7th	Ger 15t	A	14557	8068	370
Caiazzo	13OCT1943	1943	US 34th	Ger 3d	A	18210	6435	140
Capua	13OCT1943	1943	Br 56th	Ger Her	D	16857	8000	420
Castel Volturo	13OCT1943	1943	Br 46th	Ger 15t	A	17765	8158	500
Monte Acero	13OCT1943	1943	US 45th	Ger 3d	A	21265	6435	133
Triflisco	13OCT1943	1943	US 3d I	Ger Her	A	18476	7250	267
Dragoni	15OCT1943	1943	US 34th	Ger 3d	D	17034	5152	65
Canal I	17OCT1943	1943	Br 7th	Ger 15t	A	14600	8138	125
Monte Grande (Vo	16OCT1943	1943	Br 56th	Ger Her	A	16400	7239	200
Canal II	18OCT1943	1943	Br 46th	Ger 15t	A	17500	8128	220
Francolise	20OCT1943	1943	Br 7th	Ger 15t	D	14000	8088	75
Santa Maria Oliv	04NOV1943	1943	US 34th	Ger 3d	A	16870	6321	416
Monte Camino I	05NOV1943	1943	Br 56th	Ger 15t	D	19513	6750	240

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Amphitheater	100	3	.	1.00	1955	i	3940	
Port of Salerno	120	3	.	1.00	1955	i	3950	
Sele-Calore Corr	60	1	.	1.00	1955	i	3960	
Battipaglia I	1639	4	.	1.00	1955	i	3970	
Vietri I	1164	4	.	1.00	1955	i	3980	
Tobacco Factory	317	2	.	1.00	1955	i	3990	
Battipaglia II	110	2	.	1.00	1955	i	4000	
Eboli	120	2	.	1.00	1955	i	4010	
Vietri II	255	2	.	1.00	1955	i	4020	
Grazzanise	80	3	.	1.00	1955	i	4030	
Caiazzo	52	2	.	1.00	1955	i	4040	
Capua	94	1	.	1.00	1955	i	4050	
Castel Volturo	40	3	.	1.00	1955	i	4060	
Monte Acero	130	2	.	1.00	1955	i	4070	
Triflisco	76	2	.	1.00	1955	i	4080	
Dragoni	103	3	.	1.00	1955	i	4090	
Canal I	45	2	.	1.00	1955	i	4100	
Monte Grande (Vo	66	2	.	1.00	1955	i	4110	
Canal II	138	3	.	1.00	1955	i	4120	
Francolise	44	3	.	1.00	1955	i	4130	
Santa Maria Oliv	185	2	.	1.00	1955	i	4140	
Monte Camino I	33	3	.	1.00	1955	i	4150	

Table 45. Dataset=lwdb02 data (part 8)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Monte Lungo	06NOV1943	1943	US 3d I	Ger 3d	D	16600	6566	361
Pozzilli	06NOV1943	1943	US 45th	Ger 3d	D	17404	6566	155
Monte Camino II	08NOV1943	1943	Ger 15t	Br 56th	A	7942	5200	34
Monte Rotondo	08NOV1943	1943	US 3d I	Ger 3d		16350	7942	165
Calabritto	01DEC1943	1943	Br 46th	Ger 15t	D	17765	7588	250
Monte Camino III	02DEC1943	1943	Br 56th	Ger 15t	A	20744	3288	550
Monte Maggiore	02DEC1943	1943	US 36th	Ger 15t	A	5551	3288	80
Aprilia I	25JAN1944	1944	Br 1st	Ger 3d	A	19350	6750	1158
The Factory	27JAN1944	1944	Ger 3d	Br 1st	D	15317	17976	366
Campoleone	29JAN1944	1944	Br 1st	Ger 3d	A	17766	15098	742
Campoleone Count	03FEB1944	1944	Ger 3d	Br 1st	A	26029	9834	1318
Carroceto	27FEB1944	1944	Ger 3d	Br 1st	D	26490	4515	341
Moletta River De	07FEB1944	1944	Ger 65t	US 45th		7418	5000	167
Aprilia II	09FEB1944	1944	Ger 3d	Br 1st	A	27518	17730	270
Factory Countera	11FEB1944	1944	US 45th	Ger 715	D	13400	7077	101
Bowling Alley	16FEB1944	1944	Ger LXX	US 45th	D	41974	20496	2238
Moletta River II	16FEB1944	1944	Ger 65t	Br 56th	A	21478	9761	1451
Fioccia	21FEB1944	1944	Ger 114	US 45th	D	15637	19613	265
Santa Maria Infa	11MAY1944	1944	US 88th	Ger 94t	A	18702	9250	531
San Martino	12MAY1944	1944	US 85th	Ger 94t	A	17970	8141	1974
Castellonorato	14MAY1944	1944	US 85th	Ger 94t	A	16458	7500	537
Spigno	14MAY1944	1944	US 88th	Ger 94t	A	18308	8215	343

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Monte Lungo	142	2	.	1.00	1955	i	4160	
Pozzilli	25	2	.	1.00	1955	i	4170	
Monte Camino II	310	3	.	1.00	1955	i	4180	
Monte Rotondo	118	3	.	1.00	1955	i	4190	
Calabritto	20	2	.	1.00	1955	i	4200	
Monte Camino III	141	4	.	1.00	1955	i	4210	
Monte Maggiore	20	2	.	1.00	1955	i	4220	
Aprilia I	130	2	.	1.00	1955	i	4230	
The Factory	62	1	.	1.00	1955	i	4240	
Campoleone	221	3	.	1.00	1955	i	4250	
Campoleone Count	1450	2	.	1.00	1955	i	4260	
Carroceto	369	2	.	1.00	1955	i	4270	
Moletta River De	107	2	.	1.00	1955	i	4280	
Aprilia II	311	1	.	1.00	1955	i	4290	
Factory Countera	206	2	.	1.00	1955	i	4300	
Bowling Alley	1018	4	.	1.00	1955	i	4310	
Moletta River II	1693	4	.	1.00	1955	i	4320	
Fioccia	403	3	.	1.00	1955	i	4330	
Santa Maria Infa	1035	3	.	1.00	1955	i	4340	
San Martino	720	2	.	1.00	1955	i	4350	
Castellonorato	442	2	.	1.00	1955	i	4360	
Spigno	730	2	.	1.00	1955	i	4370	

Table 46. Dataset=lwdb02 data (part 9)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Formia	16MAY1944	1944	US 85th	Ger 94t	A	23190	7627	405
Monte Grande (Ro	17MAY1944	1944	US 88th	Ger 94t	A	13095	4563	203
Itri-Fondi	20MAY1944	1944	US 88th	Ger 94t	A	17912	6653	257
Terracina	22MAY1944	1944	US 85th	Ger 94t	A	18030	6653	287
Moletta Offensiv	23MAY1944	1944	Br 5th	Ger 4th		17345	12569	234
Anzio-Albano Roa	23MAY1944	1944	Br 1st	Ger 65t		17313	11343	194
Anzio Breakout	23MAY1944	1944	US 1st	Ger 3d	A	22374	12815	710
Cisterna	23MAY1944	1944	US 3d I	Ger 362	A	19971	11928	1524
Sezze	25MAY1944	1944	US 85th	Ger 29t	A	17925	6957	162
Velletri	26MAY1944	1944	US 1st	Ger 362	D	20683	12327	767
Campoleone Stati	26MAY1944	1944	US 45th	Ger 65t		19047	10593	517
Villa Crocetta	27MAY1944	1944	US 34th	Ger 3d	D	18000	13715	263
Ardea	28MAY1944	1944	Br 5th	Ger 4th	A	15557	7659	245
Fosso di Campole	29MAY1944	1944	US 1st	Ger 3d	D	29711	15801	1304
Lanuvio	29MAY1944	1944	US 34th	Ger 3d	D	17300	6108	825
Lariano	01JUN1944	1944	US 85th	Ger Her	A	22641	13012	329
Via Anziate	01JUN1944	1944	US 45th	Ger 65t		23604	19255	316
Valmontone	01JUN1944	1944	US 3d I	Ger Her	A	26607	10111	710
Tarto-Tiber	03JUN1944	1944	Br 1st	Ger 4th	A	38011	10855	572
Il Giogio Pass	13SEP1944	1944	US 85th	Ger 12t	A	15721	3700	560
St. Lo	11JUL1944	1944	US 29th	Ger 352	A	18228	7500	2777
Operation "Goodw	18JUL1944	1944	Br Seco	Ger LXX	D	76213	57500	4011

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Formia	721	3	.	1.00	1955	i	4380	
Monte Grande (Ro	332	2	.	1.00	1955	i	4390	
Itri-Fondi	380	3	.	1.00	1955	i	4400	
Terracina	380	3	.	1.00	1955	i	4410	
Moletta Offensiv	468	2	.	1.00	1955	i	4420	
Anzio-Albano Roa	107	2	.	1.00	1955	i	4430	
Anzio Breakout	1355	3	.	1.00	1955	i	4440	
Cisterna	1617	3	.	1.00	1955	i	4450	
Sezze	277	3	.	1.00	1955	i	4460	
Velletri	1319	1	.	1.00	1955	i	4470	
Campoleone Stati	580	3	.	1.00	1955	i	4480	
Villa Crocetta	598	2	.	1.00	1955	i	4490	
Ardea	374	3	.	1.00	1955	i	4500	
Fosso di Campole	1379	3	.	1.00	1955	i	4510	
Lanuvio	698	4	.	1.00	1955	i	4520	
Lariano	1178	2	.	1.00	1955	i	4530	
Via Anziate	884	2	.	1.00	1955	i	4540	
Valmontone	568	2	.	1.00	1955	i	4550	
Tarto-Tiber	850	2	.	1.00	1955	i	4560	
Il Giogio Pass	560	5	.	1.00	1955	i	4570	
St. Lo	2350	8	.	1.00	1955	i	4580	
Operation "Goodw	5000	3	.	1.00	1955	i	4590	

Table 47. Dataset=lwdb02 data (part 10)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Operation "Cobra	24JUL1944	1944	US VII	Ger LXX	A	126000	30700	1510
Mortain	06AUG1944	1944	Ger XLV	US 30th	D	25497	27673	4800
Chartres	16AUG1944	1944	US 7th	Ger Fir		15646	8325	113
Melun	23AUG1944	1944	US 7th	Ger 48t	A	17232	6000	99
Seine River	23AUG1944	1944	US XX C	Ger Fir	A	40619	15000	234
Moselle-Metz	06SEP1944	1944	US XX C	Ger Fir		59631	41500	1647
Metz	13SEP1944	1944	US XX C	Ger Fir	D	60794	39580	359
Arracourt	19SEP1944	1944	Ger 111	US CCA,	D	7500	4800	779
Westwall	02OCT1944	1944	US XIX	Ger LXX	A	32283	19632	1477
Schmidt	02NOV1944	1944	US 28th	Ger LXX	D	20493	20250	3683
Seille-Nied	08NOV1944	1944	US XII	Ger LXX	A	99583	23588	4265
Foret de Chateau	10NOV1944	1944	US 4th	Ger XII	A	43587	11185	720
Morhange	13NOV1944	1944	US CCB,	Ger 11t	A	25881	7555	1006
Morhange-Faulque	13NOV1944	1944	US XII	Ger XII	A	92393	28382	3223
Bourgaltroff	14NOV1944	1944	US CCA,	Ger 11t	A	10348	6519	185
Sarre-St. Avold	20NOV1944	1944	US XII	Ger XII	A	88941	32396	3279
Baerendorf I	24NOV1944	1944	US CCB,	Ger Pz	A	7935	5366	58
Baerendorf II	26NOV1944	1944	US 4th	Ger Pz	A	15871	6999	56
Burbach-Durstel	27NOV1944	1944	US 4th	Ger Pz	A	16232	6713	110
Durstel-Faerbers	28NOV1944	1944	US XII	Ger XII		90078	30712	482
Sarre-Union	01DEC1944	1944	US 4th	Ger 25t	A	19773	6044	234
Sarre-Singling	06DEC1944	1944	US XII	Ger XII	A	89977	31501	835

