

The US Army's Center for Strategy and Force Evaluation

RESERACH PAPER
CAA-RP-95-2

**PERSONNEL ATTRITION RATES IN
HISTORICAL LAND COMBAT OPERATIONS:
ADDENDA TO THE ANNOTATED
BIBLIOGRAPHY**

APRIL 1995



PREPARED BY
TACTICAL ANALYSIS DIVISION

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PREFACE

The Personnel Attrition Rates (PAR) Study as a whole is limited to studying personnel strengths and battle casualties in historical land combat operations. Other types of attrition (nonbattle losses, losses to equipment, casualties to other services, and so forth) are outside PAR's scope, as are personnel losses in models, simulations, war games, field experiments, or training exercises (like those of the National Training Center).

Phase 1, or PAR-P1, was devoted to assembling the available data and past studies on personnel strengths and attrition rates in land combat operations, preparing a comprehensive bibliography of it, and planning the approach to subsequent phases. Its specific objectives were to:

- Collect as many as possible of the available tabulated data and data-based studies of attrition rates in historical land combat operations,
- Prepare a comprehensive bibliography of such data and studies, and
- Outline an approach to accomplishing the subsequent phases of the PAR Study as a whole.

The bibliography of works collected during Phase 1 was published as *Personnel Attrition Rates in Land Combat Operations: An Annotated Bibliography*, US Army Concepts Analysis Agency Research Paper, CAA-RP-93-2, June 1993 (AD-A268 787). The collection of data and data-based studies consists of the files of pertinent documents maintained at the US Army Concepts Analysis Agency.

Phase 2 of the PAR Study converted some of the most important data to electronic form in order to facilitate its analysis, and performed selected analyses of the attrition data to derive information useful in US Army war games, studies, and analyses. As of this writing, the following documents have been published during Phase 2:

- *Personnel Attrition Rates in Historical Land Combat Operations: Susceptibility and Vulnerability of Major Anatomical Regions*, CAA Research Paper CAA-RP-93-3, August 1993, AD-A270 766.
- *Personnel Attrition Rates in Historical Land Combat Operations: A Catalog of Attrition and Casualty Data Bases on Diskettes Usable With Personal Computers*, CAA Research Paper CAA-RP-93-4, September 1993, AD-A279 069 (report), AD-M000 344 (diskettes).
- *Personnel Attrition Rates in Historical Land Combat Operations: A Note on the Probability of Readmissions and Multiple Wounds*, CAA Research Paper CAA-RP-94-2, April 1994, AD-280 498.
- *Personnel Attrition Rates in Historical Land Combat Operations: Some Empirical Relations Among Force Sizes, Battle Durations, Battle Dates, and Casualties*, CAA Research Paper CAA-95-1, 1 March 1995, AD number TBD.

CAA-RP-95-2

This paper, written as part of Phase 3, adds several recently received items to those listed in *Personnel Attrition Rates in Historical Land Combat Operations: An Annotated Bibliography*, US Army Concepts Analysis Agency Research Paper CAA-RP-93-2, June 1993, AD-A268 787.

PERSONNEL ATTRITION RATES IN HISTORICAL LAND COMBAT OPERATION: ADDENDA TO THE ANNOTATED BIBLIOGRAPHY	SUMMARY CAA-RP-95-2
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THE REASON FOR PERFORMING THIS RESEARCH was that several items warranting inclusion have come to our attention since the original annotated bibliography was prepared.

THE SPONSOR was the Director, US Army Concepts Analysis Agency.

THE RESEARCH OBJECTIVE was to provide annotated bibliographical entries for those items that should be added to the original annotated bibliography.

THE SCOPE OF THE RESEARCH is restricted to those documents that have come to our attention since the original bibliography was prepared.

THE MAIN ASSUMPTION of this paper is that the bulk of the pertinent works has been collected and is on file at CAA.

THE BASIC APPROACH used in this study is to prepare annotated bibliographic citations for these documents.

THE RESEARCH EFFORT was directed by Dr. Robert L. Helmbold, Tactical Analysis Division.

COMMENTS AND SUGGESTIONS may be sent to the Director, US Army Concepts Analysis Agency, ATTN: CSCA-TCT, 8120 Woodmont Avenue, Bethesda, Maryland, 20814-2797.

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EXECUTIVE SUMMARY

1. BACKGROUND. In April 1992, the US Army Concepts Analysis Agency (CAA) started a three-phased study of personnel attrition data. The Personnel Attrition Rates (PAR) Study as a whole is limited to studying personnel strengths and battle casualties in historical land combat operations. Other types of attrition (nonbattle losses, losses to equipment, casualties to other services, and so forth) are outside PAR's scope, as are personnel losses in models, simulations, wargames, field experiments, or training exercises (like those of the National Training Center).

Phase 1, or PAR-P1, was devoted to assembling the available data and past studies on personnel strengths and attrition rates in land combat operations, preparing a comprehensive bibliography of it, and planning the approach to subsequent phases. Its specific objectives were to:

- Collect as many as possible of the available tabulated data and data-based studies of attrition rates in historical land combat operations,
- Prepare a comprehensive bibliography of such data and studies, and
- Outline an approach to accomplishing the subsequent phases of the PAR Study as a whole.

An annotated bibliography of the works collected during Phase 1 was published as *Personnel Attrition Rates in Land Combat Operations: An Annotated Bibliography*, US Army Concepts Analysis Agency Research Paper, CAA-RP-93-2, June 1993 (AD-A268 787). The collection of data and data-based studies consists of the files of pertinent documents maintained at the US Army Concepts Analysis Agency.

Phase 2 of the PAR Study converted some of the most important data to electronic form in order to facilitate its analysis and performed selected analyses of the attrition data to derive information useful in US Army wargames, studies, and analyses. As of this writing, the following documents have been published during Phase 2:

- *Personnel Attrition Rates in Historical Land Combat Operations: Susceptibility and Vulnerability of Major Anatomical Regions*, CAA Research Paper CAA-RP-93-3, August 1993, AD-A270 766.
- *Personnel Attrition Rates in Historical Land Combat Operations: A Catalog of Attrition and Casualty Data Bases on Diskettes Usable With Personal Computers*, CAA Research Paper CAA-RP-93-4, September 1993, AD-A279 069 (report), AD-M000 344 (diskettes).
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- *Personnel Attrition Rates in Historical Land Combat Operations: Some Empirical Relations Among Force Sizes, Battle Durations, Battle Dates, and Casualties*, CAA Research Paper CAA-95-1, 1 March 1995, AD number TBD.

This paper, written as part of Phase 3, adds several recently received items to those listed in *Personnel Attrition Rates in Historical Land Combat Operations: An Annotated Bibliography*, US Army Concepts Analysis Agency Research Paper CAA-RP-93-2, June 1993, AD-A268 787

2. OBJECTIVE. The objective of this research paper is to provide annotated bibliographical entries for those items that should be added to the original annotated bibliography.

3. SCOPE

a. PAR as a whole is limited to studying personnel strengths and battle casualties of land combat forces. Other types of attrition (nonbattle losses, losses to equipment, casualties to other services, and so forth) are outside PAR's scope. PAR is concerned only with historical data on actual combat operations: it will not deal with personnel losses in models, simulations, wargames, field experiments, or training exercises (like those of the National Training Center). PAR focuses mainly on either original or translated works in English, although some important work in other languages may be included. Studies of personnel attrition are also included, provided they contain cogent analyses of a publicly available, nonproprietary body of tabulated data on attrition in actual combat operations. Since trends in attrition over long periods of time are of interest, data on ancient as well as recent battles are solicited. However, as no contract support is anticipated and in-house resources are limited, no systematic effort is made to extract data from the archives or primary source materials, and no original historical research is envisioned. Thus, PAR relies almost exclusively on secondary works that contain data in readily usable tabulated form.

b. The scope of this study is restricted to those documents that have come to our attention since the original bibliography was prepared.

4. ASSUMPTIONS. The main assumption of this paper is that the bulk of the pertinent works has been collected and is on file at CAA.

5. APPROACH. The basic approach used in this study is to prepare annotated bibliographic citations for documents that came to our attention since the original bibliography was prepared.

6. FINDINGS AND OTHER OBSERVATIONS. The principal finding of the work reported herein is that additional documents should be added to the original annotated bibliography. Other important findings have previously been documented in *Personnel Attrition Rates in Land Combat Operations: An Annotated Bibliography*, US Army Concepts Analysis Agency Research Paper, CAA-RP-93-2, June 1993 (AD-A268 787).

APPENDIX A
CONTRIBUTORS

A-1. QRA TEAM

a. QRA Director

Dr. Robert L. Hembold, Tactical Analysis Division

APPENDIX B

STUDY DIRECTIVE

CSCA-ZA

MEMORANDUM FOR CHIEF, TACTICAL ANALYSIS DIVISION

SUBJECT: Personnel Attrition Rates in Historical Land Combat Operations, Phase 3 (PAR-P3)

1. PURPOSE OF THE STUDY DIRECTIVE. This directive provides tasking and guidance for the conduct of the Personnel Attrition Rates in Land Combat Operations, Phase 3 (PAR-P3) study effort, which has the objectives of (i) publishing a CAA research paper documenting and summarizing selected historical data on personnel losses of army forces engaged in large-scale land combat operations, (ii) publishing a CAA research paper providing an addenda to the previously published CAA Research Paper, CAA-RP-93-2, Personnel Attrition Rates in Historical Land Combat Operations: An Annotated Bibliography, June 1993, AD-A268-787, and (iii) planning for the conduct of Phase 4 of PAR.

2. BACKGROUND

a. The results of US Army models and wargames of combat are continually being challenged to demonstrate their validity. One of the key features of military combat is the infliction and suffering of personnel attrition. To provide an adequate basis for assessing the validity of US Army wargames and models of combat, it is necessary that the reported data and past studies of personnel attrition rates in historical large scale combat operations be summarized and documented

b. PAR is limited to studying personnel strengths and battle casualties of land combat forces. Other types of attrition (nonbattle losses, losses to equipment, casualties to other services, and so forth) are outside PAR's scope. PAR is concerned only with historical data on actual combat operations; it will not deal with personnel losses in models, simulations, war games, field experiments, or training exercises (like those of the National Training Center). PAR will focus mainly on either original or translated works in English, although the most important works in other languages should be included. Studies of personnel attrition are also included, provided they contain cogent analyses of a publicly available, nonproprietary body of tabulated data on attrition in actual combat operations. Since trends in attrition over long periods of time are of interest, data on ancient as well as recent battles are solicited. However, as no contract support is anticipated and in-house resources are limited, no systematic effort will be made to extract data from the archives or primary source materials, and no original archival research will be

conducted. Thus, PAR will rely almost exclusively on secondary works that contain data in readily usable tabulated form.

c. Phase 1, or PAR-P1, was devoted to assembling the available data and past studies on personnel strengths and attrition rates in land combat operations, preparing a comprehensive annotated bibliography of it, and planning the approach to subsequent phases. It provided an annotated bibliography of over 200 relevant works, with several different types of indexes to aid retrieval.

d. Phase 2, or PAR-P2, was devoted to converting some of the most important data to electronic form in order to facilitate its analysis, and to performing selected analyses of the attrition data to derive information useful in US Army wargames, studies, and analyses. As of this writing, the following documents have been published during Phase 2, or are in preparation:

- Personnel Attrition Rates in Historical Land Combat Operations: Susceptibility and Vulnerability of Major Anatomical Regions, CAA Research Paper CAA-RP-93-3, August 1993, AD-A270 766.

- Personnel Attrition Rates in Historical Land Combat Operations: A Catalog of Attrition and Casualty Data Bases on Diskettes Usable With Personal Computers, CAA Research Paper CAA-RP-93-4, September 1993, AD-A279 069 (report), AD-M000 344 (diskettes).

- Personnel Attrition Rates in Historical Land Combat Operations: A Note on the Probability of Readmissions and Multiple Wounds, CAA Research Paper CAA-RP-94-2, April 1994, AD-280-498.

- Personnel Attrition Rates in Historical Land Combat Operations: Some Empirical Relations Among Force Sizes, Battle Durations, Battle Dates, and Casualties, CAA Research Paper, CAA-RP-95-1, 1 March 1995.

3. STUDY SPONSOR AND SPONSOR'S STUDY DIRECTOR. The Director, US Army Concepts Analysis Agency (CAA), will sponsor this study. The Sponsor's Study Director will be Dr. Robert L. Helmbold of the Tactical Analysis Division (CSCA-TCT).

4. STUDY AGENCY. CAA's Tactical Analysis Division will conduct this study. Augmentation and assistance will be provided as outlined in Paragraph 6 of this Study Directive.

5. TERMS OF REFERENCE.

a. Scope. This study directive is intended to provide for PAR-P3, the third phase of the Personnel Attrition Rates (PAR) Study.

b. Objectives. The main objectives of PAR-P3 are to (i) publish a CAA research paper documenting and summarizing selected historical data on personnel losses of army forces engaged in large-scale land combat operations, (ii) publish a CAA research paper providing an addenda to the previously published CAA Research Paper, CAA-RP-93-2, Personnel Attrition

Rates in Historical Land Combat Operations: An Annotated Bibliography, June 1993, AD-A268-787, and (iii) plan for the conduct of Phase 4 of PAR.

(1) A major objective of PAR-P3 is to publish a CAA research paper documenting and summarizing selected historical data on personnel losses of army forces engaged in large-scale land combat operations. The criteria for inclusion of a data base are as follows (roughly in order of importance). The data base must be:

(a) In the public domain, so that copies can be made available to governmental agencies and others without restriction and for (at worst) a nominal cost. However, for the sake of completeness, some important proprietary data bases can be described, even if their data cannot be made available through DTIC.

(b) In data base form (i.e., consist primarily of tabulations rather than narratives).

(c) Such as to contain information on large-scale military operations and their personnel losses.

(d) Available on diskettes usable with personal computers.

(e) Useful to many military operations analysts; developers, users, and assessors and validators of the inputs and/or outputs of wargames and analogous combat simulations; military historians; students of military art and science; and others with similar interests.

(2) The combat data bases are envisioned to possibly include those listed below.

ACSDB-1990, Ardennes Campaign Simulation Data Base (ACSDB).

BERNDT, Data from Berndt's Zahl im Kriege.

CRETE, CNA's data base of Crete.

INCHON, Busse's data on the Inchon-Seoul campaign.

IWOJIMA, Various interpretations of the Iwo Jima casualty experience.

LMI-1990, Logistics Management Institute data base of Twelfth Army casualty experience, collected by George Kuhn.

POGOGORO, Data on the Pogoroloye-Gorodische battle.

SINGER, Extracts from Singer's data on wars.

SMALL, Extracts from Small's data on wars.

WESTWALL, Data on the Westwall battle of World War II.

(3) Additional data will be sought from other sources. Potential sources may include the following:

Bodart's Kriegs-lexicon on battles, wars, and campaigns from 1600 to 1900.

Livermore's monograph on losses in the US Civil War.

The Kursk Combat Simulation Data Base.

c. Timeframe. Not applicable.

d. Assumptions. Not applicable.

e. Essential Elements of Analysis for PAR-P3.

(1) What data bases are or can be made available to support research into personnel attrition in large-scale land combat operations?

(2) What research topics will these materials support?

(3) What would be an efficient way to conduct such research?

f. Environmental and Threat Guidance. Not applicable.

g. Estimated Cost Savings or Other Benefits.

(1) It is important that the validity (or range of validity) of US Army war games and models of combat be assessed as accurately as possible. This can only be done through the application of the scientific method to historical data. This study is a necessary step in that process.

(2) US Army studies and analyses often need summary quantitative relationships applicable throughout a broad range of combat situations. It would be costly and inefficient to have each study review the literature, assemble the applicable information, convert it to electronic form, and make its own analyses of the reported data on personnel attrition. Making the results of this study available to a wide audience will help avoid unnecessary duplication of effort.

6. RESPONSIBILITIES. CAA's Tactical Analysis Division will conduct the study. Administrative support will be provided by CAA's Management Support Division.

7. LITERATURE SEARCH. A detailed annotated bibliography of sources was prepared during PAR-P1. While no formal literature search is specifically planned for subsequent phases of the PAR studies, we intend to continue informal efforts to identify and acquire additional relevant data.

8. REFERENCES

a. Administrative and Procedural.

b. Substantive.

"Personnel Attrition Rates in Land Combat Operations: An Annotated Bibliography," US Army Concepts Analysis Agency Research Paper, CAA-RP-93-2, August 1993.

9. ADMINISTRATION

a. Funding. Funding will be provided by CAA.

b. Administrative Support. Administrative support will be provided by CAA's Management Support Division.

c. Cost Limitations. Not applicable.

d. Contract Studies. Not applicable.

e. Automatic Data Processing Equipment (ADPE) Support. Personal computers and associated equipment (such as monitors, printers, etc.) will be required, as will appropriate software systems for data bases, spreadsheets, word processing, statistical analyses, and programming languages such as BASIC. No need is currently anticipated for other ADPE support.

f. Milestone Schedule. The published Research Papers describing the large-scale operations results and the addenda to the annotated bibliography, together with the draft study directive for Phase 4 and its supporting ARB presentation, are to be completed by 1 April 1996.

g. Sponsor's Study Director (SSD) and Study Advisory Group (SAG). Not applicable.

h. Responsibility for DD Form 1498. Tactical Analysis Division.

i. Study Format. The results will be documented in the form of CAA research papers. An outline approach to subsequent phases is to be presented as a draft study directive and supporting ARB.

j. Action Documents. Written evaluation of study results will be provided by the sponsor in accord with AR 5-5.

