U. S. AIR FORCE

PROJECT RAND

RESEARCH MEMORANDUM

THE DETERRENCE AND STRATEGY OF TOTAL WAR, 1959-1961: A METHOD OF ANALYSIS

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RM-2301

April 30, 1959

This research is sponsored by the United States Air Force under contract No. AF 49(638)-700 monitored by the Directorate of Development Planning, Deputy Chief of Staff, Development, Hq USAF.

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SUMMARY

This study was primarily undertaken in order to develop additional methods for the analysis of deterrence and wartime strategy. The substantive conclusions are largely a by-product of the attempt to illustrate how the method of analysis operates. These substantive results are based on certain hypothetical numbers introduced to make clearer and more concrete the nature of the model employed. Since it is not feasible to summarize in any detail the methods that are employed, the following summary deals largely with our very tentative conclusions.

A. Objectives and Procedures

1. This report deals with the deterrence of total war and the U.S. choice of strategy in the event that deterrence fails. The period considered is primarily 1959-61.

2. Only one major case is analyzed. The war studied is a Soviet initiated preventive (premeditated) war. It begins with a small Soviet surprise ("sneak") attack by either manned bombers, or missiles, or both. If missiles are employed they are presumed to be exhausted in the first attack. The Soviet surprise attack is directed only at military, primarily strategic (counterforce) targets.

3. The report first develops a model for studying S.U. and U.S. decisions on total war. The variable elements of the model include:

a) The proportion of SAC surviving the first Soviet attack

b) S.U. prewar estimates of this proportion

c) Soviet choice of targets for the second attack

d) U.S. choices of strategy

e) S.U. estimates of what this U.S. choice of strategy will be

f) S.U. and U.S. estimates of counterforce and population damage achievable by attacks of varying sizes and types

g) Availability or unavailability to the United States of tactical or strategic warning of the Soviet first attack

h) Utilities or values attached by the Soviet Union and the United States to various outcomes of the war anticipated on the basis of the initial moves of the war and their outcomes.

4. From the S.U. standpoint the problem is to determine whether the expected value of the outcome of the war, if initiated, is greater or less than that of alternative courses of action.

5. The aim of the U. S. is neither to maximize deterrence nor to maximize the utility outcome of a possible war, but rather to get the best expected value for both elements combined. The value of both elements depends upon many factors, some in control of each side in the conflict.

6. Estimates based on research or analysis are not available for most of the quantities (cf. par. 3 above) required by the model. Rather than performing a purely abstract mathematical manipulation of the model, the study introduces hypothetical numbers. Some of these numbers are introduced with little or no discussion. Others (particularly U.S. and S.U. utilities for different outcomes of the war) are derived from discussions of possible S.U. and U.S. principles of evaluating military success, civilian losses, and political power and independence.

7. It is hoped that the hypothetical numbers and the discussions of them are sufficiently plausible: (a) to show how the model works; (b) to throw light on some of the factors that probably determine what the true numbers are; (c) to give some results that may be of substantive interest to the reader if the hypothetical numbers seem plausible to him or if later research shows that they are of the right order; (d) to permit the reader to make some estimate for himself of the strategic implications of sets of numbers different from those employed in the present study.

8. Special problems related to deterrence and wartime strategy that cannot be fully explored solely within the framework of the formal model are discussed at varying lengths.

B. Findings

For reasons given above the results of this study are tentative. Even these tentative results require qualification and are applicable only under special assumptions that cannot be readily summarized. We conclude this summary, therefore, with only those few statements that can readily (although not without some danger of misrepresentation) be stated out of context.

1. The conflict between the requirements for deterrence and those for conducting war is less severe than is sometimes assumed. Few measures for increasing deterrence lessen effectiveness for fighting a war; and few measures for fighting a war lessen the effectiveness of deterrence. Where such conflict does exist, the dominance of one measure over the other makes the choice, in many cases, relatively easy.

2. The likelihood that the Russians will choose total war is affected much more by their estimate of the proportion of SAC that will survive their initial attack than by their estimates of what target system SAC will use in its retaliatory strike.

3. If SUSAC achieved a high or moderately high level of success in its surprise strike, the Russians would probably prefer that SAC's retaliation be against military (strategic) targets rather than against population. Such a preference could be based on a Soviet belief that the military losses that a small surviving SAC could inflict on an alerted SUSAC

are incapable of significantly altering the military situation. Were the small residual SAC force to be sent against civil targets substantial losses could occur than might have undesirable political and economic effects.

4. If SUSAC achieved a low level of success, Soviet preferences would be highly ambiguous. If the failure of their surprise attack led them to want to terminate the war after the first round as a standoff, they would probably prefer that SAC retaliate against military targets. If they expected or wanted the war to continue until total victory or total defeat they might prefer that SAC strike at population targets.

5. The U.S. strategy that the Russians fear most in a given circumstance is not necessarily the strategy that is best for the United States to adopt in that circumstance.

6. The U.S. strategy that seems to provide the greatest utility to the United States in most circumstances is a Mixed Target Strategy. This strategy involves attacks against <u>military</u> (strategic) targets in the Soviet Union, using high yield weapons with ground bursts so as to produce extensive fallout within the Soviet Union. The greater effectiveness of this strategy as compared with others included in the study rests largely on the assumption that heavy civilian casualties can be imposed as a "bonus" with only a small or moderate sacrifice of the effectiveness of the attack against military targets. This assumption presupposes that S.U. civil defense measures against fallout will not be effective in the 1959-61 period.

7. The U.S. strategy that seems least effective is the pure Population Attack. If the first SUSAC attack is fairly successful, the U. S. pure Population Attack is probably too weak to collapse Soviet society or significantly limit its strategic military effort. If the first SUSAC attack has only a limited success, the United States has better strategies available, particularly the Mixed Target Strategy (cf. above).

8. The greatest deficiency, under current conditions, of most U.S. strategies after a fairly successful S.U. first attack is their inability to provide for more than one major attack. The study, therefore, analyzes two variants of a Partial Withholding Strategy. They envisage a limited SAC attack (say, one-third of residual forces) against either population or military targets, plus an ultimatum to the Soviets to terminate the war, the threat being that the remaining two-thirds of the residual SAC will otherwise be launched against Soviet cities. These strategies are marginally competitive with the Mixed Target Strategy if the first S.U. attack has been very successful.

The Partial Withholding Strategies might be more effective were certain capabilities, discussed in the study, available. Primarily these capabilities involve measures for ensuring short term survivability of residual SAC forces after the initial Soviet attack. Partial Withholding Strategies are related to two current conceptions of total war. (a) These strategies represent the intentional adoption of what circum-

stances following a Soviet attack may in any case impose, namely, the launching of SAC in successive waves. If withholding is not desired but is imposed by post-attack conditions, it might still be useful to introduce (with the first U.S. wave) the ultimatum feature of the Partial Withholding Strategies. This imposed or necessitated withholding strategy would then closely resemble the intentional Partial Withholding Strategy. (b) The Partial Withholding Strategies represent the continuation of the prewar deterrent threat into the intrawar period. Some of the circumstances under which "intrawar deterrence" might succeed in terminating war after the first round of nuclear exchange are discussed in the text.

9. In the event that the United States should receive strategic or very early tactical warning of a Soviet attack, there is the possibility of forcing the Soviets to cancel or recall their attack by revealing to them that the preparation or launching of the attack is known. Under certain assumptions, both sides have a great deal to gain from calling off the war. The extremely severe feasibility conditions for such a strategy and the grave risks of deception (by both sides) are discussed in the text. This strategy of attempting to "abort" the war is viewed as an extreme case of the problem of what U.S. action is appropriate under varying degrees of equivocality in the warning received.

10. The study suggests that from the standpoint of both deterrence and wartime capabilities, the development of part of SAC into a hard core force is the single most important measure. The hard core force is not necessarily a high alert force, but rather one that has a high probability of surviving the first 24 hours of the war and preferably the first 48 hours. It is further suggested that an evaluation study might show that the most effective quick method of increasing SAC invulnerability is to disperse part of SAC to the air fields of other Air Force commands and possibly to a few major civil air fields. This measure is viewed as temporary pending the implementation of other measures that would interfere less with operating efficiency.

11. Given the handicap of going second in a nuclear war, the probability of achieving an acceptable outcome is closely linked with a capability for continued strategic action in the second, third and fourth days of the war. In a number of circumstances this capability seems to be best employed to obtain an acceptable negotiated termination of the war. The possibility of this at any given stage depends on the target choices that have been made up to that point and the sequence in which targets have been attacked.

12. Problems of intergovernmental communication (and consequently of deception) could be extremely important in certain stages of nuclear war. The very great difficulties that would be encountered in dealing with these problems are discussed in the text.

PREFACE

We attempt in this paper to clarify certain problems of deterrence and wartime strategy. In doing this the authors have had two main purposes: (a) to develop a calculus or system of analysis that by simulating U.S. and S.U. strategy deliberations would provide insights into what conclusions these deliberations might lead to; (b) to throw light on some of the numerous and conflicting considerations that enter into the making of prewar and wartime decisions on strategy.

In pursuing these more general aims the authors have given considerable attention to a number of major themes: (a) the conflict of interest between deterrence and wartime requirements; (b) the conduct of total nuclear war on the second, third and fourth days of a total war; (c) the limitation of losses in a total war while pursuing national military and political objectives once war has come; (d) the ending of a total war.

The study is primarily concerned with the period 1959-61. Despite the scope of its title and the sometimes elaborate character of the analysis, it deals with only a narrow range of cases and assumptions. The total war considered is a Soviet initiated preventive (premeditated) war that opens with a small "sneak" strike against military (and primarily strategic air) installations.

A good deal of important work is under way that deals with the feasibility and optimal mix of various instruments for conducting total war. This study does not deal with these problems. Its emphasis is on certain gross characteristics of the prewar and intrawar calculations of the enemy. We hope that this will be a useful complement to other efforts.

Since the study attempts to explore systematically many logically possible contingencies it has naturally enough come up against some very hard cases, both for the Soviet Union and for the United States. The study gives particular attention to those cases that appear very difficult for the latter.

To facilitate discussion we have introduced some hypothetical numbers to describe various military and military-political wartime states of the world. The reader should not take these specific numbers too literally but concentrate rather on the decision-making problems that these numbers help to illustrate. These problems would largely exist for any other set of numbers. We urge the reader to substitute numbers that may seem more plausible to him in order to test the stability of our tentative conclusions.

We want to record our indebtedness to Hans Speier who read two drafts with painstaking care. His comments have contributed greatly to our discussion of substantive issues and his suggestions on exposition have made the readers task -- in no case easy -- less difficult than it otherwise would have been. We have derived much help from a thoughtful

memorandum by Thomas Schelling. We wish to thank also Daniel Ellsberg, Olaf Helmer, Charles Hitch, Victor Hunt, Fred Ikle, William Kaufmann, Joseph Kershaw and Russell Nichols for helpful comments and suggestions. None of the aforementioned, of course, necessarily agrees with the entire analysis.

CONTENTS

Part One

THE ELEMENTS OF STRATEGIC CALCULATION

INTRODUCTION

We are concerned with (a) Soviet deliberations on whether to make a surprise nuclear strike against the United States and with the effect of U.S. policy, posture, and capabilities on these S.U. deliberations and (b) with our own choice of wartime strategy.

Our first aim is to provide an analytic scheme that we hope will aid in the analysis of these two problems. We are interested in devising a calculus that will help to make clear the implications of varying assumptions.

A calculus such as that described in the following pages has these advantages over less formal modes of analysis: (a) Differences in substantive and policy conclusions can more readily be traced to their sources. (Not all the problems discussed in the paper, however, are studied within this formal framework). (b) The use of a fairly general and stable framework more readily permits improvement in analysis as additional work, insight, and information accumulate.

The scheme presented below is somewhat crude, partly because we imposed simplifications in order to emphasize the gross structure of the calculus, and partly because much more information would be required to make it worthwhile to refine the calculus. Furthermore, some parts of the scheme must

almost inevitably remain imprecise, since a lack of refinement reflects not only the deficiency of the analyst's information and procedures, but also the uncertain character of the deliberations of the decision-makers themselves.

Apart from some minor comment, our analysis confines itself to one case characterized by the following assumptions:

(a) The total war we consider is not the outcome of an accident or the extension of a limited war, and does not occur in a crisis situation; it is a preventive (premeditated) and not a preemptive war.[1]

(b) This total war involves simultaneous strikes by the Soviet Union against the United States and against overseas installations, our own and those of our allies (unless these have already been politically neutralized).

(c) The period with which we deal is 1959-61.

(d) We assume for this period that the Soviet Union has a limited ICBM capability (say, 200 missiles) and that the United States has a small IRBM capability.

(e) The potential Soviet attack discussed in the paper is either a manned bomber attack or a combined missile/bomber attack in which the missile stockpile is exhausted in the first blow.

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[1] A considerable portion of our analysis is, nonetheless, relevant for the analysis of preemptive wars. We leave it, however, to the reader to decide for himself which portions would or would not be relevant for the study of such wars. Preventive and preemptive wars are, in any case, points on a continuum rather than two distinctly different types of war.

(f) The initial S.U. strike force is small in order to safeguard against strategic and tactical warning. It is engaged in a "sneak" strike.

(g) This small first strike (and any subsequent waves arriving before the United States launches its reply) is made almost exclusively against U.S. and allied strategic air capabilities. There is no attempt to get a bonus in civilian casualties. The case we deal with is, then, one in which initially the Soviet Union confines itself exclusively to military and mainly to strategic targets. Cities are not attacked. We do not assert that this is the only or indisputably the best Soviet strategy in a first strike. We do believe that it is one major possibility. Later, we discuss some of the possible motives for this type of attack.

We have made a number of other assumptions, particularly concerning the damage levels resulting from various types and sizes of S.U. and U.S. attacks. We introduce these assumptions at a later point.

Chapter 1

THE ANALYTICAL MODEL

Before examining the elements of Soviet and U.S. calculation we want to make clear what we understand to be the U.S. objective with respect to total war.

This objective is not simply to minimize the probability of the Soviet Union initiating war. The United States cannot assure that this probability will be zero. There are no grounds for assuming a total effectiveness of deterrence; nor can the possibility of an accidental or unpremeditated war be precluded. Further, actions intended to decrease the probability of the Soviet Union initiating war may affect the outcome of a war should war nonetheless occur. The United States must, therefore, concern itself with the nature of that outcome. Consequently the objectives of our analysis is not to study how to minimize the probability of war, but rather to look at the problem of how to maximize the expected value to the United States of a future course of history described in terms of (1) the probability of the Soviet Union's initiating total war, and (2) the utility value to the United States of different outcomes should war occur.[2]

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[2]In notational form the U.S. objective is to achieve

$$\text{Max} \left((1-P_W) \times U' \text{ (of no total war)} + P_W \times U' \text{ (of total war outcome)} \right)$$

where P_W is the probability of the Soviet Union's initiating

Any total U.S. policy would have to concern itself with many more aspects of the future than the two mentioned above. The maximization problem we discuss, then, is set in a restricted, though major, policy context. Conclusions reached within this limited context must be reviewed in the light of other policy requirements and objectives.

In our model, we suppose that the Soviet Union periodically chooses a particular strategy for each successive time period from among a variety of possibilities. There are three major decisions they can make: to act as if there will be continued "peace" during this time period; to initiate a limited war; to initiate a total war. Its choice for any period of, say, a few months or perhaps a year, is dependent upon the expected value of the utility it associates with each of the choices it reviews. These expected utility values will, of course, depend in part on the probabilities it assigns to various possible U.S. actions. We are concerned here only with that part of Soviet calculations that bears directly on their choice (or rejection) of total war as a course of action.

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total war, and the two U' are respectively the utilities to the United States of: (1) avoiding total war and (2) of the total war outcome if war occurs. We employ the notations U for S.U. utilities and U' for U.S. utilities.

We shall describe now (Nos. 1-6) a number of elements in the periodic Soviet calculation. These elements are usually thought of as deterrent considerations. The list is not exhaustive but includes only those considerations that enter into our formal scheme.

1. The U.S. forces surviving (S_i) the first Soviet strike.

In the following discussion we describe this military state of affairs in terms of the proportion of the U.S. and Allied (unless our allies have been neutralized) strategic forces surviving, since we believe this to be the key element in the Soviet evaluation of U.S. military forces after the first Soviet strike. This proportional survival of the U.S. strategic forces is, in turn, thought of in terms of a residual capacity to carry out those missions relevant to a counterblow or blows.[3] For our illustrative matrix we have limited ourselves to four conditions that might exist after a Soviet first strike, that is to say, four possible proportions of the U.S. strategic forces surviving that strike. These four proportions are: 20, 40, 60, and 80 per cent. An S_i, then, specifies one of these numbers and is written as S_{20}, S_{40}, S_{60}, or S_{80}.

2. The probability (P_i), as estimated by the Soviets, of each S_i given a Soviet first strike.

These probabilities would largely be the result of Soviet views on the physical vulnerability of the American strategic

[3]For the illustrative numbers we use to describe the destructive potentialities of U.S. and S.U. surviving forces and the limitations of these numbers, see Tables 1 and 2, p. 21 and p.25 and discussion in the text, pp. 19 to 29.

forces and on the degree of tactical and strategic surprise that the Soviet Union might be able to achieve. This probability is written, in general form, as P_i.

3. The Soviet utility matrix.

This matrix contains the utilities attached by the Soviets in the prewar period to various estimated war outcomes resulting from the Soviet first strike and the U.S. first countermove. The columns and rows of this matrix are S_i (20, 40, 60, 80) and M_j, namely, the possible U.S. first countermoves. In the illustrative Soviet matrix six U.S. possibilities are distinguished:

(1) PT (Population Targets): Total available residual U.S. force attacks S.U. cities.

(2) MT (Military Targets): Total available residual U.S. force attacks S.U. strategic bases and forces.

(3) MT-PT (Mixed Targets, Military and Population): Total residual U.S. force attacks military and population targets. The Mixed Target strategy does not involve simultaneous attacks on military targets and cities, but rather attacks on military (strategic) targets using ground burst nuclear weapons and the resulting heavy fallout to achieve high levels of civilian damage.

(4) PT-W (Population Targets and Withholding): 1/3 (say) of U.S. residual force attacks cities; 2/3 of residual force deployed for threat and bargaining.

(5) MT-W (Military Targets and Withholding): 1/3 (say) of U.S. residual force attacks SUSAC; 2/3 of residual force deployed for threat and bargaining purposes.

(6) CAP (Capitulation): U.S. capitulates.[4]

These strategies, rather cryptically indicated above, and some variants of them are described at greater length later in the paper. The S.U. utility matrix has, then, the form:

First Counter Move by U.S.	Percent of SAC Surviving First Soviet Attack			
	20	40	60	80
PT				
MT				
MT-PT				
PT-W				
MT-W				
CAP				

[4]We are concerned here with Soviet estimations about U.S. capitulation. A more complete Soviet matrix might distinguish U.S. capitulation and U.S. collapse. The latter, which would involve no U.S. reply at all, might be considered possible by the Soviets if they planned their first strike to include a large number of U.S. cities and control centers as targets.

Our hypothetical utility entries in this matrix and the considerations (in the minds of the Soviet decision-makers) that underlie them are discussed in the next chapter. In evaluating the entries of the matrix we have tried to conceive -- from a Soviet prewar standpoint -- of the probable outcome of the war as it is implied by events in the first phase of the war. Evaluations made in the course of the war may, of course, differ from evaluations made prior to it since reality may differ from expectations. And even when expectations prove correct, the evaluation of an event post facto may differ from the evaluation made prior to its occurrence.[5] For some purposes we do not need to be interested in the course of Soviet utilities as the war progresses. Thus the utility to the Soviets of initiating war and the probability that they will do so depend on terms that are evaluated by the Soviets prior to the war. However, in choosing U.S. deterrence postures and policies and U.S. countermoves, a knowledge (that is, an estimate) of changes that may occur in Soviet utilities during the course of the war is relevant.

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[5]The contrary assumption of the persistence of prewar utilities in the wartime period is compatible with two possibilities. (1) The decision-makers are able to predict in the prewar period what changes in their utilities will occur in the wartime period, and take these changes into account in advance; (2) the decision-makers may in the prewar period appreciate the possibility of changes in their utilities in wartime and steel themselves against this eventuality on the grounds that such changes are likely to be emotionally (irrationally) motivated; they may in the prewar period employ organizational safeguards to tie their hands.

4. The probabilities (P_{ij}), as estimated by the Soviets of different U.S. first reply moves (M_j) for each outcome (S_i) of the Soviet first move.

These Soviet estimates of what the United States might do given a particular level of SAC survival would presumably be based largely on the Soviet conception of the following factors. (a) The U.S. utility matrix. (b) The effect of wartime emotional factors, and the resilience of the U.S. political and military organizations. (c) The degree of strategic flexibility or inflexibility in SAC's posture and preparations. (d) Hints, announcements, and threats, made by the United States prior to the war: for example, statements that no matter what happens Soviet cities will be destroyed. (e) Soviet intelligence on what goes on in military and governmental conclaves in the United States on the question of strategy choices.

5. The utility to the Soviet Union of starting a war (W).

This is the expected value of total war based on the utilities of the S.U. matrix, the probabilities of the different results of a Soviet first strike, and the probabilities attached to the various U.S. countermoves. It is an average of the possible war outcomes weighted by their probabilities.[6]

6. The probability (P_W) that the Soviet Union will start a total war.

This probability is a function of the relative value to the Soviet Union of total war and alternative courses of action.

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[6] In notational form

$W=\Sigma_i (\Sigma_j P_{ij} U_{ij}) P_i$ = Utility to S.U. of starting total war.

We have included this function here primarily for the sake of showing what a complete analysis of our over-all problem would require. We have not attempted to construct this important function or to calculate its value even in a crude illustrative form. The development of this function would be virtually impossible at our present level of knowledge. It would require estimates of how the Soviet Union evaluates the relative prospects of total war, limited war, economic and diplomatic offensives, and various combinations of programs. It would be necessary to introduce into the function factors representing Soviet predictions of their own and U.S. military technological advances and military postural changes. Soviet expectations about U.S., Western and neutralist actions in the face of alternative Soviet lines of action would have to be incorporated. One might, however, do better in guessing at the way the probability of war changes than in guessing at its absolute value; and, therefore, some form of marginal analysis might conceivably be undertaken.[7]

In the subsequent sections of the paper we attempt to carry through only partially the program implied by the foregoing account. Even within the limits that we have set ourselves a

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[7] If we assume the probability of war function P_W to be an exact predictor of Soviet behavior, it should, for a given policy review period, provide a value of 1 or 0. P_W in principle is a function of the expected value of each possible course of action and assigns the value 1 to the probability of total war if total war has the highest expected value and 0 if it does not. However, from the standpoint of U.S. calculations about Soviet deliberations

more adequate analysis would require us to construct several alternative sets of entries for the utility matrices and probability distributions in order to test the sensitivity of conclusions to varying assumptions about the valuations and calculations of the antagonists. This would have been all the more desirable since there is so little empirical basis for preferring some numbers to others. The ones we introduce serve largely to make our discussion more concrete and to stimulate further guesses about their counterparts in the real world.

There are two final points to be made before concluding this outline of our scheme of analysis:

1. Even were one to carry through the entire program outlined above, this would not in itself provide complete specifications for a deterrence policy. A highly exact formulation of the probability of war function would, of course, provide a valuable basis for pursuing a deterrence policy since we could then proceed to minimize this function. But even if this function did exist, its minimization would have to be made subject to a considerable number of constraints which are not themselves specified by the theory. It follows, then, that the implications for deterrence of the type of analysis we propose do not follow clearly and compellingly from that

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it is useful to think of this function as taking values between 0 and 1. These intermediate values might be considered the proportion of votes for total war in a collective decision by the Soviet leaders. In addition, U.S. estimates of Soviet choice among the alternative courses of action will necessarily take a probabilistic form.

analysis itself. However, even a partial theory, giving some account of the operation of a few major factors that enter into Soviet calculations on the desirability of war, might help to guide policy on deterrence.

2. We have already indicated that the problem for the United States is not to minimize the probability of war. The U.S. objective is to maximize the expected value to the United States of a future time point. This expected value is a function not only of the probability of war but also of the outcome of war if war should occur. This objective involves (a) the construction of a U.S. utility matrix similar to that developed for the Soviets, and (b) U.S. estimates of the probability of various levels of success in a Soviet first strike. With the addition of these elements we are able, in principle, to broaden our analysis of U.S. strategy to take account of the failure of deterrence. These elements are discussed in Chapter 4.

Chapter 2

THE SOVIET UTILITY MATRIX

In this chapter we consider that portion of Soviet calculation which leads to the S.U. utility matrix. This matrix contains utilities attributed by the Soviet Union prior to a war to the anticipated outcomes of the war, given a particular level of survival of the U.S. strategic forces after a Soviet first attack, and given the nature of the U.S. first countermove.

It is necessary first to indicate how we envisage the first hours of the nuclear war. For purposes of this analysis, we assume that the Soviet plan involves a first attack devoted exclusively to military and largely to strategic targets. To be sure, a Soviet first attack might include several organizational centers (Washington and New York, for example) and nuclear installations, but we do not examine this case nor that of a more fully mixed military-civilian target system. The target system we have chosen for our analysis represents at least a plausible Soviet choice. Such a choice could result from (1) a Soviet desire to attain complete surprise by utilizing a small force aimed at a limited number of targets, (2) a Soviet self-interest in lowering the likelihood of a population strike by residual SAC forces, and (3) a Soviet interest in increasing the U.S. incentive to terminate the war (the Soviets might consider this incentive to be greater in the case of

limited civilian damage in the U.S.)[1]

The S.U. attack is initiated by a small "sneak" strike intended to achieve surprise. It may be executed by a bomber force, a missile force, or a mixed bomber-missile force. The initial strike may or may not be followed during a period of, say, four hours by one or more small mop-up waves also directed only against military targets. Whether such immediate follow-up waves occur would presumably depend upon the extent to which the Soviets are willing to tolerate the increased probability of alerting our strategic and tactical warning systems before the first wave is over target.[2] The initial strike plus any small follow-up waves launched shortly after the first force

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[1] Later, in discussing U.S. prewar measures and strategy choices, we return to the problem of possible Soviet motivations for a pure military first strike, since these motivations have relevance for U.S. prewar posture and wartime strategy. At this point we are interested only in establishing the pure military attack as one of several cases that deserve analysis. We do not exclude the possibility that some Soviet planners may believe that a mixed military and population strike (within, probably, the constraints imposed by the desire to attain surprise) would be the most effective means of terminating the war after the S.U. first strike or of making SAC reprisals ineffectual.

