



Modelling and Analysis in Arms Control

Edited by
R Avenhaus, R. K Huber, and J. D. Kettelle

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This book presents the results of an and Analysis of Arms Control Problem October 1985 under the joint sponsor Division and the Volkswagen Foundati

The idea for this workshop evolved i in the annual Systems Science Semina the Federal Armed Forces University Assessment in Arms Control¹⁾. There tors to that seminar and its partici potential contributions of systems a analysis and mathematical modelling, panded and a forum should be provide agreed that such a forum should inclu analysts working in the area of arms

The ensuing activities were greatly Division of NATO which provided funds vene and work out a proposal for a me Science Committee's Advanced Research clos of the University of Strasbourg committee. His role in getting French highly appreciated. In addition to Dr assistance was also provided by the Vo our gratitude to these two institution cular to Prof. John A. Buzacott of the Scientific Affairs Division, and Dr. A tion.

Thanks are also extended to Dr. Schin scientific program and the related co who carried the brunt of administrative

¹⁾ The proceedings were published in Press (Avenhaus and Huber, Eds.)

EDITORS' PREFACE

This book presents the results of an international workshop on Modelling and Analysis of Arms Control Problems held in Spitzingsee near Munich in October 1985 under the joint sponsorship of NATO's Scientific Affairs Division and the Volkswagen Foundation.

The idea for this workshop evolved in 1983, as a consequence of discussions in the annual Systems Science Seminar at the Computer Science Department of the Federal Armed Forces University Munich on the topic of Quantitative Assessment in Arms Control¹⁾. There was wide agreement among the contributors to that seminar and its participants that those efforts to assess the potential contributions of systems and decision sciences, as well as systems analysis and mathematical modelling, to arms control issues should be expanded and a forum should be provided for this activity. It was further agreed that such a forum should include political scientists and policy analysts working in the area of arms control.

The ensuing activities were greatly facilitated by the Scientific Affairs Division of NATO which provided funds for an organizing committee to convene and work out a proposal for a meeting to be supported by the NATO Science Committee's Advanced Research Workshop (ARW) program. Prof. Yves Jeanclos of the University of Strasbourg joined these editors in the organizing committee. His role in getting French scientists involved in the workshop is highly appreciated. In addition to the ARW grant, substantial financial assistance was also provided by the Volkswagen Foundation. We wish to express our gratitude to these two institutions and their representatives, in particular to Prof. John A. Buzacott of the ARW Panel, Dr. Mario Di Lullo of NATO's Scientific Affairs Division, and Dr. Alfred Schmidt of the Volkswagen Foundation.

Thanks are also extended to Dr. John Fichtner, who assisted in organizing the scientific program and the related correspondence, and to Mrs. Carin Jones, who carried the brunt of administrative and clerical work throughout the

¹⁾ The proceedings were published in 1984 under the same title by Plenum Press (Avenhaus and Huber, Eds.).

planning and operation of the workshop and the preparation of the manuscript for this book. Thirty-nine scientists and analysts from ten countries participated in the workshop. Their competence and dedicated involvement as presenters of position papers, discussants, panelists, rapporteurs and working group chairmen made the workshop a productive and enjoyable event. We are particularly indebted to Secretary of State Dr. Lothar Rühl of the German Ministry of Defence for his interesting opening statement and analysis of some recent arms control proposals with respect to their implications for crisis and arms race stability, to Prof. Paul Bracken of the Yale University for his stimulating keynote address outlining some key arms control issues and strategic trends that bear on those, and to Dr. Gwyn Prins of the University of Cambridge for his acuminous, albeit not uncontroversial, historical analysis of arms control and its lessons.

Last but not least, the editors want to thank the contributors to these proceedings for their patience and diligence in preparing the papers and providing inputs to the working group reports compiled by Dr. Syde11 P. Gold, Dr. Ernest Gilman and Prof. Derry W. Jones to all of whom we are deeply indebted.

It is noteworthy that several papers in this book had not been contributed to the workshop originally. Rather, they address aspects that surfaced as a result of the discussions and interactions throughout the workshop. The views expressed by the authors are strictly personal ones and do not necessarily represent those of the institutions of their affiliation.

Thanks also go to Mr. Julyan Watts and to Springer-Verlag for their technical assistance in preparing the manuscript of this book.

Neubiberg and Arlington, June 1986

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Reiner K. Huber

John D. Kettelle

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1. BACKGROUND AND RATIONALE

Even though desires for limiting, if not eliminating, the accumulation of nuclear weapons, which threaten the very survival of mankind, have been nationally accepted imperatives. States have been engaged in a series of bilateral negotiations of strategic nuclear weapons, which began in the 1960's and 1970's³⁾.

However, perhaps except for the Antarctic Peninsula, in 1972, these agreements have done little to reduce the arsenals. On the contrary, despite the success of these negotiations, the last 15 years have seen a buildup of nuclear and conventional capabilities, and the ensuing Western reactions contr

¹⁾ Sections of this contribution are based on work by John D. Kettle published in the *Journal of Operations Research (DGOR)* "OR Society" publishers for the permission of the publisher.

²⁾ See, e.g. ISALAH 2:4: "And he shall rebuke many people: and they shall bring their spears into pruning hooks: and against nation, neither shall they war against nation, neither shall they lift up their hands against the King James Version, p. 554

³⁾ E.g., Antarctic Treaty (1959), Partial Test Ban Treaty (1963), Outer Space Treaty (1967), Establishment of the Non-Proliferation Treaty (1968), Comprehensive Nuclear-Test Ban Treaty (1974), SALT I (1979), SALT II (1982).

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1. BACKGROUND AND RATIONALE

Even though desires for limiting, if not eliminating, weapons and armies seem to be almost as old as human society²⁾, not until the invention and accumulation of nuclear weapons, with their potential of endangering the very survival of mankind, have these desires been transmuted into internationally accepted imperatives. Since the late 1950's, the superpowers have been engaged in a series of bilateral negotiations on the limitation of strategic nuclear weapons, which resulted in several agreements in the 1960's and 1970's³⁾.

However, perhaps except for the Anti-Ballistic Missile (ABM) Treaty of 1972, these agreements have done little to curb the growth of nuclear arsenals. On the contrary, despite the continual bilateral and multilateral negotiations, the last 15 years have witnessed a rather significant build-up of nuclear and conventional capabilities by the Soviet Union. This and the ensuing Western reactions contribute to the widely held perception of

¹⁾ Sections of this contribution are contained in a joint paper with John D. Kettelle published in the Journal of the German Society of Operations Research (DGOR) "OR Spectrum" 3/86. The authors thank its publishers for the permission of reproducing the respective parts.

²⁾ See, e.g. ISAIAH 2,4: "And he shall judge among the nations, and shall rebuke many people: and they shall beat their swords into plowshares, and their spears into pruning hooks: nation shall not lift up sword against nation, neither shall they learn war anymore". The Holy Bible, King James Version, p. 554

³⁾ E.g., Antarctic Treaty (1959), Partial Test Ban Treaty (1963), Outer Space Treaty (1967), Establishment of a direct communication link (1967), Non-Proliferation Treaty (1968), ABM-Treaty (1972), SALT I (1972), Threshold Test Ban Treaty (1974), SALT II (1979, not ratified). See also Goldblat (1982).