E. B. VANDIVER III
Director

APPENDIX C

ANNOTATED BIBLIOGRAPHY

C-1. INTRODUCTION. Each documents is given a short title, usually but not always consisting of its principal author and its date of publication. Paragraph C-2 lists the titles of the documents that were reviewed. Paragraph C-3 offers some brief explanatory remarks. Paragraph C-4 contains the annotated bibliographies, arranged in order by their short title.

C-2. LIST OF TITLES

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SIVARD-1993. Sivard, Ruth, *World Military and Social Expenditures, 1992-1993*, Ruth Leger Sivard, World Priorities, Box 25140, Washington, DC 20007, ISSN 0363 4795, ISBN 0-918281-05-9, UNCLASSIFIED, available from publisher and libraries. This is the latest issue of this publication, which has appeared annually since 1980. Available from the publisher and libraries.

STOECKLI-1985. Stoeckli, MAJ (Swiss Army) H. F., "Soviet Operational Planning: Superiority Ratios vs Casualty Rates," Report AA 6, 20 pp, Soviet Studies Research Centre,

Royal Military Academy, Sandhurst, March 1985 (UNCLASSIFIED). Available from Sandhurst.

STOECKLI-1987. Stoeckli, H. F., "Soviet Operational Planning: Loss Rates in Personnel and Armour—Past and Present Norms," Report AA 17, Soviet Studies Research Centre, Royal Military Academy, Sandhurst, October 1987, 18pp, UNCLASSIFIED. Available from Sandhurst.

STOECKLI-1989. Stoeckli, H. Fritz, "Soviet Operational Planning: Superiority Ratios and Casualties in Soviet Front and Army Operations," RUSI Journal, Spring 1989, pp 33-40, UNCLASSIFIED, available from libraries.

WALTER REED-1993. *Textbook of Military Medicine*, 1993, US Army Medical Corps. Prepared under the direction of COL Ronald F. Bellamy of The Borden Institute, Walter Reed Medical Center, Building 1, Room D-100, Washington, DC 20307-5001, 202-576-2571, DSN: 291-2572, FAX: 202-572-2555. Available from Walter Reed Medical Center or from libraries.

C-3. EXPLANATORY REMARKS

a. See the Glossary for definitions of terms and abbreviations.

b. Occasionally, some related documents are specifically cited in the annotated bibliography. The chief purpose of such citations is to note important considerations significantly affecting the validity or scope of applicability of the primary document's findings. A secondary purpose is to call the reader's attention to other intimately related documents. However, in general we do not cite other documents on the same subject, or those that merely confirm or refine the primary document's findings.

c. Text included in square brackets, [like this] are clarifications or comments interpolated by the compiler of this bibliography and are not part of the original text.

d. In general, more information is given on documents that are little known, rare, or difficult to access. Nevertheless, we can only indicate a document's general nature—the annotated bibliographies are guides to the originals, not substitutes for them.

e. We have included a few documents that, technically, are outside PAR's scope. These came to our attention by chance while compiling the bibliography and it seemed silly to omit them. However, we hereby put the reader on notice that we made no attempt to seek out such distantly related documents and that there must be many other such works that did not happen to come to our attention.

C-4. ANNOTATED BIBLIOGRAPHY. The annotated bibliography is given on the following pages, listed in order by the short title of the document as listed in paragraph C-2.

BLOOD-1989

1. **Document Description.** Blood, C. G., D. K. Griffith, and C. B. Nirona, "Medical Resource Allocation: Injury and Disease Incidence Among Marines in Vietnam," Naval Health Research Center, Medical Decisions Support Department, Report 89-36, 145 pp, 1989, UNCLASSIFIED, available from DTIC as AD-A223-195.

2. **Objectives and Scope.** From the Summary: The object of the present study is to determine the frequencies of each of 348 patient conditions among US Marines serving in Vietnam, using the Marine Corps inpatient data file maintained by the Naval Health Research Center. A proportional distribution of patient conditions, as well as the incidence rates of each patient condition per 1,000 strength per day, are computed.

3. **Populations Included.** US Marine personnel who were hospitalized while serving in Vietnam, 1964-1972.

4. **Timeframes Included.** From 1964 to 1972.

5. **Casualty Types Included.** Battle injuries and diseases/nonbattle injuries (DNBI).

6. **Time Intervals Included As.** Not used.

7. **Situational Descriptors Defined As.** Not used.

8. **Data Sources Used**

a. The Marine Corps Inpatient Medical Data File of all hospitalizations recorded among active duty Marine Corps personnel during the period 1964-1972. This file is maintained by the Naval Health Research Center. The extract for hospitalizations during service in Vietnam was created by selecting those inpatient records for which two or more of the following criteria indicated that the illness or injury episode occurred in Vietnam:

- (1) Class of trauma, which specifies whether the trauma resulted from battle injury.
- (2) Causative agent, which indicates how the trauma was induced.
- (3) Military theater of operations, which identifies the geographical zone where the injury or disease occurred and whether it resulted from hostile action.
- (4) Geographical area of incidence, which identifies the geographical region where the injury or disease occurred.
- (5) Location code, which states the location of the hospital treatment facility involved.

b. Strength figures of US Marines serving in Vietnam were obtained from Department of Defense Annual Reports and from selected manpower statistics.

9. **Other and Miscellaneous.** The tabulations of patient conditions accounted for only 73 percent of the known battle injury and 63 percent of the DNBI hospital admissions.

10. **Summary of Findings Regarding Battle Casualties**

a. Among Marines serving in Vietnam between July 1965 and June 1971, there were 251,487 inpatient diagnoses representing 51,976 wounded in action admissions and 108,958 disease and nonbattle injury (DNBI) hospitalizations. Of these, the patient conditions codes accounted for 38,180 wounded in action and 68,879 DNBI admissions.

b. The five highest rates of battle injury admissions per 1,000 per day, in descending order, are: open wound chest/back with complications, open wound knee/leg/ankle with complications, open wound shoulder with complications except tendons, open wound hip/thigh with complications, and wound face/jaw/neck. These five patient conditions accounted for 64 percent of battle injuries defined within the patient condition coding system.

11. **Comments and Critique.** Diagnoses recorded before 1970 were in the Department of Defense Disease and Injury Codes (DODIC) system, while those occurring post-1970 were in the International Classification of Diseases, Eighth Revision (ICDA-8) system. Accordingly, it was necessary to convert both of these codes to one or another of the 348 patient condition codes used in this work. It must be noted that this conversion could not always be done unambiguously. Imprecise code conversions, gaps in one or another of the three patient condition coding systems, and the need for further standardization are the subject of another study and report.

BLOOD-1993a

1. **Document Description.** Blood, C. G., E. D. Gauker, R. Jolly, and W. M. Pugh, "Comparisons of Medical Presentation and Admission Rates During Various Combat Operations," Naval Health Research Center Report No. 93-12, 28 pp, June 1993, UNCLASSIFIED, available from DTIC as AD-A270 779.
2. **Objectives and Scope.** To determine rates of casualty and disease and nonbattle injury (DNBI) incidence among combat and support troops for different types of ground operations.
3. **Populations Included.** Casualty and disease rates per 1,000 strength per day were computed for ground troops deployed to Okinawa, Korea, Vietnam, and the Falklands. Daily rates were calculated from medical "presentations," which were those cases requiring less than 3 days of treatment, and "admissions," those cases which were retained at treatment facilities for 3 days or more. Combat troops are included for all operations. Support troops are included for Okinawa and Korea. The Falklands operation includes only amphibious forces.
4. **Timeframes Included.** From Okinawa (April-June 1945) to the Falklands (May-June 1982).
5. **Casualty Types Included.** WIA and DNBI presentations and admissions, and KIA.
6. **Time Intervals Included As.** From start to end of an operation, with graphs of daily incidence.
7. **Situational Descriptors Defined As.** None, other than an identification of the operation.
8. **Data Sources Used.** Various.
9. **Other and Miscellaneous.** Lengths of treatment for WIA and DNBI of combat troops in Vietnam, and for both combat and support troops in Korea, are presented.
10. **Summary of Findings Regarding Battle Casualties.** Daily incidence values fluctuate widely. The averages for the entire period studied in this document are as follows.
 - a. Okinawa Combat Troops: 6.57 WIA presentations/kpd, 4.56 DNBI presentations/kpd, 1.35 KIA/kpd. (Here kpd stands for "kilo-personnel-days," that is, 1,000 personnel days.) Twelve percent of the DNBI presentations and 16 percent of the DNBI presentations were treated and released in 2 days or less. Defining admissions as presentations requiring treatment for 3 days or more results in a DNBI admission rate of 4.03/kpd and a WIA admission rate of 5.54/kpd.
 - b. Okinawa Support Troops: 0.43 WIA presentations/kpd, 0.93 DNBI presentations/kpd, 0.09 KIA/kpd. Fifteen percent of the DNBI presentations and 32 percent of the WIA

presentations were treated and returned to duty in 2 days or less. Admission rates (treated for 3 or more days) were 0.29 WIA/kpd and 0.79 DNBI/kpd.

c. Korea Combat Troops: 2.75 WIA presentations/kpd, 3.31 DNBI/kpd, 0.20 KIA/kpd. Twenty-one percent of the DNBI presentations and 38 percent of the WIA presentations were treated and released in 2 days or less. Admission rates (treated for 3 or more days) were 1.7 WIA/kpd and 2.6 DNBI/kpd.

d. Korea Support Troops: 0.10 WIA presentations/kpd and 0.76 DNBI presentations/kpd, 0.01 KIA/kpd. Seven percent of the DNBI presentations and 44 percent of the WIA presentations were treated and released in two days or less. Admission rates (treated for three or more days) were 0.05 WIA/kpd and 0.71 DNBI/kpd.

e. Vietnam Infantry Battalion Troops: 2.50 WIA presentations/kpd and 1.78 DNBI presentations/kpd, 0.31 KIA/kpd. Twelve percent of the DNBI presentations and 36 percent of the WIA presentations required treatment for 2 days or less. Admission rates (treated for 3 or more days) for the infantry battalions were 1.61 WIA/kpd and 1.57 DNBI/kpd.

f. Falklands (UK Ground Troops in OPERATION CORPORATE): 1.86 WIA presentations/kpd and 1.27 DNBI presentations/kpd, 0.71 KIA/kpd. Twenty-two percent of the DNBI presentations and one percent of the WIA presentations were treated and released in 2 days or less. Admission rates (treated for 3 or more days) were 1.84 WIA/kpd and 0.99 DNBI/kpd.

11. Comments and Critique. This work is a useful summary of the data it uses.

BLOOD-1993b

- 1. Document Description.** Blood, C. G., E. D. Gauker, M. E. Anderson, M. S. Odowick, and E. R. O'Donnell, "Projections of Battlefield Medical Casualties Among US Marine Forces for Various Theaters of Operations," Naval Health Research Center Report No. 93-35, 66 pp, November 1994, UNCLASSIFIED, available from DTIC as AD-A278 228.
- 2. Objectives and Scope.** To provide casualty and disease/nonbattle injury (DNBI) rate projections for US Marines in three operational theaters for varying battle intensities.
- 3. Populations Included.** Casualty and disease rates per 1,000 strength per day were computed for ground troops deployed to Okinawa, Korea, Vietnam, and the Falklands. Daily rates were calculated from medical "presentations," which were those cases requiring less than 3 days of treatment, and "admissions," those cases which were retained at treatment facilities for 3 days or more. Combat troops are included for all operations. Support troops are included for Okinawa and Korea. The Falklands operation includes only amphibious forces.
- 4. Timeframes Included.** Casualty and DNBI data were extracted from military operations spanning four decades. The empirically derived rates of casualties and illnesses were then adjusted for differences in terrain, weather, and disease incidence within specific theaters.
- 5. Casualty Types Included.** Rates of WIA, KIA, and DNBI medical presentations were assessed. Rates of hospital admissions were computed as the percentage of medical presentations retained at treatment facilities for 3 or more days.
- 6. Time Intervals Included As.** From start to end of an operation, with graphs of daily incidence.
- 7. Situational Descriptors Defined As.** East Asia Operational Scenario, Southwest Asia Operational Scenario, and Europe Operational Scenario.
- 8. Data Sources Used.** Various.
- 9. Other and Miscellaneous.** Not used.
- 10. Summary of Findings Regarding Battle Casualties.** Large differences may be anticipated in casualty rates, and, to a lesser extent, disease rates, depending on the theater of operations. Also, the overall casualty and disease rates will vary greatly with the force mix of combat and support troops. Wide rate variations in daily incidence will be experienced, especially for casualty rates. It is important that medical planning take these variations, as well as the average rates, into account.
- 11. Comments and Critique.** This work attempts to project US Marine Corps casualty rates for various scenarios.

BRACKEN-1995

1. **Document Description.** Bracken, Jerome, "Lanchester Models of the Ardennes Campaign," Naval Research Logistics, Special Issue on Air-Land-Naval Warfare Models, v 42, n 4, Part III, June 1995, pp 559-577, available from libraries.
2. **Objectives and Scope.** To fit a Lanchester-type expression relating the strengths and losses to data from the Ardennes Campaign (popularly known as the Battle of the Bulge).
3. **Populations Included.** US and German army forces involved in the Ardennes Campaign of World War II.
4. **Timeframes Included.** The source data cover the period from 15 December 1944 through 16 January 1945. However, only the data for the 10 days 2 through 11 (16 through 25 December 1994) were used.
5. **Casualty Types Included.** Total battle casualties (KIA, WIA, and CMIA).
6. **Time Intervals Included As.** Daily strengths and loss data are used.
7. **Situational Descriptors Defined As.** Attacking versus defending. The source states that "Preliminary research has shown that a form of the model that includes specification of which side is attacking an defending fits the data significantly better than if this factor is left out of the model." The Germans are deemed as attacking on days 1-6 and the Allies as attacking on days 7-33.
8. **Data Sources Used.** "The Ardennes Combat Simulation Data Base (ACSDB), Phase II Final Report," Data Memory Systems, Inc., 1989.
9. **Other and Miscellaneous.** The author fits the parameters a , b , p , q , and d of a general form relating casualties to strengths given by:

$$\Delta B = a\delta R^p B^q$$

$$\Delta R = b\delta^{-1} R^q B^p$$

where

B , R = Blue, Red force strength.

δ = casualties to the side indicated.

a , b = attrition coefficients (for Blue kills by Red, Red kills by Blue), to be fitted to the data.

ω = tactical parameter with a value according to whether Blue is defending ($\omega = d$) or attacking ($\omega = d^{0.1}$). Here ω is given by the input information, but the value of the parameter d is to be fitted to the data.

p, q = exponent for the attacking force, defending force, to be fitted to the data.

These were motivated by analogy to various "Lanchester law" forms of the differential attrition equations. Force strengths and losses were taken either as personnel only, or as a linearly weighted sum of selected force components (specifically, tanks, APCs, artillery, and personnel weighted by 20, 5, 40, and 1, respectively).

10. Summary of Findings Regarding Battle Casualties. The best fitting exponents ranged from 0.7 to 1.3. This is interpreted as evidence that Lanchester's linear differential equations are close to the truth (although this may not give adequate consideration to the Constant Fallacy). A second interpretation of the results is that, although the German and Allied sides were organized differently, their total forces had about the same per man effectiveness.

11. Comments and Critique. None.

CCARS-1994

1. Document Description. "Crew Casualty Assessment Reference System (CCARS) User's Manual," prepared by The Analytical Sciences Corporation (TASC) for the Office of Director, Live Fire Testing, Office of the Director of Defense Research and Engineering (Test & Evaluation) (ODLFT/OSD), 56 pp, UNCLASSIFIED, 1994.

2. Objectives and Scope

a. The purpose is to assist authorized users actively engaged in DOD-related activities in obtaining information regarding existing data bases and models relating to personnel injury mechanisms, personnel incapacitation, and vulnerability/lethality assessment.

b. The scope includes the following major areas:

- Point of Contact (POC) information.
- Physiological Effects Data Bases and Models.
- Personnel Incapacitation Data Bases and Models.
- Crew Related Vulnerability/Lethality Data Bases and Models.
- Crew Casualty Assessment (CCA) Published Reports Data Base.

c. It should be noted that the CCARS data base contains ***NO actual data or models***, only a description of what information is available and who to contact if more information is desired.

d. Access to the CCARS data base itself is restricted to persons with an authorized need to know. Authorization may be obtained through the Department of Defense, Office of the Director of Defense Research and Engineering (Test & Evaluation) (ODLFT/OSD).

e. Access to the actual data bases or models described in CCARS may be obtained from the related point of contact (POC). Authorization for release and distribution of tangible products or detailed information is controlled at the POC's discretion. Obtaining access to the CCARS data base does not imply access to the actual data or models controlled by the POCs.