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Operation "Cobra	5000	3	.	1.00	1955	i	4600	
Mortain	2673	6	.	1.00	1955	i	4610	
Chartres	579	1	.	1.00	1955	i	4620	
Melun	362	3	.	1.00	1955	i	4630	
Seine River	906	3	.	1.00	1955	i	4640	
Moselle-Metz	1700	6	.	1.00	1955	i	4650	
Metz	210	1	.	1.00	1955	i	4660	
Arracourt	119	4	.	1.00	1955	i	4670	
Westwall	3616	6	.	1.00	1955	i	4680	
Schmidt	3000	12	.	1.00	1955	i	4690	
Seille-Nied	4880	5	.	1.00	1955	i	4700	
Foret de Chateau	446	2	.	1.00	1955	i	4710	
Morhange	197	3	.	1.00	1955	i	4720	
Morhange-Faulque	2665	4	.	1.00	1955	i	4730	
Bourgaltroff	141	2	.	1.00	1955	i	4740	
Sarre-St. Avold	4942	8	.	1.00	1955	i	4750	
Baerendorf I	224	2	.	1.00	1955	i	4760	
Baerendorf II	233	1	.	1.00	1955	i	4770	
Burbach-Durstel	216	3	.	1.00	1955	i	4780	
Durstel-Faerbers	811	2	.	1.00	1955	i	4790	
Sarre-Union	129	2	.	1.00	1955	i	4800	
Sarre-Singling	1774	2	.	1.00	1955	i	4810	

Table 48. Dataset=lwdb02 data (part 11)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Singling-Bining	06DEC1944	1944	US 4th	Ger 25t		15224	5044	155
Sauer River	16DEC1944	1944	Ger 212	US 12th	A	10000	8634	268
St. Vith	17DEC1944	1944	Ger LXV	US CCB,		87000	19996	4306
Bastogne	18DEC1944	1944	Ger XLV	US 10th	D	36678	4849	3000
Sedan-Meuse Rive	13MAY1940	1940	Ger XIX	Fr Seco	A	48000	60000	800
Jitra	12DEC1941	1941	Jap 5th	Br 11th	A	7000	12000	600
Rovno	22JUN1941	1941	Ger Fir	Sov Sou	A	132000	150000	3960
Defense of Mosco	30SEP1941	1941	Ger AG	Sov Wes	D	1100000	1372200	253000
Moscow Counterof	05DEC1941	1941	Sov Kal	Ger AG	A	1060300	880000	139800
Pogoreloye Gorod	04AUG1942	1942	Sov Twe	Ger Nin	A	54180	12035	21327
Leningrad	12JAN1943	1943	Sov Sec	Ger Eig	A	120000	30000	28000
Oboyan-Kursk Axi	04JUL1943	1943	Ger XLV	Sov Six	A	62000	45000	1364
Operation Citade	05JUL1943	1943	Ger Fou	Sov Six	A	140000	75000	3180
Oboyan-Kursk Axi	07JUL1943	1943	Ger XLV	Sov Six	A	60000	149000	3500
Oboyan-Kursk Axi	11JUL1943	1943	Ger XLV	Sov Six	D	56000	129000	2900
Prokhorovka	12JUL1943	1943	Sov Ste	Ger II	A	78000	82300	5700
Kursk Counteroff	03AUG1943	1943	Sov Vor	Ger Fou	A	980600	280000	117700
Belgorod	03AUG1943	1943	Sov Fif	Ger 167	A	70000	15000	11676
Melitopol	26SEP1943	1943	Sov Fou	Ger Six	A	524724	210000	79000
Korsun-Schevchen	24JAN1944	1944	Sov Fir	Ger Fir	A	254950	84500	63500
Nikopol Bridgehe	31JAN1944	1944	Sov 109	Ger 335	A	25100	8230	610
Sevastopol	05MAY1944	1944	Sov Fou	Ger Sev	A	397607	72000	35500

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Singling-Bining	121	1	.	1.00	1955	i	4820	
Sauer River	134	2	.	1.00	1955	i	4830	
St. Vith	1731	6	.	1.00	1955	i	4840	
Bastogne	1151	3	.	1.00	1955	i	4850	
Sedan-Meuse Rive	5000	2	.	1.00	1955	i	4860	
Jitra	1200	1	.	1.00	1955	i	4870	
Rovno	88000	5	.	1.00	1955	i	4880	
Defense of Mosco	885000	65	.	1.00	1955	i	4890	
Moscow Counterof	85300	34	.	1.00	1955	i	4900	
Pogoreloye Gorod	6534	8	.	1.00	1955	i	4910	
Leningrad	4150	7	.	1.00	1955	i	4920	
Oboyan-Kursk Axi	5680	3	.	1.00	1955	i	4930	
Operation Citade	4900	1	.	1.00	1955	i	4940	
Oboyan-Kursk Axi	25800	4	.	1.00	1955	i	4950	
Oboyan-Kursk Axi	30200	5	.	1.00	1955	i	4960	
Prokhorovka	5100	2	.	1.00	1955	i	4970	
Kursk Counteroff	39500	21	.	1.00	1955	i	4980	
Belgorod	2405	3	.	1.00	1955	i	4990	
Melitopol	36500	41	.	1.00	1955	i	5000	
Korsun-Schevchen	68000	25	.	1.00	1955	i	5010	
Nikopol Bridgehe	480	6	.	1.00	1955	i	5020	
Sevastopol	48500	5	.	1.00	1955	i	5030	

Table 49. Dataset=lwdb02 data (part 12)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Berezina River	25JUN1944	1944	Sov III	Ger 299	A	16100	8500	670
Lvov-Sandomierz	13JUL1944	1944	Sov Fir	Ger AG	A	1200000	900000	37400
Brody, Phase I	14JUL1944	1944	Sov XV	Ger 913	A	39000	3300	980
Brody, Phase II	15JUL1944	1944	Sov XV	Ger 349	A	38500	12900	1750
Vistula River Op	29JUL1944	1944	Sov XCI	Ger 171	A	12700	5100	1150
Vistula River Op	02AUG1944	1944	Sov XCI	Ger 171	D	17550	6400	3040
Yassy-Kishinev	20AUG1944	1944	Sov Sec	Ger-Rom	A	1250000	800000	135000
Vistula-Oder	12JAN1945	1945	Sov Fir	Ger AG	A	2200000	560000	46900
East Prussia	13JAN1945	1945	Sov Sec	Ger AG	A	1220000	780000	112000
Ciechanow, Phase	14JAN1945	1945	Sov 90t	Ger 7th		10800	3100	685
Ciechanow, Phase	15JAN1945	1945	Sov 90t	Ger 7th	A	12115	3900	850
Seelow Heights	16APR1945	1945	Sov 57t	Ger 303	A	13600	3710	474
Mutankiang	09AUG1945	1945	Sov Fif	Jap Fif	A	147000	75000	10000
Tarawa-Betio	20NOV1944	1944	US 2d M	Jap Gil	A	9000	4836	3302
Iwo Jima--Into t	20FEB1945	1945	US V Am	Jap 2d	A	33915	18300	6845
Iwo Jima--Suriba	20FEB1945	1945	US 28th	Jap 2d	A	3200	1600	510
Iwo Jima-Final P	11MAR1945	1945	US 3d M	Jap Chi	A	32000	2685	3885
Advance from the	02APR1945	1945	US 7th	Jap 1st	A	22888	1400	158
Advance through	05APR1945	1945	US 7th	Jap 62d	A	18398	2900	286
Tomb Hill-Ouki	19APR1945	1945	US 7th	Jap 11t	A	18111	4731	466
Skyline Ridge-Ro	19APR1945	1945	US 7th	Jap 11t	A	16291	2600	740
Kochi Ridge-Onag	25APR1945	1945	US 7th	Jap 22d	D	14594	5000	269

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Berezina River	4795	5	.	1.00	1955	i	5040	
Lvov-Sandomierz	198000	17	.	1.00	1955	i	5050	
Brody, Phase I	720	1	.	1.00	1955	o	5060	
Brody, Phase II	490	1	.	1.00	1955	i	5070	
Vistula River Op	320	3	.	1.00	1955	i	5080	
Vistula River Op	785	6	.	1.00	1955	i	5090	
Yassy-Kishinev	690000	10	.	1.00	1955	i	5100	
Vistula-Oder	147400	23	.	1.00	1955	i	5110	
East Prussia	126000	19	.	1.00	1955	i	5120	
Ciechanow, Phase	145	1	.	1.00	1955	i	5130	
Ciechanow, Phase	230	1	.	1.00	1955	i	5140	
Seelow Heights	150	2	.	1.00	1955	i	5150	
Mutankiang	36000	8	.	1.00	1955	i	5160	
Tarawa-Betio	4836	5	.	1.00	1955	i	5170	
Iwo Jima--Into t	15615	5	.	1.00	1955	i	5180	
Iwo Jima--Suriba	1231	5	.	1.00	1955	i	5190	
Iwo Jima-Final P	2685	6	.	1.00	1955	o	5200	
Advance from the	628	3	.	1.00	1955	o	5210	
Advance through	2120	4	.	1.00	1955	i	5220	
Tomb Hill-Ouki	1278	3	.	1.00	1955	i	5230	
Skyline Ridge-Ro	1661	5	.	1.00	1955	i	5240	
Kochi Ridge-Onag	1324	3	.	1.00	1955	i	5250	