[2] This consideration does not apply to the first follow-up bomber wave if the initial strike has been made by missiles. This wave strikes almost simultaneously with the missiles and from a warning standpoint is virtually equivalent to the initial force in a surprise strike made by a manned bomber force. If the initial strike is made by missiles the possible penalty on tactical surprise imposed by the use of immediate follow-up bomber waves begins only with the second follow-up wave.

takes off we refer to as the Soviet first attack. Distinct components of the first attack are referred to as waves.

The second phase of our assumed Soviet plan is the launching of a large bomber force.[3] We assume that this force is activated or possibly launched either when the first wave of the first Soviet attack is over target, or very shortly before this moment in order to prevent this large scale activity from providing warning to the United States of the first attack. If, however, the United States receives warning of the first attack and if S.U. intelligence is able to infer that surprise has not been achieved, we assume that the Soviet large attack force will be launched without further delay. We refer to this large force as the Soviet second attack force. We distinguish between a Soviet second attack force launched entirely or very largely before any U.S. counterstrike is over Soviet targets; and one that is launched largely after elements of the U.S. reply strike are over target. Under the assumptions made above the second kind arises only when the United States receives warning of the first Soviet attack. Even in this event the occurrence of the second kind would very largely depend upon

[3]We have not analyzed the case in which bombers are used exclusively in the first attack and missiles in the big follow up second attack. Such a case might not be implausible if the Soviets place great emphasis on the need for maximum accuracy in the surprise attack and a maximum of terror in the second. On the other hand considerations of surprise might dictate the attack pattern which we analyze, namely, that the Soviet ICBMs are used in the first attack.

the quick action of U.S. forces overseas. If the United States receives very early tactical warning of the first Soviet attack and if this is not known immediately to the Soviets, elements of the U.S. forces based in the Z.I. might be able to arrive over target before the bulk of the Soviet second attack force is in the air. In our subsequent analyses we assume that only forces based overseas are capable of interfering to any appreciable degree with the launching of the second Soviet attack.[4]

Although our analysis is confined to the case where the Soviet first attack strikes exclusively at military targets, we place no restrictions on the target choice of the Soviet second attack. We assume that the U.S. first countermove is launched at least several hours before the Soviet second attack force is over target.

We now proceed as follows: We shall first summarize certain factual assumptions or estimates presumed to be made by the Soviets, primarily those pertaining to damage resulting from U.S. reprisals.[5] We shall then present our entries in the

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[4] The ability of any U.S. counterstrike (whether overseas-based or Z.I.-based, but more especially the latter) to interfere with the launching of the Soviet second attack force will depend on the extent to which the Soviets will have developed in the 1959-61 period, an alert SUSAC force along SAC lines; and on whether or not this alert force has been used in the first surprise attack. It is possible that both the security of the surprise attack and the speed with which the second attack can be organized would be enhanced by utilizing, for the surprise strike, a specially designed attack force made up of a very small number of planes withdrawn from various bases rather than any SUSAC alert force.

[5] These same estimates are later also attributed to the United

illustrative Soviet utility matrix, and discuss these in order to isolate the principles of Soviet valuation that lead us to give the matrix its present entries. These principles of valuation are, of course, more important for our present purposes than the illustrative numbers entered in the matrix.

A. Assumptions on Physical Vulnerability, S.U. and U.S.

1. From a Soviet first attack limited to military and largely to strategic targets, we assume U.S. civilian mortalities of about five million or fewer. Available calculations show that for the 1959-61 period attacks sufficient to cripple SAC need not entail U.S. mortalities of more than five million.[6] We are assuming that in order to increase the chances of surprise the first attack includes only major operating strategic bases and not marginal military bases such as those of the ADC or major civilian airports near large cities.

2. We assume that the Soviets expend 10 per cent of their strategic striking force on this first attack, that 90 per cent of their strategic force is thus available prior to the launch-

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States. Properly we should distinguish between S.U. estimates, U.S. estimates, and the true values; this we have not done, but use instead the same numbers for all three.

[6] If the S.U. attack includes only SAC bases and uses airburst weapons (no ground burst weapons are needed unless SAC is hardened) total deaths in the United States should be substantially fewer than five million. With ground burst clean weapons the results would be substantially the same. With ground burst regular weapons deaths in the United States are estimated at five to fifteen million even in an attack on all SAC bases with a weight of 10 MT per base.

ing of the U.S. countermove.[7]

3. We assume that the U.S. forces surviving the S.U. first attack will be able to eliminate the following percentages (Table 1) of the S.U. population or the S.U. strategic striking power, depending on the target system chosen by the U.S. residual force. A detailed analysis would require, for each line of Table 1 and for each target system, several possible results to which the Soviets would attach varying probabilities. For our present purposes this would complicate our exposition unduly. Consequently we provide only a single expected result.

The entries in the population column are subject to variation, depending, among other factors, on the state of S.U. civil defenses (particularly with respect to fallout shelters) and on the degree of cleanness of U.S. bombs, and on whether or not they are ground burst. The population destruction numbers we employ are for the 1959-61 period. We assume (1) a S.U. population of 225 million, (2) no important change in S.U. civil

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[7] In presenting a simplified picture it is difficult to avoid using only a single number to represent Soviet expenditure on its first attack. In terms of missile and heavy bomber capabilities we might assume that the Soviet Union uses up about 20 per cent of its strategic forces. However, if the war continues into counterforce action or into population bombing threats, the danger to the United States will no longer reside solely in the Soviet truly long range forces. The large Soviet Badger force must clearly be counted as part of Soviet strategic resources. Our figure of 10 per cent represents a compromise effort to express these considerations in a single number.

defense as compared with the present,[8] and (3) the use of ordinary nuclear weapons ground burst.

Table 1

ASSUMED DESTRUCTIVE CAPACITY
U.S. STRATEGIC FORCES SURVIVING FIRST SOVIET ATTACK

Percent of U.S. force surviving after S.U. first strike (S_i)	Alternative Results of First U.S. Countermove	
	Percent of S.U. population that can be eliminated	Percent of S.U. strategic power that can be eliminated
20	10	20
40	20	35
60	45	45
80	60	60

In speaking of Soviet strategic power eliminated (Table 1, col. 3) we refer, of course, not simply to the number of planes destroyed, which may be quite small, but rather to restrictions

[8]Since the largest portion of any U.S. retaliatory strike will not arrive over target earlier than eight or more hours after the Soviet population can safely be told that war has begun, calculations of Soviet population destruction must assume possible evacuation of all but the largest Soviet cities, and partial evacuation of even the latter. In this case, the effectiveness of shelter, perhaps improvised, in the areas surrounding Soviet cities is crucial. There appear to be some very interesting possibilities open to the Soviets for cheap forms of civil defense that would complement very well Soviet strike-first operations. In most studies it is assumed that U.S. bombers and bombs find all Soviet citizens at their home addresses. We have tried to correct for this, but undoubtedly not sufficiently. Our numbers are probably optimistic as regards the potential destruction of Soviet population achievable by the various assumed SAC forces.

of the Soviet ability to launch further attacks after the U.S. strike has been completed.[9] We are particularly uncertain about the reasonableness of the numbers in this third column. Studies in this field have barely begun, and we have been forced for illustrative purposes to be guided by what seems plausible. We believe that the United States has relatively good knowledge of the location of operational bases in the Soviet Union. Therefore the United States can at least attack these bases whether the aircraft based on them are orbiting or have fled elsewhere. Such attacks may be more damaging to Soviet capabilities for subsequent strikes than one might suppose. If one were to consider the reverse case in which the U.S. struck first with a small proportion of its force and the S.U. return strike delivered between 50 and 100 bombs on current SAC bases, one would find SAC capabilities for further strikes considerably diminished. In any case, we suggest that return counterforce strikes be studied as an important part of U.S. strategy for the period 1959-61.[10]

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[9] It makes, of course, considerable difference for the course of the war whether the "further attacks" whose capabilities are affected are the second and subsequent Soviet attacks or the third and subsequent Soviet attacks (cf. p. 17).

[10] The possibilities of counterforce attacks in the period beyond 1959-61 will clearly depend on many new factors, in particular the developments of Soviet ICBM forces, their physical vulnerability, and the success of U.S. intelligence activities in locating their positions. It is too early to guess what the situation will be with regard to these developments.

4. Given a particular level of success of the Soviet first strike and given also the U.S. choice of a first countermove, we assume that the effect in residual percentage terms on the S.U. and U.S. population and military situation after the first attack by each side will be as shown in Table 2. We have not attempted to carry this table beyond the first round of the war. Later, however, when we discuss S.U. and U.S. utilities we do so in terms of possible future moves and outcomes of the war as suggested by the results of the first attacks.

The following comments will aid in the understanding of Table 2 (p. 25):

(a) The entries in the two S.U. columns under each SAC survival rate (S_i) are derived, with modifications noted below, from the figures of Table 1. The residual percentages of S.U. strategic forces, following a U.S. strike, take account of the 10 per cent attrition from the S.U. initial strike.

(b) In lines 1 (Population Targets) and 3 (Mixed Targets) where population targets are involved, we have deducted in the S_{60} and S_{80} cases some additional strength from SUSAC on the supposition that very extensive damage in the civilian sector (particularly widespread fallout) might in some measure affect SUSAC capabilities. Where, in lines 1 and 3, U.S. population strikes are much weaker (S_{20} and S_{40}) we have not made such deductions, nor have we done so in line 4 where only 1/3 of the residual force is employed.

(c) In the Partial Withholding Strategies (lines 4 and 5), where only one-third of the residual SAC force strikes back, we have used the figures of Table 1 reduced by a factor of 2/3.

(d) We have been conservative in our estimates of the further availability of forces already utilized in a strike. In S_{20} and S_{40} all U.S. forces utilized in the U.S. counterstrike are considered eliminated. In S_{60} and S_{80} U.S. capability after its first retaliatory strike is at 25 per cent of the capability remaining to the United States following the initial S.U. attack. In lines 4 and 5 (the Partial Withholding Strategies), the U.S. forces remaining after the first round are only those which have been withheld.

(e) In line 2 (Military Targets), the relatively good result of U.S. military target strikes despite the absence of surprise derives from the fact that just because these strikes are not surprise sneak raids they involve a higher attack rate than the initial Soviet strike.

(f) In lines 2 (Military Targets) and 5 (Military Targets plus Withholding), which deal with pure military strikes by the United States, we assign some population loss to the Soviet Union incident to military strikes. Similarly in all lines of the table we assign a population loss to the United States resulting from the initial Soviet pure military attack.

(g) The bracketed numbers in line 6 (Capitulation) refer to Soviet estimates.

Table 2

RESIDUAL POPULATION AND STRATEGIC POWER (IN PERCENTAGES)
AFTER THE FIRST U.S. COUNTER MOVE

U.S. First Counter-move (M_j)*	Proportion of SAC Surviving (S_i) After First Soviet Strike											
	S_{20}				S_{40}				S_{60}				S_{80}			
	S.U.		U.S.		S.U.		U.S.		S.U.		U.S.		S.U.		U.S.	
	Pop.	Mil.	Pop.	Mil.	Pop.	Mil.	Pop.	Mil.	Pop.	Mil.	Pop.	Mil.	Pop.	Mil.	Pop.	Mil.
1. PT	90	90	95	0	80	90	95	0	55	85	95	15	40	80	95	20
2. MT	95	70	95	0	90	60	95	0	85	50	95	15	80	35	95	20
3. MT-PT	92	75	95	0	85	65	95	0	65	55	95	15	50	40	95	20
4. PT-W	95	90	95	12	90	90	95	25	85	90	95	40	80	90	95	55
5. MT-W	98	82	95	12	98	80	95	25	95	75	95	40	95	70	95	55
6. CAP	100	90	95	(20)	100	90	95	(40)	100	90	95	(60)	100	90	95	(80)

* PT: Population targets. MT: Military (strategic) targets. MT-PT: Mixed targets, i.e. military targets with ground burst and high yield weapons. PT-W: One third of residual SAC force against Population targets, 2/3 of force withheld for threat and bargaining. MT-W: One third against Military targets, 2/3 withheld. CAP: Capitulation.

(h) Numbers have in some places been rounded and therefore are not entirely consistent with the figures of Table 1 and the modifications indicated above.

Table 2 is only of value as a point of departure for projecting the various future courses that a war might take and outcomes that it might have. Preferably this should be done by tracing the alterations in the table through successive time points. For many of the cells numerous variants (arising from strategy choices, from the various possible results of one's own and the enemy's activity, and from other contingencies) would need to be considered. Table 2 would proliferate into a great number of tables after two or three time points had been covered. When we evaluate (in the S.U. and U.S. utility matrices) the outcomes of the different wars implied by Table 2, it will be seen that we have proceeded much more informally. More elaborate procedures would, in any case, be justifiable only if supported by technical studies.

In using Table 2 to trace further stages of the war, it is of course important to decide whether the U.S. first counterstrike affects S.U. capabilities for a second attack or only for a third attack, that is, whether the S.U. second attack is launched free from interference by the first U.S. counterblow (cf. pp. 17-18 above). This decision would seem to depend in part on the degree of success of the Soviet first attack, that is on which S_i case is being considered in Table 2. S_i has so far in our discussion defined only the size of the U.S. strategic

capability surviving the S.U. first attack. But in fact variations in S_i also very likely signify variations in the amount of tactical and strategic warning that the U.S. receives of the S.U. surprise strike. For instance, 60 per cent (S_{60}) or 80 per cent (S_{80}) of SAC surviving is not likely to be due -- under current conditions -- just to bad aiming or bad targeting.

It seems reasonable, then, to make the two following assumptions: (a) if conditions S_{20} and S_{40} occur, the United States receives only trivial tactical warning or none at all. We must then assume that the Soviet second attack will be launched without interference by the U.S. first countermove and that the figures in Table 2 on SUSAC capabilities refer largely to SUSAC capabilities for a third attack. (The second attack has already been launched with SUSAC's full prewar capability less those forces engaged in the first attack). However, as an estimate of SUSAC capability for a third attack, Table 2 attributes too much strength to SUSAC since it does not take account of SUSAC attrition in its second attack (which is still in the air en route at the point at which Table 2 "freezes" the war).
(b) If S_{60} and S_{80} occur the U.S. receives some strategic and/or distant early warning. In this case we assume that SUSAC does not get off its second attack without some degree of interference from the U.S. first counterstrike; the figures of Table 2 can, then, more reasonably be taken to represent SUSAC capabilities for a second attack. There is, however, a lot of room for variation in "some degree of interference." How great this

interference will be depends on how early the warning is and how quickly the Soviet Union becomes aware that the United States has received tactical and/or strategic warning. The vulnerability of SUSAC to a U.S. counterstrike is partly dependent on the need (here assumed) for the greater part of SUSAC to remain largely in a peacetime posture until the initial S.U. strike is over target. If the Soviet Union is able to determine that the United States has received warning,[11] the SUSAC forces not participating in the first attack no longer have to be left in their normal state. In addition, the receipt of warning by the United States, while effective in alerting SAC and thus producing the conditions S_{60} or S_{80}, may be less effective in initiating attack orders to U.S. overseas forces. These are the forces that would have the greatest opportunity to strike at SUSAC before its second attack is launched. We can assume that the Z.I. based SAC will be launched toward targets since these forces can be recalled if necessary. Overseas forces may be required to orbit or take other precautionary measures before being given orders to proceed to target: they

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[11] An analysis should be made of the possibilities of exploiting very early warning to prevent the first S.U. strike from reaching this country. (This could comprise communications directly with the Soviet Union and also possibly with S.U. bomber crews.) Although both sides almost certainly stand to gain from this abrupt termination of the war, there are a number of very difficult problems that would have to be solved to ensure that each antagonist would feel that the war would in fact terminate, leaving the world in a mutually acceptable condition. Later we examine this attempt to forestall the Soviet first attack when very early warning is available. This is the strategy which we introduce as Withholding.

may thus lose their principal opportunity to strike SUSAC before the S.U. second attack is mounted.

Assumptions (a) and (b) above apply when important measures to reduce the vulnerability of SAC have not yet been taken. Therefore high levels of SAC survival (S_{60} and S_{80}) must be presumed to result from some amount of warning. If, however, important measures have been taken to reduce the vulnerability of SAC, S_{60} and S_{80} might be the result of these measures and not the effect of warning. In this case we would have to assume that SUSAC has a number of hours free to launch a second attack -- unless we assume further that in S_{60} and S_{80} a substantial proportion of U.S. forces overseas has also escaped destruction (and not only those in the Z.I.).

The lengthy discussion of Table 2 does not imply that we have confidence in our hypothetical figures. We have wanted only to make clear some of the problems that arise in their interpretation and use. Such problems would arise from any set of figures that one might employ.

B. Some Hypothetical Entries for the S.U. Utility Matrix

Negative signs in the S.U. utility matrix below (Table 3) indicate a state that compares unfavorably (from the S.U. standpoint) with the 1959-61 prewar state, which, for convenience, we take as a base with utility value zero. In this paper we assume this prewar period to be a peacetime state (no limited war) in which S.U. political prospects are roughly as they are now.

The Soviet Union is not anticipating a deterioration of its political world position, but it recognizes that the magnitude of its ICBM advantage over the U.S. is likely to decline in the near future.

We remind the reader that the utility entries of Table 3 are based on S.U. estimates of the outcome of the different wars whose beginnings are in part defined by a given level of success of a Soviet first attack, a given U.S. countermove and the data of Table 2.

These 24 entries contain 16 different magnitudes. The reader might be well advised to consider these 16 magnitudes as expressing primarily an ordinal arrangement, from the standpoint of S.U. utility, of the 24 cases expressed by the table. Where entries differ by 0, 5, or 10 (especially among the larger numbers), our confidence in the validity of the ordering is not very high. Even where gross differences occur, somewhat different assumptions about Soviet calculations and principles of valuation could produce startling reversals of the utility sequence. Soviet leaders, themselves, would probably not find it easy to agree on an ordering.

C. Soviet Calculations and Principles of Valuation

Any attempt to justify the entries of Table 3 has to draw on a great number of considerations. These involve the consequences of adopting various strategies during the course of the war by both antagonists and the values held by Soviet

Table 3

S.U. UTILITY MATRIX

M_j \ S_i	Percent of SAC Surviving First Soviet Attack			
	20	40	60	80
U.S. Countermove				
1. PT	20	-10	-60	-80
2. MT	30	20	-15	-80
3. MT-PT	25	- 5	-65	-100
4. PT-W	35	10	-15	-40
5. MT-W	40	25	-10	-30
6. CAP	50	50	25	20

leaders and those they impute to U.S. leaders. Some of these considerations, particularly those that stem from a more detailed analysis of the different U.S. strategies, are dealt with more fully later. In this section we emphasize more especially Soviet principles of valuation, although this constitutes an incomplete basis for the analysis of the S.U. utilities in Table 3.

A principal problem in constructing such a matrix is the relative valuation by the S.U. of civilian and military losses. This problem is discussed below with reference to lines 1 and 2 (and to a lesser extent lines 3, 4, and 5) of the matrix. These lines reflect our estimates of this Soviet valuation.

(1) U.S. Strategies PT (Population Targets) and MT (Military Targets). A comparison of the first two lines of the matrix shows: (a) A U.S. counterstrike against Soviet population targets has more disutility to the Soviets than a counterstrike against military targets when only 20, 40, and 60 per cent of SAC survives (S_{20}, S_{40}, S_{60}). (b) When 80 per cent of SAC survives (S_{80}), that is, when there is virtually complete failure of the SUSAC strike, a U.S. Military Target Strategy entails a sharp increase in disutility for the S.U. and becomes as disadvantageous to them as a U.S. Population Target Strategy.

How reasonable is such a construction of S.U. preferences with regard to these two U.S. strategies? We shall state some considerations that might lead to this interpretation.

The Soviet calculations and evaluations underlying lines 1 and 2 of the matrix are presumed to be as follows:

Military losses are preferred to civilian losses if (a) the military losses do not preclude a satisfactory military outcome of the war; (b) if the military losses do not prevent Russia's maintaining a satisfactory postwar military posture toward allies (say, China) and neutrals; and (c) if the two foregoing conditions being satisfied, the civilian losses exceed a certain critical number, which we assume to be quite low.

In wartime military goods are expendable, and with relatively little regret, provided military-political objectives are achieved and immediate postwar military strength is adequate for postwar needs. The Soviet Union could lose a sizeable fraction of its military resources in a war that eliminated its Western enemies and still be fully capable of dealing with the rest of the world. Civilian losses, under such circumstances are more regrettable because they are less quickly and less easily recuperable and may have unpleasant internal political consequences for the government and the party; they may, for example, increase the political power of the military. Sizeable losses of life and economic resources in the Soviet Union in a war initiated by the Soviets are likely to lessen the political and moral authority of the Soviet Union among neutrals and satellites to a greater extent than military losses that are insufficient to alter the predominant military position of the Soviet Union vis-à-vis these countries. Finally, civilian losses are emotionally less tolerable for most people, including probably Soviet leaders, particularly in a situation where

the alternative military losses do not threaten to undermine Soviet military domination of the world.

This principle of valuation emerges with clarity in the first case (S_{20}). It is evident that the military losses that a 20 per cent surviving SAC capability can inflict on an alerted SUSAC are incapable of significantly altering the military situation and the very favorable outcome of the war for the Soviet Union. Indeed the expenditure of the remaining 20 per cent of SAC against military targets completes the disarming of the United States by the attrition suffered in the attack and ends the war at the cost of only a quite tolerable amount of Soviet military hardware that is not too difficult to replace (for the estimated losses see Table 2, p. 25).[12] On the other

[12]There are, of course, not inconsiderable Soviet civilian losses resulting even from a U.S. Military Target Strategy. These civilian losses, however, seem to be an irreducible minimum that any country engaging in nuclear war must accept. When we speak of S.U. civilian losses in what follows we are referring to those that result from a U.S. Population Target Strategy. Possibly the disutility of the civilian deaths resulting from an attack on S.U. military targets may lessen the disutility that would otherwise be accorded to the much greater number of deaths resulting from a Population Target Strategy. One might suppose that the incremental disutility of civilian deaths declines through some portion or all of the marginal disutility curve. Such a view might be based on: (a) the supposition that the worst internal political problems would occur with a "small" (5-10 million!) loss rather than with a large (say, 20, 40, or more million) loss; (b) the supposition that after decision-makers have inured themselves to the inevitable civilian losses occasioned even by military target strikes, the additional losses become easier to bear.

hand, if the residual SAC is sent against population targets, the ten or twenty million Soviet lives and the accompanying destruction of civilian wealth, while scarcely altering the military outcome of the war, are very substantial losses which could have in varying degrees the consequences outlined in the preceding paragraph. We believe that with only 20 per cent of SAC surviving (S_{20}), the Soviets would prefer the United States to strike at military targets. At any rate it is difficult to construct any compelling motives or reasonable lines of calculation that would reverse this Soviet preference.[13]

When we turn to the second case, in which 40 per cent of SAC survives, the foregoing calculations do not seem to change. A SAC attack on Soviet military targets has only a low probability of altering the final outcome of the war or of endangering the Soviet military position in the postwar world vis-à-vis the rest of the world (see Table 2, p. 25; it should be recalled that in the 20 and 40 per cent cases, SAC is assumed to have received only slight warning or none at all and that therefore the big Soviet second attack gets off without interference

[13] One could construct some not very persuasive propagandistic considerations for the civilian target preference (for example, a Soviet attempt to convince the world that the United States had been about to annihilate the Soviet population but was prevented from doing so by preemptive Soviet strike). But quite apart from the deficiencies of these considerations, it hardly seems reasonable to suppose that the Soviet Union would prefer propagandistic advantages at the cost of much damage to its civilian sector, particularly in a situation where it is aiming at a complete military dominion of the world.

from SAC's counterstrike). On the other hand, the civilian losses that a 40 per cent SAC can impose are now very considerable indeed, say, 20 to 40 million lives; grave political and economic consequences (although not necessarily fatal) must be anticipated. We conclude that in this case also the Soviet Union would attach a greater disutility to a SAC choice of civilian targets.

In the third case, in which 60 per cent of SAC survives, the Soviet choice may on the surface seem less clearcut (cf. Table 2, p. 25). However, there is a danger here of confusing the misfortune to the Soviets resulting from an unsatisfactory result of their surprise strike with the problem of which of the two types of U.S. reprisal they would prefer. If the United States chooses a military target strike the Soviet Union may sustain a major loss in military strength. However, its estimated residual military strength could plausibly give it a comfortable margin over the United States (roughly 3:1).[14] If the Soviet Union wishes to push the war to a decisive conclusion the strength of its forces relative to those of the United States may seem sufficient to it to complete the job.

[14] In Table 2, p. 25, the reader will note that in the 20 per cent and 40 per cent cases the United States reply is considered to reduce, by attrition, the U.S. strategic forces to zero or very close to zero. In the 60 per cent case the United States is, after its counterstrike, left with a small but still appreciable capacity.

This confidence might stem from the fact that (a) the first U.S. counterstrike at military targets largely affects Soviet capacity for third and subsequent attacks, and has only a limited effect on the Soviet second (large scale) attack; and (b) the residual U.S. force, after its first military target strike, is no longer capable of imposing decisive civilian losses should it then wish to switch to population targets. On the other hand, if the United States uses a Population Target Strategy on its first counterstrike the situation of the Soviet Union becomes very grave indeed. With a 60 per cent U.S. residual force the Soviet Union must count on the possibility of losing 40 to 80 million lives together with the accompanying loss to the physical equipment of the country. In considering such a situation the S.U. government and the Party would be bold to assume that such devastation would leave their power position within the country unaltered.[15] Despite the vast military strength remaining to them in this case they might have very serious problems in maintaining a postwar authority in the world based on anything other than pure force (not that this would necessarily be unacceptable to them).