3. Populations Included. Various, but with an emphasis on the crews of combat vehicles.

4. Timeframes Included. Various.

5. Casualty Types Included. Various.

6. Time Intervals Included As. Various.

7. Situational Descriptors Defined As. Various.

8. Data Sources Used. Various.

9. Other and Miscellaneous

a. CCARS is a data base developed to run within a Microsoft Windows environment. Customized interface procedures give the user an easy method of accessing, querying, and reporting the contents of the CCARS data base.

b. CCARS for Windows was developed in FoxPro for Windows Version 2.6 on a 486/33MHz PC compatible computer system. The system requirements for successful installation of the CCARS software are listed below.

- 80386 processor (or higher).
- Mouse (not necessary, but recommended).
- 4 MB RAM.
- 9 MB available hard disk space.
- MS-DOS version 3.1 (or higher).
- Microsoft Windows version 3.0 (or higher).
- VGA monitor resolution (or higher).

10. Summary of Findings Regarding Battle Casualties. Use of CCARS will assist interested government and industry experts in the area of crew casualty assessment to interactively query a data base of existing models and data bases related to injury mechanisms, personnel incapacitation, and crew related vulnerability/lethality assessment of various ground, air, and sea weapon systems. It will enhance awareness within the DOD casualty assessment community of existing data bases and model capabilities in order to avoid duplication of efforts and promote cooperative casualty assessment activities.

11. Comments and Critique. None.

CLODFELTER-1992

1. **Document Description.** Clodfelter, Michael D., *Warfare and Armed Conflicts: A Statistical Reference to Casualty and Other Figures, 1618-1991*, McFarland & Co., Publishers, Box 611 Jefferson, NC 28640, 1992, ISBN: 0-89950-544-9 (two volume set), LC: 91-52632, 1414 pages, 1992, UNCLASSIFIED, available from publisher and libraries,.
2. **Objectives and Scope.** To present a set of essays setting world conflicts in perspective.
3. **Populations Included.** Combatants in battles and wars.
4. **Timeframes Included.** From 1618 to 1991.
5. **Casualty Types Included.** Various, according to the data available, but usually given separately for killed, wounded, missing, and prisoners.
6. **Time Intervals Included As.** From start to end of a battle.
7. **Situational Descriptors Defined As.** A short narrative accompanies the strength and loss data.
8. **Data Sources Used.** Various.
9. **Other and Miscellaneous.** Major entries in the table of contents include the following.
 - Seventeenth Century. Western Europe; England, Scotland, Ireland; Eastern Europe; Asia; Western Hemisphere.
 - Eighteenth Century. Western Europe; Eastern Europe; India; Asia; North America; Central and South America.
 - Nineteenth Century. Napoleonic Wars; Western Europe; Eastern Europe; North Africa; Sub-Saharan Africa; The Middle East and Central Asia; British Conflicts in and Around the Indian Empire; East Asia; Southeast Asia and Oceania; United States and Canada; Indian Wars in Northern United States; Indian Wars in Southern United States; American Civil War; The Caribbean Region; South America.
 - Twentieth Century (1900-1945). Western Europe; Eastern Europe; Middle East and Central Asia; Africa; East and Southeast Asia; United States; The Caribbean Region; South America; World War I; WWII European Theater; WWII Pacific Theater.
 - Twentieth Century (1945-1991). Global Situation: Conflicts of the Post-World War II Era; Europe; North Africa; Sub-Saharan Africa; Middle East; South Asia; Southeast Asia; East Asia; North and Central America; South America; Korean War; Vietnam War.

10. Summary of Findings Regarding Battle Casualties. Many of the following points echo or were taken from Bodart-1908.

- a. Losses to the officer corps were nearly always higher proportionately than those among the ranks, and stayed practically constant for long periods or periods as long as several decades.
- b. The ratio of killed to wounded has also remained fairly constant. Up to World War I, for every 10 men killed, another 35 were wounded.
- c. The duration of battles has tended to grow with the passage of time since the 1600s.

11. Comments and Critique. This work presents an extensive collection of information. It provides a handy source for a quick overview of the essentials of a subject that it covers. The presentation of material is a sort of cross between an encyclopedia of military history and a dictionary of battles. In some ways, its coverage is more complete than that of Dupuy-1970, in other ways less complete: the two works supplement each other very well. However, Clodfelter's battle accounts rarely indicate which side was on the offensive, or which side gained the victory. As in other large compendia on battles and wars, not all of the information is equally reliable, and (again, as usual) there is almost nothing to indicate which values are more and which are less reliable.

DEUTSCH-1995

1. **Document Description.** Deutsch, Harald C., "The Matter of Military Records," The Journal of Military History, vol 59, no 1, January 1995, pp 135-142, UNCLASSIFIED, available from libraries.
2. **Objectives and Scope.** This is an essay on some of the problems in dealing with military records.
3. **Populations Included.** Not applicable.
4. **Timeframes Included.** Not applicable.
5. **Casualty Types Included.** Not applicable.
6. **Time Intervals Included As.** Not applicable.
7. **Situational Descriptors Defined As.** Not applicable.
8. **Data Sources Used.** Not applicable.
9. **Other and Miscellaneous.** The author is a noted professor of military history.
10. **Summary of Findings Regarding Battle Casualties.** The main thrust of the essay is summed up in its quote from a 1938 lecture by Basil Liddell Hart: "Nothing can deceive like a document. A purely documentary history is akin to mythology." This is followed by the recitation of a number of instances where documents fail to reflect reality—including cases where the documents were deliberately falsified to describe attacks that the authors knew never took place, other instances of "cooking the books" to distort reality to one's own benefit, falsification of records before surrendering them to a victorious enemy, the use of codes where what is written in letters that may be intercepted express almost the exact opposite of the writer's concealed intent, artful omission of selected crucial facts, and similar corruptions of the written record.
11. **Comments and Critique.** This is a useful caution regarding the interpretation and analysis of original records.

ECKHARDT-1992

1. **Document Description.** Eckhardt, William, *Civilizations, Empires and Wars: A Quantitative History of War*, 1992, McFarland & Co., Publishers, Box 611 Jefferson, NC 28640, ISBN: 0-89950-709-3, LC: 91-41450, UNCLASSIFIED, 296 pp, available from publisher and libraries.
2. **Objectives and Scope.** To present a quantitative analysis of war over a long period of time.
3. **Populations Included.** Various.
4. **Timeframes Included.** The last 10,000 years.
5. **Casualty Types Included.** Undifferentiated losses.
6. **Time Intervals Included As.** From start to end of a war.
7. **Situational Descriptors Defined As.** Various, but (except for estimates of population sizes and losses) generally subjective assessments of ill-defined concepts. For example, the footnote to Table 3.5 in Eckhardt's Appendix B states, in part, that "The geometric average of the internal disturbances was an average of social area, duration, size of masses involved, and intensity. ... Ideation was a general factor characterized by faith versus sense and reason in epistemology, by idealism versus materialism in ontology, and by love versus happiness and principles in ethics."
8. **Data Sources Used.** Various, but include the leading major references on warfare.
9. **Other and Miscellaneous.** The table of contents lists the following chapter titles: Introduction; Primitive Warfare; Archaic and Ancient Wars, 3000 to 500 BC; Classic Wars, 500 BC to 500 AD; Medieval Wars, AD 500 to 1500; Modern War—An Overview; Wright's List of Modern Wars, 1480-1964; Levy's list of Great Power Wars, 1495-1975; Sorokin's List of Modern Wars, 1500-1925; Eckhardt's List of Modern Wars, 1500-1990; Civilized Wars Throughout History; Wars Since the Eighteenth Century; Civilized Battles Throughout History; War-Related Deaths Since 3000 BC; A Dialectical Evolutionary Theory; Summary and Conclusions.
10. **Summary of Findings Regarding Battle Casualties.** Anthropological evidence suggests that war began only after the agricultural revolution some 10,000 years ago. These beginnings were more the product of development than instinct, coming only after humans had placed value on land for farming and herding. Studies further reveal that, generally speaking, the more developed the society, the more fights they engaged in. Warfare, however, did not come fully into its own until civilization emerged 5,000 years ago.

A quantitative review of war brought the author to an understanding of the relationship between war, civilization, and empires. The three promote one another. Primitive battles, archaic wars (3000-500 BC), classical wars (500 BC-500 AD), medieval wars (500-1500), and

modern wars (1500-present) are studied. It becomes apparent that a civilization without warfare is possible only if imperialism is eliminated.

11. Comments and Critique

a. Dr. William Eckhardt passed away in March 1992. For some time before that, he was the research director of the Lentz Peace Research Laboratory, Dunedin, Florida, and had written over 150 articles devoted to war and peace.

b. This book contains little or no actual data on wars or battles, although it presents Dr. Eckhardt's analysis of the data he assembled on these subjects. A portion of the data he compiled was published in Sivard's annual series of publications *World Military and Social Expenditures*, *q. v.*

FAVRE-1965

1. Document Description. Favre, R., and Delacroix, P., "Etude Statistique de l'Activité des Formations Chirurgicales du Service du Santé des Armeés Pendant la Guerre Insurrectionnelle d'Algérie (1954-1962)," *Revue des Corps de Santé*, [Statistical Study of the Surgical Units of the Army Medical Service During the Insurrectional War in Algeria (1954-1962), *Medical Corps Review*], v 6, n 3, pp323-376, 1965, UNCLASSIFIED, available from libraries.

2. Objectives and Scope. From the document: "Object of These Statistics: This statistical study is strongly focused on medical research. It will be of interest to all concerned with the etiology, pathogenesis, therapeutics, and prognostics of traumatic wounds. It seeks to address all of the aspects that may be novel, or which may be typical of the type of insurrectional war of which Algeria has been the theater for nine years (from 1 November 1954 to 1 July 1962)."

3. Populations Included. French military and civilians.

4. Timeframes Included. Algerian War (from 1 November 1954 to 1 July 1962).

5. Casualty Types Included. Dead and wounded.

6. Time Intervals Included As. Generally, either overall for the war as a whole, or annually.

7. Situational Descriptors Defined As. Not used.

8. Data Sources Used. From the document: "We have studied and compared the following documents, put at our disposal by the Archival Service and by the medical statistician of the Army Health Service at Limoges (LTC Dr. Coldefy):

a. "Quarterly reports of the activity of the surgical service (those since 1955 used in totality, the 4th quarter of 1960 could not be used).

b. "Records of admissions and discharges, registries of deaths in the surgical units.

c. "Records of the operation protocols of surgical units.

d. "The individual medical folders, whose contents, highly variable, go from the first hospital admission to the last medical observation. [We have used these documents, of which there are a considerable number, only in order to clarify or complete our researches. The exploitation of all of these folders (about 380,000) would require a work of many years.]

"We have likewise used the works inspired by the war in Algeria, presented to various medical societies and published in their journals and transactions, whether presented in the form of theses or memoirs. A bibliography, located at the end of this work, lists the principal works consulted."

9. Other and Miscellaneous. From the document: "A peculiarity of the Algerian War is especially interesting for the study of the lesions characteristic of this war. All the cadavers collected on the field of battle with war wounds, in the field or the routes or the roads for the accidents and the victims of assaults, were transported to the morgue of that sector's military hospital. For each corpse thus deposited at the hospital, a doctor made a postmortem examination (with or without an autopsy). It is thus possible, for the first time of which we are aware, to know the exact cause of death or the battlefield. We have studied thus 3,280 protocols of postmortem examinations. For a surgical unit we have been able to establish a comparative statistics of those wounded and multiply wounded for those dead on arrival and of those wounded or multiply wounded for those admitted and treated in that unit (chapter on multiple wounds).

"We think that this study represents the most original element of our statistical study. We are preparing a separate, more complete, paper on the multiply wounded." ...

"We present the results of our statistical study in three separate chapters, according to the following outline:

A.—Logistical Part.

1. Etiology by traumatisms (battle and accidents).
2. Etiology by causative agent.
3. Place and number of deaths by traumatic wounds.
4. Etiology of causes of death before arrival at a surgical center of treatment.
5. Activity of the surgical services.
6. Total number of deaths.

B.—Technical Part.

General statistics and principal interventions by year.

Particular statistics by principal interventions on:

Limbs:

Compound fractures.

Arterial damage.

Vascular damage.

Amputations.

Cranium (open and closed trauma).

Spine (open and closed trauma).

Thorax (damage and contusions).

Abdomen (damage and contusions).

Multiple wounds.

Burns.

C.—Bibliographic Part.

List, in alphabetical order, of the principal works on logistics and techniques concerning wounded in the Algerian War."

10. Summary of Findings Regarding Battle Casualties. Too varied to repeat here.

11. Comments and Critique. None.

GAO-1992

1. **Document Description.** "Operation DESERT STORM: Full Army Medical Capability Not Achieved—Report to the Chairman, Subcommittee on Military Personnel and Compensation, Committee on Armed Services, House of Representatives," US General Accounting Office (GAO) Report GAO/NSIAD-92-175, August 1992, UNCLASSIFIED, 82 pp, available from libraries.
2. **Objectives and Scope.** To assess the Army's effectiveness in deploying medical units and providing medical services during the Gulf War. Specifically, to determine whether (1) the Army had experienced problems in identifying, mobilizing, and deploying medical personnel; (2) medical units had their required equipment, supplies, and transport support; (3) medical units were able to evacuate and direct patients to appropriate hospitals.
3. **Populations Included.** The US Army medical support contingent deployed to the Kuwait theater of operations in support of Operations DESERT SHIELD/DESERT STORM. The primary focus was on hospitals and evacuation units.
4. **Timeframes Included.** August 1990 through February 1991.
5. **Casualty Types Included.** Not used.
6. **Time Intervals Included As.** The Kuwait theater of operations is considered in two phases. The first phase began in August 1990. The second phase began in November 1990 and ended in February 1991.
7. **Situational Descriptors Defined As.** Not used.
8. **Data Sources Used.** These included interviews conducted by GAO at 11 hospital and 7 evacuation units. To determine the unit's status prior to and during callup and mobilization, GAO also visited selected mobilization and home stations, and interviewed Army personnel responsible for the mobilization and deployment of medical units. To ascertain the in-theater readiness status of units, GAO also interviewed Army medical personnel from selected hospital, ground and air ambulance, medical supply and logistics, and command and control units from both of the corps in theater; the US Army Central Command; and the US Central Command. The GAO also obtained, when available, units' after-action reports, as well as both corps' after-action reports. The interviews were conducted from February to December 1991 in accordance with generally accepted Government auditing standards.

9. Other and Miscellaneous. GAO also prepared reports on Air Force and Navy medical capability in the Gulf war, as follows:

a. "Operation DESERT STORM: Problems With Air Force Medical Readiness—Report to the Chairman, Subcommittee on Military Forces and Personnel, Committee on Armed Services, House of Representatives," General Accounting Office (GAO) Report GAO/NSIAD-94-58, December 1993, 23 pp, UNCLASSIFIED, available from libraries.

b. "Operation DESERT STORM: Improvements Required in the Navy's Wartime Medical Care Program— Report to the Chairman, Subcommittee on Military Forces and Personnel, Committee on Armed Services, House of Representatives," General Accounting Office (GAO) Report GAO/NSIAD-93-189, 28 July 1993, UNCLASSIFIED, available from libraries.

10. Summary of Findings Regarding Battle Casualties

a. (From the report's Executive Summary paragraph on "Results in Brief") "The Army had to overcome numerous significant problems to make medical units operational before the start of the ground war. For example, many doctors and nurses in active, Reserve, and National Guard units who were scheduled to deploy could not do so for a variety of reasons. First, the personnel information systems used to identify doctors and nurses for assignment to active units contained incomplete and outdated information. Second, units' peacetime status reports did not adequately reflect personnel deficiencies. Finally, many doctors and nurses had not trained during peacetime to perform their wartime missions, resulting in doctors and nurses being unfamiliar with their units' missions or equipment. The Army also faced equipment and other logistical support problems. Even with a massive effort to field equipment and supplies to hospital units, many did not receive equipment and supplies or received only partial shipments. Shortages of transportation and materiel handling equipment limited hospital mobility, and the evacuation of casualties was hampered by long distances, poor communications, and lack of navigational equipment. As a result, the Army's ability to provide adequate care had the war started earlier or lasted longer or had the predicted number of casualties occurred would have been questionable."

b. The DOD comments on a draft of the GAO report concurred or partially concurred with most of the findings and all of the recommendations. DOD disagreed with the overall conclusion that adequate care may not have been provided had the predicted number of casualties occurred or had the ground war started earlier or lasted longer.

11. Comments and Critique. The GAO reports are a significant contribution to medical readiness, but contain little information specifically related to the incidence of battle casualties.

HARTLEY-1995a

1. **Document Description.** Hartley, Dean S. III, "A Mathematical Model of Attrition Data," Naval Research Logistics, Special Issue on Air-Land-Naval Warfare Models, v 42, n 4, Part III, June 1995, pp 585-607, available from libraries.
2. **Objectives and Scope.** To fit a particular statistical model to historical data on strengths and losses.
3. **Populations Included.** Primarily land combat forces.
4. **Timeframes Included.** Primarily from 1600 to the late 1900s.
5. **Casualty Types Included.** Primarily total battle casualties (KIA, WIA, CMIA).
6. **Time Intervals Included As.** From start of a battle to its end.
7. **Situational Descriptors Defined As.** Not used.
8. **Data Sources Used.** The primary data source used is an early version of CAA's "Data Base of Battles—Version 1990," US Army Concepts Analysis Agency, unnumbered, diskette available from DTIC as AD-M000-121 (two diskettes, UNCLASSIFIED, 30 April 1991). For the data used here, both strengths and casualties are always the numbers of personnel.
9. **Other and Miscellaneous.** The author fits the parameters C , D , F , and G of the general form relating casualties to strengths given by

$$\Delta x = \exp(C)x^D y^G$$

$$\Delta y = \exp(F)x^G y^D$$

where

x , y = strengths of the attacking and defending sides, respectively.