Table 50. Dataset=lwdb02 data (part 13)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Kochi Ridge-Onag	28APR1945	1945	US 7th	Jap 22d	D	15986	4500	182
Kochi Ridge-Onag	30APR1945	1945	US 7th	Jap 22d	D	15764	4050	398
Japanese Counter	04MAY1945	1945	Jap 24t	US 7th	D	6850	15350	3704
Kochi Ridge IV	06MAY1945	1945	US 7th	Jap 24t	A	15109	5140	114
Shuri Envelopmen	22MAY1945	1945	US 7th	Jap 3d	A	16043	3338	170
Japanese Counter	24MAY1945	1945	Jap 24t	US 7th	D	4000	15777	1269
Shuri Envelopmen	26MAY1945	1945	US 7th	Jap 24t	D	15840	3000	124
Shuri Envelopmen	29MAY1945	1945	US 7th	Jap 24t	A	15205	2600	182
Hill 95-I	06JUN1945	1945	US 7th	Jap 44t		16091	3500	193
Hill 95-II	09JUN1945	1945	US 7th	Jap 44t	A	16002	2500	248
Yaeju-Dake	12JUN1945	1945	US 7th	Jap 44t	A	5237	2500	48
Hills 153 and 11	15JUN1945	1945	US 7th	Jap 44t	A	15808	2000	307
Advance from the	02APR1945	1945	US 96th	Jap 1st	A	19082	2000	282
Advance to Shuri	05APR1945	1945	US 96th	Jap 12t	A	18388	2900	555
Kakazu and Tombs	09APR1945	1945	US 96th	Jap 12t	D	21247	3000	1079
Nishibaru Ridge-	19APR1945	1945	US 96th	Jap 12t	A	17163	3000	879
Maeda Escarpment	26APR1945	1945	US 96th	Jap 62d	A	18095	3900	479
Attack on the Sh	11MAY1945	1945	US 96th	Jap 24t		19714	5284	502
Attack on the Sh	14MAY1945	1945	US 96th	Jap 24t		20973	4757	590
Attack on the Sh	20MAY1945	1945	US 96th	Jap 24t	A	19658	4227	313
Advance to the Y	06JUN1945	1945	US 96th	Jap 24t	A	18777	4000	112
Initial Attack o	10JUN1945	1945	US 96th	Jap 24t		18660	4250	88

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Kochi Ridge-Onag	814	2	.	1.00	1955	i	5260	
Kochi Ridge-Onag	2276	4	.	1.00	1955	i	5270	
Japanese Counter	339	2	.	1.00	1955	i	5280	
Kochi Ridge IV	1464	2	.	1.00	1955	i	5290	
Shuri Envelopmen	478	2	.	1.00	1955	i	5300	
Japanese Counter	241	1	.	1.00	1955	o	5310	
Shuri Envelopmen	434	2	.	1.00	1955	i	5320	
Shuri Envelopmen	2564	3	.	1.00	1955	i	5330	
Hill 95-I	1222	3	.	1.00	1955	i	5340	
Hill 95-II	1470	3	.	1.00	1955	i	5350	
Yaeju-Dake	2401	1	.	1.00	1955	i	5360	
Hills 153 and 11	1971	3	.	1.00	1955	i	5370	
Advance from the	1588	3	.	1.00	1955	i	5380	
Advance to Shuri	2470	4	.	1.00	1955	i	5390	
Kakazu and Tombs	2468	4	.	1.00	1955	i	5400	
Nishibaru Ridge-	2860	5	.	1.00	1955	i	5410	
Maeda Escarpment	3810	4	.	1.00	1955	i	5420	
Attack on the Sh	4038	3	.	1.00	1955	i	5430	
Attack on the Sh	4328	5	.	1.00	1955	i	5440	
Attack on the Sh	3022	2	.	1.00	1955	i	5450	
Advance to the Y	798	4	.	1.00	1955	i	5460	
Initial Attack o	1066	2	.	1.00	1955	i	5470	

Table 51. Dataset=lwdb02 data (part 14)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Capture of the Y	12JUN1945	1945	US 96th	Jap 44t	A	19047	3250	576
Jenin	05JUN1967	1967	Is Pele	Jor 25t	A	10900	6160	225
Jerusalem	05JUN1967	1967	Is Gur	Jor 27t	A	27682	13600	1750
Kabatiya	06JUN1967	1967	Is Bar	Jor 40t	A	12800	9900	375
Tilfit-Zababida	06JUN1967	1967	Is Ram	Jor 40t	A	5350	5450	250
Nablus	07JUN1967	1967	Is Pele	Jor 25t	A	10700	8640	375
Rafah	05JUN1967	1967	Is Tal	Eg 7th	A	19520	19500	700
Bir Lahfan	05JUN1967	1967	Is Yoff	Eg 3d I	A	10450	10050	90
Abu Ageila-Um Ka	05JUN1967	1967	Is Shar	Eg 2d I	A	19280	18450	300
El Arish	05JUN1967	1967	Is Tal	Eg 7th	A	6912	12750	135
Jebel Libni	06JUN1967	1967	Is Yoff	Eg 3d I		10800	3000	70
Gaza Strip	05JUN1967	1967	Is Resh	Pales 2	A	12150	17450	55
Bir Hassna-Bir T	07JUN1967	1967	Is Yoff	Eg 3d I	A	8700	3000	60
Mitla Pass	07JUN1967	1967	Eg 3d I	Is Yoff	D	22000	7250	550
Bir Hamma-Bir Gi	07JUN1967	1967	Is Tal	Eg 3d I	A	10200	13500	75
Nakhl	08JUN1967	1967	Is Shar	Eg 6th	A	18780	18450	60
Bir Gifgafa	08JUN1967	1967	Eg Armd	Is Tal	D	3500	3600	450
Tel Fahar-Banias	09JUN1967	1967	Is Gola	Syr 11t	A	5375	8160	300
Rawiyeh	09JUN1967	1967	Is Ram	Syr 8th	A	5350	4350	150
Zaoura-Kala	09JUN1967	1967	Is Mend	Syr 11t	A	5850	8560	230
Kerama	21MAR1968	1968	Is Gone	Jor 1st		11940	16168	201
Suez Canal Assau	06OCT1973	1973	Eg Seco	Is Sina	A	29490	4455	400

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Capture of the Y	3220	6	.	1.00	1955	i	5480	
Jenin	200	1	.	1.00	1989	i	5490	
Jerusalem	1500	3	.	1.00	1989	i	5500	
Kabatiya	350	2	.	1.00	1989	i	5510	
Tilfit-Zababida	250	1	.	1.00	1989	i	5520	
Nablus	350	1	.	1.00	1989	i	5530	
Rafah	2700	1	.	1.00	1989	i	5540	
Bir Lahfan	1350	1	.	1.00	1989	i	5550	
Abu Ageila-Um Ka	900	1	.	1.00	1989	i	5560	
El Arish	225	1	.	1.00	1989	i	5570	
Jebel Libni	450	1	.	1.00	1989	i	5580	
Gaza Strip	626	3	.	1.00	1989	i	5590	
Bir Hassna-Bir T	550	1	.	1.00	1989	i	5600	
Mitla Pass	90	1	.	1.00	1989	i	5610	
Bir Hamma-Bir Gi	550	1	.	1.00	1989	i	5620	
Nakhl	625	1	.	1.00	1989	i	5630	
Bir Gifgafa	60	1	.	1.00	1989	i	5640	
Tel Fahar-Banias	850	1	.	1.00	1989	i	5650	
Rawiyeh	300	1	.	1.00	1989	i	5660	
Zaoura-Kala	500	1	.	1.00	1989	i	5670	
Kerama	497	1	.	1.00	1989	i	5680	
Suez Canal Assau	275	1	.	1.00	1989	i	5690	

Table 52. Dataset=lwdb02 data (part 15)

BATTLE	DATE	YEAR	ATT	DEF	V	X0	Y0	CASX
Suez Canal Assau	06OCT1973	1973	Eg Thir	Is Sina	A	22850	3020	350
Second Army Buil	07OCT1973	1973	Eg Seco	Is Sina	A	63910	14000	800
Third Army Build	07OCT1973	1973	Eg Thir	Is Sina	A	45160	10980	750
Kantara-Firdan	08OCT1973	1973	Is Adan	Eg Seco	D	25850	67440	700
Egyptian Offensi	14OCT1973	1973	Eg Seco	Is Sass	D	81160	43400	1700
Egyptian Offensi	14OCT1973	1973	Eg Thir	Is Mage	D	57960	28600	1350
Deversoir (Chine	15OCT1973	1973	Is Shar	Eg 16th	A	22790	30970	100
Deversoir (Chine	16OCT1973	1973	Is Adan	Eg 16th	A	28900	36840	950
Deversoir West	18OCT1973	1973	Is Adan	Eg Seco	A	19600	18180	300
Ismailia	19OCT1973	1973	Is Shar	Eg Seco	D	17000	23860	600
Jebel Geneifa	19OCT1973	1973	Is Adan	Eg Thir	A	16200	35633	300
Shallufa I	22OCT1973	1973	Is Adan	Eg Thir	A	16200	25600	150
Adabiya	23OCT1973	1973	Is Mage	Eg Thir	A	10900	14620	75
Shallufa II	23OCT1973	1973	Is Adan	Eg Thir	A	11700	22570	150
Suez	23OCT1973	1973	Is Adan	Eg Thir	D	14681	22570	340
Kuneitra	06OCT1973	1973	Syr 9th	Is 7th		17750	3630	350
Ahmadiyeh	06OCT1973	1973	Syr 7th	Is 7th	D	22750	5745	700
Rafid	06OCT1973	1973	Syr 5th	Is 188t	A	19525	4958	350
Yehudia-El Al	07OCT1973	1973	Syr 5th	Is 240t	D	21984	6300	500
Nafekh	07OCT1973	1973	Syr 1st	Is 79th	D	12500	6946	500
Tel Faris	08OCT1973	1973	Is 146t	Syr 5th	A	17833	23750	450
Hushniyah	08OCT1973	1973	Is 240t	Syr 9th	A	12733	14683	450

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Suez Canal Assau	225	1	.	1.00	1989	i	5700	
Second Army Buil	450	1	.	1.00	1989	i	5710	
Third Army Build	400	1	.	1.00	1989	i	5720	
Kantara-Firdan	700	1	.	1.00	1989	i	5730	
Egyptian Offensi	380	1	.	1.00	1989	i	5740	
Egyptian Offensi	260	1	.	1.00	1989	i	5750	
Deversoir (Chine	500	1	.	1.00	1989	i	5760	
Deversoir (Chine	2400	2	.	1.00	1989	i	5770	
Deversoir West	800	1	.	1.00	1989	i	5780	
Ismailia	1800	4	.	1.00	1989	i	5790	
Jebel Geneifa	1650	3	.	1.00	1989	i	5800	
Shallufa I	1100	1	.	1.00	1989	i	5810	
Adabiya	400	1	.	1.00	1989	i	5820	
Shallufa II	1100	2	.	1.00	1989	i	5830	
Suez	1100	2	.	1.00	1989	i	5840	
Kuneitra	200	2	.	1.00	1989	i	5850	
Ahmadiyeh	250	2	.	1.00	1989	i	5860	
Rafid	250	1	.	1.00	1989	i	5870	
Yehudia-El Al	150	1	.	1.00	1989	i	5880	
Nafekh	250	2	.	1.00	1989	i	5890	
Tel Faris	1125	3	.	1.00	1989	i	5900	
Hushniyah	1125	3	.	1.00	1989	i	5910	

Table 53. Dataset==lwdb02 data (part 16)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Mount Hermonit	08OCT1973	1973	Syr 7th	Is 7th	D	31650	5395	1200
Mount Hermon I	08OCT1973	1973	Is Gola	Syr Par	D	2692	1583	50
Tel Shams	11OCT1973	1973	Is 36th	Syr 7th	A	16100	19400	525
Tel Shaar	11OCT1973	1973	Is 240t	Syr 1st	A	14700	21500	280
Tel el Hara	13OCT1973	1973	Ir 3d A	Is 240t	D	12500	14300	450
Kfar Shams-Tel A	15OCT1973	1973	Is 240t	Ir 3d A	A	11000	12000	100
Naba	16OCT1973	1973	Jor 40t	Is 240t	D	11500	11000	450
Arab Counteroffe	19OCT1973	1973	Syr 9th	Is 146t	D	35750	16100	550
Mount Hermon II	21OCT1973	1973	Is Gola	Syr Par	D	5700	4750	150
Mount Hermon III	22OCT1973	1973	Is Gola	Syr Par	A	11400	4750	100