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[15]The reader should not be misled by this and some subsequent considerations into assuming that the high negative numbers assigned to some of the cells in the S_{60} and S_{80} columns of the S.U. matrix depend critically upon the validity of all the points being raised here. Basically it is the uncertain outcome of the war and the human and physical losses of great magnitude that are central to the supposition that these states would be negatively valued relative to the prewar zero state, rather than certain speculative secondary effects such as changes in the internal power structure, although these may not be negligible. It is also apparent

The Soviet evaluation of their civilian and economic losses would probably be influenced by their conception of the physical state of Western Europe at the end of the war. We are assuming that when the Soviet Union makes its first surprise attack it strikes at strategic bases in Western Europe, and that this results in considerable devastation. If, however, the Soviet Union succeeds in thoroughly neutralizing Europe before the war, a nuclear attack on Europe becomes superfluous, although much of it may immediately be taken over by ground forces. In this eventuality Western Europe is relatively untouched while the Soviet Union is devastated. There are two considerations here that could influence Soviet evaluation of their own devastation, but they operate in opposite directions. (a) The Soviet Union might be more willing to tolerate their own devastation by virtue of their expectation of exploiting the intact resources of Western Europe. (b) The Soviet Union might be less willing to tolerate their own devastation just because an intact Europe and a devastated Soviet Union might worsen their own internal position, and also make difficult the control and exploitation of Western Europe. Purely emotional factors might enter to support this view.

Point (a) suggests an additional reason for the Soviet interest in neutralizing Europe. They might be interested in

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that in S_{60}, after a U.S. pure population strike (PT), the Soviet Union could count with considerable confidence on complete military domination if it believed that the state of the Soviet civilian society would not prevent effective military action. But complete military victory at this cost in civilian damage does not necessarily mean that the resulting state of the Soviet Union would be preferred by the Soviets to that which existed just before the war.

neutralization not only as a means of preventing or weakening a Western attack or simplifying the requirements for a surprise strike of their own, but also as a guarantee that they would not have to devastate Western Europe if and when they struck at the United States.

Whether the United States chooses population or military targets, the outcome in the 60 per cent SAC survival case is far from what the Soviets would hope for in launching a surprise attack. (We believe they would make an attack in an unthreatening situation only if the probability they associate with such a low degree of success were very small.) Nevertheless, they might well feel that a military target choice by SAC is the lesser evil, since they would still be likely to achieve military victory. If, however, the Soviets believed that a 3:1 force ratio after the first round was insufficient to give the war a satisfactory military conclusion or insufficient to leave them at least in uncontested mastery of Europe, should they and the U.S. want to end the war at this point, then we might have to revise considerably the relative utility entries for Military and Population Target Strategies in the third column of Table 3.

The fourth case, in which 80 per cent of SAC survives, might reasonably produce a reversal in the first two lines of our utility numbers. In Table 3, however, we have assigned an equal disutility, from the Soviet standpoint, to U.S. Population and Military Target Strategies. In the event of military target attacks by the United States S_{80} is the first case in which the

S.U./U.S. ratio of strategic striking power after the first round is not well above 1:1. That a marked change in evaluation of the Military Target Strategy should take place in this case is not, then, surprising. In effect, we have here an almost total failure of the initial S.U. strike. The United States is thus to a considerable measure in a position to make its first strike with most of its force intact. In this situation the United States might be able to put itself on close to an equal footing (with respect to strategic air power) with the Soviet Union through the destruction of the main Soviet operating bases. Very little analysis seems to be available of the subsequent course of such a war. Its outcome would probably depend very largely on which air force is best able to adapt itself to the disorganizing impact of the enemy's early strikes and probably also on various chance factors.

Although we have, in the case where 80 per cent of SAC survives, greatly increased the disutility, from the Soviet standpoint, of a U.S. choice of Military Targets, the utility number is the same as that attached to a U.S. Population Target choice. This seems justifiable since the loss of 80 to 120 million lives could be judged (when compared with the prewar zero base) as equivalently evil to the loss of a large portion of SUSAC -- even though the war would have a high probability of being militarily won by the Soviet Union if SAC were to choose population targets. In the 80 per cent SAC survival case we are reaching such high levels of disutility from the

Soviet standpoint that a choice of the lesser evil is very difficult. Indeed, it might be argued that a U.S. military target strategy has a lower disutility for the Soviet Union than a civilian target choice on the following grounds: following failure of the Soviet first attack a U.S. military target choice might permit the Soviet Union to secure a status ante bellum truce after the first round. This truce with roughly equivalent residual strategic power on both sides might be to the Soviets preferable, perhaps much preferable, to Soviet military success accompanied by virtual obliteration in the civilian sector. This view of Soviet preference for a truce might depend in part on whether after such a truce the government and Party could conceive of itself as still being capable of controlling the country. However, this consideration might not be important since the same question arises in the case of military success with obliteration in the civilian sector. In either case, the Party would have to consider the possibility of the military supplanting it.[16]

(2) The Mixed Target Strategy (MT-PT). This strategy has as its most essential aim the reduction of SUSAC striking power.

[16] It is possible, of course, that military control of vital Soviet decisions might occur immediately after an attack is launched. Analysis should, therefore, in dealing with post first strike Soviet policies, also take into account the evaluations or utilities of the military as well as those of the civilian leaders. On the other hand, one might well ask whether, if the military are likely to take over once war begins, the civilian leadership would initiate such a war.

But unlike the pure Military Target Strategy (MT) it seeks to attain this end while achieving civilian damage. When only 20 or 40 per cent of SAC survives (S_{20}, S_{40}), and to some extent when 60 per cent survive (S_{60}), the limited forces at the disposal of SAC require that in the Mixed Target Strategy the civilian losses be imposed largely as a bonus to strikes against SUSAC bases (for example, by using ground bursts). To some extent in S_{60} but more especially in S_{80}, damage to the civilian sector can also be achieved by extending the military target system to include the more important marginal bases and some non-SUSAC military installations whose locations in many instances close to large population centers would necessarily entail major civilian losses.[17]

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[17] A target system including major operating bases, atomic energy installations, principal control centers and possibly certain naval and army installations would, if attacked with large yield weapons and ground bursts, lead to extremely high civilian casualties. Many of the current Soviet major air bases and those especially that might be used after the initiation of war (e.g. city airports) are quite near large population centers, and fallout would additionally cover large areas of the Soviet Union not subjected to direct attack. It is apparent, then, that an extensive military target system combined with the use of appropriate weapons might also operate as a massive population target attack without any serious sacrifice to the overall military target system. However the extension of the target system to military targets other than those that could be used to launch attacks against the United States might impose an important penalty with respect to cutting down SUSAC's capability for further strikes. An all out attack on SUSAC's major and marginal bases, but neglecting all other military installations, would remedy this deficiency and still involve heavy, although reduced, civilian devastation. The size of the penalties involved -- the military penalty in the extensive military target case and the civilian penalty in the SUSAC target case -- would depend upon the weight of attack that the United States could mount, that is it would depend upon which S_i obtained after the initial Soviet strike. The larger the size of the residual SAC force the more it becomes feasible to include non-SUSAC military installations and thereby increase the civilian bonus damage.

Let us examine first the cases in which only 20 per cent and 40 per cent of SAC survive the first Soviet attack (S_{20} and S_{40}). The greater utility, from the S.U. standpoint, of the Mixed Target (MT-PT) strategy as compared with the pure Population Target attack (PT) is based on two considerations: (a) The military component of the MT-PT attack does not seriously hinder the Soviet Union from achieving victory; in S_{20} and S_{40} the U.S. attack completes, by attrition, the disarming of the United States. (b) The civilian losses are less than those sustained in a pure Population Target attack (PT).

The greater disutility to the Soviet Union of the Mixed Target (MT-PT) strategy as compared with a pure Military Target attack (MT) derives from the greater civilian loss from the former. The military loss is roughly the same in both cases, and in neither case is it sufficient to prevent a successful military outcome for the Soviet Union. In S_{20} and S_{40} then, the Mixed Target Strategy stands between Population and Military attacks, this ordering resting on (a) the amount of civilian damage these strategies impose, and (b) the inconsequential character of these strategies for the military outcome of the war.

Let us examine now the cases in which 60 per cent and 80 per cent of SAC survive the first Soviet attack (S_{60}, S_{80}). In these two cases the Mixed Target Strategy is assigned the greatest disutility to the Soviets of all the U.S. strategies.

This seems sensible enough for the following reasons: (a) In S_{60} (perhaps) and more especially in S_{80} the outcome of the war is in doubt; the anti-SUSAC component -- the central component -- of the Mixed Target attack is now a serious threat; (b) in addition, the civilian damage component is now very high, high enough -- in conjunction with the military target attack -- to have, perhaps, military as well as political consequences. The pure Military Target strategy and the pure Population Target attack (MT, PT) do not inflict on their specialized targets sufficiently great increments of damage over the military and population damage of the Mixed Target strategy to compensate for their limitation to a single target system. That this is so derives, of course, largely from the earlier assumption that in S_{60} and especially S_{80} the Mixed Target strategy effects its damage to the civilian sector with only a small sacrifice in the effectiveness of its attack on military targets.

(3) The Partial Withholding Strategies (MT-W, PT-W). The Partial Withholding Strategies envisage utilization of say, one-third of the available SAC forces for an immediate military (MT-W) or population (PT-W) attack; the remainder is held back and used (at the time of the partial attack) to threaten a population attack in order to secure a termination of the war more favorable (perhaps) than might otherwise occur.[18]

[18]The inclusion of these strategies represents an attempt on the authors' part to explore the usefulness of strategic reserve forces in all out nuclear war combined with "intrawar deterrence," i.e. the use of threats to affect Soviet action. It should be noted that

We shall discuss several problems involved in the use of such strategies more fully later when we examine them from the U.S. standpoint. Here we will mention only two conditions without which it would hardly be necessary for the Soviet Union to take these strategies into account: (a) There must be some possibility that the withheld U.S. forces can be deployed so that they will be safeguarded from the second (and possibly third) Soviet attack; (b) the tempo of events must not be so rapid that the Soviet attack or attacks which the U.S. threat is intended to forestall are already occurring or have gone so far that they are not recallable.

When only 20 per cent of SAC survives (S_{20}) the Soviet Union assigns to the two Partial Withholding Strategies a higher utility than is assigned to any other U.S. strategy, outright capitulation, of course, being excepted. The worst that the United States can do is to execute the threatened population attack which was available to it in any case by the choice of a Population Target strategy. In addition the Soviet Union might hope that a counterthreat of massive population bombing might prevent the United States from executing its threat.

When 40 per cent of SAC survives (S_{40}) <u>one</u> of the Partial Withholding Strategies, PT-W, is viewed as more damaging to the Soviets than <u>one</u> of the three "all out" strategies, namely MT. This evaluation is based on the consideration that in S_{40}

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to the extent that all residual SAC forces cannot be simultaneously launched in a single strike, partial withholding may in any case occur.

a U. S. pure military attack (MT) in effect ends the war successfully for the Soviet Union by the attrition of the remaining U.S. forces with no further risks to the civilian sector. The civilian losses already sustained (incident to the MT strike) are about the same as those effected by the 1/3 population strike of the PT-W strategy (cf. Table 2, p. 25). The U.S. attempt, in the PT-W strategy, to end the war by threatening follow-up city attacks (we assume here for the moment that appropriate conditions for such a strategy exist) poses problems for the Soviets. Given the not trivial size of the forces still available to the U.S. (25 per cent of original SAC strength, cf. Table 2), a substantial civilian loss might be experienced if the U.S. were in fact to execute its threat. In preferring that the U.S. choose the pure Military Target Strategy the Soviets would be trading a larger damage to SUSAC (but which, however, still leaves the Soviets with complete postwar world military dominance) for the possibility of avoiding very considerable (and less easily recuperable) damage to the civilian sector. Of course if the Soviets felt certain or very highly confident that in the S_{40} case, as in S_{20}, the U.S. would not, in the face of Soviet counterthreats, execute its threat, they would attach a higher utility to PT-W than to the pure Military Target Strategy.[19]

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[19]The reader may have noted that in Table 3, in S_{20} and S_{40}, the two strategies compared above, MT and PT-W, are both assigned positive utility numbers and the Soviet Union assumes complete military victory in both cases. The reader may wonder why, in

When 60 per cent of SAC survives (S_{60}) neither of the Partial Withholding Strategies is viewed as more damaging to the Soviets than the "all out" strategies. PT-W, Population Targets plus Withholding, still shows itself to be the more costly (to the Soviets) of the two Partial Withholding Strategies and receives the same utility number as the Military Target Strategy (MT). The decline of the strength of PT-W relative to MT in S_{60} (in S_{40} PT-W had the lower utility of the two) derives from the increasing danger of pure military attacks as the size of the residual SAC force increases to the point where the favorable outcome of the war is no longer definitely assured. This shift in the relative utility positions of PT-W and MT emerges very sharply when 80 per cent of SAC survives (S_{80}). MT is now far more damaging to the Soviets than PT-W.

When 60 per cent or 80 per cent of SAC survive an additional consideration enters to depreciate (in the Soviet view) the danger of the Partial Withholding Strategies relative to the "all out" strategies. S_{60} and S_{80} represent degrees of failure of the Soviet first attack, which is undertaken in the expectation of achieving S_{20} or at least S_{40}. (This follows from the fact that the war we are considering falls at the pre-

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view of this, we have entered into this (and some other) rather laborious comparisons that seem of little interest. We should like to emphasize that our aim here is to explore these comparisons to throw some light on possible Soviet principles of evaluation. The practical importance (or unimportance) of some of our strategy comparisons does not necessarily affect their value for this purpose.

ventive rather than the preemptive end of the spectrum of war motivations.) Given this failure the Soviets might well be content to call off the war, which is precisely what the U.S. Partial Withholding Strategies also seek. The U.S. Partial Withholding Strategies thus give the Soviet Union an opportunity to disengage themselves from a type of war (S_{60}/S_{80}) they had not wanted to fight. This they could do and emerge with an improved strategic power position vis-à-vis the United States (cf. lines 4 and 5 of Table 2). However, in the Population Target plus Withholding case (PT-W) the Soviet Union suffers considerably greater damage (than the United States) to their civilian sector. And this is another reason why, of the two Partial Withholding Strategies, PT-W is the one that receives the highest negative utility number for the Soviet Union.

One additional point needs to be made about the two Partial Withholding Strategies which does not necessarily apply to the three "all out" strategies (PT, MT, MT-PT). The Partial Withholding Strategies necessarily involve communications (threats, replies) between governments in the early stages of a nuclear war. We do not discuss here how such communications would be made or whether they could be timed so that events would not outrun the content and intent of the communications. It is possible that the Soviet Union would already be in communication by every available radio means, with the United States and the rest of the world the moment after the first Soviet bomb had fallen. U.S. communications, if any, would preferably (probably)

be made by similar open means at the time of its partial reply strike in the case of the Partial Withholding Strategies. Both here and in several other contexts where problems of rapid communications are referred to, we have ignored the obstacles to communication created by communications blackout effects and by direct damage to communications facilities caused by the nuclear attack. Although there are means other than radio for communication, the requirements of great speed and assurance that the message has been received and that it is available to broad sectors of the leadership and also (perhaps) to the general population make substitutes highly unsatisfactory. Therefore the blackout effects may cause special and not easily surmounted difficulties. Since we do not wish to enter here into a discussion of the difficulties produced by the blackout effect, we have simply assumed that these (as well as other communication difficulties) can with adequate planning be overcome.

While fully acknowledging, then, the very great difficulties, physical and non-physical (especially in respect to the tempo of the war), of wartime inter-governmental communications we think it useful to enter a mild protest against assumptions that in a nuclear war it is inconceivable that governments would be "talking to each other." If a nuclear war does occur, it may indeed follow the pattern of popular expectation: one round and then no more war and no more world; or a short series of very rapidly succeeding strikes by both sides accompanied by

maximum disorder and minimum (zero) communication between the antagonists. It is a mistake, however, to rule out entirely the possibility of a nuclear war in which the antagonists move in a manner that permits communications of various sorts (threats, offers). After all, a nuclear war could be very costly even for a country that makes a fairly or completely successful first (surprise) attack. A severely crippled enemy might still be able to mount a highly damaging population strike. If, then, a country does start a nuclear war, it would not be astonishing if it sought to end hostilities as quickly as possible, if it could, by means other than additional military blows. Similarly the country that received the first attack, may not be disinterested in ending hostilities, especially if it can maintain (or thinks it can maintain) national survival and independence. If a nuclear war occurs, it may be accompanied (or, perhaps, with some effort could be accompanied) by much more "talk" than seems to be popularly supposed. We believe that the entire problem of wartime intergovernmental communication (including the problem raised in the footnote on page 34) deserves intensive analysis and that its interest goes well beyond the special contexts of the withholding strategies.

(4) Capitulation (CAP) in Soviet Utility Matrix. This response receives the highest utility rating by the Soviets. The highest positive number in the Soviet utility matrix (50) is only half the size of the highest negative number (100). All that this reflects is an intuition that, given a "normal"

prewar state, the worst thing that can happen to a country in a nuclear war deserves a bigger number than the best thing that can happen.

The oddity that the Soviet Union attaches somewhat lower positive utilities to Capitulation in S_{60} and S_{80} (as compared with S_{20} and S_{40}) reflects the difficulty of understanding what capitulation means or how it is to be effected when 60 per cent or 80 per cent of the enemy's strategic forces have survived. Both the Soviets (and the writers) might feel that Capitulation in this situation is a prelude to a doublecross of some sort; or possibly a means of securing a termination of the war in order then to arrive at a more favorable total outcome than continuation of the war would permit. We could, of course, have simply left these two cells of Table 3 blank as being considered non-applicable by the Soviet Union.[20]

(5) Positive and Negative Utilities in the Soviet Utility Matrix. So far we have dealt with the Soviet utility matrix by comparing the various utility numbers with each other and exploring the calculations and valuations that might be supposed to lie behind them. This will provide material for discussion

[20] It should be noted that in S_{60}/S_{80} the Soviet utility numbers assigned to CAP refer to a situation that must seem very ambiguous in their minds. The positive utility they attach to it in our matrix represents a value that they might assign to this if they fail to foresee its possibilities for deception or do not fear them. That they would assign lower numbers in S_{60} and S_{80} than in S_{20} and S_{40} is based on the lesser degree of disarmament they would expect to be able to impose in the former cases even if they consider the capitulation not to be a deception strategy.

at a later point in the paper about the relative deterrence value of different U.S. strategies and different degrees of SAC vulnerability. We have not yet examined the matrix from another standpoint: namely, the deviation in a plus and minus direction of the utilities from the zero base which has been used to represent the value to the Soviet Union of the prewar status. A few summary statements about the matrix from this standpoint will be useful.[21]

(a) According to the matrix entries there is no U.S. strategy (among those considered) capable of providing deterrence if the Soviet Union is certain of achieving an 80 per cent destruction of SAC.[22] All entries in this column (S_{20}) are positive; the only optimistic possibility (from a U.S. standpoint) would seem to be that the amount of loss that a 20 per cent surviving SAC could inflict against population in the Soviet Union may be more negatively valued by them than we have assumed.

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[21]Further study might suggest that even if our values for the S.U. utilities are fairly reasonable when compared one with another, their position in relation to the base zero (the value of no total war) requires considerable revision.

[22]This only means that if the Soviets are certain that they will achieve S_{20} they would (given the matrix entries) be equally sure that they would improve their position as compared with the zero valued prewar state. However, this does not preclude the possibility that alternative lines of action (peace, limited war, etc.) may provide a still higher positive utility, and that total war is therefore contraindicated.

(b) It follows, then, that deterrence (within the framework of the matrix) must depend on the probabilities attached by the Soviet Union to the other columns, that is, to the occurrence of the 40 per cent, 60 per cent and 80 per cent cases of SAC survival, since these are the only columns where there are negative entries.

(c) In the 40 per cent case only two of the strategies carry minus signs; but in the 60 per cent and 80 per cent cases all strategies other than Capitulation result in minus evaluations. It should be noted that these minus entries do not imply that the Soviets calculate that they would lose the war (or even fail to win it) in all of these cases. In some of these cases they would almost certainly feel confident of winning the war in a military sense. The minus entries signify, then, that the costs, taken in relation to the character of the peace time state, are too great.[23] A different type of prewar state might change some of these negative entries into positive numbers (although leaving, perhaps, the ordering of the entries unchanged), or even into more highly negative numbers.

(d) The 40 per cent SAC survival case (S_{40}) is probably the most critical one, and critical in three senses: (i) It is unlikely that the Soviet Union would undertake a strike against

[23] It is possible, of course, that the Soviets might estimate that alternative policies lead to even higher negative utilities; in which case the negative utilities of the war outcome are not necessarily deterrent.

the United States (when an attack by the United States is not considered likely) unless the S.U. leaders believed that there was a high probability of destroying all but 20 per cent of SAC case. They might attach a great deal of the residual probability to the 40 per cent case as the next most likely event.[24] For this reason their utilities in the second column are particularly important. (ii) These utilities are also critical because (in our construction) only two are negative and therefore the prediction of the U.S. strategy by the Soviet Union is in this case especially important. (iii) An additional element of criticality is that these two negative values are quite low (-10, -5) and thus lie closer to the boundaries of the acceptable than most of the other negative entries.

(e) The Soviet utility numbers show a fairly high sensitivity to population losses. This is largely due to the fact that in S_{20}, S_{40} and S_{60} the Soviet Union might regard its military prospects as very good (because of the advantage of going first) even if the United States were to attack military targets; consequently the less easily recuperable population

[24] If the 20 per cent case does not occur this may signify the operation of factors that make the 80 per cent case or the 60 per cent case next most likely. For the moment, however, we assume that the probabilities decline as we pass from the case considered most likely to the remaining cases in their order of success. This assumption would seem particularly appropriate for a carefully planned preventive war surprise attack. If the Soviets thought we were about to attack and engaged in a hastily prepared preemptive attack, their estimates of the probability of achieving various levels of SAC destruction would presumably tend to a higher variance.

losses and, perhaps, political losses are regarded more negatively than the military losses. This sensitivity to population losses is, then, in large measure due to the optimistic military forecasts that S.U. leaders might make if the United States were to use its residual forces for military strikes in S_{20}, S_{40} and perhaps also in S_{60}. If our numbers have some validity, one might expect the Soviets to show considerable interest in civil defense. In fact it does appear that the Soviet civil defense program is considerably more active and far-reaching than that of the United States.

Chapter 3

SOVIET PROBABILITY CALCULATIONS

Our theoretical schema requires two probability elements in the Soviet calculations: (a) the S.U. prewar estimates (P_i) of the likelihood that varying proportions of SAC will survive the Soviet first strike; (b) Soviet estimates (P_{ij}) of the likelihood of each of the various U.S. responses, given that the U.S. strategic forces are in a particular state S_i after the Soviet first attack. As in the preceding section, we confine ourselves here to the principal considerations with which the Soviet estimators must presumably concern themselves. We reserve to Part II the implications for deterrence of these considerations even though they lie close to the surface of our present discussion.

A. Soviet Estimates of the Level of SAC Survival (P_i)

The Soviet estimate of the likelihood that a certain proportion of SAC will survive after the first attack is a function of many variables. First among these are their views of U.S. military preparations to forestall an effective surprise attack. The principal elements in such preparations with which they would concern themselves are presumably the following:

(a) The degree of hardening of the U.S. strategic force. For an ICBM attack of fixed size, such a measure increases (with a high degree of confidence) the probability of a considerable proportion of SAC surviving.

(b) The degree of dispersal of SAC and its position vis-à-vis the warning line. These affect Soviet probability estimates mainly through the increased likelihood of setting off the U.S. tactical and strategic warning system in the case of a manned bomber attack.

(c) The proportion of SAC presumed to be in the air, and the proportion of these planes that have bombs on board.

(d) U.S. response time, which affects Soviet estimates primarily by affecting U.S. capabilities to profit from warning prior to the first bomb, or from warning time resulting from imperfections in the simultaneity of attack.

(e) Effectiveness of the U.S. tactical and strategic warning systems: The Soviet Union may well have a quite cautious view of the American warning system, not because their estimates will necessarily accord it a high sensitivity, but rather because there must be certain aspects of it that they regard as imponderable. They are unlikely to have complete confidence that they understand and can evaluate correctly the operation of our tactical warning system. They may also attribute a good capability to our strategic warning system. In this regard they may be influenced by disclosed U.S. Intelligence successes, especially those connected with the breaking of Japanese codes prior to Pearl Harbor, even if the latter did not in that instance prevent the attack coming as a surprise. Furthermore, if they consider themselves efficient in the field of strategic warning, they might tend to attribute similar

capabilities to us. However, the effectiveness of our strategic warning system is partly under their control. The Soviets may use air maneuvers and exercises in an effort to degrade the U.S. strategic warning system. Still, one may assume that the Soviets give some credit to our strategic warning system and probably a greater amount to our tactical warning system. From their point of view they are virtually compelled to make cautious forecasts.[1] Consequently, as a matter of insurance, they have strong incentives to launch, in a manned-bomber sneak attack, only that number of aircraft which is below what they might consider the level of detectability. The Soviets may feel that the probability of their preparations for a missile attack being detected by the U.S. strategic warning system is lower than for a bomber attack. If missiles are used in an initial strike it is possible, then, that the attack will be larger than in the manned bomber case.