$\exp(\odot)$ = the usual exponential function.

C , F , D , G = parameters to be fitted to the data.

10. **Summary of Findings Regarding Battle Casualties.** The author finds $D = 0.75$, $G = 0.4$, and concludes that attrition is governed by a certain form of differential equation. The attempt to infer a differential equation form from the regression analyses used to find the parameter values runs afoul of the Constant Fallacy.
11. **Comments and Critique.** The attempt to infer a differential equation form from the regression analyses used to find the parameter values commits the Constant Fallacy.

HARTLEY-1995b

1. **Document Description.** Hartley, Dean S. III, and Helmbold, Robert L., "Validating Lanchester's Square Law and Other Attrition Models," Naval Research Logistics, Special Issue on Air-Land-Naval Warfare Models, v 42, n 4, Part III, June 1995, pp 609-633, available from libraries.
2. **Objectives and Scope.** To fit various statistical models to the data on the Inchon-Seoul campaign.
3. **Populations Included.** US and North Korean army forces.
4. **Timeframes Included.** The Korean War's Inchon-Seoul campaign, 15 September-7 October 1950.
5. **Casualty Types Included.** Total battle casualties (KIA, WIA, and CMIA).
6. **Time Intervals Included As.** Daily information on strengths and losses.
7. **Situational Descriptors Defined As.** The campaign is often divided for analytical purposes into three phases: from the landing at Inchon to the outskirts of Seoul, the fight for Seoul, and pursuit of North Korean forces following the seizure of Seoul. Each of these phases lasted about a week.
8. **Data Sources Used.** Various sources were consulted. However, the main data on strengths and losses are based on *The Inchon-Seoul Operation*, Volume II of the series *U.S. Marine Operations in Korea 1950-1953*, L. Montross and N. A. Canzona, History Branch, G-3, HQ USMC, 1955, available from the Pentagon Library as DS919.U58.
9. **Other and Miscellaneous.** Not used.
10. **Summary of Findings Regarding Battle Casualties.** A square-law type of model with constant attrition coefficients gives a very poor fit to the data. Instead, the data indicate that, if the basic square law model is adopted, then the attrition coefficients must be changed at least once a week or so in order to obtain a satisfactory fit to the data. Moreover, North Korean losses appear to have been largely insensitive to variations in US force strength. These findings are shown to be essentially unaffected by several plausible variations in the timing of reinforcements, inclusion or exclusion of POWs from the casualty counts, timing and amount of reinforcements to the US 1st Marine Division, and uncertainties in the North Korean strength and loss figures.
11. **Comments and Critique.** Not used.

HRAF-1993

1. **Document Description.** Human Relations Area Files, PO Box 2054 Yale Station, New Haven, CT 06520-2054, phone: 203-777-2334. Available from HRAF.
2. **Objectives and Scope.** The Human Relations Area Files, Incorporated (HRAF) is a non-profit research and educational organization centered at Yale University in New Haven, Connecticut. Since 1949, HRAF has devoted its resources to developing programs and services to encourage and facilitate the worldwide comparative study of culture, society, and human behavior. Today, the HRAF Archive, with some 3,500,000 pages of information organized into files on more than 330 different cultural groups and available on over 21,500 microfiche, stands as the world's most complete source of information on the ways of life of people around the world. Today, over 80 percent of the major research universities in the United States are members of HRAF and maintain the complete set of the HRAF Archive.
3. **Populations Included.** Primarily preindustrial, or even primitive cultures.
4. **Timeframes Included.** Various.
5. **Casualty Types Included.** Various.
6. **Time Intervals Included As.** Various.
7. **Situational Descriptors Defined As.** Various.
8. **Data Sources Used.** Various.
9. **Other and Miscellaneous.** The HRAF Archive is a collection of mostly primary descriptive materials (books, articles, manuscripts, etc.) classified both by the culture or society to which they pertain and the topics discussed therein. Thus, the Archive combines the basic elements of a test archive with those of an information retrieval system for easy user access and rapid information retrieval. Every year for the past 38 years, the Archive has been updated and expanded to broaden coverage of the cultures of the world.

The collection is organized, first, into culture files, with each culture file containing information on a particular cultural group such as the Zuni Indians, the Rural Irish, the Yoruba of Nigeria, or the Central Thai. The full collection contains files on more than 330 different cultural groups.

The collection is organized, second, by subject, according to the more than 700 subject categories in the "Outline of Cultural Materials (OCM)." Thus, all information on a given subject is brought together in one place in each cultural file, making for rapid and comprehensive information retrieval.

All materials are provided on silver halide microfiche. The 1997 Annual Report noted that a program to computerize major portions of the Archive had been initiated.

10. Summary of Findings Regarding Battle Casualties. Dr. Melvin Ember, President of Human Relations Area Files, Inc., delivered a paper on "Fear of Disasters as an Engine of History: Resource Crises, Warfare, and Interpersonal Aggression" to the multidisciplinary conference on "What is the Engine of History?" at Texas A&M University, 27-29 October 1988. This paper, based on HRAF data, makes the following points:

a. Contrary to what many have wanted to believe, most societies known to anthropology have had warfare, and the warfare probably occurred a lot more often than even we are used to in the modern world. In the societies we have looked at that were described before pacification, nearly 75 percent had warfare at least once every 2 years.

b. In the few cases where we have detailed information on the number of people killed over time, it seems that "primitive" warfare might have been even more lethal proportionately than modern warfare. For example, the Mae Enga of the New Guinea Highlands lost about 25 percent of their males because of intervillage warfare, and other societies in New Guinea and Amazonia lost between 19.5 and 30 percent.

c. Our results strongly suggest that people in preindustrial societies mostly go to war to moderate or cushion the impact of expected but unpredictable disasters that destroy food resources—disasters such as droughts, floods, storms, killing frosts, and locust infestations.

d. The notion that greater social complexity increases the likelihood of war is only very weakly supported by the data.

e. Chronic scarcity does not seem to increase the likelihood of warfare.

f. Our results do not support the view that punitive or nonrewarding socialization has a major effect on the likelihood of war. Indeed, our only near-significant result suggests that indulgence in infancy may increase rather than decrease the likelihood of war.

g. The notion that sexual frustration increases the likelihood of war is not supported by the data.

h. Societies that encourage boys to be aggressive have more warfare, but this is interpreted as a consequence of frequent wars rather than a cause of them.

i. The notion that a higher level of interpersonal aggression increases the frequency of warfare is only weakly supported by the data. As of now, we suspect that higher aggression frequencies are mostly indirect consequences of a high frequency of warfare. High frequency of warfare (induced by disasters) induces the culture to produce fierce warriors, and this greater aggressiveness spills over into higher rates of homicide and other forms of interpersonal violence within the culture. Also, a high frequency of warfare may "legitimize" violence (another study has found that homicide rates increase after episodes of war). Moreover, the threat of disasters

may have a direct effect on aggressive behavior by creating a great deal of free-floating anxiety, insecurity, and a feeling of lack of control (another study has found that capricious violence in folk tales is associated with a high threat of natural disasters).

11. Comments and Critique. The authors themselves caution that the research reported here is based on preindustrial cultures and may not apply to complex industrialized societies with their complex international dependencies.

ICPSR-1993

1. Document Description. *Guide to Resources and Services, 1993-1994*, Inter-University Consortium for Political and Social Research (ICPSR), The University of Michigan, Institute for Social Research, PO Box 1248, Ann Arbor, MI 48106, Phone: 313-764-2570, FAX: 313-764-8041, ICPSR can be reached over the Internet at the address icpsr_netmail@um.cc.umich.edu. To reach the ICPSR Computer Support Group directly, the address is support@icpsr.umich.edu.

2. Objectives and Scope. As stated in Article II of its Constitution, the purposes of the ICPSR are as follows: "The purposes of the ICPSR are to promote and facilitate research and instruction in the social sciences and related areas, by acquiring, developing, archiving, and disseminating data and documentation for instruction and research; conducting related instructional programs; conducting such other activities as may be authorized in accord with the Bylaws; and obtaining the resources necessary to accomplish these purposes."

From the *Guide to Resources and Services, 1993-1994*, p vii, "ICPSR was founded in 1962 as a partnership between the Survey Research Center at the University of Michigan and 21 universities in the United States. By 1993, membership in ICPSR had expanded to over 370 colleges and universities located in many countries throughout the world. ... Scholars from countries around the globe are able to share common data resources, to interact and study together in the ICPSR training programs, and to utilize a common set of technical aids. The goal of ICPSR is to maximize the availability and utilization of social science resources and to minimize the inconvenience and cost of teaching and studying social and historical phenomena."

- 3. Populations Included.** Various.
- 4. Timeframes Included.** Various.
- 5. Casualty Types Included.** Various.
- 6. Time Intervals Included As.** Various.
- 7. Situational Descriptors Defined As.** Various.
- 8. Data Sources Used.** Various.
- 9. Other and Miscellaneous**

a. From p vii of the *Guide to Resources and Services, 1993-1994*, "The Archive of ICPSR receives, processes, and distributes machine-readable data on social phenomena occurring in over 130 countries. U\5 The Archive contains machine-readable records of individual attitudes and social experience relevant to the full range of social science disciplines. The content of the Archive extends across economic, sociological, historical, organizational, social, psychological, and political concerns. ... Also included is an array of data on national attributes, domestic and

international events, conflicts, international organizations, nation dyads, alliances, and international systems. ... The data resources of ICPSR are developed and maintained by the Archive, which performs two basic functions. First, the Archive acquires data and transforms them into forms that can be used by persons not intimately familiar with the original studies. Not all data collections received by the Archive are extensively 'cleaned' in this manner. Rather, those major studies deemed by a set of advisory committees most likely to be of widespread interest are cleaned and fully checked for any problems that might inhibit their extended use. A classification system is used to inform the potential user of the extent to which particular data sets have been cleaned and documented by ICPSR staff. The Archive's second function is to disseminate data. The distribution process is described in detail in the section of this introduction entitled 'Servicing Information'."

b. Currently (1993) the Archive has over 30,000 machine-readable files in nearly 2,900 study titles. This number continues to grow as nearly 200 titles are added to the holdings annually. All ICPSR machine-readable data resources are maintained and distributed in a manner designed to maximize utilization for secondary analysis. Membership in ICPSR is not a prerequisite for access to the data resources. However, virtually all of the data resources are available to individuals at ICPSR member institutions without charge, while the analogous services are available on a charge basis to individuals who are not so affiliated. All requests for data from individuals at member institutions should be made through the Official Representative. Requests for data from individuals at nonmember institutions should be addressed to the ICPSR Director of Technical Services. Estimates of the costs involved in providing specific data services will be provided upon request. No services will be provided to individuals at non-member institutions until the cost has been agreed upon.

c. As of 1993, the ICPSR data base holdings are organized into the following major categories and first-order subcategories.

(1)Census Enumerations. Historical and Contemporary Population Characteristics. (United States; Nations Other Than the United States).

(2)Community and Urban Studies. (Studies of Local Politics; Detroit Area Studies; Historical Urban and Community Structure Studies).

(3)Conflict, Aggression, Violence, Wars. (Conflict and Stability Within Nations; Conflict Between and Among Nations).

(4)Economic Behavior and Attitudes. (Continuing Series of Consumer Surveys; Surveys of Economic Attitudes and Behavior; Historical and Contemporary Economic Processes and Indicators).

(5)Education. (United States; Nations Other Than the United States).

(6)Elites and Leadership. (United States; Nations Other Than the United States).

(7) Geography and Environment.

(8) Governmental Structures, Policies, and Capabilities. (Behavior and Attitudes of Bureaucrats; Historical and Contemporary Public Policy Indicators and Outputs; Statistics on Government Operations).

(9) Health Care and Health Facilities.

(10) Instructional Packages and Computer Programs.

(11) International Systems, Linkages, Relationships, and Events. (Dyadic and Small-Group Interaction (Events Data); International Organizations; Structural Characteristics of the International System; Alliances and Military Affairs).

(12) Legal Systems.

(13) Legislative and Deliberative Bodies. (Historical and Contemporary Roll Call Voting Records; Studies of Decision-making in Deliberative Bodies).

(14) Mass Political Behavior and Attitudes. (Historical and Contemporary Electoral Processes; Political Participation; Public Opinion on Political Matters; Political Parties).

(15) Organizational Behavior. (United States; Nations Other Than the United States).

(16) Social Indicators. (United States; Nations Other Than the United States).

(17) Social Institutions and Behavior. (Minorities and Race Relations; Religion; Socialization, Students, and Youth; Age and the Life Cycle; Crime and the Criminal Justice System; Leisure and Recreation; Vital Statistics; Family and Gender).

d. Each entry in the ICPSR *Guide* is described according to the following format (although not all collections have entries for all of the fields described below). The following conventions are used to present technical information: (1) one-part data collections have one entry; (2), small, multipart collections have individual entries; (3) large, multipart collections show only a range of figures for each element, using one or (if there are several groupings of data) more entries.

(1) Principal Investigator. Each description begins with the name of the Principal Investigator (an individual or individuals or an agency), the authoritative title of the collection with qualifications specific to the current release of the data in parentheses if needed, and the ICPSR study number to be used when ordering.

(2) Summary. This is an abstract of the collection describing its purpose and substance.

(3) Class. Contains the ICPSR class number.

4) Universe. Identifies the group of entities which comprise the object of study in a research investigation: the "population" of elements from which a sample is selected.

(5) Sampling. Describes the procedures used to extract the sample from the universe.

(6)Note. Used to describe details of interest to users.

(7)Extent of Collection. Lists the components of the entire collection, including the number of data files as well as files of machine-readable documentation and/or other material.

(8)Data Format. Lists all of the collection's available data formats.

(9)Extent of Processing. Describes processing steps performed on the collection, either by ICPSR, by the principal investigator, or by the data producer. The categories and abbreviations used for this are explained below.

Users should understand that all ICPSR data collections have been checked to determine that data and documentation correspond. ICPSR currently employs two systems to describe the extent of additional processing devoted to data collections. The first is a scheme of data "classes" that categorizes collections according to the level of processing performed by ICPSR. Class numbers appear at the end of the SUMMARY field in data collection descriptions. These class numbers are explained below:

Class I: Class I data sets have been checked, corrected if necessary, and formatted to ICPSR specifications. Also, the data may have been recoded and reorganized in consultation with the investigator to maximize their utilization and accessibility. A code book, often capable of being read by a computer, is available. This code book fully documents the data and may include descriptive statistics such as frequencies or means. For those Class I data sets with code books available in printed form, a copy of the printed code book is supplied routinely to each Official Representative. All Class I studies are available in multiple technical formats: SPSS Control Cards are also available for many Class I collections.

Class II: Class II studies have been checked and formatted to ICPSR specifications. Most nonnumeric codes have been removed. The studies in this class are available in multiple formats, with SPSS control cards available for many Class II collections. The documentation exists as either a machine-readable code book (which may be edited and updated as required by further processing), a multilithed draft version, or a photocopy of the investigator's code book. Any peculiarities in the data are indicated in the documentation. A copy of the documentation is supplied when the data are requested.

Class III: Class III studies have been checked by the ICPSR staff for the appropriate number of data records and accurate data locations as specified by the investigator's code book. Often, frequency checks on these data have been made. Known data discrepancies and other problems, if any, will be communicated to the user at the time the data are requested. One copy of the code book for these data is supplied when the data are requested. The data themselves usually are available only in the format provided by the principal investigator.

Class IV: Class IV studies are distributed in the form received by ICPSR from the original investigator. The documentation for Class IV studies is reproduced from the material originally received. One copy of the documentation is supplied upon request from the Official Representative.

The second system, implemented in 1992 and intended ultimately to replace the system of data classes, describes discrete processing steps performed on the data, either by ICPSR, by the principal investigators of a collection, or by the data producers. This system presents the data processing information in the form of abbreviations in a separate field of the data collection description called EXTENT OF PROCESSING. The following is a key to these abbreviations:

BLANKS	= Data contain blanks.
CONCHK.ICPSR	= Consistency checks performed by ICPSR.
CONCHK.PI	= Consistency checks performed by Principal Investigator.
CONCHK.PR	= Consistency checks performed by Data Producer.
FREQ.ICPSR	= Frequencies provided by ICPSR.
FREQ.PI	= Frequencies provided by Principal Investigator.
FREQ.PR	= Frequencies provided by Data Producer.
MDATA	= Missing data codes standardized within the collection.
NONNUM	= Data contain non-numeric codes.
RECODE	= ICPSR performed recodes and/or recalculated derived variables.
UNDOCCHK.ICPSR	= Checks for undocumented codes performed by ICPSR.
UNDOCCHK.PI	= Checks for undocumented codes performed by Principal Investigator.
UNDOCCHK.PR	= Checks for undocumented codes performed by Data Producer.

(10) Part Number. Gives the official number of the part and a descriptive name for that part for multipart collections.

(11) File Structure. Describes the structure of the part: rectangular, hierarchical, hierarchical in variable blocked format, or relational.