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Mount Hermonit	400	2	.	1.00	1989	i	5920	
Mount Hermon I	100	1	.	1.00	1989	i	5930	
Tel Shams	1200	3	.	1.00	1989	i	5940	
Tel Shaar	900	2	.	1.00	1989	i	5950	
Tel el Hara	50	1	.	1.00	1989	i	5960	
Kfar Shams-Tel A	200	1	.	1.00	1989	i	5970	
Naba	100	1	.	1.00	1989	i	5980	
Arab Counteroffe	160	1	.	1.00	1989	i	5990	
Mount Hermon II	200	1	.	1.00	1989	i	6000	
Mount Hermon III	250	1	.	1.00	1989	i	6010	

Table 54. Dataset=lwdb03 data

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Sidi Bou Zid I	14FEB1943	1943	Ger Elm	US CCA,	A	6400	5333	20
Sidi Bou Zid II	15FEB1943	1943	US CCC,	Ger Elm	D	2738	8380	367
Kasserine Pass	19FEB1943	1943	Ger Afr	US 26th	A	7000	5303	200
Rapido North I	20JAN1944	1944	US 141s	Ger 1st	D	8000	2200	408
Rapido South I	20JAN1944	1944	US 143r	Ger 3rd	D	7700	1800	162
Rapido North II	21JAN1944	1944	US 141s	Ger 1st	D	7600	2200	666
Rapido South II	21JAN1944	1944	US 143r	Ger 3rd	D	7538	1800	575
Bowling Alley I	16FEB1944	1944	Ger LXX	US 2nd/	D	14600	4500	1129
Bowling Alley II	16FEB1944	1944	Ger LXX	US 180t	D	10000	4625	439
Bowling Alley II	16FEB1944	1944	Ger LXX	US 179t	A	15736	5050	613
Mortain II	07AUG1944	1944	Ger Elm	US 120t	D	8500	4600	375
Mortain I	07AUG1944	1944	Ger Elm	US 117t	D	8150	3700	700
Schmidt I	02NOV1944	1944	US 112t	Ger LXX	D	6200	5025	640
Schmidt II	02NOV1944	1944	US 110t	Ger LXX	D	4350	3450	163
Schmidt III	02NOV1944	1944	US 109t	Ger LXX	D	4950	3700	350
Wahlerscheid	13DEC1944	1944	Us 9th	Ger LXV	A	8300	1400	370
Schnee Eifel Sou	16DEC1944	1944	Ger 62n	US 424t	A	11000	4300	200
Schnee Eifel Nor	16DEC1944	1944	Ger 18t	US 14th	A	14300	2050	50
Schnee Eifel Nor	16DEC1944	1944	Ger 18t	US 422n	A	12800	4150	200
Our River Center	16DEC1944	1944	Ger XLV	US 110t	A	43800	5340	900
Our River North	16DEC1944	1944	Ger LVI	US 112t	A	16000	5740	770
Schnee Eifel Cen	16DEC1944	1944	Ger 293	US 423r	A	4100	3900	200

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Sidi Bou Zid I	920	1	.	1.00	1955	i	6020	
Sidi Bou Zid II	50	1	.	1.00	1955	o	6030	
Kasserine Pass	527	2	.	1.00	1955	i	6040	
Rapido North I	13	1	.	1.00	1955	i	6050	
Rapido South I	13	1	.	1.00	1955	i	6060	
Rapido North II	13	1	.	1.00	1955	o	6070	
Rapido South II	13	1	.	1.00	1955	o	6080	
Bowling Alley I	442	4	.	1.00	1955	i	6090	
Bowling Alley II	199	4	.	1.00	1955	i	7000	
Bowling Alley II	750	2	.	1.00	1955	i	7010	
Mortain II	600	1	.	1.00	1955	i	7020	
Mortain I	400	1	.	1.00	1955	i	7030	
Schmidt I	850	4	.	1.00	1955	i	7040	
Schmidt II	100	2	.	1.00	1955	i	7050	
Schmidt III	200	3	.	1.00	1955	i	7060	
Wahlerscheid	250	4	.	1.00	1955	i	7070	
Schnee Eifel Sou	300	1	.	1.00	1955	i	7080	
Schnee Eifel Nor	127	1	.	1.00	1955	i	7090	
Schnee Eifel Nor	3535	4	.	1.00	1955	i	8000	
Our River Center	3300	3	.	1.00	1955	i	8010	
Our River North	700	2	.	1.00	1955	i	8020	
Schnee Eifel Cen	3700	4	.	1.00	1955	i	8030	

Table 55. Dataset=lwdb03 data (part 2)

BATTLE	DATE	YEAR	ATT	DEF	V	XO	YO	CASX
Krinkelt-Rochera	17DEC1944	1944	Ger 12t	US 38th	D	9100	6600	900
Krinkelt-Rochera	17DEC1944	1944	Ger 12t	US 3rd/	A	3300	1357	100

BATTLE	CASY	DAYS	HOURS	WGT	ENDDATE	OUT	NUMB	NOTE
Krinkelt-Rochera	720	3	.	1.00	1955	i	8040	
Krinkelt-Rochera	400	1	.	1.00	1955	i	8050	

A.2 CAMPAIGN DATABASE DATA

This section contains four sets of tables. The first set contains the battles selected for the campaign analysis. The second set contains the battles selected for the country attacker-defender analysis. The third set contains the Okinawa battles. The fourth set contains the Iwo Jima daily battle data.

The general campaign analysis tables contain the variables CNAME, BATTLE, YEAR, ATT, DEF, V, X0, Y0, CASX, CASY, and NUMB. The only new variable is CNAME. This variable identifies the war and campaign of the battle and thus connects the battles into sets of campaigns.

The country attacker-defender tables contain the variables AD, CNAME, YEAR, ATT, DEF, V, X0, Y0, CASX, CASY, and NUMB. Theses data form a subset of the general campaign analysis tables. The added variable, AD, is formed of the first letter of the attacker variable and the first letter of the defender variable.

The Okinawa campaign tables contain data similar to those in the other tables; however, the battle, attacker and defender names are expanded to permit better identifications. The upper part of the tables contain the variables BATTLE, DATE, ATT, and DEF. The lower part of the tables contain the variables BATTLE, A, D, V, X0, Y0, CASX, CASY, and NUMB. The new variables A and D identify the attacker and defender units, respectively, in abbreviated form.

The Iwo Jima table contains the variables DATE, ATT, DEF, X, Y, and NOTE. The variables X and Y contain the available attacker (United States) and defender (Japanese) daily force sizes. NOTE contains the identification of the dropped data. Dropping these data is consistent with Engel's speculation that the final days of the battle might be different in kind from the earlier days.

Table 56. Campaign segmentation data

CNAME	BATTLE	YEAR	ATT	DEF	V	XO	YO	CASX	CASY	NUMB
Franco-Prussia Metz	Weissenburg	1870	Germany	France	A	51000	6000	1600	2100	2200
Franco-Prussia Metz	Froeschwiller (W	1870	Germany	France	A	82000	41000	10700	20300	2210
Franco-Prussia Metz	Spichern	1870	Germany	France	A	42000	28000	4900	3100	2220
Franco-Prussia Metz	Mars la Tour	1870	Germany	France	A	91000	113000	16000	14000	2230
Franco-Prussia Metz	Gravelotte-St. P	1870	Germany	France	A	187000	113000	20200	12800	2240
Israel 67 Golan	Tel Fahar-Banias	1967	Israel	Syria	A	5375	8160	300	850	5650
Israel 67 Golan	Rawiyeh	1967	Israel	Syria	A	5350	4350	150	300	5660
Israel 67 Golan	Zaoura-Kala	1967	Israel	Syria	A	5850	8560	230	500	5670
Israel 67 Sinai	Rafah	1967	Israel	Egypt	A	19520	19500	700	2700	5540
Israel 67 Sinai	Bir Lehfan	1967	Israel	Egypt	A	10450	10050	90	1350	5550
Israel 67 Sinai	Abu Ageila-Um Ka	1967	Israel	Egypt	A	19280	18450	300	900	5560
Israel 67 Sinai	El Arish	1967	Israel	Egypt	A	6912	12750	135	225	5570
Israel 67 Sinai	Jebel Libni	1967	Israel	Egypt		10800	3000	70	450	5580
Israel 67 Sinai	Gaza Strip	1967	Israel	Egypt	A	12150	17450	55	626	5590
Israel 67 Sinai	Bir Hassna-Bir T	1967	Israel	Egypt	A	8700	3000	60	550	5600
Israel 67 Sinai	Mitla Pass	1967	Israel	Egypt	D	22000	7250	550	90	5610
Israel 67 Sinai	Bir Hamma-Bir Gi	1967	Israel	Egypt	A	10200	13500	75	550	5620
Israel 67 Sinai	Nakhl	1967	Israel	Egypt	A	18780	18450	60	625	5630
Israel 67 Sinai	Bir Gifgafa	1967	Israel	Egypt	D	3500	3600	450	60	5640
Israel 67 West Bank	Jenin	1967	Israel	Jordan	A	10900	6160	225	200	5490
Israel 67 West Bank	Jerusalem	1967	Israel	Jordan	A	27682	13600	1750	1500	5500
Israel 67 West Bank	Kabatiya	1967	Israel	Jordan	A	12800	9900	375	350	5510
Israel 67 West Bank	Tilfit-Zababida	1967	Israel	Jordan	A	5350	5450	250	250	5520
Israel 67 West Bank	Nablus	1967	Israel	Jordan	A	10700	8640	375	350	5530
Israel 73 Golan	Kuneitra	1973	Syria	Israel		17750	3630	350	200	5850
Israel 73 Golan	Ahmadiyeh	1973	Syria	Israel	D	22750	5745	700	250	5860
Israel 73 Golan	Rafid	1973	Syria	Israel	A	19525	4958	350	250	5870
Israel 73 Golan	Yehudia-El Al	1973	Syria	Israel	D	21984	6300	500	150	5880
Israel 73 Golan	Nafekh	1973	Syria	Israel	D	12500	6946	500	250	5890
Israel 73 Golan	Tel Faris	1973	Israel	Syria	A	17833	23750	450	1125	5900
Israel 73 Golan	Hushniyah	1973	Israel	Syria	A	12733	14683	450	1125	5910
Israel 73 Golan	Mount Hermonit	1973	Syria	Israel	D	31650	5395	1200	400	5920
Israel 73 Golan	Mount Hermon I	1973	Israel	Syria	D	2692	1583	50	100	5930
Israel 73 Golan	Tel Shams	1973	Israel	Syria	A	16100	19400	525	1200	5940
Israel 73 Golan	Tel Shaar	1973	Israel	Syria	A	14700	21500	280	900	5950
Israel 73 Golan	Arab Counteroffe	1973	Syria	Israel	D	35750	16100	550	160	5990
Israel 73 Golan	Mount Hermon II	1973	Israel	Syria	D	5700	4750	150	200	6000
Israel 73 Golan	Mount Hermon III	1973	Israel	Syria	A	11400	4750	100	250	6010
Israel 73 Suez	Suez Canal Assau	1973	Egypt	Israel	A	29490	4455	400	275	5690
Israel 73 Suez	Suez Canal Assau	1973	Egypt	Israel	A	22850	3020	350	225	5700
Israel 73 Suez	Second Army Buil	1973	Egypt	Israel	A	63910	14000	800	450	5710
Israel 73 Suez	Third Army Build	1973	Egypt	Israel	A	45160	10980	750	400	5720
Israel 73 Suez	Kantara-Firdan	1973	Israel	Egypt	D	25850	67440	700	700	5730
Israel 73 Suez	Egyptian Offensi	1973	Egypt	Israel	D	81160	43400	1700	380	5740
Israel 73 Suez	Egyptian Offensi	1973	Egypt	Israel	D	57960	28600	1350	260	5750
Israel 73 Suez	Deversoir (Chine	1973	Israel	Egypt	A	22790	30970	100	500	5760
Israel 73 Suez	Deversoir (Chine	1973	Israel	Egypt	A	28900	36840	950	2400	5770
Israel 73 Suez	Deversoir West	1973	Israel	Egypt	A	19600	18180	300	800	5780
Israel 73 Suez	Ismailia	1973	Israel	Egypt	D	17000	23860	600	1800	5790
Israel 73 Suez	Jebel Geneifa	1973	Israel	Egypt	A	16200	35633	300	1650	5800