The S.U. estimate of the probability that a given proportion of SAC will survive will depend, therefore, on what the Soviet Union plans to do to counteract U.S. survival measures

[1]However, the assumption that the U.S. will have no strategic warning is perfectly justifiable in research trying to construct high-confidence measures; this assumption has been made in a number of studies. One may wish to study the worst case, but one that is nonetheless not too unrealistic, in order (a) after proper measures have been taken, to make even the worst case for the U.S. an unacceptable one to the S.U. and (b) to construct a fortiori arguments for the measures proposed by designing them not only to work in the worst case but to be even better in cases that are fundamentally easier.

and on the type of attack that the Soviet Union might choose. The Soviet Union might consider -- especially were SAC made much less vulnerable -- that the chances of successful surprise are so low that, if they nonetheless still decided to attack, they should sacrifice some of their chance to achieve surprise in order to attain a heavier weight of attack. However, even if SAC were less vulnerable, it is probable that the Soviets would seek to maximize the probability of a successful surprise attack on the crucial SAC bases, since only by achieving surprise is an acceptable outcome possible. This is a case where the attacker would be likely to try to maximize the probability of an acceptable outcome and not the average outcome. In the present analysis we continue to assume that the Soviet attack and the Soviet calculation of the chances of SAC survival are based on an attempt to achieve complete surprise.

There may be some important factors in Soviet estimates of the level of SAC survival that operate independently of U.S. posture. One of these may be the relative reliability of the missile and bomber systems. However, both systems are, in the 1959-61 period, even for the small scale attack required for a surprise strike, untried systems.

Fortunately, our present aim is not to predict the actual Soviet probability estimates of different levels of SAC survival for various types of attacks, but rather to specify some variants of these estimates. We want later to discuss the likely consequences of a given set of Soviet estimates of SAC survival

and arrive at proposals for altering them. Three major cases would seem to suffice for a preliminary analysis.

(1) The Soviet Union estimates that the total probability will be distributed almost entirely between S_{20} and S_{40} (that is, the cases of Soviet greatest success when only 20 or 40 per cent of SAC survives) and the probability of S_{60} and S_{80} (Soviet failure) will be very, very low, if not zero. This still leaves considerable room for variation, of course. Thus we might have probability of S_{20} = .9 and probability of S_{40} = .1 or probability of S_{20} = .6 and probability of S_{40} = .4 or cases where the probability estimate of S_{40} exceeds that of S_{20}.

(2) The Soviet Union estimates the probability of S_{20} plus that of S_{40} as small; and the probability of S_{60} plus that of S_{80} as large.

(3) An interesting third possibility is a high variance case. Here sizable probabilities are assigned to all the S_i or there is a concentration of the probability distribution in the extreme cases (S_{20} and S_{80}). Thus, the Soviets may calculate that they have a high probability of achieving S_{20} (only 20 per cent of SAC survivals) but consider that if anything goes wrong it will be due to an "accidental" (that is, unanticipated) alerting of the U.S. strategic or early tactical warning system. In this case they might consider that the result will not be mediocre success (that is, S_{40}) but rather failure of the

attack, namely S_{60} or S_{80}.[2]

B. Soviet Estimates of the Probability of Different U.S. Reply Moves Given a Particular Level of SAC Survival

We turn now to a discussion of Soviet estimates of the relative likelihood of various U.S. responses to their strike, given each of the possible states of SAC after that strike. As in the preceding discussion we shall simply indicate the types of considerations that the Soviet Union must bring to bear on these estimates.

(a) Nature of the S.U. target choice on its first attack. We have assumed that the S.U. first strike is almost exclusively an attack on SAC. Thus the initial S.U. attack would not include strikes against the U.S. population, although some U.S. cities would be damaged, especially those near SAC airfields, missile sites, and possibly atomic weapons storage sites. The Soviets might believe that they could attack four or five U.S. cities (in the course of an initial military target strike) without lowering appreciably their chances of attaining surprise. However, they would have to consider what effect this would have on the U.S. choice of counterstrike.[3] Even if the United

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[2]The other major condition for a high variance case is the preemptive attack launched on the supposition of an impending U.S. attack. Such an attack, in which timing is less subject to Soviet control, might be presumed by them to give less predictable results than in the case of premeditated attack.

[3]A full discussion would, of course, have to consider cases in which the initial Soviet attack also strikes at a much greater number of U.S. urban centers.

States thought that attacks on its cities would not alter its pre-elected strategy it is still possible that Soviets will believe that the U.S. response would be influenced by the nature of their own attack. One can conceive of some Soviet decision-makers arguing that if the Soviet Union adds a considerable amount of city destruction to the attack on SAC, this will destroy the U.S. will to fight and that it is thus some protection against an insufficient demolition of SAC. Others may argue that urban destruction might create an emotional necessity for the U.S. to strike back at S.U. cities and that a pure military strike would give the United States the greatest incentive (for fear of reprisals against U.S. cities on a second S.U. attack) to come to terms or reply only by bombing SUSAC.

In addition to calculations about how their <u>first</u> attack might affect the choice by the United States of a target system for its reply, the Soviets might concern themselves with the effect of their <u>second</u> attack on U.S. target selection. They might be disposed, for instance, in advance of the actual second attack, to threaten to send it against U.S. cities. This threat could be motivated particularly in S_{20} and S_{40}, by an attempt to intimidate the United States into recalling or not launching its counterstrike. However, in making this threat against U.S. cities, the Russians would have to try to estimate what effect their threat might have on the U.S. choice of target if the intimidation attempt failed. Pre-

sumably they would suppose that such a threat would increase the likelihood of city attacks by the U.S.

(b) Soviet views on what it is reasonable for the United States to do, given a particular level of SAC survival. If U.S. cities have not been destroyed in the initial strike, the Soviets will surely ask themselves whether the United States will want to concentrate on destroying Soviet cities instead of making every effort to destroy SUSAC. Even if the Soviets appreciate that it is rational for the United States to threaten to destroy cities, they must decide whether it remains rational for the United States to execute the population threat after a S.U. strike. On the other hand, they will certainly appreciate also that after a very successful SUSAC strike, a U.S. strike against SUSAC with small residual SAC forces is not an attractive strategy. They will presumably ask themselves whether the United States, after a successful Soviet strike, will be sufficiently "sensible" to come to terms fairly satisfactory to the S.U. (particularly if the Soviet Union accompanies its first strike against SAC with threats that the second attack will be against U.S. cities). In trying to estimate possible U.S. courses of action the Soviets would presumably attempt to construct their version of the U.S. utility matrix.[4]

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[4]Or several versions, corresponding to their conceptions of different U.S. groups in whose hands the ultimate decision may rest.

(c) U.S. statements and posture. The Soviets could scarcely ignore U.S. threats if preparations were consistent with these threats. Undoubtedly the Soviet Union would be particularly impressed by preparations that appeared to leave the U.S. without much alternative.[5] But no matter how much credibility they attributed to these threats, they would also be interested in whether the United States could modify its plans or improvise quite different forms of attack once war had begun.

(d) With so much at stake the Soviet Union must also presumably try to take into account the possibility of emotionally motivated U.S. responses, not only at the governmental level but also at different organizational levels (especially of the military) which may be out of touch with higher authorities or which may in any case act independently.

(e) Finally, Soviet intelligence -- if any -- on U.S. plans for the contingency in question will obviously be important to their calculations, although the preceding point would indicate that quite apart from an absence of total confidence in such intelligence they could not count absolutely on U.S. prewar decisions predicting what in fact the U.S. will do.[5]

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[5]For example, if while threatening retaliatory city destruction SAC training were exclusively for city targets. The relation of SAC posture to the credibility of U.S. threats is discussed in greater detail in Chapter 5.

Chapter 4

THE U.S. UTILITY MATRIX

So far we have dealt with S.U. utilities and probability estimates. It is apparent that the problem of deterrence is in considerable measure to manipulate the utility of war to the Soviets so as to produce Soviet incentives not to initiate war. But this is not the entire problem.

The U.S.-S.U. conflict is not a zero-sum game in which each side's loss is exactly the other's gain. We might succeed by our posture in inducing the Soviet leaders to assign high probabilities to very negatively valued outcomes should they initiate total war. But some of these outcomes may be as, or even more, undesirable for the United States. If the United States had perfect confidence that the Soviets would with certainty be restrained from engaging in war by the probabilities associated with these unfavorable outcomes, the negative evaluation of them by the United States would not matter. But total confidence in deterrence of a preventive (premeditated) total war is not justified. War may occur by sheer accident or by a Soviet conviction that the United States is about to strike.

There are two cases to be considered. (a) If U.S. deterrence policies have no effect on the nature of the war (if war occurs),[1] then U.S. utilities of different war outcomes would

[1]For example, if U.S. deterrence policies do not affect the U.S. or S.U. choice of target systems or the probability of success of their strikes.

remain irrelevant to the formulation of U.S. deterrence policy. For in this case the occurrence in the war of very negatively valued states is not the result of our prewar deterrence efforts. (b) However some prewar policies designed to provide maximum discouragement to the Soviets against initiating war may, by constraining the U.S. wartime strategy and/or influencing that of the Soviets, affect the manner in which the war is fought, if war occurs.[2] U.S. deterrence policy might thus, if war comes, precipitate war states that are more disagreeable to the United States than those which would occur had its deterrence policy been different. For this reason it is important to investigate not only the relation between deterrence policy and the probability of war, but also the relation between deterrence policy and the course of a war (should deterrence fail). The investigation of the latter relationship requires a U.S. utility matrix (similar to that for the Soviet Union) and U.S. probability estimates of different levels of SAC survival following a Soviet first attack. Without the former we cannot judge whether any relationship we may discover between deterrence policy and the course of a war leads to very negatively (or even positively) valued war outcomes, and consequently whether a given deterrence

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[2]To take an extreme case: It might be argued that the Soviets would not wish to engage in a reciprocal campaign of city destruction; that one might thereby inhibit aggressive intentions by placing SAC bases as close as possible to our largest urban concentrations. Clearly, if this strategy of deterrence fails, the consequences would be disastrous.

measure, even though appropriate for deterrent purposes, may not have undesired effects should deterrence fail.

In addition to its value for the study of deterrence policy, a U.S. utility matrix (or something corresponding to it) is essential for the evaluation of different U.S. war strategies.

With the construction of a U.S. utility matrix and U.S. probability estimates of SAC survival (S_i), we have appropriate analytic elements[3] for investigating how to maximize the expected value of a future course of history described in terms of the probability of war and the utility (disutility) value to us of the outcome should war occur.[4]

In constructing the U.S. utility matrix we shall, in this first illustrative approximation, make the assumption that there is no difference between prewar and intra-war utilities.[5]

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[3] We do not mention here U.S. estimates of the probability that the U.S. will in a given state S_i employ a particular strategy. For some analytic purposes we are entitled to suppose that the U.S. knows or thinks it knows what its own strategy will be and that therefore the U.S. estimate that it will employ a given strategy in a particular state of SAC survival (S_i) is 1 or 0. However, there are some problems in deterrence where one would need to take into account the possibility that U.S. decision-makers in advance of war might not know with certainty what strategy they will follow, even assuming a given level of SAC survival.

[4] It will be recalled that the utility value to the U.S. of the war outcome is derived by averaging several outcomes weighted by their probabilities (cf. pp. 5-6). Actually the illustrative numbers we present below were arrived at by much more rough and ready methods.

[5] Some conditions which make this or the contrary supposition plausible were discussed above, p. 10.

The U.S. matrix states the utilities to the United States[6] of different U.S. strategies, given a particular level of SUSAC success (S_i) in its initial strike against SAC. As in the case of the Soviet matrix, the U.S. utilities are based not on the first-round results but on the implications of these results for the future course and final outcome of the war. Of course, a number of future courses can follow from a given initial state of the war. A fuller analysis than we provide would cover a multitude of possible courses supported by appropriate technical studies. Were the materials for such an analysis available, we might find our numbers in the U.S. utility matrix undergoing considerable change. Those we use are based on more or less informal war scenarios developed in discussion sessions. In any event, we feel that our entries in the U.S. matrix are useful in stimulating inquiry into ways and means for investigating the true numbers and their significance for U.S. policy.

A. Assumptions Underlying the U.S. Matrix

In assigning values to the U.S. matrix we need to specify which of the following conditions are assumed to exist: (a) Does the United States receive warning of the first Soviet attack or not? (b) Does the S.U. second (large) attack get off with or without interference from the U.S. first attack? (c) What is the target objective of the Soviet second attack?

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[6] In this paper we have excused ourselves from specifying whose utilities are involved when we speak of "U.S." utility.

(1) (a) In S_{20} and S_{40} when 20 per cent and 40 per cent SAC survive: we assume that there is only a trivial amount of warning or none at all. (b) Consequently the Soviet second attack gets off entirely or largely without interference from any surviving U.S. forces based overseas, and entirely without interference from residual SAC forces based in the Z.I. (c) The Soviet second attack and the U.S. first attack are over their respective targets at approximately the same time. Consequently the U.S. target choice cannot be affected by knowledge of the target of the Soviet second attack. We consider two cases: (i) The S.U. second attack is confined to an extended military target system -- mop-up of SAC bases, other air force bases, perhaps a few major civilian airports, air defense installations such as SAGE centers, nuclear weapons sites and installations. We assume an additional five to ten million civilian mortalities, bringing the total for the first two Soviet attacks to ten or fifteen million. (ii) The Soviet second attack is a city attack combined with military mop-up targets. We assume civilian casualties of, say, 60 million.

(2) In S_{60} and S_{80} when 60 per cent or 80 per cent of SAC survive: (a) We assume the U.S. receives tactical warning of the Soviet first attack (it is this that is presumed to produce the favorable states S_{60} and S_{80}). (b) We assume that U.S. forces based overseas are over target shortly before or during the time that the Soviet second attack is being launched. We assume that the Soviet second attack is completely or largely

launched before U.S. forces based in the Z.I. are over target. Without prejudice to the target system that might be used by the United States in its first attack by Z.I.-based forces, we do assume that the target of the overseas-based forces is SUSAC. We express the effect of this strike on the Soviet second attack forces by supposing that the Soviets attempt (for their second attack) to launch a 500 plane attack but are forced to cut this down to a 300 plane attack by the intervention of the U.S. overseas-based attack. (c) We assume that the U.S. Z.I. forces are over target several hours (say, three) before the Soviet second attack is over U.S. targets. We assume that the Soviet choice of targets for its second attack is unaffected by the U.S. choice of target for its Z.I.-based forces.[7] As in S_{20} and S_{40}, we consider two cases for the target system of the Soviet second attack: (i) the extended military target system and (ii) combined city attacks and counter-SAC attacks.

We have restricted ourselves in the present chapter largely to an attempt to make clear some of the possible U.S. strategy choices, and the principles in terms of which these choices might be evaluated. We have not attempted here to give an account of the feasibility of the strategies evaluated.

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[7] On the other hand, were U.S. residual overseas forces to strike at S.U. cities (contrary to our assumption) this might more reasonably affect S.U. target choices for its second attack, since the S.U. second attack does not get off until the U.S. overseas forces have made their strike.

Discussion of this will be found in Part II of the paper. For the present, whether it is likely that such and such an event will occur is less important for our discussion than the evaluation of it in U.S. utility terms were it to occur.

B. Description and Discussion of the U.S. Utility Matrix

The U.S. utility matrix, developed in considerably greater detail than the S.U. utility matrix, is presented in two tables, 4A and 4B[8] (p. 77). The following notes will help in the reading of these tables and the subsequent discussion.

(a) Tables 4A and 4B characterize the first stage of the war in terms of: the nature of the S.U. first attack (SAC targets); the degree of success of the attack (S_i); whether or not warning occurred; the first U.S. countermove (M_j); the target of the Soviet second attack. The utility numbers in the tables represent the value to the United States of the results of the different wars prefigured by the foregoing elements. Since any given set of the above elements permits a variety of developments in the subsequent stages of the war, it is evident that each number in our tables represents not the value of a single war outcome but the average of several different outcomes having various values that are weighted by their probabilities.

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[8] The U.S. matrix contains two strategies that were not included in the Soviet matrix. There is of course no logical reason why the two matrices need be identical. How one constructs the matrix will depend upon what is most convenient for analysis, first from a Soviet point of view, then from the U.S. point of view.

(b) In assigning utility values, from the U.S. standpoint, to different states of the world, it is convenient to have a particular state of the world to which a base value can be assigned. We have set the utility to the U.S. of the prewar (no-total-war) state at zero. The utility of this state of the world will, however, vary according to additional circumstances. If the United States believed that the Soviet Union were about to launch a total war, or if the United States were engaged in fighting a limited war, or if the Soviet Union were making very great gains politically, the utility of these no-total-war states would vary accordingly. In setting the utility of the no-total-war state at zero, we have in mind a "normal" period such as the present. Other prewar contexts can be given values deviating from zero. Thus if the United States were to believe that the chances of an S.U. attack had increased (but not enough for the United States to do much about it), the utility to the United States of this no-total-war state might be (say) -20. Or if the United States is engaged in a limited war, this no-total-war state might be assigned -10 or a positive number if the war were improving the U.S. position. In principle this procedure permits comparison among the utilities assigned to different prewar conditions, among the intrawar utilities of different total wars that are investigated, and between prewar and intrawar utilities.[9]

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[9]We have defined the U.S. objective as the attainment of the best expected value based on two elements: the probability of war and the utility outcome of a war should war occur

(c) Table 4A assumes that the Soviet second attack is directed at the extended military target system defined on p. 71. Table 4B assumes that the Soviet second attack is directed at U.S. cities and SAC bases.

(d) In both Tables 4A and 4B it is assumed that in S_{20} and S_{40} the United States receives little or no warning of the Soviet surprise attack. In S_{60} and S_{80} the United States receives warning of the Soviet attack.

(e) We have entered two numbers in each cell of the Partial Withholding Strategies (PT-W, MT-W). The number to the right of the slanting stroke represents "success"; the number to the left of the stroke represents "failure." By "sucess" we mean that the U.S. threat of population attack made at the time of its partial first attack succeeds in having the Soviets abandon their second attack and thus the (strategic) war ends for at least the time being. By "failure" we mean that the execution of the Soviet second attack is not cancelled by the U.S. threat. The Partial Withholding Strategies assume that the U.S. threat of city bombing after (MT-W) or of renewed and larger scale city bombing after (PT-W) is made as the partial

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(p. 5). In notational form this requires the maximization of the expression

$\{(\overline{1}-P_W) \times U'$ (of no total war) + $P_W \times U'$ (of total war outcome.$\}$

Since we have set the utility of no total war at zero as a convenient base number, the left hand portion of the above expression will equal zero and the expression becomes Max ($P_W \times U'$).

(limited) strike is launched (S_{20}, S_{40}) or as the partial strike is over target (S_{60}, S_{80}); that is, in time for the S.U. to hold back or recall its second attack. Otherwise, of course, these strategies are not applicable since we assume that the S.U. second attack is not recallable or will not be recalled after it is well on its way.

(f) U.S. Strategy Withholding was not included among those U.S. strategies considered by the Soviets in constructing their matrix. Reference was made to this strategy previously (cf. footnote, p.28). The Partial Withholding Strategies aim at getting the Soviets to abandon their second attack. In the Withholding Strategy it is the first Soviet (surprise) attack that one seeks to get called off. If possible at all, this would obviously require very early warning of the first attack, rapid communication with the Soviet Union, a Soviet ability to recall their attack, and a willingness on both sides to run the risk of enemy deceit in such a situation. The strategy is of interest because if the true S.U. utility matrix (Table 3) corresponds to anything approaching our constructions for the S_{60} and S_{80} cases, then the Soviets may have much to gain by calling off the war when it is apparent that surprise will fail by a large margin. It is worthwhile, then, to inquire whether the United States would stand to gain or lose by this abrupt termination of a war in which the Soviet attempt at surprise has failed completely.

Table 4

U.S. UTILITY MATRIX

Utilities of terminal states of war as a function of (a) degree of S.U. success in its first attack; (b) nature of U.S. first reply move; (c) nature of S.U. second attack.

Table 4A

(Assuming S.U. Second Attack Against Military Targets)

	No Warning		Warning	
M_j \ S_i	20	40	60	80
PT	-125	-125	-115	-100
MT	-80	-70	-45	-35
MT-PT	-90	-70	-45	-35
PT-W	-90/-35	-80/-25	-70/-25	-60/-15
MT-W	-80/-35	-70/-20	-55/-20	-45/-10
W	N.A.	N.A.	-55/+10*	-50/+10*

Table 4B

(Assuming S.U. Second Attack Against City (And Military) Targets)

	No Warning		Warning	
M_j \ S_i	20	40	60	80
PT	-160	-1[illegible]	-140	-130
MT	-160	-1[illegible]	-100	-80
MT-PT	-130	-100	-70	-60
PT-W	-160/-35	-120/-25	-110/-25	-100/-15
MT-W	-160/-35	-160/-20	-110/-20	-90/-10
W	N.A.	N.A.	-85/+10*	-75/+10*

NOTES TO TABLE 4:

PT: Population Targets

MT: Military Targets

MT-PT: Mixed Target Strategy (military targets with ground burst weapons to secure population damage as "bonus").

PT-W: 1/3 (say) of residual SAC attacks population targets, 2/3 withheld for further population threat and ultimatum.

MT-W: 1/3 of residual SAC attacks military targets, 2/3 withheld for population threat and ultimatum.

W: Withholding (applicable only with strategic or very early tactical warning: attempt to "abort" war by revealing to S.U. that the launching of its first attack is known).

For the meaning of double entries in some cells, of N.A., and the asterisks see paragraphs (f), (g) and (h) in text, pp. 76-78.

(g) N.A. (not applicable) signifies that the foregoing U.S. strategy, Withholding (W), is not applicable in columns S_{20} and S_{40} since in these cases the United States does not have the requisite amount of warning time.

(h) The distinction between "success" (right hand number) and "failure" (left hand number) is also made in the case of the Withholding Strategy (W), "success", meaning that the Soviets abandon their "surprise" attack when they learn that its launching has been detected. The asterisks attached to the right hand numbers ("success") draw attention to the fact that the column headings (S_{60}, S_{80}) do not strictly apply to these cases. Since in the event of "success" the first Soviet attack is abandoned, the residual strength of SAC would be 100 per cent and not 60 per cent or 80 per cent. The utility numbers for this strategy are otherwise, however, pertinently entered since they appear in the two columns that assume warning, this being the essential condition for the Withholding Strategy to be at all applicable.

(i) We ask the reader not to take the numbers of Tables 4A and 4B too literally. What is important are the considerations that underlie the ordering of the numbers. These considerations are numerous and complexly interrelated. Our numbers serve primarily to get discussion started on these matters.

In terms of what characteristics of the final state is the war outcome to be evaluated? We have kept in mind primarily

the following very grossly specified aspects: (1) the immediate post-war military-political condition which might vary from complete domination of the Soviet Union by the United States to complete domination of the United States by the Soviet Union. Various intermediate cases have been thought of in terms of the degree of political compulsion or resistance that each power can exercise vis-à-vis the other and the rest of the world, and in terms of the ratio of military power of the two primary antagonists. (These intermediate cases are of considerable importance; there are a number of reasonable war scenarios where the antagonists terminate the war without a decisive result, in the sense of total domination, being reached); (2) lives lost and material damage sustained primarily by oneself, but also by the enemy; (3) the long term political and military prospects of the United States in the post war world.

Aspects (1) and (2) of the terminal state receive much more weight than (3) which, however, has a not negligible significance for certain war termination states.

Given the foregoing criteria for evaluating war outcomes, it is evident that when a utility number is assigned to a certain war outcome (or to several which are then weighted by their probabilities) a certain exchange rate is implied between the value of the U.S. position on (1) the victory-defeat scale and (2) the civilian loss scale. How much gain on the victory-defeat scale compensates for how much damage on the civilian sector scale? The writers are not interested in persuading

readers to accept the values that are implied by the utility numbers in Table 4A and 4B. It would have been more satisfactory to have spelled out various terminal war states in terms of the three aspects listed above. The reader could then apply his own sense of values to judge which outcomes are (for him) more or less desirable. This, however, would have required us to construct quite explicitly perhaps a hundred or more war outcomes and to attach probabilities to them. We have done a good deal of this informally on a crude basis but we do not believe that the results are worth passing on to the reader. We were content to start with a given set of initial conditions for the war, to envisage crudely two or three of the more likely outcomes and their relative likelihood, and then to set down a number that reflected the not too precise evaluations of these outcomes relative to one another and relative to those stemming from other sets of initial conditions. These numbers provide us with a convenient point of departure for exploring the possible consequences of different U.S. wartime strategy choices. In discussing the relations between these numbers we will be able to raise important issues.[10]

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[10]The discussions in the following pages are not easy reading. The reader may find it useful to read rather rapidly at this point the Analytical Summary contained in Section C of this chapter (pp.97-101). We have retained Section C for the end of the chapter, instead of providing this guide at the beginning, because it serves so well as a summary of much of the chapter.

(1) Why are most of the utility numbers of Table 4B more negative than the corresponding numbers of Table 4A?

In Table 4B the Soviet big second attack includes city targets; in 4A it is an extended military target attack. In the former case, the civilian losses are presumed to be very great, and the utility numbers reflect these losses. In 4A it is of course still possible that the Soviets will attack city targets on a third or subsequent attack. The 4A numbers are, nonetheless, (on the whole) less negative for the following reasons: (a) There is still a non-negligible probability that city attacks will not occur, because of war termination after the second Soviet attack and the U.S. first attack, or because of mutual restraint; (b) If they do occur, they will come at a stage when the Soviets will have suffered considerable attrition from their first and second attacks and our first attack; some evacuation will also have taken place.

But is not the Soviet inclusion of city targets (in their second attack) militarily inexpedient for them and militarily advantageous to the United States (particularly in S_{60} and S_{80} where their surprise attack knocks out only a small portion of SAC)? And does this not compensate for the U.S. civilian losses? This may be so. But if so it applies only to S_{60} and more especially S_{80}, since in S_{20} and S_{40} we assume residual SAC strength to be insufficient to capitalize on the Soviet inclusion of city targets in their second attack. But even in S_{60} and S_{80} it is not at all clear that the lesser weight of

attack on SAC due to the Soviet inclusion of city targets fully compensates for the large negative utilities in the civilian sector: the large Soviet second attack, though hitting cities hard, still includes attacks on SAC. The 300 plane attack (cf. p. 72) permits considerable attention to SAC bases while still being a massive city attack.