(12) Cases. Indicates the number of units of analysis.

(13) Records Per Case. Gives the number of 80-character card image records per case when the data are in card image format. Gives the number of records per case when the data are available in logical record length format.

(14) Variables. Gives the number of variables contained in each file.

(15) Record Length. Gives the number of characters in each physical data record. Where alternate data formats are available, record length refers to the data in its logical record length or OSIRIS format. Record length for card image records is always 80 characters.

(16) Related Publication. Contains citations to important publications which are based on the data.

e. ICPSR Data Bases Listed Under Category III (Conflict, Aggression, Violence, Wars), Subcategory A (Conflict and Stability within Nations).

Domestic Conflict Behavior, 1918-1966 (ICPSR 5003).

- Justifying Violence: Attitudes of American Men 1969 (ICPSR 3504).
- Data Bank of Assassinations, 148-1967 (ICPSR 5208).
- Data Bank of Minority Group Conflict, 1955-1965 (ICPSR 5209).
- Political Events Project, 1948-1965 (ICPSR 5206).
- Systemic Conditions of Political Aggression (SCOPA) Project, 1955-1964 (ICPSR 5207).
- Causal Model of Civil Strife, 1961-1965 (ICPSR 5009).
- Civil Strife Events, 1955-1970 (ICPSR 7531).
- Civil Strife Conflict Magnitudes, 1955-1970 (ICPSR 7485).
- Conflict and Society (ICPSR 7452).
- Economic Interpretations of American Intervention, 1964-1968 (ICPSR 7382).
- Personality Disorganization Among Refugees of Violence in Columbia, South America (ICPSR 7055).
- Contentious Gatherings in Britain, 1758-1834 (ICPSR 8872).
- Domestic Violence, International Behavior and National Attributes of Developing Nations, 1962-1967 (ICPSR 5013).
- Anti-Foreign Demonstrations in Asia, 1945-1980 (ICPSR 9338).
- Political Violence in the United States, 1819-1968 (ICPSR 0080).
- Study of Political Violence Attitudes, Personal Experiences With Violence, Emotional Reactions to Assassination and Violence in the Media, 1968 (ICPSR 7354).
- Argentina Domestic Violence and Economic Data, 1955-1972 (ICPSR 5213).
- World Handbook of Political and Social Indicators II, 1948-1967: Annual Event Data (ICPSR 5028).
- World Handbook of Political and Social Indicators II, 1948-1967: Daily Event Data (ICPSR 5215).
- Disturbances in France, 1830-1860 and 1930-1960: Intensive Sample (ICPSR 0051).
- Strikes and Labor Activities in France, 1830-1960 (ICPSR 8421).
- Analysis of Arrests in Paris, June 1848 (ICPSR 0049).
- Violent Events in France, 1830-1860 and 1930-1960 (ICPSR 9080).

f. ICPSR Data Bases Listed Under Category III (Conflict, Aggression, Violence, Wars), Subcategory B (Conflict Between and Among Nations).

- International Conflict Episodes, 1945-1979 (ICPSR 8303).
- Conflict and Peace Data Bank (COPDAB), 1948-1978 (ICPSR 7767).
- Dimensions of Interaction, 1948-1973 (ICPSR 7426).
- Middle East Event/Interaction Data, 1949-1969 (ICPSR 5201).
- Middle East Military Event Data, 1949-1969 (ICPSR 5202).
- CASCON Project: Local Conflict Data, 1945-1969 (ICPSR 5301).
- International Crisis Behavior Project, 1918-1988 (ICPSR 9286).
- Interstate Security Conflicts, 1945-1974 (ICPSR 7536).
- US and USSR Crises, 1946-1976 (ICPSR 7702).
- Political Conflicts, 1944-1966 (ICPSR 5302).
- Nations in Conflict: Data on National Growth and International Violence for Six European Major Powers, 1870-1914 (ICPSR 7425).

- Transactional Data Bank of International Conflict and Amity Events (ICPSR 5210).
- Conflict Management by International Organizations, 1945-1970 (ICPSR 5303).
- Behavioral Correlates of War, 1816-1975 (ICPSR 8606).
- Decisions, Events, and Perceptions in International Crises: The Arab-Israel Conflict, 1967-1973 (ICPSR 5307).
- International Terrorism: Attributes of Terrorist Events, 1968-1977 (ICPSR 7947).
- War Ledger Data, 1870-1974 (ICPSR 9000).
- Statistics of Deadly Quarrels, 1809-1949 (ICPSR 5407).
- Dimensionality of Nations Project: Dyadic Foreign Conflict Variables, 1950-1965 (ICPSR 5408).
- Foreign Conflict Behavior, 1950-1968 (ICPSR 5214).
- Dimensions of Conflict Behavior Within and Between Nations, 1955-1960 (ICPSR 5021).
- Wages of War, 1816-1980: Augmented With Disputes and Civil War Data (ICPSR 9044).
- World Handbook of Political and Social Indicators II, 1948-1967: Intervention Data (ICPSR 5306).
- Study of War: Warlikeness and Other Characteristics of Primitive Peoples (ICPSR 5905).

10. Summary of Findings Regarding Battle Casualties. Not used.

11. Comments and Critique. Currently, the ICPSR archive has over 30,000 machine-readable files in approximately 2,900 study titles (a rough estimate is that this represents over 6 million variables). This number continues to grow as nearly 200 titles are added to the holdings annually. Without some automated assistance, it is impossible to gain a good understanding of what is in the holdings, especially at the variable level. Accordingly, ICPSR has developed four informational data bases in SPIRES (Stanford Public Information Retrieval System) to supply this need, all of which are available for general use. Three of these computer-based resources describe ICPSR data holdings and will aid in identifying data needed for research, instructional, and other applications. The fourth contains bibliographic references to published and unpublished materials bearing upon survey research methodology. These four data bases are as follows.

a. ICPSR GUIDE. This data base (approximately 2,900 entries) provides the complete information included in the ICPSR publication *Guide to Resources and Services* for each of the data collections included in the data holdings and is updated quarterly with descriptions of newly added data collections as announced in the ICPSR Bulletin. The information provided includes the full study title, names of principal investigators, major publications based on the data, size and technical characteristics of the collection, and the complete textual description of the collection as provided in the published *Guide*.

b. ICPSR VARIABLES. This data base (about 69,500 entries) includes the complete text for all questions used in selected surveys held by ICPSR. Among the data collections currently part of the data base are the American Election Studies 1948-1984; the General Social Survey, Cumulative File, 1972-1984; the Euro-Barometers, 3-21 (1975-1984); the CBS and the

New York Times surveys; and the ABC and the Washington Post surveys. The data base provides study and variable names and numbers, dates of data collection, question texts, and code categories and frequencies. The data base is being expanded to contain additional collections bearing on aging and health related research areas such as the Health Interview Surveys, Health and Nutritional Surveys, and Retirement History Longitudinal Surveys.

c. ICPSR ROLLCALLS. The ICPSR ROLLCALLS data base includes an entry for each of the over 20,000 roll call votes recorded in the House of Representatives and the Senate during the Eighty-ninth through the One-Hundred-First Congresses (1965-1989). The information comes from UNITED STATES CONGRESSIONAL ROLL CALL VOTING RECORDS (ICPSR 0004). This data base provides the date of the vote, outcome in terms of number of yeas and nays, name of initiator, the relevant bill or resolution number for each roll call, and a textual description of the issues. Comparable information for new Congresses will be added as the data become available.

d. SMIS. The SMIS (Survey of Methodology Information System) data base provides citations, some with annotations, to published and unpublished literature dealing with all aspects of the methodology of survey research. SMIS was begun and maintained for some years by the Bureau of the Census and was subsequently moved to the ICPSR. The data base currently includes author, title, publication and subject information for nearly 8,100 articles, books, conference, and other papers written primarily between 1972 and 1988. New citations will be added in the future on a continuing basis.

KRIVOSHEYEV-1993

1. Document Description. *Losses to the Armed Forces of the USSR in Engagements, Battles, Operations, and Military Conflicts: Statistical Analysis*, (in Russian), Colonel-General G. F. Krivosheyev (ed), Moscow Military Press, ISBN 5-203-01400-0, 1993, 415 pages, UNCLASSIFIED (formerly SECRET). Available from booksellers and libraries.

2. Objectives and Scope. This book presents statistical investigations of the number of losses in personnel and materiel to Soviet Armed Forces in battles, combat operations, and military conflicts from 1918 to 1989.

3. Populations Included. Primarily Soviet Military Forces, including their Navy as well as their Army. However, some information is presented on German losses on the Eastern Front during World War II. Personnel losses, regardless of how they were originally described, are presented in contemporary (Soviet) terminology. For example, officers include junior officers, field grade officers, general officers and branch chiefs, students in military staff colleges, generals and admirals; sergeants include noncommissioned and petty officers, warrant officers, and senior petty officers; soldiers include Red Army (men), Red Fleet (sailors), seamen, and students in military academies.

4. Timeframes Included. From 1918 to 1989.

5. Casualty Types Included. Personnel operational losses to the army (navy) in this book are divided into:

a. Permanent. These include killed on the field of battle, died of wounds during medical evacuation, missing or taken prisoner (the number who died of wounds or illness in hospitals appears only in the total losses to military strength). The number of permanent operational losses of the army also include losses due to those disabled, and not associated with immediately obvious military operations—those who perished as a result of serious accidents, sentenced to capital punishment for spying, suicides, and died of illness in hospitals.

b. Medical. Those personnel wounded, contused, burned, sick, and frostbitten in combat, who were evacuated from the zone of combat operations to army, Front, or communications zone hospitals. In considering the total number of medical losses we necessarily have included many troops who received in the course of combat two or more wounds and were repeatedly given hospital treatment; therefore, we took into account the losses incurred on two or more occasions.

6. Time Intervals Included As. Various, but generally either for the war as a whole or subdivided into various subcategories. For example, the World War II data are subdivided according to year (quarter) of the war, army group, operation, branch of service, military rank, and organizational assignment. In addition, separate tabulations are made for each of the major strategic operations conducted by the Soviets on the Eastern Front.

- 7. Situational Descriptors Defined As.** Not used—although very brief accounts of the operation are given, they are not detailed enough to serve as situational descriptors.
- 8. Data Sources Used.** Various, but essentially the Soviet archives.
- 9. Other and Miscellaneous.** Some information on Soviet losses of army materiel and naval ships is included. In its 415 pages, the book presents 111 numbered tables, exclusive of a great many other unnumbered tables. The table of contents is summarized below:

a. Foreword

b. Chapter 1. Personnel Losses of the Red Army in the Time of the Civil War and International Military Intervention.

Losses of the Red Army in 1918-1922.

Losses of the Red Army in Liquidating the Last Centers of Counterrevolution and Intervention (1918-1922).

c. Chapter II. Personnel Losses of the Red Army in Combat Operations and Military Conflicts of the Inter-War Period.

Turkish Front (Turkish Military District) in the Struggle With the Basmach in 1923-1931.

Soviet-Chinese Conflict, 1929.

Volunteer Fighters in Aid of the Spanish Republic (1936-1939).

Volunteer Fighters in Aid of China (1937-1939).

Soviet-Japanese Military Conflict Near Lake Khasan in 1938.

Campaign in Western Ukraine and Western Belorussia in 1939.

Soviet-Finland War (30 November 1939 to 13 March 1940).

d. Chapter III. Losses to Military Forces of the USSR in the Great Patriotic War (1941-1945).

Permanent Losses.

Medical Losses.

Missing in Action.

Estimated Total Losses.

Army Operations, Their Strengths and Losses.

Losses By Period in Military Campaigns.

Losses in Strategic Operations.

Defensive Operations in Lithuania and Latvia.

Defensive Operations in Belorussia.

Defensive Operations in Western Ukraine.

Strategic Defensive Operations in Zapolyarye and Karelia.

Kiev Strategic Defensive Operation.

Leningrad Strategic Defensive Operation.
Battle of Smolensk.
Donbas-Rostov Strategic Defensive Operation.
Moscow Strategic Defensive Operation.
Tikhvin Strategic Offensive Operation.
Rostov Strategic Offensive Operation.
Moscow Strategic Offensive Operation.
Kerch-Feodosiya Airborne Operation.
Rjev-Vyazama Strategic Offensive Operation.
Voronezh-Voroshilov Strategic Defensive Operation.
Stalingrad Strategic Defensive Operation.
North Caucasus Strategic Defensive Operation.
Stalingrad Strategic Offensive Operation.
North Caucasus Strategic Offensive Operation.
Operations to Run the Leningrad Blockade.
Voronezh-Kharkhov Strategic Offensive Operation.
Kharkhov Defensive Operation.
Kursk Strategic Defensive Operation.
Orlov Strategic Offensive Operation.
Belgorod-Kharkhov Strategic Offensive Operation.
Smolensk Strategic Offensive Operation.
Donbas Strategic Offensive Operation.
Chernego-Poltava Strategic Offensive Operation.
Novorossia-Tamansk Strategic Offensive Operation.
Lower Dnepr Strategic Offensive Operation.
Kiev Strategic Offensive Operation.
Dnepr-Carpathian Strategic Offensive Operation.
Leningrad-Novgorod Strategic Offensive Operation.
Crimean Strategic Offensive Operation.
Vyborg-Petrovsk Strategic Offensive Operation.
Belorussia Strategic Offensive Operation.
Lvov-Sandomirsk Strategic Offensive Operation.
Yassy-Kishinyev Strategic Offensive Operation.
East-Carpathian Strategic Offensive Operation.
Baltic Strategic Offensive Operation.
Belgrade Strategic Offensive Operation.
Petsamo-Kirchen Strategic Offensive Operation.
Budapest Strategic Offensive Operation.
Vistula-Oder Strategic Offensive Operation.
Western Carpathian Strategic Offensive Operation.
East Prussia Strategic Offensive Operation.
East Pomerania Strategic Offensive Operation.
Vienna Strategic Offensive Operation.
Berlin Strategic Offensive Operation.
Prague Strategic Offensive Operation.

Manchurian Strategic Offensive Operation.

Personnel Losses in Some Major Front Operations.

Losses of Fronts and Detached Armies.

Personnel Losses on the Northern Front.

Personnel Losses on the North-Western Front.

Personnel Losses on the Western Front.

Personnel Losses on the Third Belorussian Front.

Personnel Losses of the Southwestern Front (First Formation).

Personnel Losses of the Southern Front (First Formation).

Personnel Losses of the Central Front (First Formation).

Personnel Losses of the Reserve Front (First Formation).

Personnel Losses of the Briansk Front (First and Second Formations).

Personnel Losses of the Leningrad Front.

Personnel Losses of the Karelian Front.

Personnel Losses of the Kalinin, First Baltic Front, and Zemland Combat Groups.

Personnel Losses of the Volkhov Front (First and Second Formations).

Personnel Losses of the Caucasus Front.

Personnel Losses of the Crimean Front.

Personnel Losses of the Trans-Caucasus Front (Second Formation).

Personnel Losses of the North-Caucasus Front (First Formation).

Personnel Losses of the North-Caucasus Front (Second Formation).

Personnel Losses of the Voronezh and First Ukraine Fronts.

Personnel Losses of the Stalingrad (First Formation) and Donbas Fronts.

Personnel Losses of the South-East and Stalingrad (Second Formation) Fronts.

Personnel Losses of the South-West (Second Formation) and Third Ukraine Fronts.

Personnel Losses of the Southern (Second Formation) and Fourth Ukrainian (First and Second Formations) Fronts.

Personnel Losses of the Reserve (Second Formation), Kursk, Orlov, and Briansk (Third Formation) Fronts.

Personnel Losses of the Stepn and Second Ukrainian Fronts.

Personnel Losses of the Baltic and Second Baltic Fronts.

Personnel Losses of the Central (Second Formation), Belorussia, and First Belorussia Fronts.

Personnel Losses of the Second Belorussia Front (First Formation).

Personnel Losses of the Second Belorussia Front (Second Formation).

Personnel Losses of the Third Baltic Front.

Personnel Losses of the TransBaikal Front.

Personnel Losses of the First Far Eastern Front.

Personnel Losses of the Second Far Eastern Front.

Personnel Losses to the Troops of the Moscow Defense Zone.

Personnel Losses of the 51st Independent Army.

Personnel Losses of the 7th Independent Army.

Personnel Losses of the 52nd Independent Army.

Personnel Losses of the 4th Independent Army.

Personnel Losses of the Independent Maritime Army (First Formation).
 Personnel Losses of the Independent Maritime Army (Second Formation).
 Personnel Losses of the 37th Independent Army.
 Personnel Losses of the 14th Independent Army.
 Personnel Losses of the Navy and Flotillas.
 Personnel Losses of the Baltic Fleet.
 Personnel Losses of the Northern Fleet.
 Personnel Losses of the Pacific Ocean Fleet.
 Personnel Losses of the Black Sea Fleet.
 Personnel Losses of the Amur Combat Fleet.
 Personnel Losses of the Volga Combat Fleet.
 Personnel Losses of the Dnepr Combat Fleet.
 Personnel Losses of the Danube Combat Fleet.
 Personnel Losses of the Caspian Combat Fleet.
 Personnel Losses of the Onega Lake Combat Fleet.
 Personnel Losses of the Pinsk Combat Fleet.
 Personnel Losses to Elements of the Navy Central Command.
 Losses of Our Nation's Troops.
 Permanent Losses of the Officer Complement.
 Cost of Our Liberation.
 On Losses to Allied Formations.
 Captured and Missing.
 Armaments and Military Materiel: Production and Losses.
 Losses of the Enemy.

e. Chapter IV. Losses Among Soviet Military Servicemen, Including Collaborating in Voluntary International, Military-Technical Assistance to Allied Nations, and Also Liquidation of Border Military Conflicts.