Table 57. Campaign segmentation data (part 2)

CNAME	BATTLE	YEAR	ATT	DEF	V	XO	YO	CASX	CASY	NUMB
Israel 73 Suez	Shallufa I	1973	Israel	Egypt	A	16200	25600	150	1100	5810
Israel 73 Suez	Adabiya	1973	Israel	Egypt	A	10900	14620	75	400	5820
Israel 73 Suez	Shallufa II	1973	Israel	Egypt	A	11700	22570	150	1100	5830
Israel 73 Suez	Suez	1973	Israel	Egypt	D	14681	22570	340	1100	5840
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	25040	22150	196	675	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	24844	21350	26	675	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	24818	20500	76	350	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	24742	22750	102	450	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	24640	22600	72	600	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	24568	22100	147	600	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	24421	27675	231	1350	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	24190	25975	165	1200	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	24025	24375	143	900	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	23882	25305	289	950	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	23593	24290	276	1750	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	23317	22390	203	950	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	23114	24640	189	1252	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	22925	23250	43	332	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	22882	22710	69	102	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	22813	22100	61	305	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	22752	23465	19	75	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	22733	28265	97	350	.
Korea Inchon	Inchon-Seoul	1950	USA	North Korea	A	22636	27835	38	800	.
WWI Belleau Wood	Belleau Wood	1918	USA	Germany		9437	6436	1087	730	3360
WWI Belleau Wood	Hill 142	1918	USA	Germany	A	2913	1458	383	471	3370
WWI Belleau Wood	West Wood I	1918	USA	Germany	D	1740	1121	361	54	3380
WWI Belleau Wood	Bouresches I	1918	USA	Germany		2733	1352	343	186	3390
WWI Belleau Wood	Hill 192	1918	USA	Germany	D	3608	3955	340	87	3400
WWI Belleau Wood	West Wood II	1918	USA	Germany	A	3343	1798	279	541	3410
WWI Belleau Wood	North Wood I, "H	1918	USA	Germany	A	1747	1952	167	293	3420
WWI Belleau Wood	North Wood II	1918	USA	Germany	D	1697	1428	192	18	3440
WWI Belleau Wood	North Wood III	1918	USA	Germany	D	1256	1565	133	19	3450
WWI Belleau Wood	North Wood IV	1918	USA	Germany	A	4453	1546	273	437	3460
WWI Belleau Wood	Vaux	1918	USA	Germany	A	12812	10358	336	1074	3470
WWI Belleau Wood	La Roche Wood Ea	1918	USA	Germany	A	4515	5182	94	568	3480
WWI Belleau Wood	La Roche Wood We	1918	USA	Germany	A	4508	5177	223	506	3490
WWI Isonzo	First Isonzo	1915	Italy	Austria	D	200000	100000	14947	9958	2960
WWI Isonzo	Second Isonzo	1915	Italy	Austria	D	200000	128500	41866	46640	2970
WWI Isonzo	Third Isonzo	1915	Italy	Austria	D	356000	157000	67008	31474	2980
WWI Isonzo	Fourth Isonzo	1915	Italy	Austria	D	311000	136000	48967	40217	2990
WWI Isonzo	Fifth Isonzo	1916	Italy	Austria	D	300000	160000	3800	1985	3120
WWI Isonzo	Sixth Isonzo (Go	1916	Italy	Austria	A	308000	168000	51232	41835	3150
WWI Isonzo	Tenth Isonzo	1917	Italy	Austria	A	280000	165000	157000	75700	3220
WWI Isonzo	Eleventh Isonzo	1917	Italy	Austria	A	518000	2[illegible]2000	166000	85000	3230
WWI Meuse-Argonne	Blanc-Mont I	1918	USA	Germany	A	26000	13000	4700	4000	3670
WWI Meuse-Argonne	Medeah Farm	1918	USA	Germany	A	1921	155	247	83	3680
WWI Meuse-Argonne	Essen Hook	1918	USA	Germany	A	1420	216	140	120	3690
WWI Meuse-Argonne	Blanc Mont Ridge	1918	USA	Germany	A	1400	458	308	241	3700
WWI Meuse-Argonne	Sommepy Wood	1918	USA	Germany	A	9230	670	620	450	3710
WWI Meuse-Argonne	Blanc Mont II	1918	USA	Germany		18000	10000	1589	500	3720

Table 58. Campaign segmentation data (part 3)

CNAME	BATTLE	YEAR	ATT	DEF	V	XO	YO	CASX	CASY	NUMB
WWI Meuse-Argonne	Meuse-Argonne, P	1918	France	Germany	A	500000	300000	77448	75068	3730
WWI Meuse-Argonne	Exermont-Montref	1918	USA	Germany		5336	3245	352	192	3740
WWI Meuse-Argonne	Mayache Ravine	1918	USA	Germany		5427	1899	376	114	3750
WWI Meuse-Argonne	La Neuville le C	1918	USA	Germany	A	5365	1940	340	61	3760
WWI Meuse-Argonne	Ferme des Grange	1918	USA	Germany	A	5461	2587	242	250	3770
WWI Meuse-Argonne	Hill 212	1918	USA	Germany	A	5022	3355	301	173	3780
WWI Meuse-Argonne	Bois de Boyon-Mo	1918	USA	Germany	A	4778	2925	132	136	3790
WWI Meuse-Argonne	Hill 272	1918	USA	Germany	A	2950	2563	109	250	3800
WWI Meuse-Argonne	Meuse-Argonne, P	1918	France	Germany	A	600000	380140	30426	29491	3810
WWI Meuse-Argonne	Remilly-Allicour	1918	USA	Germany	A	1210	296	25	30	3820
WWI Meuse-Argonne	Hill 252-Pont Ma	1918	USA	Germany	A	1989	1655	110	182	3830
WWI Soissons	Missy aux Bois R	1918	USA	Germany	A	5004	3013	393	1853	3530
WWI Soissons	Breuil	1918	USA	Germany	A	5039	2663	448	1243	3540
WWI Soissons	St. Amand Farm	1918	USA	Germany	A	1150	400	120	400	3550
WWI Soissons	Beaurepaire Farm	1918	USA	Germany	A	4480	565	125	181	3560
WWI Soissons	Cravancon Ferme-	1918	USA	Germany	A	10345	2420	895	1610	3570
WWI Soissons	Chaudun	1918	USA	Germany	A	1611	800	130	500	3580
WWI The Marne	Heights of Nancy	1914	Germany	France	D	350000	276000	75000	52000	2690
WWI The Marne	Ourcq I	1914	France	Germany		100000	45000	5600	2500	2700
WWI The Marne	Ourcq II	1914	France	Germany		198000	157000	40000	39000	2710
WWI The Marne	Petit Morin	1914	France	Germany	A	227000	82000	45000	19000	2720
WWI The Marne	Marshes of St. G	1914	Germany	France	D	101000	141000	25000	29000	2740
WWI The Marne	Vitry le Francoi	1914	Germany	France	D	113000	170000	26000	27000	2750
WWI The Marne	Gap of Revigny	1914	Germany	France	D	142000	180000	29000	29000	2760
WWII Anzio	Aprilia I	1944	England	Germany	A	19350	6750	1158	130	4230
WWII Anzio	The Factory	1944	Germany	England	D	15317	17976	366	62	4240
WWII Anzio	Campoleone	1944	England	Germany	A	17766	15098	742	221	4250
WWII Anzio	Campoleone Count	1944	Germany	England	A	26029	9834	1318	1450	4260
WWII Anzio	Carroceto	1944	Germany	England	D	26490	4515	341	369	4270
WWII Anzio	Moletta River De	1944	Germany	USA		7418	5000	167	107	4280
WWII Anzio	Aprilia II	1944	Germany	England	A	27518	17730	270	311	4290
WWII Anzio	Bowling Alley	1944	Germany	USA	D	41974	20496	2238	1018	4310
WWII Anzio	Moletta River II	1944	Germany	England	A	21478	9761	1451	1693	4320
WWII Anzio	Fioccia	1944	Germany	USA	D	15637	19613	265	403	4330
WWII Anzio	Bowling Alley I	1944	Germany	USA	D	14600	4500	1129	442	6090
WWII Anzio	Bowling Alley II	1944	Germany	USA	D	10000	4625	439	199	7000
WWII Anzio	Bowling Alley II	1944	Germany	USA	A	15736	5050	613	750	7010
WWII Ardennes	Sauer River	1944	Germany	USA	A	10000	8634	268	134	4830
WWII Ardennes	St. Vith	1944	Germany	USA		87000	19996	4306	1731	4840
WWII Ardennes	Bastogne	1944	Germany	USA	D	36678	4849	3000	1151	4850
WWII Ardennes	Schnee Eifel Sou	1944	Germany	USA	A	11000	4300	200	300	7080
WWII Ardennes	Schnee Eifel Nor	1944	Germany	USA	A	14300	2050	50	127	7090
WWII Ardennes	Schnee Eifel Nor	1944	Germany	USA	A	12800	4150	200	3535	8000
WWII Ardennes	Our River Center	1944	Germany	USA	A	43800	5340	900	3300	8010
WWII Ardennes	Our River North	1944	Germany	USA	A	16000	5740	770	700	8020
WWII Ardennes	Schnee Eifel Cen	1944	Germany	USA	A	4100	3900	200	3700	8030
WWII Ardennes	Krinkelt-Rochera	1944	Germany	USA	D	9100	6600	900	720	8040
WWII Ardennes	Krinkelt-Rochera	1944	Germany	USA	A	3300	1357	100	400	8050
WWII Battle of Britain	Battle of Britai	1940	Germany	England		1485	700	45	13	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		489	494	19	8	.