Not all the utility numbers are altered in passing from Table A to Table B. In the Partial Withholding strategies and in Withholding (W) the numbers to the right of the slanting bar are identical in both Tables 4A and 4B. These numbers (cf. pp. 75 and 77) represent the utilities of a successful application of these strategies, that is an application that succeeds in forestalling the second Soviet attack, or in the case of W, the first Soviet attack. The difference in target intended by the Soviets in 4A and 4B does not, then, alter the utility of the successful case of the strategies since the Soviet attacks are forestalled.

(2) Why do the utility numbers of Table 4A and 4B (on the whole) become less negative in moving from column S_{20} (20 per cent survival of SAC) to S_{80} (80 per cent survival of SAC)?

Evidently this reflects the improved position of the United States as the proportion of SAC surviving the Soviet first attack increases. This improvement has two aspects: (a) the greater force available for the U.S. first attack (and possibly subsequent attacks); (b) the receipt of warning in S_{60} and S_{80} which permits some interference with the launching of the S.U.

second attack. The improvement is greater for U.S. counter-strikes aimed purely or largely at military targets than it is for other strategies. This derives from the supposition that as we move from S_{20} through to S_{80} much of the U.S. gain resulting from a larger residual SAC is capitalized on if SAC attacks SUSAC and is lost if SAC expends its resources on S.U. population targets. And this, in turn, rests on the supposition (discussed later) that population attacks have only a low or moderate probability of achieving decisive military gains.

(3) Why is less utility attached (in almost all cases) to a U.S. Population Target (PT) strategy than to a U.S. Military Target (MT) or Mixed Target (MT-PT) strategy? And why are there two exceptions to this (Table 4B, S_{20} and S_{40})?

In S_{20} and S_{40} (20 per cent and 40 per cent survival of SAC) all strategies have severe limitations. In the 4A case, where the Soviet second attack is still confined to military targets, the transformation of the war by the United States into pure population attacks with the limited resources of S_{20} or S_{40} would presumably be based on the hope of either (a) collapsing the Soviet war effort by the population attacks, or (b) inducing the Soviets to abandon prosecution of the war because of the fear of further population attacks. We have assumed in this paper that collapsing or paralyzing Soviet military action by a pure population strike is, even in the best case (S_{80}), highly uncertain. We assume that the probability of it occurring in

S_{20} or S_{40} is too low to justify a pure population attack which leave SUSAC unmolested by direct attack. Nor do we believe that in S_{20} and S_{40} the Soviets are at all likely to terminate the war after a U.S. population attack, although a badly confused state of their intelligence could conceivably lead to this. We assume that the Soviets initiate the war because they expect with high probability to get S_{20} and, failing this, not to do worse than S_{40}. We assume further, then, that their decision to go to war indicates a willingness and probably an ability to absorb the heaviest losses that S_{40} might occasion should they fail to get S_{20}. Given the almost total absence of damage to SUSAC after a U.S. pure city attack and the virtual total exhaustion of SAC after its attack, it seems reasonable to suppose that the Soviets would at this stage push the war to a decisive conclusion.[11]

These negative considerations about the pure Population Target strategy do not imply, of course, that in S_{20} and S_{40} the Military Target (MT) and Mixed Target (MT-PT) strategies are especially attractive. However, the Military Target Strategy (in the 4A case) does make some inroads on SUSAC which will weaken subsequent Soviet attacks. And the Mixed Target Strategy, by making military targets the direct object of attack and

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[11] The repeated use of the words "we assume" in the propositions of the foregoing paragraph should not be overlooked. These propositions (like so many others in this paper) are scarcely testable in our present state of knowledge and are not likely to become testable in any relevantly close future. Nonetheless some position with regard to them is essential for analysis in the field of this report.

civilian casualties a "bonus," does give a high measure (for the limited resources available) of Soviet civilian destruction while diminishing to some extent the strength of SUSAC. In addition this lessens to some extent the likelihood and strength of a subsequent Soviet city attack should they have confined their second attack to military targets.

In S_{20} and S_{40} of Table 4B (where the second Soviet attack is a city attack) the Population Target Strategy is no longer at a disadvantage compared with the Military Target Strategy. The Soviets in fact chose city targets for their second attack and the Population Target Strategy turns out not to have precipitated an otherwise (possibly) avoidable transformation of the war into population attacks. The Mixed-Target Strategy (MT-PT) which combines both military and civilian damage, is of course the strongest of the three all-out strategies in a situation in which the transformation of the war into city attacks has already occurred since it combines (with a limited sacrifice of one target system to the other) the two target objectives of the pure Population (PT) and Military (MT) strategies.

In S_{60} and S_{80}, Table 4A (where the S.U. second attack is on military targets) the value of a Population Target strategy declines sharply relative to the other two all-out strategies, and for three reasons. (a) With very considerable strength available to SAC, the equalizing prospects of a Mixed Target (MT-PT) attack are greatly increased. (b) It is possible that

the very heavy civilian damage that can be inflicted on the Soviet Union by a population attack may collapse or paralyze further S.U. effort, but a large scale destruction of SUSAC capabilities (Military Target Strategy) or such destruction plus very heavy damage in the civilian sphere (Mixed Target Strategy) seems a far more certain way of ensuring that further Soviet capabilities for attack on the United States are sharply reduced. (c) After a population attack, the Soviet military and political leaders, if they are capable of carrying on the war, have little incentive to seek an immediate termination. Since they initiated the war in the expectation of achieving S_{20} or S_{40} the occurrence of S_{60} and S_{80} plunges them into a war the costs of which are above what made war worthwhile for them. (Cf. discussion on pp. 52-53.) A pure population attack by inflicting the huge losses that the Soviets presumably hoped to avoid may largely remove, rather than increase, Soviet incentive to end the war.

The same loss of incentive to end the war would probably occur after a U.S. Mixed Target (MT-PT) attack,[12] but this attack with its two target components has great compensating advantages that the pure Population Attack lacks. The pure Military Target response following the failure of the Soviet

[12]MT-PT is presumed to decrease Soviet incentive to end the war because after failure of the initial Soviet strike and after the U.S. MT-PT attack immediate termination of the war would virtually represent a complete S.U. defeat. The S.U. incentive to continue the war by means of their second big attack with their still considerable strategic resources would thus be considerable.

initial attack probably has the best chance of leading to a Soviet interest in terminating the war at the end of the first round; and is more likely to be effective in severely limiting future SUSAC action than would be the disorganization subsequent to heavy population attacks. The advantages of a first strike are so considerable that it may well be that even after a Soviet failure in their first attack, that is with the United States possessing a 60 per cent or 80 per cent residual SAC, U.S. prospects in the subsequent stages of the war will not be any better ("on the average") than a "draw." A Soviet desire to end the war after the first round might, therefore, be of interest to the United States.

In S_{60} and S_{80}, Table 4B (S.U. second attack includes city targets), there is less difference between the utility value of pure Population Attack on the one hand and the Military and Mixed Target attacks on the other, since an attempt to prevent the extension of war into city bombing would have failed. However, for reasons (a) and (b) above (pp. 85-86) we still believe that the Military and Mixed Target strategies are considerably better than the pure Population Attack.

(4) A comparison of the Mixed Target (MT-PT) and Military Target (MT) strategies: Why are they given essentially the same utility rating in Table 4A? And why is the Mixed Target strategy preferred to the Military Target strategy in Table 4B?

We first examine Table 4A. The Mixed Target Strategy has

the following advantages over the Military Target Strategy: (a) It does much more civilian damage than the pure Military Target attack and (it is here assumed) without much sacrifice of the attack against military targets (especially in S_{60} and S_{80}); it is more "powerful." It may through its disorganizing and other effects (for example, high radiation) combined with the direct attack on SUSAC limit SUSAC operations. (b) SAC may not be able to make another major strike; hence, there may be no further opportunity to weaken the Soviet economy and society to an extent that will render it more difficult for the Soviet Union to exploit whatever the postwar circumstances may be.

The Mixed Target Strategy has the following disadvantages as compared with the pure Military Target Strategy: (a) It increases the probability, if the war continues, that the Soviet Union will attack U.S. cities. (However, a pure Military Target Strategy does not guarantee that the subsequent stages of the war will remain confined to counterforce action.) (b) It increases considerably the likelihood that the war will not end after the Soviet second attack and our first attack, since the avoidance of major damage to the Soviet civilian sector is no longer at stake or is much less important as a Soviet incentive to call off the war. To be sure major civilian damage might possibly produce incentives toward termination. But of these two possibilities we believe that the incentive to continue is stronger, and probably by a substantial margin.

The Military Target Strategy has the following advantages: (a) It provides a somewhat heavier weight of attack on military targets than does the Mixed Target Strategy. This advantage is fairly small since we assume that in MT-PT not too much sacrifice is required of military target objectives, since the civilian damage is achieved by attacking military targets with ground bursts and high yield weapons. (b) It increases the probability that the war will be terminated since both sides now have their cities largely intact and still at stake. (c) If the war goes on it provides a greater probability that the war will continue along counterforce lines and that civilian targets, if they are ever attacked, will be hit at a stage of the war when forces are considerably depleted.

The Military Target Strategy has the following disadvantages: (a) It inflicts much less civilian and material damage on the S.U. (b) Since, despite the choice of a pure Military Target attack, the war may later develop into counterpopulation attacks, the United States will have lost its primary opportunity to inflict sizeable civilian losses on the Soviet Union.

In Table 4B the introduction of city attacks by the Soviet Union removes one of the major incentives for the choice of the pure Military attack, namely, the attempt to keep city targets out of the war as long as possible. In this case, then, the dual target system of the Mixed Target Strategy has higher utility to the United States than the pure Military Target Strategy.

(5) The utilities of the successful (cf. p.75) execution of the Partial Withholding Strategies are generally less negative than the utilities of most of the other strategies. What justifies this favorable evaluation of these strategies?

First it should be noted that we are not concerned here with the feasibility of these strategies or the likelihood that they would in fact accomplish their aim of forestalling the second Soviet attack and terminating the war (at least for the time being). We are concerned with the evaluation of these strategies, assuming that they are successful.

(a) Since these strategies are evaluated in terms of their utility to the United States were they successful their utility numbers reflect a particular assumed outcome; whereas in the case of the all-out strategies the nature of the outcome is very much in doubt, and the utility numbers are an "average" of several different possible results. Our numbers for the Partial Withholding Strategies would in this respect be more comparable with the others if we had presented only a single number in each cell, namely an average of the "successful" and "unsuccessful" execution of partial withholding.

(b) In S_{20} and S_{40}, the likely outcomes of the three "all out" strategies are clearly very negative, and the much lower negative utility of the Partial Withholding Strategies, when successful, hardly requires comment. The successful Partial Withholding Strategy terminates the war, reduces both military and civilian losses, and produces a postwar military-

political relation between the United States and the Soviet Union which is almost certainly as favorable as the outcomes that could be expected from the other strategies in the S_{20} and S_{40} cases.

(c) In S_{60} and S_{80}, the Partial Withholding Strategies, if successful, are rated more favorable to the United States than any of the all-out strategies. We assume that the best of the all-out strategies, even in the S_{80} case, offers to the United States no more than roughly even prospects in the war with the Soviet Union and that these prospects have to be purchased at the risk of enormous losses. Against these fifty-fifty chances the successful Partial Withholding Strategies terminate the war with roughly equal damage to both sides (cf. Table 2, p. 25). This is particularly so in Table 4B where the second Soviet attack, which is forestalled, is intended to strike U.S. cities; but a similar consideration could apply to Table 4A, since the transformation of the war into population attacks after the second S.U. military attack is by no means excluded in the case of the all-out strategies.

One of the long term consequences for the U.S. of the successful employment of the Partial Withholding Strategies is that after S_{60} the United States might be able to impose a status ante bellum with respect to Europe.

(6) Comparison of the Utilities of the Partial Withholding Strategies (Unsuccessful Cases) and the All-out Strategies.

Unsucessful Partial Withholding means, of course, that the U.S. intra-war population bombing threats made at the time of the U.S. partial strike to prevent the continuation of the war, and in particular the carrying out of the large second Soviet attack, are ineffectual.

In Table 4A the Partial Withholding Strategies, even though unsuccessful in stopping the Soviet second attack, are roughly on the same utility level as the all-out strategies in the cases S_{20} and S_{40}. The principal difference between the Partial Withholding Strategies and the all-out strategies is that in the latter the total residual forces are thrown into a single strike, whereas in the Partial Withholding Strategies the residual forces are split into two strikes, the initial one-third (of residual forces) and (when withholding fails and the big second Soviet attack continues on its way) the remaining two-thirds. The delay in sending off the second (two-third) portion is a matter of, say, three hours; the second (two-third) wave still takes off in advance of the big second Soviet attack. This delay is perhaps compensated for (given the weakness in S_{20} and S_{40} of even the all-out strategies) by the possibility that two partial strikes of increasing strength may, in the possible confusion of Soviet intelligence during the initial 24 hours of the war, appear more threatening than a single counterstrike with nothing happening thereafter. There may also be some advantage accruing from a possibly more effective target choice in the two phase attack as compared with the

one phase all-out strategies. In any event it may turn out that in the operational difficulties following a successful Soviet attack with full surprise the residual SAC forces cannot all be launched at once. In this case the attempt to secure cessation of the war by the two wave Partial Withholding Strategy is essentially cost free; there may be an inevitable fragmentation in the launching of the U.S. attack forces in any event.

Although as we indicated above the utilities of the unsuccessful cases of the Partial Withholding strategies are in S_{20} and S_{40} roughly on a par with those of the all-out strategies, our utility matrix does show a fairly clear preference for Partial Withholding over the pure Population strike. This follows from the following assumptions: (a) that the all-out population attack in S_{20} and S_{40} will not be sufficiently strong to disintegrate the Soviet war effort; (b) in addition, it increases the probability of city strikes against the United States without making prior inroads on SUSAC; (c) it commits irrevocably all of the residual forces to population targets, whereas even in the case of PT-W, which involves an initial population strike (with one-third residual forces), the remaining two-thirds (after the failure of withholding is apparent) have the option of military targets or continuing with population targets.

In S_{60} and S_{80}, the Partial Withholding Strategies are downgraded relative to the all-out strategies (the pure popula-

tion attack again excepted). In these cases SAC residual forces are sufficiently strong to pursue strategies more vigorous than the Partial Withholding Strategies. In addition the time delay in withholding the two-third portion of the residual forces in the Partial Withholding Strategies may in the S_{60} and S_{80} instances be expected to impose a higher penalty.

In Table 4B the relation of the unsuccessful cases of the Partial Withholding Strategies to the other strategies is somewhat altered. First of all the Population Target Strategy (PT) is not at such a disadvantage relative to the unsuccessful Partial Withholding Strategies; it is not chargeable with the risk of converting the war into mutual city attacks (since this, in fact, was intended anyway by the Soviets on their second attack). Secondly the Partial Withholding Strategies now decline in utility value relative to the two favored all-out strategies, MT and MT-PT. Since the Partial Withholding Strategies seek to terminate the war before its transformation into city attacks on the United States their failure in this respect removes much of the benefit to be expected from them, and they still retain their defect of delaying the attack on the Soviet Union by the two-thirds of the residual force that is temporarily withheld. As was indicated above, this penalty is greater in S_{60} and S_{80} than in S_{20} and S_{40}.

(7) The Withholding (W) strategy (an attempt to forestall the Soviet first (surprise) attack when strategic or very early tactical warning is available, cf. pp. 28 and 76) has the distinction, in the event of success, of providing the only positive utility number in the entire U.S. table. The probability that appropriate conditions for use of this strategy will exist may be very, very small, and the likelihood of its success, even if appropriate conditions for its use did exist, is very difficult to evaluate. Nonetheless, since it provides the only positive utility in the U.S. matrix, it deserves attention. We are not at this point concerned with feasibility and the probability of success and we need only examine the justification for the positive utility.[13] First, war would be averted (at least for the time being).[14] Secondly, the Soviet Union would presumably suffer a political defeat, although it is to be supposed that the Soviets would attempt

[13]The Withholding (W) strategy has never, to our knowledge, been studied. Given its extraordinarily great pay-off were it successful we feel justified in drawing attention to it even though the conditions for its successful utilization might seem to be impossible to realize. We believe that the fact that both antagonists have so much to gain from it (if they can overcome their fears of deception) is the most important feature of it and justifies attempts to determine whether these mutual gains might be realizable.

[14]Here as well as in other cases where it is assumed that World War III is brought to a rapid end serious consideration has to be given to the possibility that thereby World War IV may be made nearly inevitable. Even if this should be the case, there is, perhaps, in such circumstances a greater chance that it will be the United States that will go first in that war.

to pass off the "incident" as a U.S. misinterpretation of a SUSAC exercise or as an outright U.S. fabrication. Thirdly, the fact that the United States receives such early warning would presumably have a deterrent effect on future attempts at surprise, that is, unless the Soviet Union were to learn the source of the warning and could take the necessary corrective measures. In such circumstances, they might decide to use a different form of surprise attack, say, a pure missile attack without simultaneous follow-up by manned bombers (if its faulty attack was a manned bomber or manned bomber/missile attack). On the other hand, if their first failure led the Soviets to discount the probability of achieving surprise, this would have a considerable deterrent effect since the inability to achieve surprise makes war in the nuclear age much too costly except in situations of great urgency.

If the Withholding strategy fails (that is, if the Soviet attack force persists in coming on despite the U.S. announcement that it has spotted the impending attack), one of the all-out U.S. strategy choices is assumed to follow. Through the U.S. announcement the Soviets would learn that the United States has received warning. This penalty to the United States may not be quite as great as it seems, for the U.S. receipt of warning would lead to the alerting and take off of U.S. overseas and Z.I. forces and this might provide an equivalent indication to the Soviets. Secondly, if the United States

really took the warning seriously, it would presumably alert the civilian population, which would also indicate to the Soviets that their "surprise" attack had been detected. In addition, alerted Z.I. forces, though subject to recall, would already be en route to the Soviet Union; consequently failure of the S.U. to abandon their attack would not have delayed these forces. However, U.S. overseas forces, because of the much shorter flying time to the Soviet Union, might have to hold their fire until it became clear whether or not the Soviet Union was proceeding with its "surprise" attack. This would undoubtedly impose a considerable penalty on the capacity of the overseas forces to interfere with the mounting of the Soviet big second attack. This penalty occurs only if the United States considers the warning to be absolutely unequivocal and if it would <u>in fact</u> send off its overseas forces without delay to the Soviet Union.

C. <u>An Analytic Summary of the U.S. Utility Matrix</u>

We shall now attempt to summarize the foregoing discussions by stating (a) the principles of evaluation and (b) some factual suppositions that were applied in arriving at the utility numbers. The following statements will be made, for convenience and brevity, much more dogmatically than is warranted. In any case, their dogmatic quality will be somewhat modified by the <u>intentional</u> vagueness of some of our terms (for example, "a reasonable probability"). When we introduce such terms we intend not so much a statement as a <u>question</u>: what level of

probability would make the proposition acceptable? We are more interested in drawing the reader's attention to factors that enter into the utility evaluation of a strategy than persuading him of the validity of the following propositions. Each of the following statements should be understood to begin with "all other things being equal."

(1) Principles of Evaluation

(a) One strategy is to be preferred to another if it increases the probability of an improved outcome for the United States on the victory-defeat scale.

(b) One strategy is to be preferred to another if it provides superior long term military-political-economic prospects for the United States in the post-war world.

(c) One strategy is to be preferred to another if it decreases the expected size of our civilian losses.

(d) One strategy is to be preferred to another if it increases the probability that the war will end sooner rather than later.

(e) It is preferable to continue the war, at the cost of "x" amount of damage to the nation, if the alternative is total or almost total submission and defeat and if continuation of the war provides a low but "reasonable" chance of securing a draw or a victory.

(f) The amount of damage to the nation one is willing to sustain or risk should be greater in the interests of acquiring a "reasonable" chance of turning a total defeat into a draw

than in turning a draw into victory.

(g) A strategy that has a high probability of terminating the war immediately is preferable to one that increases substantially the probability of great civilian damage in circumstances where the continuation of the war provides negligible chances of improving its political-military outcome.

(h) Strategies that increase the likelihood of Soviet attacks being confined to U.S. military targets are to be preferred to strategies that increase the likelihood of city attacks (unless the Soviet choice of city attacks provides considerably enhanced opportunities for the improvement of the U.S. position on the victory-defeat scale).

(i) Of strategies that risk the transformation of the war into city attacks, those are to be preferred that delay this transformation until SUSAC capabilities have been depleted by attrition and U.S. counterattacks (and until evacuation has occurred).

(j) One strategy is to be preferred to another if it provides a greater weakening of SUSAC capabilities for further strikes.

(2) Some Factual Suppositions

(a) For a high U.S. attack rate (S_{60}, S_{80}) a strategy that hits at SUSAC directly is more likely to limit SUSAC action than a strategy that inflicts relatively little military and enormous civilian losses (PT).

(b) In the case of a low U.S. attack capability (S_{40}), a strategy that inflicts very substantial civilian casualties is more likely to provide an incentive to the Soviet Union to discontinue the war and is more likely to limit SUSAC action than a strategy using a similar capability (S_{40}) against SUSAC, S_{40} being insufficient to alter significantly the ratio of strategic forces.

(c) Nonetheless the probability of achieving either of these two objectives by city attacks in S_{40} is very small. (We assume that the Soviet Union in initiating the war is very likely willing and able to absorb losses from retaliation by SAC reduced to S_{20} or S_{40}).

(d) Very great civilian losses inflicted on the Soviet Union may make it difficult for the Soviet Union to exploit a military victory.

(e) U.S. city attacks on the Soviet Union increase the likelihood of S.U. city attacks on the United States (if these have not already occurred).

(f) In a situation of U.S. weakness (S_{20}, S_{40}, perhaps S_{60}) the intrawar threat by the United States of city attacks on the Soviet Union by U.S. residual forces provides a greater incentive to the Soviet Union to terminate the war, or to settle for less, or to limit their action in the war than the execution of the city attack itself.

(g) If S_{60} or S_{80} occur, the Soviets have great incentives to terminate the war (they initiated it on the supposition of achieving S_{20} or at least S_{40}).

Part Two

APPLICATIONS

INTRODUCTION

In this section we analyze some implications of our scheme of analysis and the illustrative numbers that we have employed. Some of these implications have been foreshadowed by our discussions of the S.U. and U.S. utility matrices. These discussions, however, although having rather evident significance for deterrence policy and for wartime strategy, did not examine the issues arising from possible instances where (a) the most effective deterrent measures threaten to increase the disutility to the United States of the war outcome; or, conversely, where (b) the military posture and strategy most effective for the eventuality of war decrease the effectiveness of deterrence. Our objective is to discuss resolutions of the possible conflict of interest between deterrence and wartime strategy so as to provide the best overall expected result for the United States.

We shall proceed as follows: First we discuss deterrence without regard to the consequences for the United States should deterrence fail. Of course, a major assumption of the paper is that deterrence strategy must take into account the possible failure of deterrence. Nonetheless, it is useful to see what a pure deterrence strategy would look like given the assumptions made concerning the Soviet utility matrix and Soviet calculations about the chances of success of their first strike and the

character of U.S. reply. Secondly, wartime strategy will be examined without regard to the requirements of deterrence. And finally, we will consider the question of reconciling the possible conflicting interests of deterrence and wartime strategy.

Chapter 5

MAXIMIZING DETERRENCE

Maximizing the deterrence of total war involves: (1) increasing Soviet estimates of the probabilities (P_i) that high levels of SAC survival (S_i) will occur so that total war seems more likely than not to end badly for the Soviet Union; (2) increasing Soviet estimates of the probabilities (P_{ij}) that the United States will employ one of the U.S. strategies that offers the Soviet Union a high disutility.[1] We will discuss measures that might be taken to achieve these objectives.

Before discussing the problem of how the United States might influence these two S.U. estimates, a general comment or two is perhaps in order. First, a glance at our judgments concerning the entries in the S.U. utility matrix on page 31 will make it quite clear that if these judgments are accepted the likelihood that the Soviet leaders will choose to initiate total war is affected very much more by their estimate of the proportion of SAC that will survive their initial attack than by their estimate of what target system SAC will use in its reply strike. This means that from the purely deterrent point

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[1] As we indicated earlier (p. 11) the Soviet probability of total war function P_w is also a function of various alternative courses of action and their value and Soviet expectations about U.S. actions. In the largest sense, then, maximizing the deterrence of total war involves minimizing the function P_w. In the discussion that follows, however, when we speak of maximizing the deterrence of total war, we are speaking of deterrence somewhat more narrowly, namely, minimizing the utility to the Soviets of starting total war (cf. p. 11).

of view it is much more important to influence the P_i (estimates of SAC survival) than the P_{ij} (estimates of U.S. strategy choices). For this reason, among others, we devote considerably more space to the problem of influencing Soviet estimates of the level of SAC survival. Second, we want to remind the reader that the utilities assigned in the matrices refer to projected final outcomes of wars beginning with Soviet strikes of specified levels of success and particular U.S. initial countermoves. Our analyses suggest to us that the capacity for continued survival, in operational form, of U.S. strategic military power beyond the first S.U. attacks can have a very great affect upon Soviet valuation of the attractiveness of initiating total war. Thus measures which may not increase immediate capability to hit back, but contribute to sustained wartime capabilities can have important deterrent aspects.

A. Influencing Soviet Estimates (P_i) of SAC Survival (S_i)

In this section we will first discuss some general characteristics of deterrent measures. Then follows a discussion of the questions: Are there any feasible measures for improving the survival capability of SAC during the period 1959-61 that can be adopted now? Finally, we discuss briefly some aspects of the relation of SAC survival measures to deterrence in the period beyond 1961.

(1) The Nature of Deterrent Measures

Deterrent measures have two aspects: (1) the degree to which the measures change the actual or objective value of the probability of SAC surviving at a given level; (2) the degree to which they change Soviet estimates of this objective probability.[2] As the title of this section suggests, our ultimate aim in deterrence is to influence these Soviet estimates.