War in Korea (1950-1953).
 Limited Wars and Military Conflicts in the Nations of Asia, Middle-East, and Africa.
 Battle of Hungary, 1956.
 Invasion of Czechoslovakia, 1968.
 Border Clashes in the Far East and in Kazakhstan, 1959.
 Voluntary Military Assistance to the Government of Afghanistan, 25 December 1979 to 15 February 1989.

f. Summary Data on the Losses to Soviet Military Forces in Battles, Combat Operations, and Military Conflicts

g. Conclusions

10. Summary of Findings Regarding Battle Casualties. An overall summary of all losses to Soviet military forces for the period 1918 to 1989 shows that in this period as a result of military operations permanent losses of combat personnel were 9,763,326 men, and medical losses to

29,878,153. The greatest number of personnel permanently lost were in the two worst wars—the Civil War (1918-1922) and the Great Patriotic War (1941-1945). In the former 939,755 were lost; in the latter, 8,668,400.

This book's findings on the total personnel losses of the Soviet military forces can be used among other things in scientific research purposes, as well as for accomplishing diverse measures for perpetuating the memory of those who perished in war.

11. Comments and Critique. For many years, the kind of information given in this book was classified SECRET by the Soviet Union. This is the first time a systematic collection of this sort of information has been available in unclassified form.

KUHN-1992

1. **Document Description.** Kuhn, George W. S., "Ground Forces Battle Casualty Rates: Uses in Casualty Estimation and Simulation Evaluation," in Proceedings of the 1992 60th Military Operations Research Symposium [being published], 38 pp. Available from MORS or from the author [Logistics Management Institute, 2000 Corporate Ridge Parkway, Tysons Corner, VA 22102].
2. **Objectives and Scope.** This article summarizes the author's research conducted from 1987 to 1991 and documented in three previous reports (see Kuhn-1989, Kuhn-1990, and Kuhn-1991). Also, after providing a more expansive discussion of the original research's theoretical and methodological background, the article extends the research by discussing Operation DESERT STORM results in light of the researcher's previous insights into casualty rate "patterns." General implications of the overall research for future (i.e., post-Cold war) rate expectations are then suggested.
3. **Populations Included.** As in Kuhn-1989.
4. **Timeframes Included.** As in Kuhn-1989, but revised to include Operation DESERT STORM.
5. **Casualty Types Included.** As in Kuhn-1989.
6. **Time Intervals Included As.** As in Kuhn-1989.
7. **Situational Descriptors Defined As.** As in Kuhn-1989 and further developed in Kuhn-1990—expanded to introduce a new major operational scenario descriptor, namely "disintegrated front."
8. **Data Sources Used.** As in Kuhn-1989 and Kuhn-1990, plus use of DESERT STORM rate results (from US and other official Coalition data releases) in conjunction with the author's characterization of estimated Iraqi ground forces casualty experience in the Kuwaiti theater of operations (based on accounts of operations).
9. **Other and Miscellaneous.** Includes numerous tables and charts. One that encapsulates the author's views is the single-graphic comparison of major personnel casualty rate expectations, showing his estimates of the normal ranges of personnel casualty rates within peak 10-day periods for army-sized forces engaged in attack or defense in "continuous front," "disrupted front," and "disintegrated front" operational scenarios.
10. **Summary of Findings Regarding Battle Casualties.** This article summarizes and restates the author's general findings about the relationship between casualty rates and types of operations. The available evidence suggests that for army-sized forces there is a decline in the attacker's, and a dramatic climb in the defender's, peak 10-day personnel casualty rate with each step along a spectrum of declining defender front coherence—from continuous, to disrupted, to

disintegrated. (Specific normal ranges for the peak 10-day casualty rates of army-sized forces are displayed in the graphic mentioned in the previous paragraph.) During the Cold War era, it was often visualized that our forces would be on the defensive but able to maintain a continuous front. If in the post-Cold War era we find our forces mainly on the attack and successfully imposing "disrupted" or "disintegrated" front conditions on the defender, then our casualty rates can be expected to be lower than those anticipated in the earlier Cold War scenarios.

11. Comments and Critique. This article provides a summary and extension of the author's original research.

O'DONNELL-1993

1. **Document Description.** O'Donnell, E., and C. G. Blood, "Distribution Characteristics of Marine Corps Casualty and Illness Rates," Naval Health Research Center Report No. 93-20, 19 pp, 1 April 1993, UNCLASSIFIED, available from DTIC as AD-A276 015.
2. **Objectives and Scope.** To examine the underlying statistical distributions of WIA, KIA, and DNBI incidence rates among combat and combat support troops deployed to Okinawa and Korea.
3. **Populations Included.** US Marine Corps battalions stationed in Okinawa or Korea during the time periods considered.
4. **Timeframes Included.** Ninety-one days from 1 April to 30 June 1945 for Okinawa and 150 days from February to June 1951 for Korea.
5. **Casualty Types Included.** KIA, WIA, and DNBI.
6. **Time Intervals Included As.** Daily rates are used.
7. **Situational Descriptors Defined As.** None used, other than the general theater of operation and the span of dates included.
8. **Data Sources Used.** Data on US Marine Corps battalions stationed in Korea were extracted from their unit diaries stored at the Marine Corps Historical Center in Washington DC. Data on US Marine Corps battalions stationed in Okinawa were obtained from their muster rolls held by the National Archives.
9. **Other and Miscellaneous.** Separate rates were computed for the daily incidence of DNBI, WIA, and KIA among both combat and combat support troops per 1,000 troop strength. Rates are used in the hope of minimizing disparate results due to differences in the sizes of the battalions treated. The preliminary objective of the analysis is to test the hypothesis that the rates are exponentially distributed. An additional objective was to fit a classical Box-Jenkins autoregressive moving average (ARIMA) model to the data.
10. **Summary of Findings Regarding Battle Casualties** (adapted from the report)
 - a. Lognormal and normal distributions were used to roughly approximate Poisson processes of the DNBI rates of the combat and combat support troops from both military operations. The WIA and KIA rates from each campaign were modeled with the use of compound Poisson processes and exponentially distributed interarrival times.
 - b. The use of mean rates for casualty projections, while providing rough approximations of WIA and KIA incidence, does not adequately represent the dynamic properties of military

operations. ... Further, a multivariate paradigm is required to model the interrelationship between DNBI and WIA rates and to express the underlying trends in the time series.

11. Comments and Critique. This appears to be the first use of ARIMA models to analyze and to fit casualty and loss data. See also O'DONNELL-1994a and O'DONNELL-1994b.

O'DONNELL-1994a

1. **Document Description.** O'Donnell, E., and C. G. Blood, "A Bivariate Autoregressive Integrated Moving Average Analysis of Combat Troop Casualty Rates," Naval Health Research Center, PO Box 85122, San Diego, CA 92186-5122, Report No. 94-2, 15 pp, February 1994, UNCLASSIFIED, available from DTIC as AD-A276 015.
2. **Objectives and Scope.** To fit a bivariate autoregressive integrated moving average (ARIMA) model to selected historical time series data on WIA and DNBI incidence rates among combat troops.
3. **Populations Included.** DNBI and WIA rates were extracted from Marine Corps unit diaries for a 150-day period of the Korean War, a 90-day period of the World War II Okinawa Campaign, and a 123-day period of the Vietnam War.
4. **Timeframes Included.** Not used.
5. **Casualty Types Included.** DNBI and WIA.
6. **Time Intervals Included.** Daily historical incidence rates were used.
7. **Situational Descriptors Defined As.** Only the operational names were used as descriptors.
8. **Data Sources Used.** US Marine Corps unit diaries.
9. **Other and Miscellaneous.** See also the following: [BLOOD-1989], [BLOOD-1993A], and [BLOOD-1993B].
10. **Summary of Findings Regarding Battle Casualties**
 - a. All of the univariate models are best represented with a moving average term. The Okinawa and Korea data are comfortably fit with a ARIMA(0,1,2) and the Vietnam data with an ARIMA(0,1,1).
 - b. DNBI rates cannot be forecast accurately by a simple mean rate that remains constant. They are highly variable and depend on operational events.
11. **Comments and Critique.** This study demonstrates that WIA rates can be a useful predictor of DNBI rates when using a bivariate ARIMA model. High levels of WIA incidence affect DNBI rates on both the immediate and the following day. These results were consistent among the three military conflicts examined and should prove indicative for future military campaigns.

O'DONNELL-1994b

- 1. Document Description.** O'Donnell, E. R, and C. G. Blood, "Using the FORECAS Simulation Program to Project Casualty and Illness Rates," Naval Health Research Center Report No. 94-?? (Draft), 16 pp, 1994, UNCLASSIFIED, available from the authors.
- 2. Objectives and Scope.** To propose a method of accurately predicting the incidence of disease and nonbattle injury (DNBI), as well as wounded in action (WIA) and killed in action (KIA) casualties. The computer implementation of the resulting method is known as the FORECAS model.
- 3. Populations Included.** Casualty data were extracted for troops serving during the Vietnam War, the Korean Conflict, the Okinawa operation during World War II, and the Falklands. These data included casualties to combat troops, support troops, and service support troops.
- 4. Timeframes Included.** The data used to calibrate the FORECAS model were obtained from World War II, Korea, Vietnam, and the Falklands.
- 5. Casualty Types Included.** The FORECAS model can provide as outputs the number of DNBI, WIA, KIA, DNBI@WIA, or WIA@KIA.
- 6. Time Intervals Included As.** The FORECAS model projects the daily casualty numbers for a force.
- 7. Situational Descriptors Defined As.** The FORECAS model inputs include the following:
 - a. A battle intensity descriptor, with levels of NONE, LIGHT, MODERATE, HEAVY, and INTENSE.
 - b. An indicator of what forces to consider, with levels of COMBAT TROOPS, SUPPORT TROOPS, and SERVICE SUPPORT TROOPS.
 - c. A theater of war indicator, with levels of EUROPE, EAST ASIA, and SOUTHWEST ASIA.
 - d. An indicator of the length of the scenario, with levels of 15 DAYS, 30 DAYS, 60 DAYS, 90 DAYS, and 120 DAYS.
- 8. Data Sources Used**
- 9. Other and Miscellaneous.** The outputs available from the FORECAS model include the following casualty projections.
 - a. A graphical display of the daily DNBI, WIA, and KIA incidence across the temporal course of the modeled scenario. One such graph is produced for each of the troop types selected on input.

b. Statistical summaries of the daily incidences (for example, the total KIA, average KIA, maximum daily KIA, and daily KIA rate per 1,000 troop strength).

10. Summary of Findings Regarding Battle Casualties. The study concludes that “the simulation accurately depicts the statistical patterns of empirical data and may be used to forecast casualty and illness arrivals during a hypothetical military scenario.”

11. Comments and Critique. The FORECAS model appears to be based in large part on the statistical analysis given in O'DONNELL-1994a.

OGAR-1994

1. **Document Description.** Operation GRANBY Analytical Record (OGAR), developed by DSc (Land), Ministry of Defence, UK, aided by Landair International Ltd., UK (Whiteparish, Salisbury, Wiltshire), and available from the British Ministry of Defence to qualified investigators.
2. **Objectives and Scope.** To compile an analytical record of British Army operations during the "100 hours" land campaign, known to them as Operation GRANBY and conducted in concert with allied forces during Operation DESERT STORM. It is intended to provide a firm basis for all subsequent analyses of this operation.
3. **Populations Included.** British Army forces.
4. **Timeframes Included.** Same as DESERT STORM.
5. **Casualty Types Included.** Various.
6. **Time Intervals Included As.** Various.
7. **Situational Descriptors Defined As.** Various.
8. **Data Sources Used.** British and allied forces combat records, said to be "the highest quality data available."
9. **Other and Miscellaneous**

a. **General.** OGAR was developed by DSc (Land), Ministry of Defence, UK, aided by Landair International Ltd., UK. The project was conducted in two phases: Jan-Mar 93 and Nov-Mar 94. OGAR includes, in addition to a textual data base, digital maps and a numerical data base with the ability to analyze the data, pulling together all the various data bases into record-making extensive use of EXCEL. A 486 computer with at least 8 Mb of RAM is recommended to operate it. It comprises three elements:

- (1) The Data Base, on Microsoft Access V2.0.
- (2) The Data Analysis, on Microsoft Excel V4 or 5, and incorporating some additional external data, particularly on training and logistics.
- (3) The Digital Maps, on Coreldraw V4.

b. **The Data Base.** The Landair Op GRANBY Data Base is the primary source of data, drawn from the Commander's Diary of each participating unit, and supplemented by the operational radio logs. It is a chronological extraction of unit (including formation HQs) activity over the period 240001-280800 Feb 91 (from 180700 in the case of artillery regiments to take account of preparatory fires). It is an amalgam of three separate data bases, as follows.

(1) Consolidated records of:

- Vehicle and personnel casualties.
- AFV strength returns.
- Direct and indirect fire engagements.
- LOCSTATS.
- POW captures and sightings.

(2) The Out-of-Area Conflict Cost Data Base, created by HVR Consulting Services LTD, and compiled to provide the basis for the analysis and development of a cost model of the land element of Op GRANBY.

(3) The Land Scientific Evaluation Team (LANDSET) Tabulated Data Base, a record of the interviews in all the basic military functional areas conducted in theater by a number of specialist teams in the immediate aftermath of the war.

c. The Data Analysis. Some analysis of the original high integrity data has been undertaken. Additional sources of data have been included in order to provide a more complete analysis. Military analysts have made calculations from recorded map coordinates and other information, and have made best use of the charting capabilities of MS Excel. The Excel Notes facility has been used to record qualifying statements on the data sources and may be used in the future to record additional comments. Subject areas include:

- Ammunition and fuel stock holdings and expenditure.
- Rates of advance.
- Training prior to G-day.
- Vehicle availability, including Challenger and Warrior mean distance between failure (MDBF).
- Activity during the 100 hours (time spent static, moving, in battle, etc.).

d. The Digital Maps. The maps, currently prepared on Coreldraw V4, are an invaluable additional aid to understanding what happened on those objectives for which data was available. It is a vector-based system, allowing for automatic changes in the level of detail when zooming in and out. It includes:

- Grid lines superimposed upon a "desert" background.
- (UK) Armored division boundaries, phase lines, and objectives.
- A series of separate layers showing, across the battlefield:
 - ◊ Own forces activity (grouping, lines of departure, axes of assault, etc.)
 - ◊ Enemy locations (as perceived by G2 intelligence before the battle).
 - ◊ Direct fire engagements, including Blue on Blue.
 - ◊ Indirect fire engagements.
 - ◊ Artillery positions and arcs of fire.

e. OGAR Limitations. OGAR is based on the highest integrity information available. Although the temptation was to embellish from other (arguably less credible) sources, the DSc(Land) policy of "pure information only" was clear. OGAR therefore, inevitably, has its limitations. For example:

- Not all units submitted a Commander's Diary.
- Among those who did, the quality varied.
- US artillery support to 1 (UK) Armored Division is not included.
- The data on direct fire engagements is far from complete.
- There is little G2 intelligence data.

10. Summary of Findings Regarding Battle Casualties. Not applicable.

11. Comments and Critique. This was the first (and, so far as I know, the only) campaign to have been put on a computer data base and analyzed in such detail so close to the event. It is a unique contribution to the data on military operations. It focuses on the operations of a single armored division for a relatively short period of operations, but attempts to be comprehensive in its account of the division's activities.

PAR-1993a

1. Document Description. Personnel Attrition Rates in Land Combat Operations: An Annotated Bibliography, US Army Concepts Analysis Agency Research Paper, CAA-RP-93-2, June 1993, 472 pp, UNCLASSIFIED, available from DTIC as AD-A268 787.

2. Objectives and Scope.

a. The aim was to collect as many as possible of the available tabulated data and data-based studies of attrition rates in historical land combat operations, and to prepare a comprehensive bibliography of such data and studies.

b. The scope of the effort includes works on the personnel strengths and battle casualties of land combat forces. Other types of attrition (nonbattle losses, losses to equipment, casualties to other services, and so forth) are outside PAR's scope. PAR is concerned only with historical data on actual combat operations; it does not deal with personnel losses in models, simulations, war games, field experiments, or training exercises (like those of the National Training Center). PAR is focused mainly on original or translated works in English, although a few important works in other languages are included. Studies of personnel attrition are also included, provided they contain cogent analyses of a publicly available, nonproprietary body of tabulated data on attrition in actual combat operations. Since trends in attrition over long periods of time are of interest, data on ancient as well as recent battles are included. However, as no contract support was available and in-house resources were limited, no systematic effort has been made to extract data from the archives or primary source materials, and no original historical research was undertaken. Thus, PAR relies almost exclusively on secondary works that contain data in readily usable tabulated form. All works received prior to the cutoff date of 31 May 1993 are included.