Table 59. Campaign segmentation data (part 4)

CNAME	BATTLE	YEAR	ATT	DEF	V	XO	YO	CASX	CASY	NUMB
WWII Battle of Britain	Battle of Britai	1940	Germany	England		1786	974	75	34	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		1715	776	45	21	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		1200	981	38	22	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		880	524	20	16	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		1088	829	41	31	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		225	335	9	1	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		976	761	30	20	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		940	526	17	9	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		1605	1054	36	26	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		1620	1007	41	39	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		820	690	14	15	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		1047	780	35	31	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		676	745	16	16	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		947	698	25	17	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		903	712	23	20	.
WWII Battle of Britain	Battle of Britai	1940	Germany	England		797	1031	35	23	.
WWII Kursk	Oboyan-Kursk Axi	1943	Germany	Russia	A	62000	45000	1364	5680	4930
WWII Kursk	Operation Citade	1943	Germany	Russia	A	140000	75000	3180	4900	4940
WWII Kursk	Oboyan-Kursk Axi	1943	Germany	Russia	A	60000	149000	3500	25800	4950
WWII Kursk	Oboyan-Kursk Axi	1943	Germany	Russia	D	56000	129000	2900	30200	4960
WWII Kursk	Prokhorovka	1943	Russia	Germany	A	78000	82300	5700	5100	4970
WWII Kursk	Kursk Counteroff	1943	Russia	Germany	A	980600	280000	117700	39500	4980
WWII Kursk	Belgorod	1943	Russia	Germany	A	70000	15000	11676	2405	4990
WWII Okinawa	Advance from the	1945	USA	Japan	A	22888	1400	158	628	5210
WWII Okinawa	Advance through	1945	USA	Japan	A	18398	2900	286	2120	5220
WWII Okinawa	Tomb Hill-Ouki	1945	USA	Japan	A	18111	4731	466	1278	5230
WWII Okinawa	Skyline Ridge-Ro	1945	USA	Japan	A	16291	2600	740	1661	5240
WWII Okinawa	Kochi Ridge-Onag	1945	USA	Japan	D	14594	5000	269	1324	5250
WWII Okinawa	Kochi Ridge-Onag	1945	USA	Japan	D	15986	4500	182	814	5260
WWII Okinawa	Kochi Ridge-Onag	1945	USA	Japan	D	15764	4050	398	2276	5270
WWII Okinawa	Japanese Counter	1945	Japan	USA	D	6850	15350	3704	339	5280
WWII Okinawa	Kochi Ridge IV	1945	USA	Japan	A	15109	5140	114	1464	5290
WWII Okinawa	Shuri Envelopmen	1945	USA	Japan	A	16043	3338	170	478	5300
WWII Okinawa	Japanese Counter	1945	Japan	USA	D	4000	15777	1269	241	5310
WWII Okinawa	Shuri Envelopmen	1945	USA	Japan	D	15840	3000	124	434	5320
WWII Okinawa	Shuri Envelopmen	1945	USA	Japan	A	15205	2600	182	2564	5330
WWII Okinawa	Hill 95-I	1945	USA	Japan		16091	3500	193	1222	5340
WWII Okinawa	Hill 95-II	1945	USA	Japan	A	16002	2500	248	1470	5350
WWII Okinawa	Yaeju-Dake	1945	USA	Japan	A	5237	2500	48	2401	5360
WWII Okinawa	Hills 153 and 11	1945	USA	Japan	A	15808	2000	317	1971	5370
WWII Okinawa	Advance from the	1945	USA	Japan	A	19082	2000	282	1588	5380
WWII Okinawa	Advance to Shuri	1945	USA	Japan	A	18388	2900	555	2470	5390
WWII Okinawa	Kakazu and Tombs	1945	USA	Japan	D	21247	3000	1079	2468	5400
WWII Okinawa	Nishibaru Ridge-	1945	USA	Japan	A	17163	3000	879	2860	5410
WWII Okinawa	Maeda Escarpment	1945	USA	Japan	A	18095	3900	479	3810	5420
WWII Okinawa	Attack on the Sh	1945	USA	Japan		19714	5284	502	4038	5430
WWII Okinawa	Attack on the Sh	1945	USA	Japan		20973	4757	590	4328	5440
WWII Okinawa	Attack on the Sh	1945	USA	Japan	A	19658	4227	313	3022	5450
WWII Okinawa	Advance to the Y	1945	USA	Japan	A	18777	4000	112	798	5460
WWII Okinawa	Initial Attack o	1945	USA	Japan		18660	4250	88	1066	5470

Table 60. Campaign segmentation data (part 5)

CNAME	BATTLE	YEAR	ATT	DEF	V	XO	YO	CASX	CASY	NUMB
WWII Okinawa	Capture of the Y	1945	USA	Japan	A	19047	3250	576	3220	5480
WWII Rome	Santa Maria Infa	1944	USA	Germany	A	18702	9250	531	1035	4340
WWII Rome	San Martino	1944	USA	Germany	A	17970	8141	1974	720	4350
WWII Rome	Castellonorato	1944	USA	Germany	A	16458	7500	537	442	4360
WWII Rome	Spigno	1944	USA	Germany	A	18308	8215	343	730	4370
WWII Rome	Formia	1944	USA	Germany	A	23190	7627	405	721	4380
WWII Rome	Monte Grande (Ro	1944	USA	Germany	A	13095	4563	203	332	4390
WWII Rome	Itri-Fondi	1944	USA	Germany	A	17912	6653	257	380	4400
WWII Rome	Terracina	1944	USA	Germany	A	18030	6653	287	380	4410
WWII Rome	Moletta Offensiv	1944	England	Germany		17345	12569	234	468	4420
WWII Rome	Anzio-Albano Roa	1944	England	Germany		17313	11343	194	107	4430
WWII Rome	Anzio Breakout	1944	USA	Germany	A	22374	12815	710	1355	4440
WWII Rome	Cisterna	1944	USA	Germany	A	19971	11928	1524	1617	4450
WWII Rome	Sezze	1944	USA	Germany	A	17925	6957	162	277	4460
WWII Rome	Velletri	1944	USA	Germany	D	20683	12327	767	1319	4470
WWII Rome	Campoleone Stati	1944	USA	Germany		19047	10593	517	580	4480
WWII Rome	Villa Crocetta	1944	USA	Germany	D	18000	13715	263	598	4490
WWII Rome	Ardea	1944	England	Germany	A	15557	7659	245	374	4500
WWII Rome	Fosso di Campole	1944	USA	Germany	D	29711	15801	1304	1379	4510
WWII Rome	Lanuvio	1944	USA	Germany	D	17300	6108	825	698	4520
WWII Rome	Lariano	1944	USA	Germany	A	22641	13012	329	1178	4530
WWII Rome	Via Anziate	1944	USA	Germany		23604	19255	316	884	4540
WWII Rome	Valmontone	1944	USA	Germany	A	26607	10111	710	568	4550
WWII Rome	Tarto-Tiber	1944	England	Germany	A	38011	10855	572	850	4560
WWII Saar	Seille-Nied	1944	USA	Germany	A	99583	23588	4265	4880	4700
WWII Saar	Foret de Chateau	1944	USA	Germany	A	43587	11185	720	446	4710
WWII Saar	Morhange	1944	USA	Germany	A	25881	7555	1006	197	4720
WWII Saar	Morhange-Faulque	1944	USA	Germany	A	92393	28382	3223	2665	4730
WWII Saar	Bourgaltroff	1944	USA	Germany	A	10348	6519	185	141	4740
WWII Saar	Sarre-St. Avold	1944	USA	Germany	A	88941	32396	3279	4942	4750
WWII Saar	Baerendorf I	1944	USA	Germany	A	7935	5366	58	224	4760
WWII Saar	Baerendorf II	1944	USA	Germany	A	15871	6999	56	233	4770
WWII Saar	Burbach-Durstel	1944	USA	Germany	A	16232	6713	110	216	4780
WWII Saar	Durstel-Faerbers	1944	USA	Germany		90078	30712	482	811	4790
WWII Saar	Sarre-Union	1944	USA	Germany	A	19773	6044	234	129	4800
WWII Saar	Sarre-Singling	1944	USA	Germany	A	89977	31501	835	1774	4810
WWII Saar	Singling-Bining	1944	USA	Germany		15224	5044	155	121	4820
WWII Volturno	Grazzanise	1943	England	Germany	A	14557	8068	370	80	4030
WWII Volturno	Caiazzo	1943	USA	Germany	A	18210	6435	140	52	4040
WWII Volturno	Capua	1943	England	Germany	D	16857	8000	420	94	4050
WWII Volturno	Castel Volturo	1943	England	Germany	A	17765	8158	500	40	4060
WWII Volturno	Monte Acero	1943	USA	Germany	A	21265	6435	133	130	4070
WWII Volturno	Triflisco	1943	USA	Germany	A	18476	7250	267	76	4080
WWII Volturno	Dragoni	1943	USA	Germany	D	17034	5152	65	103	4090
WWII Volturno	Canal I	1943	USA	Germany	A	14600	8138	125	45	4100
WWII Volturno	Monte Grande (Vo	1943	England	Germany	A	16400	7239	200	66	4110
WWII Volturno	Canal II	1943	England	Germany	A	17500	8128	220	138	4120
WWII Volturno	Francolise	1943	England	Germany	D	14000	8088	75	44	4130
WWII Volturno	Santa Maria Oliv	1943	USA	Germany	A	16870	6321	416	185	4140
WWII Volturno	Monte Camino I	1943	England	Germany	D	19513	6750	240	33	4150

Table 61. Campaign segmentation data (part 6)

CNAME	BATTLE	YEAR	ATT	DEF	V	XO	YO	CASX	CASY	NUMB
WWII Volturno	Monte Lungo	1943	USA	Germany	D	16600	6566	361	142	4160
WWII Volturno	Pozzilli	1943	USA	Germany	D	17404	6566	155	25	4170
WWII Volturno	Monte Rotondo	1943	USA	Germany		16350	7942	165	118	4190
WWII Volturno	Calabritto	1943	England	Germany	D	17765	7588	250	20	4200
WWII Volturno	Monte Camino III	1943	England	Germany	A	20744	3288	550	141	4210
WWII Volturno	Monte Maggiore	1943	USA	Germany	A	5551	3288	80	20	4220