There are (a) some measures which effect more or less equally both the actual survival level of SAC and Soviet estimates of it (for example, hardening). This class of measures is usually called "objectively" deterrent measures. There are other classes of useful measures: (b) measures that induce substantial changes in the probable level of survival but for various reasons do not at all, or only moderately, influence Soviet estimates; (c) measures which do not at all, or only minimally, change the actual level of survival but which may have substantial effects on Soviet estimates of the probable level of SAC survival.

An example of type (b) would be the improvement of the strategic warning system. The United States would probably wish to keep secret the exact nature of the improvement in its warning system in order to prevent the Soviets from taking counter

[2]We have not distinguished, notationally, the true values of P_i and Soviet estimates of P_i. The text will make clear to which of these P_i we are referring.

measures against it. It might be possible, however, to let the Russians know that an improvement had occurred without disclosing its precise nature. For example, the United States might disclose an important intelligence finding or adopt postures which obviously indicated that it expected to get warning, or the United States might covertly or publicly make known through leaks or other devices that it had an increased assurance of achieving strategic warning of Soviet attack. To the extent to which the United States is able to convince the Soviets of the improvement without allowing them to take countermeasures against it, the improvement in the warning system would be transformed into a type-(a) measure ("objectively" deterring).

Examples of class (c) measures are: (i) military activities which are of little or no effectiveness in altering the true level of SAC survival but which, misinterpreted or wrongly evaluated by the Soviets, might induce them to change their estimates in a direction desired by the United States; or, which simply complicate their calculations and introduce unknown factors into their estimates; (ii) statements, diplomatic and political activities which, possibly by their aggressiveness, suggest a high U.S. level of political and military confidence; (iii) certain sensational scientific accomplishments with military overtones that lead to an image of the U.S. as a formidable antagonist (for example, lunar exploration).

Class-(a) measures are probably the most effective deterrent measures. Class-(b) measures (say, improvement of the strategic warning system) have an effect on Soviet estimates disproportionately lower than their real effect on SAC survival; in the extreme case they have no effect at all on Soviet estimates although they may be invaluable if deterrence fails. Although Class-(c) measures are not "objectively" deterring, they probably deserve fuller study than they usually receive. The decision to initiate nuclear war is surely the gravest and most difficult decision that the leaders of any country can make. In such situations various intangible factors and vague apprehensions may play a restraining role out of all proportion to their "objective significance." Very likely a decision to initiate nuclear war cannot be made on the basis of strict calculation. A considerable element of impressionistic evaluation will almost surely enter. Opportunities may exist to work on the impulses and attitudes that underlie such forms of judgment.

In connection with all three classes of deterrent measures it may be possible to take account of special Soviet dispositions. Our discussion has emphasized those characteristics of Soviet judgment and evaluation that they might be supposed to share, on the whole, with most groups of reasonable decision-makers. It might be worthwhile investigating whether there are idiosyncratic Soviet dispositions that can be exploited to increase the deterrent effect of various measures (or to suggest

quite new ones).

A thorough analysis of the nature of deterrent measures would require a systematic consideration of various neglected points in the theory of deterrence. For example, what is the contribution of vulnerable forces (that is, forces with a high probability of being destroyed if the enemy strikes first) to deterrence? Do they increase or lower deterrence? In order to answer this question, it would be necessary to evaluate two opposing effects caused by a hypothetical increase in such forces: (a) unless the destruction of such forces is certain, the added forces will lower the average utility to be achieved by the enemy if he attacks, (b) if the enemy believes that the United States might go first, the added forces make the risk of not attacking greater. Which of these effects has the larger weight is not at all clear.

Another problem requiring more analysis is the effect of certain deterrent measures in producing important indirect or secondary deterrent effects. This is particularly true of measures which may lead to enemy countermeasures (increased enemy strike size, special anti-Polaris measures, etc.) that in turn lead to an increased probability of receiving some form of strategic warning of the attack.

However, we cannot here analyze the complicated relationships among various hypothetical deterrent measures that might be taken in the future. We turn now to the problem of maximizing deterrence in the period 1959-61.

(2) What Can Be Done During The Period 1959-61 To Improve Deterrence Through Changing Soviet Estimates of SAC Survival (P_i)

It is clearly important and indeed urgent to ensure for the 1959-61 period that the Soviets attach substantial probabilities to the 40 per cent, 60 per cent and 80 per cent cases of SAC survival following a Soviet surprise attack. The only way the United States can have confidence that the Soviet Union will in fact make such estimates is to ensure that these probabilities are in fact objectively substantial. Measures beyond those now in operation and which could be made effective within the 1959-61 period to raise the probabilities of the high SAC survival cases are not easy to find. Given ordinary lead times, it is apparent that additional measures must either be undertaken on a crash basis or have unusually short lead times. We shall discuss under two headings some measures that might be adopted: crash program measures and interim measures. By a crash program we mean the rapid and perhaps partial implementation of a measure having a long term value such as hardening or any other procedures acceptable over a long period and having a significant effect on Strategic Air Force vulnerability. By an interim measure we have in mind procedures such as a dispersal program that could be implemented in a relatively short time, which would work for perhaps a couple of years (although having a rather disruptive effect on the general operation of the Strategic Air Force for at least the initial period of its operation), and which would probably

be abandoned after more permanent solutions had taken effect.

Before discussing such suggestions, it seems worthwhile to mention at least two programs which lately have been considered for operation within the 1959-61 time period: airborne alert and IRBM's stationed in Europe.

The objective of the airborne alert is to ensure survival of at least approximately 20 per cent of the B-52 force, the latter being approximately one-third of our total strategic force during the 1959-61 period. The measure thus aims at guaranteeing survival of one-fifth of one-third of the total strategic force, that is one-fifteenth (7 per cent) of our strategic power. Our hypothetical Soviet utility matrix suggests that this level of SAC survival is well below the minimum required for deterrence. Although the airborne alert attempts to guarantee the survival of only a low percentage of the strategic force, this does not preclude the partial survival of other parts of the strategic forces. However, the nature of the airborne alert operation makes it difficult to provide a good survival probability for additional portions of the B-52 force; and unless there is some way of securing warning of ballistic missile attack during the 1959-61 period, the survival probabilities for the remainder of the force, that is, B-47 aircraft and the rather small and unhardened ICBM force, will not satisfy deterrence requirements. Although the airborne alert does make a contribution to deterrence, it is insufficient by itself and requires to be supplemented or replaced by

measures that would attempt to ensure that at least 40 per cent of the strategic force will survive a Soviet surprise attack.

The program to place IRBM's in Europe has had a variety of motives, one of which was that it should add to the Western, and in particular, U.S. deterrent posture. The current program has several difficulties: (a) the missiles will be very vulnerable to attack, and (b) there will be awkward control problems both for the United States and for our allies. The military and consequently deterrent effectiveness of the program is therefore seriously in doubt. However, this does not mean that a somewhat changed IRBM program would not be of use. Even modestly hardened IRBM's could have several deterrent effects. (a) They might reduce the frequency and vigor of dangerous Soviet probes in Europe that might lead to inadvertent war. (b) They might permit, despite control difficulties, some of our allies independently to resist Soviet pressure more effectively in situations where the United States is not willing to risk precipitating an extremely severe crisis. To the extent that this might prevent the neutralization or political subserviency of our allies, it would also probably prevent an increase in Soviet belligerency <u>vis-à-vis</u> the U.S. (c) The Soviet Union in contemplating a total war with the United States may require that it be able to take over Western Europe with its resources relatively intact and with minimum "brutality"; this means, then, that the liquidation of IRBM's, however feasible

militarily, may make the war against the United States undesirable since the war would necessitate eliminating the IRBM's, thus destroying much of what the Soviet Union would hope to gain in Western Europe. Both economic and political considerations might dictate to the Soviet Union an avoidance of large scale devastation in Western Europe.[3]

In the case with which we are primarily concerned, namely deterrence of a premeditated war, we cannot, of course, assume that the Soviet Union would be unwilling to devastate much of Western Europe in order to eliminate IRBM's. If this unwillingness did not exist, IRBM's would have only the relatively small deterrent effect resulting from the increased number of Soviet aiming points.

It appears, then, that both the airborne alert and IRBM's require supplementation or replacement by other measures if the probability of a satisfactory level of strategic force survival is to be increased to provide a greater measure of deterrence. A relatively small Soviet missile and/or bomber force might, at present, seem to the Soviets to have a reasonable chance of

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[3]The existence of manned aircraft in the allied countries might suggest that the Soviet Union would in any case have to attack bases in these countries whether they contained IRBM's or not. However, the Soviet Union might feel that its fully alerted defenses could quite well dispose of these enemy forces. In addition, the Soviet Union might not find it disagreeable to knock out vulnerable aircraft with light weapons, but be unwilling to use heavy nuclear weapons against modestly hardened IRBM's. Aircraft, of course, could also be hardened. But it may be easier to secure some degree of hardening of a new weapons system like IRBM's than to impose this requirement in Western Europe on presently existing systems.

destroying the U.S. capability for a retaliatory attack. Probably the calculations of an aggressor will tend to be conservative, but we can scarcely be sure of that. Nor can we exclude the possibility that in a situation where deterrence is at an ambiguous level, enemy calculations may even be over optimistic.

There is, then, clearly a need to take measures that will increase the actual level and the Soviet estimate of U.S. strategic force survival for the period 1959-61. In the following pages we make some suggestions that may be feasible in the above time period on a crash program basis, although, of course, not necessarily in its first year (1959). But 1960 and 1961 are also years for which an increased deterrent capability is crucial. We want to stress that feasibility of execution in the time period 1959-61 and the actual military effectiveness of the suggestions made below have not been evaluated by us. It will be apparent to the reader that the present study has confined itself to certain gross features of the deterrence and military strategy problems of the next three years. Our analysis of total premeditated war has, we believe, placed certain objectives in a more comprehensive and, we hope, clearer context. It is because of this that we draw attention to suggestions that derive some of their significance from our overall analysis, even though their feasibility and military worth would require technical study before any recommendations could be made.

What kind of crash programs appear to make sense? First would be a crash program for the hardening of some of our aircraft and most or all of our missiles. This is a past and continuing RAND suggestion and one which is clearly perfectly feasible in the sense that the design for the right kind of shelters both for aircraft and missiles is known and its effectiveness has been evaluated.[4] The only question of feasibility relates to how quickly and at what cost one could implement a shelter program on a crash basis. How many shelters could the United States have in place in 1960, how many in 1961?

Secondly, there could be a speed-up in the production rate of ICBM's along with the hardening program for the ICBM. This is again feasible according to the statements of the ICBM manufacturers; indeed production rates could probably be doubled. This is a matter of budget and the production of trained crews in the interim.

In addition to the two foregoing crash programs, a case can be made for an attempt to produce a specialized portion of the total strategic force which we have called the hard core force. This is a force designed to survive the initial attack,

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[4] A. J. Wohlstetter, and H. S. Rowen, Protecting U.S. Power To Strike Back in The 1950's and 1960's,(U), The RAND Corporation, Report R-290, September 1, 1956 (Top Secret Restricted Data). H. S. Rowen and M. E. Arnsten, The Basing and Operation of Inter-Continental Ballistic Missiles To 1965 (U), The RAND Corporation, Research Memorandum RM-2136, March 28, 1958 (Secret Restricted Data). A. C. Enthoven, A Survey of Hardening Strategic Offensive Forces (U), The RAND Corporation, Research Memorandum RM-2355, April 1, 1959 (Secret).

and indeed repeated attacks, and to be able to function on the second and third days of the war. As we have indicated in our analysis there would be great value in a force (a) which could, if required, be withheld securely for purposes of bargaining, intrawar deterrence and ultimate threat against Soviet cities; (b) the actual employment of which in the war is rendered more flexible by its relative invulnerability; (c) which might, if the United States and Soviet Union terminate the war before a decisive conclusion has been reached, provide superior conditions of termination and security in the immediate postwar world. Such a force might comprise initially (1959-61) about 10 per cent of the total force and later about 20 per cent. By what ways can such a force be achieved? There seem to be several possible routes. One of these would be through a program of super-hardness for a small part of the total force, which for the 1959-61 period would presumably mean hardening to something like 500 to 1000 psi with provisions for the continued operability of the force in the face of repeated attacks. Such super-hardness might be achieved through deep underground shelters. Since the force need not necessarily be a quick reaction force, exiting arrangements could involve, if necessary, a good deal of time.

Another weapon system for the hard core force is the Polaris submarine, which has the characteristic of considerable invulnerability prior to surfacing or firing.

We emphasize that the characteristic of the hard core force weapon system is that it can survive beyond the initial enemy attacks. Is it possible to produce such a force during the 1959-61 time period? The Polaris submarine force will begin coming into service toward the end of 1960, and it might be possible by a stepped up program to increase appreciably by 1961 forces of this type. However, a principal requirement is to adopt a doctrine for their use which takes advantage of certain of their characteristics so that they can be used, if required, in the hard core role. In addition, there is a cheaper form of the Polaris type of weapon which might be introduced either through refitting ordinary submarines, or through the use of submersible platforms of the DeLong Dock variety. Whether or not it would be possible to produce some form of super-hardness for a relatively small land based force within the 1959-61 time period is not clear but worth investigation. A crash program cannot make the impossible possible, but it often can make the implausible surprisingly feasible.

A form of weaponry that is especially complementary to a hard core force is very large MT weapons, perhaps in the 100 megaton and over range. It would be an advantage for a hard core force to have such weapons available. Such weapons also suggest a special force very different from what we have so far discussed. One might combine hardness, dispersal, and cheap sites for a small force of large transport aircraft with a large bomb built into each of them which would enter the Soviet

Union on autopilot flying at very low altitudes with dead man fuzing. A supplementary force of this type might on a crash basis be put together in a year or two; it would stand a significant chance of surviving initial attacks and would pose, even in rather small numbers, a significant deterrent threat to the Soviet Union and also a significant intrawar threat. It is one of the weaknesses of the Polaris weapon system that the warhead in its missiles will be rather small. Thus this system can have its performance as a destroyer of population considerably degraded by the evacuation of cities and by other forms of Soviet civil defense measures. It is doubtful whether any very large yield weapons can be fitted into the Polaris system during the 1959-61 time period. Hence the Polaris system has limitations if one imposes a requirement for large megaton weapons. Since forces of the hard core type increase considerably their deterrent and intrawar capabilities by having such weapons available, land based hard core forces are, at least with respect to this one requirement, preferable.

In the class of interim measures, two possibilities will be mentioned. One is a program of SAC dispersal. By this we mean an all-out program to disperse SAC aircraft to a great many fields around the U.S.: various military air fields, and possibly some municipal airports capable of handling B-47's and B-52's. Such a program would undoubtedly interfere with training missions and seriously disturb maintenance and other

routines, but it has the attraction that on a high-urgency basis it could probably be successfully implemented in the near future. This measure could easily double, triple or quadruple the number of points that the Soviet Union would need to hit in an initial attack; it could have a significant payoff for the next few years. When missiles become rather plentiful in the Soviet military forces, this measure would lose much of its value. By that time, of course, one would hope that other measures would begin to take over the main job of providing a U.S. deterrent.

A variant on the dispersal program would be to give to Air Force reserve units B-47 aircraft which would be retired or could be retired from the regular force. If the reserve units could keep up operational standards, this would supply a dispersed force to back up the regular SAC forces.

(3) The Post-'61 Period

Our analysis does not cover the post-'61 period; while we hope that the broad scheme of our analysis will remain useful, it seems likely that the military environment will change rather sharply in the early '60s and hence specific calculations about deterrence and wartime strategy will shift. However, there are some results of our analysis that we feel will carry over. In particular, we would predict the continued usefulness of a hard core force, even though some of its characteristics might change. New opportunities will emerge for providing

this type of force. One of these is the emergence of long endurance aircraft both nuclear and chemically fueled, which could be used as launching platforms for ballistic missiles. However, in the post-'61 period, it is quite possible that the Soviet Union will have a significant civil defense program and perhaps even other forms of defense against ballistic missiles. For both of these reasons there will probably continue to be a significant premium on missiles which can carry large payloads, either to be used for large warheads or for carrying decoys and other penetration aids. For this reason it seems likely, even in the post-'61 period, that an adequate hard core force will require land-based hardened weapons.

B. Influencing Soviet Estimates of the U.S. Choice of Strategy (P_{ij})

We now consider the problem of increasing deterrence by inducing the Soviets to make high probability estimates that in the event of war the United States is likely to adopt those strategies that carry (in a given S_i case) the larger disutilities for the Soviet Union.

Our construction of the Soviet utility matrix (p. 31) implies that we should attempt to influence Soviet estimates of our strategy choices in the following manner: We want them to believe that if they reduce SAC to 20 per cent or 40 per cent, we will counter with a pure Population Target attack (PT) or alternately a Mixed Target (MT-PT) attack; that if they reduce SAC only to 60 per cent we will adopt a Mixed Target

strategy or alternately a pure population attack (PT); and that if 80 per cent of SAC survives we will adopt a Mixed Target strategy.

There are two principal ways of influencing Soviet probability estimates of U.S. strategy choices: (a) by the adoption of various measures affecting our military posture and (b) by statements that we make about our intentions.

(1) Military Postural Measures

Since a preventive war initiated by the Soviet Union is almost certain to be predicated on a high probability of achieving S_{20} or at least S_{40}, Soviet expectations about our actions in these cases are of special importance.[5] We have just seen that in these cases we want the Soviets to expect a retaliatory blow producing high civilian casualties, that is, either a pure Population Attack or a Mixed Target strategy. A minimum means for attaching credibility to our intention to strike cities is to have a strategic force suitable for doing so. At present the U.S. strategic forces fulfill the basic requirement of being suitable for and capable of attacking population targets. However this capability might be operationally vitiated

[5]However, if the Soviets attach any residual probability to S_{60} and S_{80} they will be interested in U.S. strategy for these cases as well. For instance even a very small probability of S_{60} might be restraining if the Soviets thought the U.S. would use its sizeable residual force to attack population since they may be unwilling to bear such costs. If the U.S. attacks only Military Targets (MT), they might feel that the force ratio (cf. Table 2) is sufficient to ensure a S.U. military victory while sparing them large costs in the civilian sector.

(and therefore reduce Soviet expectations of effective population strikes by the United States) if the training and targeting procedures in SAC were so inflexibly oriented toward counterforce strikes that it would be impossible or difficult (especially in the circumstances of a successful S.U. surprise attack) to mount city attacks. From a deterrence standpoint such inflexibility is dangerous, of course, only if it both exists and is known to the Soviets. It would be safer to credit Soviet intelligence with some knowledge of U.S. targeting, training and allocation of crews. If we do so, it is clearly desirable that the United States in fact have plans that ensure, especially in S_{20} and S_{40}, that targets, crews and appropriate weapons (ground bursts, high fallout) could be effectively allocated for population attacks.

A more persuasive means of attaching credibility to our intention to strike cities (in S_{20}, S_{40} and perhaps S_{60}) is to have not simply a capability of switching to pure city targets if circumstances require, but a <u>portion</u> of our force that is especially allocated and developed for this specific purpose.

It might seem that to maximize this aspect of deterrence the <u>entire</u> U.S. strategic force should be so developed and allocated. But there are several reasons why even from a strictly deterrent standpoint one does not want a force that is dedicated solely to population attacks: (i) Although we have avoided discussing limited and preemptive wars, we must at least take into account that a pure city attacking force

would reduce deterrence of limited wars initiated by the Soviet Union by removing our capability for a go-first (that is, counter-force) attack; (ii) and since a limited war may develop into a total war the decreased deterrence of limited wars partially offsets any increased deterrence of total war; (iii) the Soviet Union in initiating a total war may attach very high probabilities to S_{20} and S_{40}, but they probably cannot avoid attaching some probability to S_{60} and S_{80}. In these cases, especially S_{80}, the inability of a pure population attacking force to exploit the failure of the Soviet surprise attack by attacking SUSAC may make the Soviets more inclined to risk war; (iv) more generally, it is too risky to assume a sure knowledge of Soviet utilities or to assume their stability. To organize a force for deterrent purposes exclusively around one particular assumption about Soviet utilities does not seem wise.

We return then to the point that the fixed allocation of a <u>portion</u> of the strategic force for population strikes seems a reasonable means of increasing Soviet expectations that city attacks are intended (in those instances where they are likely to be the strategy that the Soviets believe will do them most harm).

The portion of SAC allocated for population attack should preferably be a <u>hard-core</u> force of the type described above. It should be that part of the force most likely to survive if the Soviets reduce SAC to 20 per cent or 40 per cent (S_{20}, S_{40}).

Such a force may not be a very quick reacting force, but its mission requires not that it be able to react with utmost speed but rather with utmost certainty.

From the standpoint of increasing deterrence by influencing Soviet views of U.S. strategy, the important question would be how the Soviets can be made to view the hard-core force as being in fact a population attacking force. Both by design and perhaps by necessity this special force may be slower reacting than the rest of the strategic force. Its character of being an ace in the hole -- quite literally in the hole! -- should be fairly persuasive in itself that its mission is population attack. In addition, training and targeting of the force for the mission could be done without undue regard for secrecy. The force might even be referred to as the hard core reprisal force. Finally, one might consider giving extra deterrent weight to this force by designing it and discretely publicizing it as being armed with specially designed super large thermonuclear weapons in the 100 MT or larger range. If this force is to include missiles (as it might in the post 1961 period), they would have to be designed to lift large warhead weights if the policy of arming the force with very large yield weapons is to be carried out.

Without a hard core population-attacking-force it would be essential that the Soviets believe that SAC has the flexibility to switch to population or strategic targets as the situation might require. With a hard core force one would

want the Soviets to be convinced of the inflexibility of this population-attacking-force. Its design could contribute to such convictions. However, the Soviets might be convinced not only of inflexibility with regard to the force's target system but also of its inflexibility with respect to specific population targets assigned to its crews. Crews trained and allocated for one specific population target represent not a desirable but rather an undesirable type of inflexibility. Of course, if one were certain that the entire hard core force would survive, such flexibility would be unnecessary. One cannot exclude, however, the possibility of Soviet intelligence and attack (or sabotage) capabilities combining to put certain hard core crews or sites hors de combat in order to protect particularly important S.U. population centers. Flexibility is a protection against such possibilities.

For SAC at large, flexibility with regard both to individual targets and target systems is desirable. However, with a hard core force available, it is flexibility with respect to targets of a single target system that becomes especially important. If the less protected part of SAC is inflexible in this respect, the Soviets may well argue that any surviving portion will in fact be weaker than its numerical size suggests. Measures designed to increase SAC targeting flexibility would lead to increased Soviet expectations that surviving SAC forces would be utilized in a more efficient manner and hence add to the deterrent effect of these forces.

A very different set of measures that could influence Soviet views of prospective U.S. strategies is an extensive U.S. civil defense program. A large scale civil defense program could scarcely proceed very far in the 1959-61 period. Nor does it seem desirable to invest heavily in such a program at the expense of the U.S. missile program or the task of making U.S. strategic forces invulnerable. In addition, the principal motives for a civil defense program would presumably be (a) to give the United States greater freedom and vigor of action vis-à-vis the Soviet Union especially in a future period in which mutual deterrence may be more stable than it is now; and (b) should deterrence nonetheless fail, to permit a greater range of strategies in an intrawar period and ensure the recuperation of the U.S. economy in the postwar world. There are, however, secondary deterrent effects provided by a civil defense program, and it is these that are relevant to our present discussion. Suppose the United States initiated a program designed to allow the evacuation of the U.S. urban population to places of safety, and provided fallout shelters and supplies for survival in shelters over periods of (say) 90 days together with a program for recovery after a war. Such a program would suggest rather strongly to the Soviets that U.S. strategy regarded city bombing as a likely event. The suggestion would gain force by the provision of blast shelters in U.S. cities. If Soviet leaders are at all disposed to believe that city bombing, though threatened, would not be executed by the U.S.,

then an elaborate U.S. civil defense program would no doubt serve to weaken such comforting assumptions. In addition to influencing Soviet estimates of U.S. strategy choices, a civil defense program would also have a deterrent effect by making some types of Soviet probes much more dangerous and thus reducing the occasions (limited war or some actions short of limited war) that might eventually lead to total war.

It might be argued that the development of a large scale civil defense system would have a counter-deterrent effect, that is, that it might frighten the Soviet Union into a preemptive attack. One cannot deny such a possibility, but civil defense is probably not as "provocative" or threatening (from a Soviet standpoint) as, for example, a continuous airborne alert. If civil defense were <u>preceded</u> by real gains in reducing SAC vulnerability, it is not at all likely that a civil defense program would have a significant counter-deterrent effect. Obviously such an effect, if it exists, will exist only during the period of construction.[6]

Clearly it is not civil defense measures alone that will affect deterrence of total war. Our discussion of city attacks by the United States as a deterrent threat assumes a considerable vulnerability of the Soviet population to blast and fallout.

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[6]There may be a rather large class of measures that have the character that their deterrent or provocative nature is very different once they exist from what it is while they are in the process of being created. A part of the theory of deterrence is necessarily dynamic.

For the time being it is unlikely that the Soviets will achieve protection against population attacks on cities.[7] But it must be recognized that even minimal shelter and training programs could substantially reduce casualties from fallout. Future civil defense developments in the Soviet Union may alter considerably the validity of some of the analyses presented in this paper. Such developments are especially likely to affect the power of the Mixed Target Strategy (MT-PT). This strategy relies largely on fallout for its civilian destruction; the latter is a "bonus" from attacks with appropriate weapons on military targets. The effectiveness of such indirect attacks against civilians could be considerably reduced by not too expensive Soviet civil defense measures. It is indeed possible that by 1959-61 the bonus casualties assumed in our discussions of the Mixed-Target Strategy will already be over optimistic.

It has been suggested that an extreme postural device intended to increase deterrence would be to place U.S. strategic bases close to its largest cities.[8] The argument here is that

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[7]Although some capacity to evacuate Soviet cities must be assumed even now.