3. Populations Included. Various, but primarily land combat forces engaged in battles.

4. Timeframes Included. Various.

5. Casualty Types Included. Various.

6. Time Intervals Included As. Various.

7. Situational Descriptors Defined As. Various.

8. Data Sources Used. Various.

9. Other and Miscellaneous. Not used.

a. The collection of data and data-based studies consists of the files of pertinent documents maintained at the US Army Concepts Analysis Agency. Subsequent phases of the PAR Study converted some of their most important data to electronic form to facilitate its independent analysis (see PAR-1993c).

b. The annotated bibliography is intended to provide a guide to the literature on personnel attrition rates in historical land combat operations. It should be useful to all who need to consider historical attrition rates for the purposes of modeling, war gaming, studies, and analysis. Since it includes well over 200 titles, the following aids are provided to facilitate its use. First, all documents are given a short title that consists of the principal author's last name and its date of publication. For example, Hartley-1989c refers to a work by Hartley published in 1989. The added letter, c, indicates that the document referred to is the third publication in 1989 by this author. These short titles serve as the key document identifiers. Second, Appendix A gives a list of the full document titles in order by these short titles. Third, Appendix B gives a short subject index to the documents, classified by selected subject categories. Fourth, Appendix C gives a key word index to the full titles arranged alphabetically by the key words they contain. The annotated bibliography itself is in Appendix D, arranged in order by the short titles described above.

10. Summary of Findings Regarding Battle Casualties. The principal findings of the work reported herein are that a great deal of relevant work is available. However, for a given purpose, only a properly chosen part of it is useful. Sometimes none of it applies. Also, there is no terminological standardization of strength or loss nomenclature among nations, among services within a given nation, among theaters even for a given service, and sometimes not even among arms within a given service in a particular theater. Moreover, the nomenclature is continually being refined or redefined. Furthermore, any supposed terminological standardization is commonly ignored in the heat of battle. Since it is impractical to convert differences in terminology and classification schemes to a common basis, comparisons among strength and loss reports can be seriously misleading.

11. Comments and Critique. This annotated bibliography gives US Army operations analysts a well-organized guide to the literature on personnel casualties and attrition rates in historical land combat operations. Properly used, this information can help to improve US Army treatment of personnel attrition in models, wargames, studies, and analyses.

PAR-1993b

1. **Document Description.** Personnel Attrition Rates in Historical Land Combat Operations: Susceptibility and Vulnerability of Major Anatomical Regions,"US Army Concepts Analysis Agency Research Paper CAA-RP-93-3, August 1993, 72 pp, available from DTIC as AD-A270 766.
2. **Objectives and Scope.** To provide estimates based on historical combat data of the susceptibility and vulnerability of major anatomical regions.
3. **Populations Included.** Land combat forces.
4. **Timeframes Included.** Various, but mostly World War II, Korea, and Vietnam.
5. **Casualty Types Included.** Susceptibility is the probability that a major anatomical region will be hit, given a hit on the body. Vulnerability is the conditional probability of being wounded or killed given a hit in a major anatomical region.
6. **Time Intervals Included As.** Not used.
7. **Situational Descriptors Defined As.** Not used.
8. **Data Sources Used.** Various.
9. **Other and Miscellaneous.** Includes numerous tables giving susceptibility and vulnerability estimates based on the historical data from various data sources.
10. **Summary of Findings Regarding Battle Casualties.** The principal findings are that published attrition data can be used to estimate the susceptibility and vulnerability of major anatomical regions. The susceptibility estimates based on various sources are generally similar, which suggests that they are influenced only slightly by variations in the tactical situation. The vulnerability estimates appear to be somewhat more sensitive to the tactical situation, but clearly indicate that a hit in one of the vital regions (head, thorax, and abdomen) is far more likely to result in a killed in action than a hit on the extremities (arms and legs).
11. **Comments and Critique.** This paper's use of available personnel attrition data to estimate the susceptibility and vulnerability of major anatomical regions yields results that should be useful to those engaged in weapons systems analysis and development, wargaming and simulation, and the assessment of personal protective devices.

PAR-1993c

1. Document Description. Personnel Attrition Rates in Historical Land Combat Operations: A Catalog of Attrition and Casualty Data Bases on Diskettes Usable With Personal Computers, US Army Concepts Analysis Agency Research Paper CAA-RP-93-4, September 1993, 177 pp, available from DTIC as AD-A279 069 (report), AD-M000 344 (diskettes). Revised set of diskettes, AD-M000 368.

2. Objectives and Scope

a. The study objective was to provide the Army with a convenient catalog of the readily available computerized data bases on personnel casualties and attrition. A coordinate objective is to provide diskette copies of these data bases to the Defense Technical Information Center (DTIC) for archival storage.

b. The scope of this effort is limited to a selected class of data base. The criteria for inclusion of a data base are as follows (roughly in order of importance). The data base must be:

(1) In the public domain, so that copies can be made available to governmental agencies and others without restriction and for (at worst) a nominal cost. However, for the sake of completeness, some important proprietary data bases can be described, even if their data cannot be made available through DTIC.

(2) In data base form (i.e., consist primarily of tabulations rather than narratives).

(3) Such as to contain information on military operations in and/or outcomes of battles or wars.

(4) Available on diskettes usable with personal computers.

(5) Useful to many military operations analysts; developers, users, assessors, and validators of the inputs and/or outputs of wargames and analogous combat simulations; military historians; students of military art and science; and others with similar interests.

(6) Difficult or inconvenient for individuals and separate study teams to generate or recreate, but which would be more frequently used if they were readily available through DTIC.

3. Populations Included. Various.

4. Timeframes Included. Various.

5. Casualty Types Included. Various, but focused on battle casualties.

6. Time Intervals Included As. Various.

7. Situational Descriptors Defined As. Various

8. Data Sources Used. Various.

9. Other and Miscellaneous. Appendix A lists the data bases in alphabetical order according to a short title adopted for ease of reference. Thus, ACSDB-1990 refers to the Ardennes Combat Simulation Data Base, which was current or originally created in the year 1990. Appendix B contains the detailed catalog of information on each data base, covering the following items of information:

- Data sources used.
- Diskette format (computer hardware and software compatibility restrictions, file descriptions, data field specifications, and so forth).
- Other and miscellaneous (example of the use of this data base, other informative remarks).
- Comments and critique (discussion of the strong and weak points of this data base).

Appendix C is devoted to a particular class of proprietary data base, namely, those maintained and provided by the Inter-University Consortium for Political and Social Research (ICPSR). Appendix D mentions some additional important data bases and sources of information that were omitted from Appendix B's catalog of data bases for one reason or another.

10. Summary of Findings Regarding Battle Casualties

a. The principal finding of this work is that several data bases are available for use with personal computers. Such data bases can be used for a variety of analyses, including model validation, projections of personnel casualty and attrition rates for use in studies and analyses, weapons evaluation, war games and simulations, assessing the utility of protective measures, and so forth.

b. The data bases often partially overlap. That is, the same operation or action may be listed in more than one of them. One consequence of this is that different data bases may give different values for a given operation or action. For example, the values for the US Civil War battle of Antietam can be used to construct the following comparison, where TBC stands for "Total Battle Casualties," i.e., for the sum of the killed in action (KIA), wounded in action (WIA), and captured or missing in action (CMIA):

Data base	USA Strength	USA TBC	CSA Strength	CSA TBC
BWSH-1993	60,000	12,500	40,000	11,200
CDB90-1991	90,000	12,410	46,000	13,700
LIVRMORE-1993	75,316	12,410	51,844	13,724
PARMISC-1993	75,000	12,140	41,000	13,724
SP128-1961	70,000 ^a	15,029	39,200	11,305 ^a
^a These values include killed and wounded only.				

c. Chapter 2 offers a number of observations on data base design and construction, drawn from our experiences as well as those of others. These are arranged under the following headings:

- What are the main types and uses of historical data on land combat operations?
- What data should be recorded?
- How should the data be presented?
- What accuracy is needed to support subsequent analyses?
- Should degrees of confidence in the data be estimated? If so, how should they be presented?
- What quality control measures are appropriate?
- In what areas would additional data be most useful?
- Who should be involved?

11. Comments and Critique. This paper provides a catalog and guide to the principal data bases on personnel casualties and attrition that are available on diskettes for use with personal computers. It will be of considerable value to all who use personnel casualty and attrition data in studies and analyses, weapons evaluation, wargames and simulations, model validation, assessing the utility of protective measures, and so forth. It also provides useful advice for those contemplating the construction of such data base.

PAR-1994

1. **Document Description.** Personnel Attrition Rates in Historical Land Combat Operations: A Note on the Probability of Readmissions and Multiple Wounds, US Army Concepts Analysis Agency Research Paper CAA-RP-94-2, April 1994, 59 pp, available from DTIC as AD-280 498.
2. **Objectives and Scope.** The objective of this paper is to describe and illustrate the application of a model of the probability of multiple incidence suitable for analyzing data on the number of aircraft with multiple personnel casualties, the number of casualties with multiple anatomical regions wounded, the number of personnel with multiple wounds, and the number of personnel with multiple WIA admissions. The scope of the study is limited to the probability of multiple incidence in the situations mentioned above. The basic approach is to compare the observed distributions of multiple incidence to those fitted to the data by an application of the Maximum Entropy Principle.
3. **Populations Included.** Examples are drawn from data on the number of aircraft with multiple personnel casualties, the number of casualties with multiple anatomical regions wounded, the number of personnel with multiple wounds, and the number of personnel with multiple WIA admissions.
4. **Timeframes Included.** Various—mostly World War II, although some data from DESERT STORM is included.
5. **Casualty Types Included.** Various.
6. **Time Intervals Included As.** Various.
7. **Situational Descriptors Defined As.** Various.
8. **Data Sources Used.** Various.
9. **Other and Miscellaneous**
10. **Summary of Findings Regarding Battle Casualties.** It is feasible to use published data to test the estimated distributions of multiple events obtained from the Maximum Entropy Principle. Moreover, such comparisons show that the estimated distributions obtained from the Maximum Entropy Principle often agree moderately well with historical data. The fits occasionally would be rejected by the rote application of statistical hypothesis tests, but on the other hand these data often do not satisfy all of the assumptions required for the applicability of formal statistical hypothesis tests. Nevertheless, visual inspection shows that the fit is usually about as good as might be expected, and is usually adequate for practical use when moderately accurate estimates are better than having no estimates. Although the results are very supportive of the applicability of the Maximum Entropy Principle to these kinds of problems, the available historical data are meager. Additional relevant data would be most welcome.

11. Comments and Critique. This model will be useful to those engaged in weapons systems analysis and development, wargaming and simulation, studies of military medical and personnel support systems, and the assessment of personal protective devices.

PAR-1995

1. Document Description. Personnel Attrition Rates in Historical Land Combat Operations: Some Empirical Relations Among Force Sizes, Battle Durations, Battle Dates, and Casualties, US Army Concepts Analysis Agency Research Paper CAA-RP-95-1, 1 March 1995, available from DTIC as AD-(TBD).

2. Objectives and Scope. The reason for performing this study was that the estimation of attrition in future combat engagements might be improved if the general relationships connecting casualties with force sizes and battle durations are better understood. The study objective was to search for some empirical relationships among force sizes, battle durations, and battle casualties in historical land combat operations, using the comprehensive bibliography and data base collection previously assembled in the Personnel Attrition Rates (PAR) studies. The scope of the study is restricted to consider mainly total battle casualties (TBC), defined to be the sum of its principal components, namely, the killed in action (KIA), the wounded in action (WIA), and the captured or missing in action (CMIA). The issues to be examined in this paper, gleaned from a variety of sources, are grouped into two general groups, as listed below.

- Group 1—What empirical trends in force sizes, battle durations, force ratios, casualty numbers, casualty exchange ratios, casualty fractions, and fractional exchange ratios of the opposing sides persisted over extended periods of time?
- Group 2—How are force sizes, battle durations, force sizes, force ratios, casualty numbers, casualty fractions, and casualty rates interrelated?

The primary data analysis technique used is descriptive statistics.

3. Populations Included. Various.

4. Timeframes Included. Various.

5. Casualty Types Included. Total battle casualties.

6. Time Intervals Included As. Various.

7. Situational Descriptors Defined As. Not used.

8. Data Sources Used. Various.

9. Other and Miscellaneous. Includes the only known summary of prior work in this area. Numerous charts are provided to display the findings in graphical form. Provides the most extensive available tabulations of the regression coefficients when casualty numbers are regressed on friendly and enemy strengths, battle durations, and battle dates.

10. Summary of Findings Regarding Battle Casualties. Since 1600 AD:

- a. Battle durations have tended to increase.
- b. Attacker and defender strengths have been fairly stable over time, and tended to be nearly equal. The force ratio favoring the defender has been fairly stable over time, and defenders typically fought at a slight numerical disadvantage.
- c. Attacker and defender TBC casualty numbers have declined over time and tended to be nearly equal. The casualty exchange ratio favoring the defender appears to have been fairly stable and close to unity.
- d. Attacker and defender TBC casualty fractions have declined over time, and the defender's TBC fraction has tended to be greater than the attacker's. The fractional exchange ratio favoring the defender has been relatively stable over time.
- e. Winner and loser strengths exhibit different trends with different data bases, some data bases showing an increase and others either a decrease or no appreciable change. However, all the data bases agree that the force ratio favoring the winner has been stable and close to unity.
- f. Winner and loser TBC casualty numbers have declined over time, with the loser's casualties typically at least twice those of the winner. The casualty exchange ratio favoring the winner has been more or less stable over time, depending on the data base used.
- g. Winner and loser TBC casualty fractions have declined over time, with the loser's casualty fraction typically at least twice that of the winner. The fractional exchange ratio favoring the winner has been fairly stable over time.
- h. Some of the trends differ from one data base to another. However, all of the data bases agree that strength is not particularly associated with victory in battle and that the casualty or fractional exchange ratio are incomparably more strongly associated with victory in battle. From past research [Helmbold-1986], it would seem that the fractional exchange ratio is a somewhat better index of victory in battle than the casualty exchange ratio.
- i. It is not true that the defender has some inherent advantages over the attacker. In fact, the attacker has generally taken fewer TBC than the defender. The casualty exchange ratio favoring the defender is less than one. The fractional exchange ratio favoring the defender is also less than one.
- j. Smaller forces take and inflict proportionately more casualties than larger forces. It is conjectured that this is a result of diminishing returns to scale.
- k. Neither Lanchester's square law, Osipov's law, nor Peterson's logarithmic law are good approximations to the true relation of casualty fractions to force ratios.
- l. The data do not reveal the expected (that is, approximately) dependency of casualty numbers on the temporal duration of a battle. One might expect that the casualty numbers would be in direct proportion to the duration of a battle, but this is clearly not what the data show.

m. The casualty exchange ratio favoring the defender *decreases* as the force ratio favoring the defender *increases*, despite what one might have expected. In fact, the approximate equation relating *CERY* to *FRY* is

$$CERY \approx \frac{1}{2}(FRY)^{-0.4}.$$

As indicated, the battle duration and battle date appear to have very little influence on this relation.

n. However, the fractional exchange ratio favoring the defender does increase as the force ratio favoring the defender increases. The approximate equation relating *FERY* to *FRY* is

$$FERY \approx \frac{1}{2}(FRY)^{+0.6}.$$

As indicated, the battle duration and battle date appear to have very little influence on this relation.

o. The casualty exchange ratio favoring the winner *decreases* as the force ratio favoring the winner *increases*, despite what one might have expected. In fact, the approximate equation relating *CERW* to *FRW* is

$$CERW \approx 7.4(FRW)^{-0.5}.$$

As indicated, the battle duration and battle date appear to have very little influence on this relation.

p. However, the fractional exchange ratio favoring the winner does increase as the force ratio favoring the winner increases. The approximate equation relating *FERW* to *FRW* is

$$FERW \approx 7.4(FRW)^{+0.5}.$$

As indicated, the battle duration and battle date appear to have very little influence on this relation.

q. Other casualty relations appear to differ, depending on the data base use, the battle duration, and the battle date. The reasons for these differences are left to future investigations.

11. Comments and Critique. This paper's analysis of the principal data bases on personnel casualties over extended periods of time gives US Army operations analysts a much improved foundation for judging future casualty numbers, casualty fractions, and casualty rates in historical land combat operations. Specifically, it advances the state of the art over prior efforts by (i) giving the Constant Fallacy appropriate recognition [Helmbold, Robert L., "The Constant Fallacy: A Persistent Logical Flaw in Applications of Lanchester's Equations," *European Journal of Operations Research*, Vol 75 (1994), pp 647-658.], (ii) using a regression model that includes

the battle duration and battle date as potentially important factors, (iii) employing robust regression to minimize the distorting effects of a few gross errors in the data, (iv) systematically using more than one data base at a time in order to determine the sensitivity of the results to different sets of data, and (v) using several dependent variables, to include the casualty numbers as well as the casualty exchange ratio. Properly used, this information can be exploited to improve US Army treatment of personnel attrition in models, war games, studies, and analyses. Application of the findings requires the assumption is that the statistics of future battles will be like the statistics of past battles—in other words, that trends of sufficiently long duration can be extrapolated to the near future with a reasonable degree of confidence.