Table 62. Attacker/defender pair segmentation data

AD	CNAME	YEAR	ATT	DEF	V	XO	YO	CASX	CASY	NUMB
EG	WWII Anzio	1944	England	Germany	A	19350	6750	1158	130	4230
EG	WWII Anzio	1944	England	Germany	A	17766	15098	742	221	4250
EG	WWII Rome	1944	England	Germany		17345	12569	234	468	4420
EG	WWII Rome	1944	England	Germany		17313	11343	194	107	4430
EG	WWII Rome	1944	England	Germany	A	15557	7659	245	374	4500
EG	WWII Rome	1944	England	Germany	A	38011	10855	572	850	4560
EG	WWII Volturno	1943	England	Germany	A	14557	8068	370	80	4030
EG	WWII Volturno	1943	England	Germany	D	16857	8000	420	94	4050
EG	WWII Volturno	1943	England	Germany	A	17765	8158	500	40	4060
EG	WWII Volturno	1943	England	Germany	A	16400	7239	200	66	4110
EG	WWII Volturno	1943	England	Germany	A	17500	8128	220	138	4120
EG	WWII Volturno	1943	England	Germany	D	14000	8088	75	44	4130
EG	WWII Volturno	1943	England	Germany	D	19513	6750	240	33	4150
EG	WWII Volturno	1943	England	Germany	D	17765	7588	250	20	4200
EG	WWII Volturno	1943	England	Germany	A	20744	3288	550	141	4210
FG	WWI Meuse-Argonne	1918	France	Germany	A	500000	300000	77448	75068	3730
FG	WWI Meuse-Argonne	1918	France	Germany	A	600000	380140	30426	29491	3810
FG	WWI The Marne	1914	France	Germany		100000	45000	5600	2500	2700
FG	WWI The Marne	1914	France	Germany		198000	157000	40000	39000	2710
FG	WWI The Marne	1914	France	Germany	A	227000	82000	45000	19000	2720
GE	WWII Anzio	1944	Germany	England	D	15317	17976	366	62	4240
GE	WWII Anzio	1944	Germany	England	A	26029	9834	1318	1450	4260
GE	WWII Anzio	1944	Germany	England	D	26490	4515	341	369	4270
GE	WWII Anzio	1944	Germany	England	A	27518	17730	270	311	4290
GE	WWII Anzio	1944	Germany	England	A	21478	9761	1451	1693	4320
GE	WWII Battle of Britain	1940	Germany	England		1485	700	45	13	.
GE	WWII Battle of Britain	1940	Germany	England		489	494	19	8	.
GE	WWII Battle of Britain	1940	Germany	England		1786	974	75	34	.
GE	WWII Battle of Britain	1940	Germany	England		1715	776	45	21	.
GE	WWII Battle of Britain	1940	Germany	England		1200	981	38	22	.
GE	WWII Battle of Britain	1940	Germany	England		880	524	20	16	.
GE	WWII Battle of Britain	1940	Germany	England		1088	829	41	31	.
GE	WWII Battle of Britain	1940	Germany	England		225	335	9	1	.
GE	WWII Battle of Britain	1940	Germany	England		976	761	30	20	.
GE	WWII Battle of Britain	1940	Germany	England		940	526	17	9	.
GE	WWII Battle of Britain	1940	Germany	England		1605	1054	36	26	.
GE	WWII Battle of Britain	1940	Germany	England		1620	1007	41	39	.
GE	WWII Battle of Britain	1940	Germany	England		820	690	14	15	.
GE	WWII Battle of Britain	1940	Germany	England		1047	780	35	31	.
GE	WWII Battle of Britain	1940	Germany	England		676	745	16	16	.
GE	WWII Battle of Britain	1940	Germany	England		947	698	25	17	.
GE	WWII Battle of Britain	1940	Germany	England		903	712	23	20	.
GE	WWII Battle of Britain	1940	Germany	England		797	1031	35	23	.
GF	Franco-Prussia Metz	1870	Germany	France	A	51000	6000	1600	2100	2200
GF	Franco-Prussia Metz	1870	Germany	France	A	82000	41000	10700	20300	2210
GF	Franco-Prussia Metz	1870	Germany	France	A	42000	28000	4900	3100	2220
GF	Franco-Prussia Metz	1870	Germany	France	A	91000	113000	16000	14000	2230
GF	Franco-Prussia Metz	1870	Germany	France	A	187000	113000	20200	12800	2240
GF	WWI The Marne	1914	Germany	France	D	350000	276000	75000	52000	2690
GF	WWI The Marne	1914	Germany	France	D	101000	141000	25000	29000	2740

Table 63. Attacker/defender pair segmentation data (part 2)

AD	CNAME	YEAR	ATT	DEF	V	XO	YO	CASX	CASY	NUMB
GF	WWI The Marne	1914	Germany	France	D	113000	170000	26000	27000	2750
GF	WWI The Marne	1914	Germany	France	D	142000	180000	29000	29000	2760
GU	WWII Anzio	1944	Germany	USA		7418	5000	167	107	4280
GU	WWII Anzio	1944	Germany	USA	D	41974	20496	2238	1018	4310
GU	WWII Anzio	1944	Germany	USA	D	15637	19613	265	403	4330
GU	WWII Anzio	1944	Germany	USA	D	14600	4500	1129	442	6090
GU	WWII Anzio	1944	Germany	USA	D	10000	4625	439	199	7000
GU	WWII Anzio	1944	Germany	USA	A	15736	5050	613	750	7010
GU	WWII Ardennes	1944	Germany	USA	A	10000	8634	268	134	4830
GU	WWII Ardennes	1944	Germany	USA		87000	19996	4306	1731	4840
GU	WWII Ardennes	1944	Germany	USA	D	36678	4849	3000	1151	4850
GU	WWII Ardennes	1944	Germany	USA	A	11000	4300	200	300	7080
GU	WWII Ardennes	1944	Germany	USA	A	14300	2050	50	127	7090
GU	WWII Ardennes	1944	Germany	USA	A	12800	4150	200	3535	8000
GU	WWII Ardennes	1944	Germany	USA	A	43800	5340	900	3300	8010
GU	WWII Ardennes	1944	Germany	USA	A	16000	5740	770	700	8020
GU	WWII Ardennes	1944	Germany	USA	A	4100	3900	200	3700	8030
GU	WWII Ardennes	1944	Germany	USA	D	9100	6600	900	720	8040
GU	WWII Ardennes	1944	Germany	USA	A	3300	1357	100	400	8050
IE	Israel 67 Sinai	1967	Israel	Egypt	A	19520	19500	700	2700	5540
IE	Israel 67 Sinai	1967	Israel	Egypt	A	10450	10050	90	1350	5550
IE	Israel 67 Sinai	1967	Israel	Egypt	A	19280	18450	300	900	5560
IE	Israel 67 Sinai	1967	Israel	Egypt	A	6912	12750	135	225	5570
IE	Israel 67 Sinai	1967	Israel	Egypt		10800	3000	70	450	5580
IE	Israel 67 Sinai	1967	Israel	Egypt	A	12150	17450	55	626	5590
IE	Israel 67 Sinai	1967	Israel	Egypt	A	8700	3000	60	550	5600
IE	Israel 67 Sinai	1967	Israel	Egypt	D	22000	7250	550	90	5610
IE	Israel 67 Sinai	1967	Israel	Egypt	A	10200	13500	75	550	5620
IE	Israel 67 Sinai	1967	Israel	Egypt	A	18780	18450	60	625	5630
IE	Israel 67 Sinai	1967	Israel	Egypt	D	3500	3600	450	60	5640
IE	Israel 73 Suez	1973	Israel	Egypt	D	25850	67440	700	700	5730
IE	Israel 73 Suez	1973	Israel	Egypt	A	22790	30970	100	500	5760
IE	Israel 73 Suez	1973	Israel	Egypt	A	28900	36840	950	2400	5770
IE	Israel 73 Suez	1973	Israel	Egypt	A	19600	18180	300	800	5780
IE	Israel 73 Suez	1973	Israel	Egypt	D	17000	23860	600	1800	5790
IE	Israel 73 Suez	1973	Israel	Egypt	A	16200	35633	300	1650	5800
IE	Israel 73 Suez	1973	Israel	Egypt	A	16200	25600	150	1100	5810
IE	Israel 73 Suez	1973	Israel	Egypt	A	10900	14620	75	400	5820
IE	Israel 73 Suez	1973	Israel	Egypt	A	11700	22570	150	1100	5830
IE	Israel 73 Suez	1973	Israel	Egypt	D	14681	22570	340	1100	5840
IS	Israel 67 Golan	1967	Israel	Syria	A	5375	8160	300	850	5650
IS	Israel 67 Golan	1967	Israel	Syria	A	5350	4350	150	300	5660
IS	Israel 67 Golan	1967	Israel	Syria	A	5850	8560	230	500	5670
IS	Israel 73 Golan	1973	Israel	Syria	A	17833	23750	450	1125	5900
IS	Israel 73 Golan	1973	Israel	Syria	A	12733	14683	450	1125	5910
IS	Israel 73 Golan	1973	Israel	Syria	D	2692	1583	50	100	5930
IS	Israel 73 Golan	1973	Israel	Syria	A	16100	19400	525	1200	5940
IS	Israel 73 Golan	1973	Israel	Syria	A	14700	21500	280	900	5950
IS	Israel 73 Golan	1973	Israel	Syria	D	5700	4750	150	200	6000
IS	Israel 73 Golan	1973	Israel	Syria	A	11400	4750	100	250	6010

Table 64. Attacker/defender pair segmentation data (part 3)

AD	CNAME	YEAR	ATT	DEF	V	X0	Y0	CASX	CASY	NUMB
UG	WWI Belleau Wood	1918	USA	Germany		9437	6436	1087	730	3360
UG	WWI Belleau Wood	1918	USA	Germany	A	2913	1458	383	471	3370
UG	WWI Belleau Wood	1918	USA	Germany	D	1740	1121	361	54	3380
UG	WWI Belleau Wood	1918	USA	Germany		2733	1352	343	186	3390
UG	WWI Belleau Wood	1918	USA	Germany	D	3608	3955	340	87	3400
UG	WWI Belleau Wood	1918	USA	Germany	A	3343	1798	279	541	3410
UG	WWI Belleau Wood	1918	USA	Germany	A	1747	1952	167	293	3420
UG	WWI Belleau Wood	1918	USA	Germany	D	1697	1428	192	18	3440
UG	WWI Belleau Wood	1918	USA	Germany	D	1256	1565	133	19	3450
UG	WWI Belleau Wood	1918	USA	Germany	A	4453	1546	273	437	3460
UG	WWI Belleau Wood	1918	USA	Germany	A	12812	10358	336	1074	3470
UG	WWI Belleau Wood	1918	USA	Germany	A	4515	5182	94	568	3480
UG	WWI Belleau Wood	1918	USA	Germany	A	4508	5177	223	506	3490
UG	WWI Meuse-Argonne	1918	USA	Germany	A	26000	13000	4700	4000	3670
UG	WWI Meuse-Argonne	1918	USA	Germany	A	1921	155	247	83	3680
UG	WWI Meuse-Argonne	1918	USA	Germany	A	1420	216	140	120	3690
UG	WWI Meuse-Argonne	1918	USA	Germany	A	1400	458	308	241	3700
UG	WWI Meuse-Argonne	1918	USA	Germany	A	9230	670	620	450	3710
UG	WWI Meuse-Argonne	1918	USA	Germany		18000	10000	1589	500	3720
UG	WWI Meuse-Argonne	1918	USA	Germany		5336	3245	352	192	3740
UG	WWI Meuse-Argonne	1918	USA	Germany		5427	1899	376	114	3750
UG	WWI Meuse-Argonne	1918	USA	Germany	A	5365	1940	340	61	3760
UG	WWI Meuse-Argonne	1918	USA	Germany	A	5461	2587	242	250	3770
UG	WWI Meuse-Argonne	1918	USA	Germany	A	5022	3355	301	173	3780
UG	WWI Meuse-Argonne	1918	USA	Germany	A	4778	2925	132	136	3790
UG	WWI Meuse-Argonne	1918	USA	Germany	A	2950	2563	109	250	3800
UG	WWI Meuse-Argonne	1918	USA	Germany	A	1210	296	25	30	3820
UG	WWI Meuse-Argonne	1918	USA	Germany	A	1989	1655	110	192	3830
UG	WWI Soissons	1918	USA	Germany	A	5004	3013	393	1853	3530
UG	WWI Soissons	1918	USA	Germany	A	5039	2663	448	1243	3540
UG	WWI Soissons	1918	USA	Germany	A	1150	400	120	400	3550
UG	WWI Soissons	1918	USA	Germany	A	4480	565	125	181	3560
UG	WWI Soissons	1918	USA	Germany	A	10345	2420	895	1610	3570
UG	WWI Soissons	1918	USA	Germany	A	1611	800	130	500	3580
UG	WWII Rome	1944	USA	Germany	A	18702	9250	531	1035	4340
UG	WWII Rome	1944	USA	Germany	A	17970	8141	1974	720	4350
UG	WWII Rome	1944	USA	Germany	A	16458	7500	537	442	4360
UG	WWII Rome	1944	USA	Germany	A	18308	8215	343	730	4370
UG	WWII Rome	1944	USA	Germany	A	23190	7627	405	721	4380
UG	WWII Rome	1944	USA	Germany	A	13095	4563	203	332	4390
UG	WWII Rome	1944	USA	Germany	A	17912	6653	257	380	4400
UG	WWII Rome	1944	USA	Germany	A	18030	6653	287	380	4410
UG	WWII Rome	1944	USA	Germany	A	22374	12815	710	1355	4440
UG	WWII Rome	1944	USA	Germany	A	19971	11928	1524	1617	4450
UG	WWII Rome	1944	USA	Germany	A	17925	6957	162	277	4460
UG	WWII Rome	1944	USA	Germany	D	20683	12327	767	1319	4470
UG	WWII Rome	1944	USA	Germany		19047	10593	517	580	4480
UG	WWII Rome	1944	USA	Germany	D	18000	13715	263	598	4490
UG	WWII Rome	1944	USA	Germany	D	29711	15801	1304	1379	4510
UG	WWII Rome	1944	USA	Germany	D	17300	6108	825	698	4520