[8]The intentional mingling of population and military targets is a special case of a more general problem: the relation of damage to civilians as a function of military target attacks. The extent of the coupling between civilian and military targets has a game-like character. Both attacker and defender control some of the variables that determine the extent of the coupling. The defender controls the location of the bases relative to the population centers and the relative hardening of military targets and civilian population (through civil defense measures). The attacker controls the form of attack in terms of air bursting versus

the Soviets may wish to attack only military targets because they want to avoid - if they can - a war involving population attacks; they may be tempted to believe that despite any threats the United States will not in fact reply with city attacks if its cities are left untouched. By placing bases close to large cities the United States would force the Soviets to destroy our cities and thus force the Soviet Union to anticipate city attacks in reply. If there were absolutely nothing else that could render plausible a U.S. intention to reply with city attacks (in certain cases, say, S_{20}, S_{40} and perhaps S_{60}), such an extreme measure (extreme in its consequences if deterrence fails) might be more attractive. But we have seen that there are other postural measures that are not without their merits in this regard and have in addition considerable advantages from the standpoint of fighting as well as deterring war.

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ground bursting weapons, the use of clean weapons, restraint in bombing possible or potentially useable airfields rather than actual military bases. Leaving aside an intentional coupling of military and civilian targets, the general problem of their relationship still remains. While we should not forego the hardening of military targets such as SAC because it will tend to increase the damage to the civilian population that even a careful enemy might inflict (since he is forced to use bigger bombs, ground-burst weapons, etc.), nonetheless both the U.S. and the S.U. may become concerned about the consequences of increasing the hardness of military targets without increasing the protection of population.

The current relations between bases and cities are largely the result of factors other than calculations of damage in war (cost, convenience of various sorts). The optimal degree of separation between bases and cities has hardly been considered a crucial problem of military policy.

(2) Threats

It seems likely that in estimating our target preferences, the Soviets would attach greatest credibility to our postural measures. Statements and threats consistent with the posture would, however, probably have some reinforcing effect. Since the target strategy most damaging to the Soviets is almost certainly Population in S_{20} and S_{40}, Population or Mixed Targets in S_{60}, and probably Mixed Targets in S_{80}; and since also one cannot be entirely certain of Soviet utilities, it is not necessarily inappropriate that the public picture given of U.S. strategy choice should be not at all consistent, clear cut and simple. In this respect the freedom in the United States of military and civilian leaders to express themselves on such problems may be (from a deterrent standpoint) much more advantageous than one might suppose. The value of these somewhat imprecise and at times conflicting threats would, however, be increased if they represented not just a confusion of purpose but a genuine flexibility, a capability of adopting according to the situation that strategy that carries the largest Soviet disutility.

In concluding this chapter we want to emphasize again that we do not attribute equal deterrence value to the two sets of measures intended to influence Soviet calculations, namely measures to affect their estimates of the probable level of SAC survival and measures to affect their estimates

of our strategy choices. While we think the latter are of real importance, we believe that the more important deterrent consideration for the Soviets is their estimate of what the level of SAC will be after their first attack. In any case, it is fortunate that some of the most important measures (for example, the provision of a hard core portion of SAC) serve to affect Soviet estimates of both SAC survival and U.S. strategy choices.

Chapter 6

IF WAR COMES: THE CHOICE OF STRATEGIES

It is not uncommon to discuss deterrence without considering too closely how it would affect the conduct of war, if war should come. The reverse type of discussion seems more difficult, or at least on first thought artificial. Nonetheless what we wish to do in this chapter is to discuss wartime strategy without concern for any effects that measures taken in advance of war to implement these strategies might have on the prevention of war.

In considering what a good wartime strategy might be, many factors have to be taken into account. The choice of strategy is not simply a matter of examining U.S. utilities.

I. INTRODUCTION

A. Uncertainty

The choice of the wartime strategy actually to be carried out should war come will in the last analysis have to be made under conditions of considerable uncertainty. As should already be clear, optimal U.S. strategy may in part depend upon Soviet actions.

(1) One of the factors of greatest uncertainty which could influence the U.S. choice of strategy is the targeting of the Soviet second attack following a successful surprise attack (S_{20}/S_{40}). The United States would like, if it could, to make

its choice with knowledge of whether in this second attack the Soviets have chosen mainly military targets or whether they are also going to attack U.S. cities. However, the U.S. must launch its first strike not knowing whether the Soviet incoming second attack is targeted for U.S. cities or not. The Soviet first and/or second attack may, of course, be accompanied by demands for surrender and threats intended to bring about immediate capitulation. Soviet threats might reveal something about the targeting of the Soviet attack which was on its way, but it would not be clear to what extent the United States could or would believe them.

Tables 4A and 4B, which assume military (4A) and civilian (4B) targets for the S.U. second attack, suggest that some differences in the U.S. choice of strategy would occur if the U.S. knew for certain the nature of the Soviet second attack. Further work might well indicate that even more strongly differentiated U.S. strategic choices would be to the U.S. advantage in the two cases we have distinguished.

(2) If the Soviets do not achieve surprise (S_{60}/S_{80}) the U.S. first reply will be launched without certain knowledge of the target system in the Soviet <u>first</u> attack. (In our analysis we have, however, assumed that the first Soviet strike is confined to military targets.) Warning may tell the United States something about the size of the attack, and from this some rather uncertain inferences might be drawn. Unless the first attack is on a really massive scale, the U.S. would almost

necessarily assume that the bulk of the attack is directed against SAC.

(3) A third source of uncertainty are the probabilities to be associated with the successful and unsuccessful outcomes of the Partial Withholding Strategies (cf. Tables 4A and 4B). Of course, all strategies have highly uncertain outcomes, but the Partial Withholding Strategies are a rather special case, since the uncertainty here attaches to a very special event: in the face of U.S. intra-war threats, will the Soviet Union be able and willing to recall its second attack once it is launched? If the chances are considered good (say, 1 in 3 or better) that the Soviets would indeed recall their forces, the Partial Withholding Strategies are attractive. On the other hand if the likelihood is thought to be quite small (less than 1 in 5), the Partial Withholding Strategies appear to be marginal or to provide a lower expected value than some of their competitors. Not only will U.S. leaders be in doubt as to Soviet willingness to recall the force that they have launched, but certain questions of feasibility, such as how far out the second attack is, will arise. For example, when the U.S. is launching its counterstrike, it may not know how much time the Soviets would in fact have in order to receive U.S. threats and come to a decision to recall their forces. It may already be too late to try a Partial Withholding Strategy with the aim of turning back or preventing the launching of the large Soviet attack. The whole question of the potential usefulness of Partial

Withholding Strategies will be taken up in more detail later.

(4) A fourth source of uncertainty is U.S. ignorance about how much information the Soviet Union has about the extent of its success in its first (surprise) attack. For several reasons the Soviets may not know very well whether they have achieved S_{20} or S_{80}. This raises the possibility of bluffing on the part of the United States. For example, in S_{20} we might send all of the force remaining to us and at the same time "claim" that we had a larger force which had also survived in reserve. This means following an all-out strategy while claiming a Partial Withholding one. We have not included such strategies in our utility tables, but clearly they deserve some consideration.

(5) Undoubtedly, once war has come, the execution of an invariant strategy fully decided upon in advance would be easier than choosing a particular strategy according to the special conditions under which the war was initiated and a best estimate of the course of events and of enemy intentions. However the gains to be made, or disasters to be avoided, through more flexible war planning seem too great to ignore. Should war come it seems likely that the United States will have to choose its first moves in conditions of considerable uncertainty concerning crucial factors. Any discussion of wartime strategy will have to take this into account. This difficulty, however, does not preclude advance planning and advance decisions for different hypothetical contingencies and varying degrees and types of uncertainty.

B. Objectives and Expectations

In the period 1959-61 if the United States strikes second (in an all-out preventive war launched by the Soviets, with a rather vulnerable SAC posture and with an unfavorable missile balance) it can aspire to obtain a real military win only in exceptional circumstances.[1] Given the available and projected military budget, we are constrained to view the choice of strategy as a choice among methods of obtaining the best outcome short of clear-cut victory.[2] "Best" is defined in terms of the postwar military balance of power, the general world position of the U.S. and the magnitude of U.S. destruction. We, therefore, view the use of the military forces remaining after the first enemy strike as part of a "bargaining" process. Indeed, a good many of the informal war scenarios that led to the utility matrix of Table 4A ended in a "negotiated" termination of the war. The high negative utilities associated with S_{20} and S_{40} reflect in the main the very low bargaining power conferred by the possession of small forces after the enemy's first strike.

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[1] There is, of course, no reason why the U.S. must allow the military balance at the onset of war to be an unfavorable as it is likely to be in 1959-61. Indeed it is perhaps too early to abandon the hope that with really effective measures the U.S. could absorb a first strike and still have a winning strategy. But this would require a major national effort.

[2] This, of course, is not meant to exclude seizing every opportunity that Soviet errors or sheer chance might provide for achieving complete military victory.

The point to be emphasized is that even all-out war is unlikely to be exclusively a military problem. Obviously the "bargaining" process and the "negotiated" termination of the war to which we refer above cannot be conceived as a process of extended diplomatic activities or even of communications of any real length or complexity. We have in mind largely peremptory communications such as "Do that or we will do this," "If you stop, we will stop," or very little more. A more extended bargaining or threatening process would undoubtedly ensue after (nuclear) hostilities had ceased; and one of the criteria about the desirability of terminating hostilities would no doubt be U.S. forecasts about the outcome of this process as compared with the outcome of continuing the nuclear war. We have already indicated the great importance we attach to the problem of inter-governmental communications in a nuclear war and would like to emphasize it again in the present context. Our view is that the very great difficulties, uncertainties and evident objections that one might have to the entire idea of inter-governmental communications in wartime make a closer examination of this subject all the more important and urgent.

C. Flexibility and Inflexibility

Putting aside the complication introduced by uncertainty with respect to the target objectives of the second Soviet attack, one might, in principle, even within the context of any Soviet target choice wish to choose a different U.S. response or strategy

according to the percent of SAC surviving the first attack. However, there appear to be severe constraints upon the amount of flexibility in the choice of strategy one can afford to buy in developing a strategic force, particularly when the final choice will have to be made with great rapidity just after the war has begun. Thus some compromise of the ideal response structure indicated by a matrix may have to be made.

There are several flexibility problems: (1) the flexibility of switching from a prewar deterrence-maximizing posture to the execution, once war has begun, of an attack strategy that may be different; (2) more generally, the operational flexibility that would permit a choice between several war strategies immediately after the war has begun; (3) flexibility in choosing among particular targets within some overall system of targets. In one respect these are all the same problem. They all require that a particular crew or missile be capable of attacking several different targets and of using a variety of launch times and approaches to the Soviet Union.

While our immediate concern with flexibility is associated with the problem of switching strategies, in fact flexibility is an important problem in other contexts of current war planning. In these the interest is primarily in flexibility with regard to individual targets of a single target system. Unless the reflex and alert forces get off intact or unless one foregoes any attempt to maximize the effectiveness of the non-alert portion of the U.S. strategic air force, the problem of last-minute

replanning of U.S. strikes for optimal use of the remaining forces is crucial. Calculations suggest that the efficiency with which SAC can use the force remaining to it after even a moderately successful Soviet attack is very low unless there is some capability for switching target assignments among crews and rearranging the coordination between tankers and bombers. In many cases all or most of the SAC aircraft assigned to targets of high priority may be destroyed in the Soviet first strike; without a capability to reassign targets these high priority targets may not be attacked in the first U.S. counterstrike. In addition, even if some of these aircraft do survive they may abort or may not get to the Soviet Union because of disturbed coordination between tankers and bombers. This may require that other aircraft be capable of assuming the target objectives of the ones that failed to get through. Even a minor capability of switching from low to high priority targets could be very important. Thus if SAC is hitting at Soviet population, it will be important to assure that there are aircraft assigned to the largest Soviet cities (and not to Tomsk simply because the aircraft crew trained for this target survived). Or if SAC is hitting counterforce targets, primary interest will be in the large Soviet medium bomber force which may comprise the bulk of the Soviet big second attack. The medium bomber force will have to take off from advanced staging bases because of their short range. Hence there will be a great urgency to destroy these bases. SAC must be able to assure that aircraft

assigned to these targets but destroyed in the Soviet first strike can be replaced by surviving aircraft previously assigned to less important missions.

The effective utilization of flexible capabilities involves knowing what percent of SAC has survived (S_i) at the time when the order to launch one or another type of attack has to be given. Communication and control capabilities are crucial if the response appropriate to a given S_i is to be made. Even without adequate communication it may be possible in some cases to infer which S_i has arisen or is likely to arise. For example if the United States receives warning and acts on it, it might be reasonable to assume that S_{60} or S_{80} is likely and choose accordingly. The reflex forces, especially the overseas ones, are a special case. It may well turn out after analysis that the only targets one ever wants these forces to attack are counterforce targets. In that case no problem of switching between target systems exists for them. It may be possible to arrange the other forces in such a way as to correlate their vulnerability and likelihood of survival with the kind of target they are to attack if they survive.

The flexibility problem is obviously one of enormous importance. Considerable work could well be devoted to finding out just how much flexibility the U.S. strategic forces could have and what its best use might be.

II. EVALUATIONS

A. Strategy Choices for 1959-61

Our earlier discussions of strategy choices for 1959-61 were based largely on the entries in the S.U. and U.S. utility matrices and were intended to indicate some of the implications of these matrices for the choice of strategy. These discussions did not take into account problems of uncertainty, flexibility and feasibility which would still affect U.S. strategy choice even if we had sure knowledge of U.S. and S.U. utilities. The remainder of this chapter attempts to restate the problem of strategy choice in the light of the difficulties presented by uncertainties, feasibility considerations, and limitations on flexibility.

In trying to choose the best strategies for the United States, if war should come in 1959-61, we can only venture our personal opinions. There is no clear cut dominance of any one strategy. A choice of strategy will depend upon such factors as subjective probability estimates of the likelihood that the Soviet second attack will be directed at military targets rather than city targets, the likelihood of successfully using Partial Withholding Strategies to stop the Soviet second attack by means of threats against Soviet cities, and the relative likelihood of the various levels of SAC survival (S_i). The latter factor intrudes because the strategy requirements are relatively different for each level.

Below we present some very tentative summary statements that take into account two of the uncertainties that were discussed earlier, namely (a) what the Soviet target system will be for its big second attack (military targets or city plus military targets); (b) the probability that a Partial Withholding Strategy (partial strike plus threat of city bombing by remaining force) would lead the Soviet Union to terminate the war. These summary statements represent a combining of Tables 4A and 4B (p. 77) and a combining of the two utility numbers in the cells of the Partial Withholding Strategies. It should be emphasized that the numbers that are being combined and the probabilities in terms of which weights are applied to arrive at the new combined utilities are all highly speculative. The views expressed below are only suggestive of the type of results that the present method of analysis generates. Any judgment of their validity would rest on the acceptability of the numbers that have been introduced.

1. We examine first the case in which only <u>20 per cent or 40 per cent of SAC survive</u> the first Soviet attack.

(a) Irrespective of the probabilities that might be assigned to the Soviet choice of military or population targets, the Mixed Target Strategy (MT-PT) is preferred to either of the other two "all-out" strategies (Population Targets; Military Targets).

(b) The Partial Withholding Strategies are preferred to the Mixed Target Strategy only if (1) the probability that the second Soviet attack will be confined to military targets is quite high (about two-thirds), and (2) the chances of the intra-war threat used in the Partial Withholding Strategies of getting the Soviet Union to abandon its second attack are better than they are likely to be (say, higher than 1 in 10). If we assign an equal probability (which may be the most reasonable guess) to the two main Soviet target choices for their second attack, the Partial Withholding Strategies would have to have a 1 in 5 chance of succeeding to be able to compete with the Mixed Target Strategy. This requires an unreasonably high expectancy of success. We conclude, then, that when only 20 per cent or 40 per cent of SAC survive, the Mixed Target Strategy is to be preferred to both the other all-out strategies and probably to the Partial Withholding Strategies.

(c) Although the Partial Withholding Strategies are not preferred to the Mixed Target Strategy, they are, nonetheless, at their best in the case of a low level of SAC survival (20 per cent and 40 per cent). As we shall see later, the addition of other factors (a hard core force with good intra-war survivability, and a high yield weapon capability) would make the Partial Withholding Strategies of greater interest in the 20 per cent and 40 per cent SAC survival cases. In the 20 per cent case the Partial Withholding Strategies would be competitive if for any reason we were able to assign a high probability to

the Soviets confining their second attack to military targets.

2. We examine now the case in which 60 per cent or 80 per cent of SAC survive the first Soviet attack.

(a) As the level of SAC survival increases the Mixed Target Strategy (MT-PT) become still more clearly the strategy of choice. Any reasonable assignment of probability to the Soviet choice of target on its second attack leaves the Mixed Target Strategy with a fairly clear margin of superiority (on the basis of the numbers we are using) over both the other all-out strategies and over the Partial Withholding Strategies. The latter would now have to have a one in three chance of success to be able to compete with the Mixed Target Strategy.

The fact that the Mixed Target Strategy comes out with a superior utility rating in so many of the foregoing comparisons mitigates considerably (within the framework of our numbers) the problem of achieving a flexible capability for several strategies. (The ability to shift aircraft and crews among individual targets within a single target system still remains an acute problem). Nonetheless the Mixed Target Strategy shares, in the 1959-61 period, together with the Population Target (PT) and Military Target (MT) strategies a severe limitation. At present our programmed forces appear to enter this period with a one strike capability, which further is limited by the fact that these forces cannot safely be withheld, even temporarily, and used as a threat. Thus the United States is forced, should war come, to commit its forces immediately against Soviet cities

or against counterforce targets, or both, at a time when almost nothing is known of Soviet strategic intentions. In launching its strike the United States will deprive itself almost completely of forces for second or third strikes (1) because most of the forces that do not get off will be destroyed on their bases and (2) through enemy attrition or because they are out of commission on post-strike staging bases[3] a very high attrition of the forces sortied on the U.S. first strike results. The main hope for second and third strikes depends upon improvised forces and the regrouping of that small fraction of the sortied force able to make a round trip without touching down outside the United States.

Fighting a war in which the enemy strikes first depends crucially on having a capability for continued military operations beyond the first strike or two of a war. At present some Partial Withholding Strategies (of a somewhat different type from those discussed in our paper) that seem potentially attractive are unlikely to be available.[4] These strategies depend

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[3]Most of the planned post-strike bases will not exist when they are needed, having been destroyed before the first SAC aircraft complete their missions. Many aircraft will have to crash land, others will have to divert to less suitable fields where there may be no POL, etc. In many cases, they might well be interned. All of the B-47's have to stage after their first strike.

[4]The Partial Withholding Strategies treated in the paper required the recall of the Soviet second wave to be a success. If the second attack does not turn back these strategies become a delayed execution of one of the all-out strategies. Thus the current state of high intra-war vulnerability of the U.S. strategic forces places almost impossible demands upon the withholding strategies for their success. With a different vulnerability

upon a continuing ability of strategic forces to avoid destruction and remain operational. Not only are our current strategic forces vulnerable but also their operations depend crucially on the existence of their home bases. Even if most of SAC aircraft and crews survived an attack, their continued sortie capability might be quite small unless certain crucial other elements can be supplied to them. Of course, it might be possible to improvise the supply of these elements after war has actually started, but some stockpiling and planning for such operations are bound to have an enormous payoff.

In the foregoing discussion of the strategies entered in the U.S. matrix, we have ignored the Withholding Strategy. This strategy assumes quite special circumstances, namely that the United States has received strategic warning or extremely early tactical warning of the first Soviet attack. In this strategy the United States reveals to the Soviet Union that the latter's attack or attack preparations have been detected, with the intent of securing an immediate termination of the war.[5]

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posture for at least a portion of the strategic forces, less difficult and very important roles can be played by the Partial Withholding Strategies. Indeed the capability of retaining some irremovable level of threat against the enemy population may be the most important bargaining element a nation can have for avoiding the worst contingencies in all-out nuclear war.

[5]It is worthwhile noting that the commander of the Japanese fleet that attacked Pearl Harbor was under orders to return if the fleet was detected before a certain point had been reached. It is less likely that the Soviet first attack force will receive similar instructions to cover a case of very early detection. Still it is not impossible that the Soviet leaders might recall the attack when they know that most of SAC is virtually certain to survive their "surprise" attack.

(Cf. the brief account of this strategy, pp. 28, 76, 95). Here we wish to add only two remarks: (a) the utility of this strategy if it is successful is obviously very high (at least in the short run) and it deserves more study; (b) this strategy, which presupposes more or less unequivocal warning of an S.U. attack, is a special case of a wide spectrum in which the warning we receive may have varying degrees of equivocality. The strategy raises, then, not simply the question of what to do in the case of unequivocal warning but also what to do beyond ordinary alert procedures when the warning is equivocal.

We will now complete our discussion of U.S. strategies by considering in somewhat greater detail three questions: Why is carrying out the Population Strategy (PT) ineffective? Why is the Mixed Target (MT-PT) Strategy so strong? What are the prospects for the Partial Withholding Strategies?

B. Why is Carrying Out a Pure Population Target Strategy Bad?

From the Soviet utility matrix on page 31, and the discussion in Chapter 3, it appears that the threat of city destruction is indeed a powerful deterrent, particularly when the portion of SAC surviving the initial Soviet attack is sizeable. Discussions of the problem of deterrence often make it seem inevitable and correct that the use of this threat before a Soviet attack will be followed by its execution if the attack materializes. Indeed, in public thinking about retaliation, it is usually assumed that our counterstrike will include and in

many cases be concentrated upon a large number of Soviet urban centers. Whether such-and-such a weapon can reach Moscow is often taken as the most important test of its utility. This preoccupation with the destruction of Soviet cities seems to be due to the following factors:

(1) It is apparently assumed that it is not possible to combine military attacks with large scale civilian losses; that is, the possibility of a Mixed Target Strategy is ignored. Our assumption that this strategy can secure large civilian casualties with relatively little sacrifice to the effectiveness of the military attack may be over optimistic. But this would first need to be demonstrated. Even if the penalty on amount of civilian damage achieved is greater than we suppose it is, the Mixed Target Strategy would still provide a considerably greater payoff than the Population Target Strategy in S_{60} and especially in S_{80}.

In the Mixed Target Strategy the penalty to civilian damage imposed by trying to secure it as a "bonus" is likely to be greater the smaller our residual forces are. The tendency to ignore this strategy is more understandable in these instances. But it is far from self-evident that even in S_{20} and S_{40} a pure Population Target Strategy is preferable to the Mixed Target Strategy (not to mention other possible strategies).

(2) It is assumed that the initial Soviet attack will almost surely produce extensive damage to U.S. cities; first, because the wish to destroy American cities is attributed to

the Soviets as one of their prime war objectives; or secondly, because certain patterns of target choice that are common in U.S. strategic studies are attributed to the Soviets. In such studies, Soviet target systems even if militarily oriented, often include a great many targets near or in major U.S. cities that are of doubtful importance for military operations during the first phase of a total nuclear war. Thus, even when a militarily oriented target system is attributed to the Soviets, this often results in calculations of large-scale damage to U.S. cities. Given this view of the probable destruction of many U.S. cities on the Soviet first strike or immediate follow-up waves, it is concluded that the United States has no reason to refrain from hitting Soviet cities. Another reason for the common U.S. assumption of an initial Soviet strike against U.S. cities is the neglect of sneak attacks for mass attacks in analyses of Soviet initiated wars. If a first mass strike is assumed, then a Soviet Population or Mixed Target strike has somewhat more plausibility.

(3) A third factor in the preoccupation with hitting Soviet cities is a conviction that it is not feasible to attack anything else in a retaliatory strike. SUSAC's first strike might so weaken SAC that any counterattacks on SUSAC (which would in the meantime have reduced its prewar vulnerability through dispersal, etc.), are sometimes thought beyond its strength. On the other hand, it is assumed that cities are

rather soft, stationary targets.[6] Also it is often assumed that deficiencies in U.S. knowledge of the location of Soviet air force bases, and potentialities for hiding the Soviet air force, make it impossible for SAC to carry out a counterforce strike effectively, even were it to survive the Soviet first strike in relatively good shape.

Thus it is often thought that (a) it is not possible to combine great civilian damage with military attacks; (b) the U.S. will have no incentive to avoid hitting Soviet cities, since U.S. cities will already have been attacked; and (c) the U.S. will be unable to hit any other target system. These views, in conjunction with some vagueness in thinking about the rationale and rationality of our retaliatory strikes (in general, a failure to analyze what motivations and expectations could justify various types of U.S. return strikes) have some times tended to leave unanalyzed U.S. potentialities for attack against targets other than cities. Thus policies of curtailing

[6] While cities are stationary, the urban populations need not remain so. With even cheap civil defense preparations the Soviets could evacuate the city populations to places of safety. This is true even when rather large U.S. retaliatory strikes are considered, let alone the smaller attacks they can more or less count on if they achieve S_{20} or S_{40}. Only when the United States will be able to hit Soviet cities within less than an hour after the first bombs fall on the United States, will there be a major problem in evacuating the Soviet cities. Evacuated populations may, of course, still be vulnerable to fallout, but this is precisely the circumstance that may lend special point to the Mixed Target Strategy that avoids direct city bombing in order to achieve population damage while attacking military targets.

retaliation and using remaining U.S. forces for their bargaining value do not seem to have been considered.

How reasonable are these views? Let us examine first the belief that the United States will have no incentive to refrain from hitting Russian cities because the U.S. will have already suffered significant destruction. Our view is that there is at least a better than even chance that no major U.S. cities will be hit in the Soviet first strike and a substantial likelihood that even the large second attack will be devoted to a military mop-up.

It is not at all certain that it is to the advantage of the Soviet Union to destroy U.S. cities in its initial operations. First, the need to maximize the probability of attaining strategic -- and in the case of manned bombers, tactical -- surprise, may constrain the S.U. to launch a rather small initial strike targeted only for essential missions -- those of reducing the U.S. capacity to retaliate. There is no immediate need for the Soviet Union to destroy many nominally military targets in the United States. (S.U. missiles, however, could be used for simultaneous attack on cities without jeopardizing tactical surprise, although they presumably would involve some danger of giving the United States strategic warning. The latter could be minimized by delaying the missile strike briefly.)