SIVARD-1993

1. **Document Description.** Sivard, Ruth, *World Military and Social Expenditures, 1992-1993*, Ruth Leger Sivard, World Priorities, Box 25140, Washington, DC 20007, ISSN 0363 4795, ISBN 0-918281-05-9, available from publisher and libraries. This is one of the recent issues of this publication, which has appeared annually since 1980. Available from the publisher and libraries.
2. **Objectives and Scope.** As stated on page 4, "The purpose of this report is to provide an annual accounting for the use of world resources for social and for military purposes, and an objective basis for assessing relative priorities. In bringing together military costs and social needs for direct comparison, the report bridges a gap in the information otherwise available to the public. It is hoped that this will help to focus attention on the competition for resources between two kinds of priorities. Future issues will attempt to improve the coverage with additional measures, monetary and nonmonetary, of the state of the world."
3. **Populations Included.** Civilian and military personnel (separately), in conflicts where deaths averaged more than 1,000 per year. Deaths due to massacres, political violence, and famines associated with the conflicts are included.
4. **Timeframes Included.** Each annual issue of this publication addresses primarily the last course of expenditures over the last 10 to 20 years. However, the material on wars and war-related deaths covers the period from 1700 to the present.
5. **Casualty Types Included.** Deaths.
6. **Time Intervals Included As.** From start to end of a war.
7. **Situational Descriptors Defined As.** Not used, apart from the general location, time span, and such extremely succinct descriptions of the conflict as "Independence from France," "Bosnia versus Turkey," and the like.
8. **Data Sources Used.** The data reported by Sivard were compiled by Dr. William Eckhardt. See the entry under Eckhardt-1993 for more information on data sources.
9. **Other and Miscellaneous**
 - a. The table of contents lists the following major chapter headings: Summary and priorities, Perspectives on the common security, Dynamics of the arms race, Human costs, A turning point?, Priorities USA, Statistical annex, and Weapons in wonderland.
 - b. The tabulation of wars in the chapter on "Human costs" is presented in the following form. The primary division is by major geographical region (North America, Latin America, Europe, Middle East, South Asia, Far East, Oceania, Sub-Saharan Africa, and Other Areas). Each of these regions is further subdivided into nations (e.g., Burma, Cambodia, China,

Indonesia, Japan, Korea, Laos, Malaysia, Mongolia, Philippines, Taiwan, Tibet, and Vietnam). Within each nation, the following information is given on each conflict listed: inclusive dates (e.g., 1952-1963), a short description (e.g., "Independence from UK"), and the estimated number of civilian and military deaths (together with their total).

10. Summary of Findings Regarding Battle Casualties

- a. The bigger the war, and the more recent, the less reliable are the estimates.
- b. Most of the war deaths of three centuries have occurred in the 20th, which has so far accounted for over 90 percent of the deaths in wars since 1700 AD.
- c. Starters of wars are infrequently the winners. In the 20th Century, starters on average have won 39 percent of the wars.
- d. The geography of warfare has changed radically. Europe was the principal site of wars and war deaths over the three century span, but since World War II, only one conflict (Hungary) has taken place in Europe. All other wars have been fought in the Third World. They have not, however, been without involvement of the major powers, and recently this involvement, often indirect and covert, appears to have increased.
- e. As for "causes" of wars, the most frequent objectives were for territory or independence. However, civil wars, representing power conflicts within nations, have increased sharply in the 20th Century, and are now by far the major form of warfare.

11. Comments and Critique

- a. The data on wars were compiled by Dr. William Eckhardt. See the entry under Eckhardt-1993 for more information.
- b. The author clearly has the view that military expenditures are excessive and that a peaceful world is better than a fighting one. Some portions of the publication are somewhat propagandistic for these views.

STOECKLI-1985

1. **Document Description.** Stoeckli, MAJ (Swiss Army) H. F., "Soviet Operational Planning: Superiority Ratios vs Casualty Rates," Report AA6, 20 pp, Soviet Studies Research Centre, Royal Military Academy, Sandhurst, March 1985. Available from Sandhurst.
2. **Objectives and Scope.** To analyze Soviet studies to determine a Soviet planning factor for the relationship of casualties to force ratio.
3. **Populations Included.** Soviet operations in World War II, mainly of combined arms armies in major Front operations.
4. **Timeframes Included.** World War II.
5. **Casualty Types Included.** Medical casualties, which are defined according to the Soviets as wounded (requiring hospitalization) and sick (those with serious complaints that would keep them incapacitated for some 3 weeks). The author estimates total losses are estimated by adding 30 percent to the medical casualties.
6. **Time Intervals Included As.** From start to end of an operation.
7. **Situational Descriptors Defined As.** The data fall into three categories. First, the breakthrough phase of Army operations; second, Front and Army operations; third, planning estimates made by medical personnel prior to the operation. There is a very brief discussion of terrain and surprise effects.
8. **Data Sources Used.** Various, but mainly the book *Combat and Combat Medicine*, (in Russian), by E. I. Smirnov, published by Meditsina, Moscow, 1979.
9. **Other and Miscellaneous.** Not used.
10. **Summary of Findings Regarding Battle Casualties.** Soviet medical casualties (percent) decline with overall Soviet superiority ratios from roughly 20 percent at 1:1 Soviet superiority ratio to about 3 percent at 7:1 Soviet superiority ratio. Here the Soviet superiority "ratio" is a weighted average of the differences in numbers, defined by the formula:

overall superiority ratio = (superiority in troops + superiority in artillery + superiority in tanks and self-propelled guns + 1/2 the superiority in aircraft) divided by 3.5.

11. **Comments and Critique.** The author's relation between losses and superiority is intriguing. However, it is based on a relatively few cases, there is considerable scatter about the average trend line, and the relationship is unmotivated. It is not clear that this system is still used by the Soviets or by any one else, or whether it would apply to the operations of other forces in other circumstances.

STOECKLI-1987

1. **Document Description.** Stoeckli, H. F., "Soviet Operational Planning: Loss Rates in Personnel and Armour—Past and Present Norms," Report AA 17, Soviet Studies Research Centre, Royal Military Academy, Sandhurst, October 1987, 18pp, UNCLASSIFIED. Available from Sandhurst.
2. **Objectives and Scope.** To suggest how Soviet planning factors for personnel and armor losses are arrived at.
3. **Populations Included.** Soviet personnel.
4. **Timeframes Included.** World War II.
5. **Casualty Types Included.** Medical casualties (see STOECKLI-1985 for the Soviet definition of medical casualties).
6. **Time Intervals Included As.** From start to end of an operation.
7. **Situational Descriptors Defined As.** Not used.
8. **Data Sources Used.** Various Soviet publications, principally describing military medical practice.
9. **Other and Miscellaneous.** Not used.
10. **Summary of Findings Regarding Battle Casualties.** Soviet medical casualties decline from about 0.9 percent per day at a Soviet superiority ratio of 1:1, to about 0.4 percent per day at a Soviet superiority ratio of 6:1 (see STOECKLI-1985 for a definition of how the Soviet superiority ratio is defined).
11. **Comments and Critique.** The alleged relationship is based on a very small number of cases—nine cases, to be specific. The scatter of the data about the proposed trend line is quite large. Some of the values plotted are planning estimates, and it is hard to tell which are planning estimates and which are figures from actual operations.

STOECKLI-1989

1. **Document Description.** Stoeckli, H. Fritz, "Soviet Operational Planning: Superiority Ratios and Casualties in Soviet Front and Army Operations," RUSI Journal, Spring 1989, pp 33-40, available from libraries.
2. **Objectives and Scope.** This paper attempts to establish that Soviet operational planners see a relationship between battle casualties and superiority over the enemy.
3. **Populations Included.** Soviet Front and Army operations.
4. **Timeframes Included.** World War II.
5. **Casualty Types Included.** Soviet medical casualties and total personnel losses (see STOECKLI-1985 for a definition of Soviet medical casualties).
6. **Time Intervals Included As.** From start to end of the operation.
7. **Situational Descriptors Defined As.** Not used.
8. **Data Sources Used.** Various Soviet military medicine sources.
9. **Other and Miscellaneous.** Not used.
10. **Summary of Findings Regarding Battle Casualties.** Soviet medical casualties decline linearly from about 17 percent at a Soviet superiority ratio of 1:1 to about 3 percent at a Soviet superiority ratio of 7:1 (see STOECKLI-1985 for a definition of Soviet superiority ratio).
11. **Comments and Critique**
 - a. This paper appears to have been prepared by merging and smoothing the presentation of material previously presented in STOECKLI-1985 and STOECKLI-1987.
 - b. Some 29 points are used to define the trend line. However, at least three of them are estimated values, rather than actual loss experience in combat. Also, there may be a high correlation among some of the data points, since, in many instances, several phases of an overall operation value, are plotted, in addition to the overall value. This runs the risk of double counting some of the data.

WALTER REED-1993

1. **Document Description.** *Textbook of Military Medicine*, 1993, Office of The Surgeon General, US Army. Prepared under the direction of BG Russ Zatchuk (Editor in Chief), Donald P. Jenkins (Managing Editor), and COL Ronald F. Bellamy (Associate Editor), Walter Reed Medical Center, Building 1, Room D-100, Washington, DC 20307-5001, 202-576-2571, DSN: 291-2572, FAX: 202-572-2555. Available from Walter Reed Medical Center or libraries.
2. **Objectives and Scope.** To prepare a comprehensive series of textbooks on military medicine.
3. **Populations Included.** US Army personnel.
4. **Timeframes Included.** Various.
5. **Casualty Types Included.** Focuses primarily on the medical treatment of US Army personnel operating in a combat environment.
6. **Time Intervals Included As.** Various.
7. **Situational Descriptors Defined As.** Various.
8. **Data Sources Used.** Various.
9. **Other and Miscellaneous.** This is a series of volumes. As of this writing, 19 volumes are planned, organized under four major headings or parts, as follows (numbers in parentheses indicate status—either the date of publication or To Be Published):
 - a. **Part I.** Warfare, Weaponry, and the Casualty.
 - Vol. 1, Battlefield Environment (TBP).
 - Vol. 2, Medical Consequences of Nuclear Warfare (1989).
 - Vol. 3, Medical Consequences of Biological Warfare (TBP).
 - Vol. 4, Medical Consequences of Chemical Warfare (TBP).
 - Vol. 5, Conventional Warfare: Ballistic, Blast, and Burn Injuries (1991).
 - Vol. 6, Combat Stress (TBP).
 - b. **Part II.** Principles of Medical Command and Support.
 - Vol. 1, Medical Command and Support in Airland Battle (TBP).
 - Vol. 2, Medicine in Low-intensity Conflict (TBP).

c. Part III. Military Preventive Medicine and the Environment.

Vol. 1, Mobilization and Deployment (TBP).

Vol. 2, Occupational Health: The Soldier and the Industrial Base (1993).

Vol. 3, The Natural Environment: Altitude, Cold, and Heat (TBP).

d. Part IV. Surgical Combat Casualty Care.

Vol. 1, The Casualty (TBP).

Vol. 2, Anesthesia and Critical Care (TBP).

Vol. 3, Medical Imaging (TBP).

Vol. 4, Head and Neck Surgery (TBP).

Vol. 5, Ophthalmic Surgery and Neurosurgery (TBP).

Vol. 6, Cardiothoracic Surgery (TBP).

Vol. 7, Abdominal and Urogenital Surgery (TBP).

Vol. 8, Orthopedic Surgery (TBP).

10. Summary of Findings Regarding Battle Casualties. Various.

11. Comments and Critique. These volumes will no doubt be the principal standard reference on the subject for many years to come.

MODEL FORMAT

- 1. Document Description.**
- 2. Objectives and Scope.**
- 3. Populations Included.**
- 4. Timeframes Included.**
- 5. Casualty Types Included.**
- 6. Time Intervals Included As.**
- 7. Situational Descriptors Defined As.**
- 8. Data Sources Used**
- 9. Other and Miscellaneous.**
- 10. Summary of Findings Regarding Battle Casualties.**
- 11. Comments and Critique.**

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GLOSSARY

1. INTRODUCTION. Some of the abbreviations and special terms used in this document are listed below. If the definition given is an official one, the organizations that have adopted it are given in parentheses; otherwise, no indication of its adoption are given. Note that the definitions used by other countries or by the US in earlier times may differ more or less from those given below and may be interpreted in various ways even within the US Department of Defense.

2. DEFINITION OF TERMS

Battle casualty - (DOD) Any casualty incurred in action. "In action" characterizes the casualty status as having been the direct result of hostile action, sustained in combat or relating thereto, or sustained going to or returning from a combat mission provided that the occurrence was directly related to hostile action. Included are persons killed or wounded mistakenly or accidentally by friendly fire directed at a hostile force or what is thought to be a hostile force. However, not to be considered as sustained in action and thereby not to be interpreted as battle casualties are injuries due to the elements, self-inflicted wounds, and, except in unusual cases, wounds or death inflicted by friendly forces while the individual is in absent without leave or dropped from rolls status or is voluntarily absent from a place of duty. See also died of wounds received in action; nonbattle casualty; wounded.

Bloody losses - The sum of the KIA and WIA.

Casualty - (DOD, IADB) Any person who is lost to the organization by reason of having been declared dead, wounded, injured, diseased, interned, captured, retained, missing, missing in action, beleaguered, besieged or detained; see also battle casualty; nonbattle casualty; wounded.

CMIA - Captured or missing in action. See POW and MIA.

CRO - Carded for record only. (Adapted from Beebe, Gilbert W.; and De Bakey, Michael E., *Battle Casualties: Incidence, Mortality, and Logistic Considerations*, Charles C. Thomas (publisher), 1952.) Basically, admissions to a medical treatment facility include all cases admitted for medical care and not returned to duty on the same calendar day as that on which first seen. Cases which are treated on an outpatient (duty) status, are designated as carded for record only (CRO).

DNBI - Disease and nonbattle injury. Personnel treated for diseases and for injuries not received in action. See Nonbattle casualty.

DOW - Died of wounds received in action (DOD, NATO). A battle casualty who dies of wounds or other injuries received in action, after having reached a medical treatment facility. See also killed in action.

DTIC - Defense Technical Information Center.

KIA - Killed in action (DOD, NATO, IADB). A battle casualty who is killed outright or who dies as a result of wounds or other injuries before reaching a medical treatment facility. See also died of wounds received in action.

Losses - (Adapted from FM 101-10-1/2, Staff Officers' Field Manual Organizational, Technical, and Logistical Data Planning Factors, October 1987). A personnel loss is any reduction in the assigned strength of a unit. Personnel losses are recorded in three general categories: battle, nonbattle, and administrative.

- Battle losses are those incurred in action. They include wounded or injured in action (including those who died of wounds and died of injuries received in action), killed in action, and missing in action or captured by the enemy.
- Nonbattle losses are those not directly attributable to action regardless of when sustained. They include nonbattle dead, nonbattle accident/injury, nonbattle missing, and illness/disease.
- Administrative losses are those resulting from transfer from the unit, absence without leave, desertion, personnel rotation, and discharges.

LWIA - Lightly wounded in action (see Slightly Wounded).

MIA - (adapted from FM 101-10-1/2, Staff Officers' Field Manual Organizational, Technical, and Logistical Data Planning Factors, October 1987). Missing in action describes battle casualties whose whereabouts or fate cannot be determined and who are not known to be in an unauthorized absence status (desertion or absence without leave). Missing in action (MIA) casualties are not usually included in medical statistical records or reports received by The Surgeon General, but are reportable to The Adjutant General.

NFW - Nonfatal wound. A person who is wounded in action (WIA), but who does not die of wounds (DOW).

Nonbattle casualty - (DOD, NATO, IADB) A person who is not a battle casualty, but who is lost to his organization by reason of disease or injury, including persons dying from disease or injury, or by reason of being missing where the absence does not appear to be voluntary or due to enemy action. See also battle casualty; wounded.

Nonbloody loss - Battle casualties other than KIA and WIA; include (for example) MIA, POW, absent without leave, stragglers, and deserters.

NP - Neuropsychiatric.

POW - Prisoner of war. Detainee (DOD). A term used to refer to any person captured or otherwise detained by an armed force. (According to FM 101-10-1/2, Staff Officers' Field Manual Organizational, Technical, and Logistical Data Planning Factors, October 1987, captured describes all battle casualties known to have been taken into custody by a hostile force as a result of and for reasons arising out of any armed conflict in which US armed forces are engaged.

Captured casualties are not usually included in medical statistical records or reports received by The Surgeon General but are reported to The Adjutant General.)

Seriously wounded - (DOD, IADB) A stretcher case. See also WIA.

Slightly wounded - (DOD, IADB) A casualty that is a sitting or walking case. See also WIA.

SWIA - Seriously wounded in action (see Seriously Wounded).

TBC - Total battle casualty. The sum of the KIA, WIA, and CMIA casualties.

WIA - Wounded in action (DOD, NATO, IADB). A battle casualty other than "killed in action" who has incurred an injury due to an external agent or cause. The term encompasses all kinds of wounds and other injuries incurred in action, whether there is a piercing of the body, as in a penetrating or perforated wound, or none, as in the contused wound; all fractures, burns, blast concussions, all effects of biological and chemical warfare agents, the effects of exposure to ionizing radiation, or any other destructive weapon or agent.

/kpd - Used as an abbreviation for the phrase "per thousand per day." Thus, the statement that "the attrition rate amounted to 10 per thousand per day" is abbreviated to "the attrition rate amounted to 10/kpd."