Table 65. Attacker/defender pair segmentation data (part 4)

AD	CNAME	YEAR	ATT	DEF	V	XO	YO	CASX	CASY	NUMB
UG	WWII Rome	1944	USA	Germany	A	22641	13012	329	1178	4530
UG	WWII Rome	1944	USA	Germany		23604	19255	316	884	4540
UG	WWII Rome	1944	USA	Germany	A	26607	10111	710	568	4550
UG	WWII Saar	1944	USA	Germany	A	99583	23588	4265	4880	4700
UG	WWII Saar	1944	USA	Germany	A	43587	11185	720	446	4710
UG	WWII Saar	1944	USA	Germany	A	25881	7555	1006	197	4720
UG	WWII Saar	1944	USA	Germany	A	92393	28382	3223	2665	4730
UG	WWII Saar	1944	USA	Germany	A	10348	6519	185	141	4740
UG	WWII Saar	1944	USA	Germany	A	88941	32396	3279	4942	4750
UG	WWII Saar	1944	USA	Germany	A	7935	5366	58	224	4760
UG	WWII Saar	1944	USA	Germany	A	15871	6999	56	233	4770
UG	WWII Saar	1944	USA	Germany	A	16232	6713	110	216	4780
UG	WWII Saar	1944	USA	Germany		90078	30712	482	811	4790
UG	WWII Saar	1944	USA	Germany	A	19773	6044	234	129	4800
UG	WWII Saar	1944	USA	Germany	A	89977	31501	835	1774	4810
UG	WWII Saar	1944	USA	Germany		15224	5044	155	121	4820
UG	WWII Volturno	1943	USA	Germany	A	18210	6435	140	52	4040
UG	WWII Volturno	1943	USA	Germany	A	21265	6435	133	130	4070
UG	WWII Volturno	1943	USA	Germany	A	18476	7250	267	76	4080
UG	WWII Volturno	1943	USA	Germany	D	17034	5152	65	103	4090
UG	WWII Volturno	1943	USA	Germany	A	14600	8138	125	45	4100
UG	WWII Volturno	1943	USA	Germany	A	16870	6321	416	185	4140
UG	WWII Volturno	1943	USA	Germany	D	16600	6566	361	142	4160
UG	WWII Volturno	1943	USA	Germany	D	17404	6566	155	25	4170
UG	WWII Volturno	1943	USA	Germany		16350	7942	165	118	4190
UG	WWII Volturno	1943	USA	Germany	A	5551	3288	80	20	4220

Table 66. Okinawa internal data

BATTLE	DATE	ATT	DEF
Advance from the	02APR1945	US 7th Inf Div (+)	Jap 1st Spec Estab Rg
Advance from the	02APR1945	US 96th Inf Div (+)	Jap 1st Spec Est Rgt
Advance through	05APR1945	US 7th Inf Div (+)	Jap 62d Div (-)
Advance to Shuri	05APR1945	US 96th Inf Div (+)	Jap 12th Ind Inf Bn (
Kakazu and Tombs	09APR1945	US 96th Inf Div (+)	Jap 12th Ind Inf Bn (
Tomb Hill-Ouki	19APR1945	US 7th Inf Div (+)	Jap 11th Ind Inf Bn (
Skyline Ridge-Ro	19APR1945	US 7th Inf Div (+)	Jap 11th Ind Inf Bn (
Nishibaru Ridge-	19APR1945	US 96th Inf Div (+)	Jap 12th Ind Inf Bn (
Kochi Ridge-Onag	25APR1945	US 7th Inf Div (+)	Jap 22d Inf Rgt
Maeda Escarpment	26APR1945	US 96th Inf Div (+)	Jap 62d Div (-) (+)
Kochi Ridge-Onag	28APR1945	US 7th Inf Div (+)	Jap 22d Inf Rgt
Kochi Ridge-Onag	30APR1945	US 7th Inf Div (+)	Jap 22d Inf Rgt (+)
Kochi Ridge IV	06MAY1945	US 7th Inf Div (+)	Jap 24th Div (-)
Attack on the Sh	11MAY1945	US 96th Inf Div (+)	Jap 24th Inf Div (-)
Attack on the Sh	14MAY1945	US 96th Inf Div (+)	Jap 24th Inf Div (-)
Attack on the Sh	20MAY1945	US 96th Inf Div (+)	Jap 24th Inf Div (+)
Shuri Envelopmen	22MAY1945	US 7th Inf Div (+)	Jap 3d Spec Estab Rgt
Shuri Envelopmen	26MAY1945	US 7th Inf Div (+)	Jap 24th Div (-) (+)
Shuri Envelopmen	29MAY1945	US 7th Inf Div (+)	Jap 24th Div (-) (+)
Hill 95-I	06JUN1945	US 7th Inf Div (+)	Jap 44th Ind Mixed Bd
Advance to the Y	06JUN1945	US 96th Inf Div (+)	Jap 24th Inf Div (-)
Hill 95-II	09JUN1945	US 7th Inf Div (+)	Jap 44th Ind Mixed Bd
Initial Attack ̮	10JUN1945	US 96th Inf Div (+)	Jap 24th Inf Div (-)

BATTLE	A	D	V	XO	YO	CASX	CASY	NUMB
Advance from the	U7.	J1.	A	22888	1400	158	628	5210
Advance from the	U96	J1.	A	19082	2000	282	1588	5380
Advance through	U7.	J62	A	18398	2900	286	2120	5220
Advance to Shuri	U96	J12	A	18388	2900	555	2470	5390
Kakazu and Tombs	U96	J12	D	21247	3000	1079	2468	5400
Tomb Hill-Ouki	U7.	J11	A	18111	4731	466	1278	5230
Skyline Ridge-Ro	U7.	J11	A	16291	2600	740	1661	5240
Nishibaru Ridge-	U96	J12	A	17163	3000	879	2860	5410
Kochi Ridge-Onag	U7.	J22	D	14594	5000	269	1324	5250
Maeda Escarpment	U96	J62	A	18095	3900	479	3810	5420
Kochi Ridge-Onag	U7.	J22	D	15986	4500	182	814	5260
Kochi Ridge-Onag	U7.	J22	D	15764	4050	398	2276	5270
Kochi Ridge IV	U7.	J24	A	15109	5140	114	1464	5290
Attack on the Sh	U96	J24		19714	5284	502	4038	5430
Attack on the Sh	U96	J24		20973	4757	590	4328	5440
Attack on the Sh	U96	J24	A	19658	4227	313	3022	5450
Shuri Envelopmen	U7.	J3.	A	16043	3338	170	478	5300
Shuri Envelopmen	U7.	J24	D	15840	3000	124	434	5320
Shuri Envelopmen	U7.	J24	A	15205	2600	182	2564	5330
Hill 95-I	U7.	J44		16091	3500	193	1222	5340
Advance to the Y	U96	J24	A	18777	4000	112	798	5460
Hill 95-II	U7.	J44	A	16002	2500	248	1470	5350
Initial Attack o	U96	J24		18660	4250	88	1066	5470

Table 67. Okinawa internal data (part 2)

BATTLE	DATE	AT1	DEF
Yaeju-Dake	12JUN1945	US 7th Inf Div (+)	Jap 44th Ind Mixed Bd
Capture of the Y	12JUN1945	US 96th Inf Div (+)	Jap 44th Ind Mixed Bd
Hills 153 and 11	15JUN1945	US 7th Inf Div (+)	Jap 44th Ind Mixed Bd

BATTLE	A	D	V	XO	YO	CASX	CASY	NUMB
Yaeju-Dake	U7.	J44	A	5237	2500	48	2401	5360
Capture of the Y	U96	J44	A	19047	3250	576	3220	5480
Hills 153 and 11	U7.	J44	A	15808	2000	317	1971	5370

Table 68. Iwo Jima daily battle data

DATE	ATT	DEF	X	Y	NOTE
19FEB1945	USA	Japan	54000	21500	
20FEB1945	USA	Japan	52839	.	
21FEB1945	USA	Japan	56945	.	
22FEB1945	USA	Japan	56031	.	
23FEB1945	USA	Japan	54890	.	
24FEB1945	USA	Japan	66749	.	
25FEB1945	USA	Japan	66155	.	
26FEB1945	USA	Japan	65250	.	
27FEB1945	USA	Japan	64378	.	
28FEB1945	USA	Japan	62874	.	
01MAR1945	USA	Japan	62339	.	
02MAR1945	USA	Japan	61405	.	
03MAR1945	USA	Japan	60667	.	
04MAR1945	USA	Japan	59549	.	
05MAR1945	USA	Japan	59345	.	
06MAR1945	USA	Japan	59081	.	
07MAR1945	USA	Japan	58779	.	
08MAR1945	USA	Japan	58196	.	
09MAR1945	USA	Japan	57259	.	
10MAR1945	USA	Japan	56641	.	
11MAR1945	USA	Japan	56061	.	
12MAR1945	USA	Japan	55308	.	
13MAR1945	USA	Japan	54796	.	
14MAR1945	USA	Japan	54308	.	
15MAR1945	USA	Japan	53938	.	
16MAR1945	USA	Japan	53347	.	
17MAR1945	USA	Japan	53072	.	
18MAR1945	USA	Japan	52804	.	
19MAR1945	USA	Japan	52735	2000	
20MAR1945	USA	Japan	52608	.	drop
21MAR1945	USA	Japan	52507	.	drop
22MAR1945	USA	Japan	52462	.	drop
23MAR1945	USA	Japan	52304	.	drop
24MAR1945	USA	Japan	52155	.	drop
25MAR1945	USA	Japan	52155	.	drop
26MAR1945	USA	Japan	52155	.	drop
27MAR1945	USA	Japan	52140	0	drop

END

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