Second, there is no direct military incentive to attack any U.S. cities on the first wave, unless there are persuasive Soviet calculations that destruction of certain control centers

would reduce the effectiveness of whatever retaliatory strike the United States may choose to launch, or would paralyze the U.S. will strike back.[7] The Soviets would have the greatest incentive to achieve such effects if they feared that their attack might leave SAC with a very large residual striking capability (S_{60}, S_{80}). But S_{60} and S_{80} signify (in our scheme and very likely in Soviet calculations for the 1959-61 period) failure to achieve surprise. In these cases U.S. forces are launched before the Soviet attack is on targets. Consequently the inclusion of organization centers and other cities in the Soviet first attack cannot achieve the disorganizing or paralyzing effects (on the U.S. first counterattack) that would presumably motivate such a target selection. These motivations and expectations could effectively apply only to cases S_{20} and S_{40} (or to U.S. subsequent attacks in S_{60} and S_{80}), that is to cases where their possible payoff is significantly smaller. But even in these cases the Soviets would have to balance two opposed effects of city bombing: possible disorganization and paralysis of U.S. military activity on the one hand and an increased impulse to hit back in the most damaging way possible, that is by city attacks on the Soviet Union. Furthermore, in S_{20} and S_{40}

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[7] There may of course be such calculations, and we do not deny that the Soviets might attack U.S. cities, especially with the large second attack. In addition to the possible military advantages that attacks on U.S. control centers might give, the Soviets might feel that some level of damage to U.S. cities may make the United States politically more vulnerable and more easily controllable after the war which the S.U. hopes to win.

the Soviet Union might hope to forestall a U.S. reply attack by threatening, at the time of their successful surprise attack, total destruction of U.S. cities if it retaliates. Third, the Soviet Union has a significant interest in not hitting U.S. cities since it may wish to use them as hostages for the inviolability of its own urban centers. They may make this fully evident by threats at the time of their initial strike.

A plausible Soviet first strike appears, then, to be one oriented toward (a) the maximum disarming of the U.S. capacity to retaliate, and (b) creating a situation in which the United States has an incentive not to employ its residual strategic forces to destroy Soviet cities. If the Soviet Union is successful in largely destroying the U.S. capacity to retaliate, it clearly has the ability to threaten and to destroy U.S. cities irrespective of the target system the United States chooses in its reply. If the Soviet Union fails in its attempt to disarm the United States, the fact that it has not destroyed U.S. cities gives the United States an incentive to engage in counterforce actions or to seek a favorable settlement. We have seen that the U.S. and S.U. utility interests coincide on this score. If the United States does engage in city destruction, the Soviet Union still has a similar attack on the U.S. open to it. A detailed presentation of a variety of possible scenarios of the first few days of the war would help the reader to evaluate some of the consequences of the various patterns of target choice by both sides. We have not attempted to present

here the rather lengthy discussions that we have developed, but the reader should be able to construct some interesting possibilities for himself.

There appears, then, to be grounds for not wanting to go through with a pure Population Target Strategy against the Soviet Union immediately after a first strike against SAC. (1) Such a move would probably not add to the protection of the United States since it would leave S.U. strategic forces largely intact. (2) It would very likely raise the enemy's incentive to destroy U.S. cities. Actually, destroying his cities would, in this context, amount to using up the U.S. threat most appropriate for the protection of U.S. cities.[8] (3) The attrition of SAC

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[8] A recurrent problem in many of our informal scenarios stemmed precisely from a situation in which the U.S. had carried out the maximum city destruction in its power, depleting its residual strategic forces without eliminating any sizeable proportion of the S.U. strategic force. We then found that the threat and bargaining position of the S.U. commanders was tremendously enhanced by removing any necessity for the S.U. to preserve its civilian society. The U.S., in effect, had given to the S.U. the maximum freedom of action (within the admittedly severe constraints imposed by the massive destruction of its civilian society), while the U.S. remains constrained by the desire to prevent (if it can) a similar disaster to its own civilian society. To be sure, this point has special force only when the U.S. population strike has been very successful. The smaller the amount of S.U. civilian destruction, the less is the freedom of action of the S.U. commanders (assuming that their will to act will not collapse short of some unattainable level of civilian destruction).

While it is rather trite to state that if Western power is utterly destroyed the Soviet Union could rule the world, it should be pointed out that if the S.U. society is destroyed, the S.U. military commanders are likely to discover that they have a monopoly of tremendous destructive power at their disposal and nothing else to govern except the non-Soviet world. If they can maintain control over their strategic forces and their troops one can envisage

suffered as a consequence of SUSAC's initial strike combined with SAC's all-out population target strike would enhance the capacity of SUSAC to perform continued counterforce strikes against SAC in S_{60}/S_{80} and against a wider range of targets in S_{20}/S_{40}.

If the Soviet Union does include U.S. cities in the first strike and/or uses the large follow-up second attack to destroy as many U.S. cities as possible, the best U.S. reply is not necessarily a strike exclusively oriented toward the destruction of S.U. cities. The U.S. aim in striking back should be to end or diminish the Soviet capacity for further blows against both the U.S. strategic military forces and U.S. cities. There are probably greater prospects of doing this by operations that include counterforce attacks (MT-PT or MT) or by a Partial Withholding Strategy. After the war has started, it is doubtful wisdom for the United States to indulge in such luxuries as vengeance and retribution, while leaving SUSAC largely untouched.

Are there, nonetheless, any arguments for going through with the Population Target threat? Three may be mentioned: (1) Although societies, as distinct from individuals, have seldom been thought to have an interest in sacrificing themselves for some larger (supra-national) good, one might argue that from the point of view of world history, it would be a bad precedent

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the Red commanders "taking over" and issuing commands to the world from the rubble of Moscow -- or points westward. A few informal war games tend to make this version of future history seem less fanciful than it may strike the reader.

in the nuclear age not to carry out the threat of city destruction in the circumstances that the prewar threat had envisaged. The nation may have no interest in proving its honorableness by a willingness to forego the use of militarily more expedient strategies. Still it is clear that if one or more nations risked defeat and perhaps annihilation to engage in punitive action rather than pursuing a course based on military considerations and self-interest, deterrence might in the future be much more effective. (2) Particularly in the S_{20} and S_{40} cases the population and capital losses inflicted on the Soviet Union by a Population attack (together with political changes that this might produce) might compensate considerably for the postwar military power difference between the Soviet Union and the United States, provided that the subsequent cessation of the war is speedy enough to forestall, or does not in any case involve extensive destruction of the United States. The sureness and swiftness of U.S. retaliation on S.U. population targets, in conformity with prewar threats, might restrain the Soviet Union from striking back at our cities since the war, after the U.S. strike, might be effectively over. It is clearly very difficult to say anything about the final outcome of a situation in which the "winner" of a nuclear war with a severely damaged society attempts to impose terms and to exact reparations from a relatively undamaged and wealthy adversary.[9] (3) A pure Population

[9]Most of our discussion refers to a situation in which both the S.U. and the United States have no effective civil defense measures. Any alteration in this assumption radically alters the analysis.

Target attack on the Soviet Union might disorganize or paralyze the Soviet strategic forces. We have already discussed this possibility. Our view is that in S_{20}/S_{40} this cannot reasonably be expected; and that if such possibilities exist at all in S_{20}/S_{40}, they would rest on population attacks combined with direct attacks on SUSAC, that is, on using the Mixed Target Strategy. In S_{60}/S_{80} the hoped-for paralysis and disorganization of SUSAC is more likely to occur when the Mixed Target Strategy is used, with its massive direct attack on SUSAC while inflicting at the same time very heavy civilian losses.

C. Why is the Mixed Target Strategy So Strong?

The answer to this question may seem self-evident. Under the assumptions made in this paper the attack on military targets with high yield weapons and ground bursts is assumed to yield a high level of civilian casualties while imposing only a small or moderate limitation on the effectiveness of the military attack. Since this strategy accomplishes in one blow the objectives of the pure Population Target Strategy (PT) and of the pure Military Target Strategy (MT), it is not surprising that it shows up so well in comparison with the other two strategies. However, whether the virtue of the Mixed Target Strategy is self-evident or not, we know of no evidence that suggests that our assumption (that civilian losses can be attained as a "bonus" with only moderate sacrifice of military targets) is necessarily wrong. Our analysis suggests that this

strategy may be so superior to others that a close determination should be made (a) of the amount of sacrifice of the effectiveness of military attacks involved in trying to secure population damage as a "bonus"; and (b) the amount sacrificed in population damage in trying to cut down S.U. strategic forces.

Although there are evident attractions in including population in a military attack, we have already noted a number of disadvantages resulting from a pure Population Attack. A question arises, then, as to whether these disadvantages are not present also in the Mixed Target Strategy because of its population component.

We shall discuss now a number of advantages and limitations of the Mixed Target Strategy. The Mixed Target Strategy produces a high measure of population damage, <u>while considerably diminishing SUSAC capabilities for hitting back</u>. However, this reduction in Soviet capabilities for retaliating against U.S. cities could in all likelihood, only be achieved in significant degree when a substantial portion of SAC survives (S_{60}/S_{30}) unless the population damage to the Soviet cities itself contributes heavily to a diminished SUSAC capability for continuing strikes. We do not believe that in S_{20}/S_{40} this latter effect is large, and in particular is unlikely to occur unless some form of improvisation of continued S.U. capabilities is required. In this latter case the use of civilian workers in operations designed to recover and ready the Soviet strategic force for further strikes would be one mechanism by which some such effect

might take place. This effect might be reinforced by the radioactive environment in which the Soviet third attack (S_{20}/S_{40}) or the Soviet second attack (S_{60}/S_{80}) would have to be launched. When 60 per cent or 80 per cent of SAC have survived (S_{60}/S_{80}) the widespread civilian destruction, the failure of the initial SUSAC strike and the radioactivity problem may make SUSAC centers and crews unwilling to operate further even if the high command so orders. We do not know how to evaluate this latter possibility, but our impression is that it is an event of low probability. We would, however, suppose such an event to be more likely following the Mixed Target attack (MT-PT), in which SUSAC has been severely hit, than following a pure Population Strike (PT) which has left SUSAC untouched by direct attack.

The estimated large-scale destruction of Soviet population resulting from the Mixed Target Strategy imposes heavy losses in S_{60}/S_{80}, which might be capitalized upon by U.S. statements and offers to end the war; in S_{60}/S_{80} such offers might be welcome since we assume that the Soviets initiated the war in the belief that they would achieve a high level of SAC destruction. However, a termination of the war after the failure of a Soviet small surprise attack and after a U.S. Mixed Target response, would leave the Soviet Union in a markedly inferior military and economic position -- virtually a lost war-- and they would, for this reason, have very great incentives to continue the war.

Since the first U.S. strike in response to Soviet attack may be the only SAC strike of substantial size that it is possible to launch, the Mixed Target Strategy may provide the only opportunity to produce certain effects that are quite important from a long-term point of view. Large-scale capital destruction and population losses may hinder Soviet exploitation of any military advantage it may achieve in a war. Also, if the war were to end rather soon after the one and only SAC strike, the relative position of the U.S. and S.U. economies might be such that the post-war recuperation of the Soviet Union would be slower than that of the United States. In this paper we have not dealt with some of these longer-term effects which are of such obvious importance, but are also very difficult to analyze. A good deal of work on the long-term consequences of various war outcomes is surely needed.

Detailed technical studies would be required to determine how much less population damage would be inflicted by the Mixed Target Strategy than by the pure Population Strategy. Such studies would have to take into account the two following considerations: (a) If only a small proportion of SAC (S_{20}, S_{40}) survives the Soviet first attack, this signifies (under the assumptions of this paper) that the U.S. has received little or no warning. Consequently the Soviets would have considerable time (say, 8 hours) to effect evacuation of cities. In these circumstances the bombs used against Soviet cities in a pure Population Attack may not be much more effective in producing

casualties than the bombs used in the Mixed Target Strategy against bases near cities. Of course bombs dropped on cities would still effect great damage to the physical structure of the cities even if the population had fled, but physical urban damage is not likely to play a decisive role in collapsing or limiting the Soviet war effort at these levels (S_{20}, S_{40}) of SAC attack. (b) If a large proportion of SAC survives the first Soviet attack (S_{60}, S_{80}), this signifies (under the assumptions of the present study) that the United States has received tactical or strategic warning. In these circumstances the Soviets have less time available to effect evacuation. A pure Population Attack on cities would, then, very likely impose considerably heavier casualties than the Mixed Target Strategy. However, in S_{60} and S_{80} the strength of SAC is sufficient to enable it to attack numerous marginal bases and military installations. This extensive target pattern would (with ground burst weapons) also produce heavy civilian casualties. Given the likely failure of the pure Population Attack to eliminate or even significantly cut down Soviet strategic capabilities, we would guess that the Mixed Target Strategy would have a considerably higher total payoff despite the lower population damage that it would produce.

The Mixed Target Strategy may, as compared with the Military Target Strategy, increase the chances of an all-out Soviet attack on U.S. cities. Of course, the Soviets may decide in any case to attack U.S. cities in their first or second attack;

in this event the Mixed Target Strategy scarcely risks anything. If, however, the initial Soviet attacks are confined mainly to military targets, the risk of inciting attacks on U.S. cities are obviously great, although possibly mitigated by the fact that the U.S. Mixed Target Strategy does not directly attack city populations.

As we have seen in looking at the more favorable side of the Mixed Target Strategy, Soviet willingness (when 60 per cent or 80 per cent of SAC has survived) to end the war after the U.S. attack seems, in effect, to leave them with a lost war. We must, therefore, assume that they will have very strong incentives to risk further losses for an opportunity to attain a better power outcome. A pure population second attack by SUSAC does not, in S_{60} and S_{80}, overcome Soviet failure to cripple SAC in their first surprise strike. SUSAC could, however reply with much the same kind of mixed target strike that SAC uses in its counterstrike. This has neither the possible military futility of the pure terrorization strike nor the limitation, given their own state of civilian destruction, of a second pure counterforce action. They might expect that after this strike the United States would still be willing -- and very likely even more willing -- to call a halt to the war. But now the Soviets would have attained a situation of rough parity in military and civilian destruction and possibly a

balance in their favor.[10]

The above discussion and the utilities assigned to the Mixed Target Strategy in the U.S. matrices make certain feasibility assumptions. In particular, it is assumed that the population damage caused by this strategy is largely free. That is, with quite minor diversion of resources from the kind of attack that would be carried out in a pure Military Target Strategy, plus some shift in the operational carrying-out of the attack -- for example, ground bursting weapons -- it would be possible to inflict large civilian casualties. Given the target system for the Mixed Target attack (SUSAC bases plus those marginal bases most likely to be used for further operations but not currently used by the Soviet long-range air force), the attack would lead to considerable destruction of cities but with most of the population loss resulting from fallout. Even a rather cheap Soviet civil defense program could radically alter the vulnerability of the Soviet population to this mode of by-product attack. Indeed, such a Soviet program is feasible within the 1959-61 time period, and the assumed effectiveness of the Mixed Target Strategy against population might cease to

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[10] A parity after the first round (in S_{60} and S_{80}) would more likely occur were the United States to reply with a pure Military Target attack. In this case the Soviets, having got into a S_{60} or S_{80} war, might be much more interested in terminating the struggle immediately. Thus the civilian damage inflicted by the population component of the Mixed Target Strategy might, in S_{60} and S_{80} make the war harder to terminate after the U.S. reply than would be the case in a pure MT strategy or one of the Partial Withholding Strategies.

be true even in the near future. Any really extensive and large-scale Soviet civil defense program that included blast shelters as well as fallout protection would even more obviously alter the expectations one might have about the population effects of the attacks envisaged in the Mixed Target Strategy. It is not clear how one would evaluate the Mixed Target Strategy if the requirement of extensive damage to the S.U. population entailed a significant shifting of delivery capacity from military targets to direct attacks on population targets.

This is not to say that in the future, military target attacks with a substantial by-product of city destruction and fallout will not still be possible or have good results. Even the pinning-down of the population for a substantial period by extensive fallout, and the attendant complication of the recovery problem produced by widespread fallout would probably have a significant value. But these problems belong to the analysis of wars beyond 1961.

D. What are the Nature and Prospects of the Partial Withholding Strategies?

The withholding strategies have been considered so far under quite special assumptions of feasibility. The motive in withholding the larger portion of the residual SAC force following the Soviet initial attack is to threaten use of the remaining force against population to cause the Soviets to turn back (S_{20}/S_{40}) or cancel (S_{60}/S_{80}) its large second strike. If only 20 per cent or 40 per cent of SAC survive (S_{20}/S_{40}), the all-out

strategies totally deplete SAC (and probably without having inflicted really crippling damage on further S.U. strategic capabilities). In S_{20}/S_{40} an initial one-third U.S. retaliatory blow together with the threat of using the remaining two-thirds of the residual SAC for a city attack, preferably with very large megaton weapons (at least in the threat), might provide a better outcome than a single all-out strike.

When 60 per cent or 80 per cent of SAC survive, the expectation of intimidating the Soviets by a Partial Withholding Strategy would be considerably better, both because the initial one-third strike would have been stronger, and the remaining two-thirds strike is very substantial indeed. Since the Soviets fail to achieve surprise they do not have a sound basis for supposing that the initial one-third strike represented the total U.S. resources and that the United States lacks the forces to make the threatened two-thirds strike. In S_{20}/S_{40}, the Soviet Union might suppose that this is the case; but they might also believe that our residual two-thirds force is greater than it is.

However, the turning back or cancellation (even in S_{60}/S_{80}) of the Soviet second strike in the face of the U.S. threat delivered with the first limited (one-third) attack is unlikely. Hence, the Partial Withholding Strategies have not seemed very attractive. There are several reasons that make the Soviet turnback unlikely. First, there are questions of timing. The U.S. ultimatum would have to be delivered to the Soviets as early as possible following or coincident with the U.S. initial attack

so that there would still be time for the Soviets to reach a decision and, indeed, for it to be feasible for them to call back the force (S_{20}/S_{40}) or possibly to refrain from launching it (S_{60}/S_{80}). One of the feasibility problems is that the Soviet force may get beyond the actual communication range of the Soviet command if too much time elapses. In addition, since a large portion of the big second attack is composed of Badger aircraft, there is in effect a point of no return. These planes must therefore presumably be recalled before this point is reached. Otherwise an attempt to return may result in the loss of this portion of the force. Thus, unless very unusual arrangements are made -- such as refueling in neutral territory and returning to the Soviet Union -- the Badger component of the force, after a certain time, will have to continue on to target. Further, there are clearly certain difficulties, some of which are of a psychological nature, for the Soviets to overcome before they can make a decision to call back their second strike even if, as in S_{60}/S_{80}, it might otherwise be advantageous. The Soviets themselves might be attempting to use their second attack for purposes of threat and bargaining. In this case, a submission to our ultimatum would have to replace their attempt to threaten us.

In S_{20}/S_{40} the U.S. message would not reach them before their second attack force had taken off; and even if technically feasible it is probably psychologically much more difficult to have the flight turn back once it is launched than it would be

to cancel or at least temporarily hold the launching of it. In S_{60}/S_{80}, the United States has had warning and the one-third counterstrike together with the threat of the two-thirds follow-up might possibly reach the Soviet Union just before the big second strike takes off or only a relatively short time after it had been launched. A hazard for the Soviets, tempted as they may be in S_{60}/S_{80} to terminate the war, is that they have no guarantee that the United States will in fact forego its two-thirds strike. The U.S. withholding threat could be a deception strategy intended to delay Soviet execution of their second attack. This interpretation may not be made by the Soviets since a U.S. attempt at deception presumably could be made only at the cost of weakening the U.S.'s first counter-strike. It is not easy to suppose that in the few minutes available to the Soviets for reaching a decision they would feel capable of evaluating such a complex situation.

The Soviet Union could also engage in deception. Whether or not there was time enough for the Soviets to recall or cancel their strike, they might pretend to submit to the U.S. ultimatum while in fact continuing with their second attack force, thus possibly enhancing its effectiveness. Given its quite vulnerable forces, the United States would be sorely troubled in deciding whether the Soviet really meant what they said. This raises the unexplored question: what exactly are the tokens

of actual compliance.[11]

If a Partial Withholding Strategy is attempted and fails (that is, the Soviets second attack continues on course) the United States may wish to carry out a Mixed Target attack, or perhaps a Military Target attack even though city attacks had been threatened. In the 1959-61 period, when partial withholding fails, it would be necessary to launch the whole of the remaining strategic force because of its vulnerability to attack on the ground. There will be practically no capability for continuing a withholding strategy once the initial threats fail to turn back the Soviet second strike. The full two-thirds delayed strike will have to be made. This delayed attack will very likely be less effective than the prompt employment of one of the allout strategies.[12]

The Partial Withholding Strategies might, with some modification in the U.S. military posture, look better in the future. It might be possible to consider strategies in which an initial

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[11] If in S_{60}/S_{30} the U.S. were able to force Soviet surrender in an allout war, there are difficult problems of how the S.U. surrender is to take place, especially with regard to its remaining strategic capabilities. Are the aircraft to be flown to some neutral ground and interned? How are the missiles to be destroyed? What orders does one issue concerning the disposal of the atomic stockpile of the defeated enemy? Clearly these residual capabilities are still very threatening even after a formal avowal of surrender by the enemy.

[12] However, the fact that the two strikes involved in the partial withholding strategy show an increasing strength of attack might possibly, in a confused intelligence situation, give greater concern to the Soviets.

third of the force is dispatched immediately upon warning of the Soviet attack, another third if the threat failed to turn back the Soviet large second strike, retaining another third of the force for continued attack and bargaining as the war progresses. Obviously, some form of fairly invulnerable hard-core force would be useful as a final reserve. It is not clear how an intrawar ability to survive continued enemy attack and to maintain an operational capability can be attained. To our knowledge, there are no studies of this particular problem. However, a system of recovery bases for the evacuated force plus a hard-core component might achieve a respectable intrawar survival capability. Measures for rapid decontamination and an ability to operate in situations with moderate levels of radiation would also be required. In order to protect the evacuated force, the tactical warning system would have to survive, and an active air defense would play a large role in a situation in which repeated attacks are attempted by the enemy. Some hardening of the recovery bases might make sense, perhaps even the provision of shelters for some of the evacuated aircraft. Good security measures to make it as difficult as possible for the enemy to find the scattered force would make a big contribution. Finally, a capability for improvising augmentation to the surviving strategic force from the training command forces, possibly from the civil air lines jet aircraft, would help to pose a sustained counter city threat.

The object of continued withholding of some portion of the force is, of course, to have the bargaining power conferred by a continuing capability to do still more damage. If continued partial withholding were made feasible,[13] we could envisage several variants distinguished by: (1) the type of settlement the United States might propose; (2) the nature of the threat the United States would make with its residual force and (3) the proportion of residual forces withheld.

A capability for maintaining invulnerable the residual SAC force during part of the intrawar period is assumed in the following discussion.

1. Terms

U.S. threats are attempts to arrive at a settlement. It would be easy to multiply variants of this aspect of the U.S. partial withholding ultimatum. For our present purpose, two principal cases will suffice. (a) After S_{20} and S_{40}, the United States would probably have to content itself with trying to end the war. In such circumstances, the nation would be interested in maintaining its political independence, though it would not be strong enough, at least by means of a Partial Withholding Strategy, to circumscribe Soviet action elsewhere in the world.

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[13] If withholding (and our preoccupation with it) strike the reader as somewhat bizarre, he might, as we have suggested earlier, be able to naturalize these conceptions in his own thinking by translating the term 'withholding' into more conventional military language, namely 'strategic reserves.' In the nuclear age, strategic reserves must mean invulnerable reserves.

(b) After S_{60} and S_{80} the United States would also seek by its ultimatum to end the war, but in this instance it might be strong enough to demand and get the inviolability of Western Europe.[14]

2. Threats

The residual SAC force is partially withheld in the belief that in some circumstances its employment for threat and bargaining may give the United States a better result than full immediate military use. What threats might be made? Given the S.U. utility matrix and given the rather evident weakness of partially withholding and threatening SUSAC (which in S_{20} and S_{40} has already been launched on its second attack), the U.S. threat would primarily be the destruction of Soviet cities. In the S_{20} and S_{40} cases the small size of the residual U.S. force and its consequent inability to make decisive inroads against an alerted SUSAC make ineffective any threat except one against the Soviet population. However, in the S_{60} and S_{80} cases the implication that military installations would also be destroyed (Mixed Target Strategy) would be of value, although even in these cases the threat would emphasize the wholesale

[14] If Western Europe possesses some form of strategic striking power of its own, which either partially survives the initial attack or just conceivably is not attacked at all, it might in the S_{20} and S_{40} cases be able to avoid subjugation. In conjunction with the much stronger position of the United States in the S_{60} and S_{80} cases, Western Europe might be able to reinforce the effectiveness of any terms that the United States demands on its behalf.

physical destruction of Soviet society in the process. (Needless to say, if the Soviet Union does not abandon its second attack the United States is free to choose a Mixed Target attack rather than a pure Population Attack).

Since threats are accompanied by proposed terms, the United States would in effect be issuing an ultimatum to the Soviets. The effectiveness of the threat would, of course, depend both on the size of the residual SAC force and the Soviet interest in, and capability for, protecting its population. In the future, if the Soviets undertake effective civil defense measures, the vulnerability of the urban population (but not of the cities themselves) may significantly decrease within a few hours after the Soviet first attack. In this case one might need special weapon systems for attacking dispersed, and perhaps sheltered, populations. Assuming that under the conditions of current Soviet civil defense preparations the population threat does have considerable force, some time specification (very brief) for the expiration of the ultimatum would have to be made.

The actual outbreak of war would most likely be preceded by a period during which the enemy has been directly or implicitly threatened with the destruction of his cities were he to attack. He did attack and the United States either defaulted on its population threat if it used MT-W (Military Targets plus partial withholding) or only partly carried out the prewar threat if it used PT-W (Population Targets plus partial withholding). In the Partial Withholding Strategies the United States makes

the same threat which had proved empty (MT-W) or considerably weaker (PT-W) than what was threatened in the prewar period. How credible would the new (intrawar) threat be? Here the difference between past wars (and contemporary limited wars), on the one hand, and all-out nuclear conflicts on the other, might be decisive. The magnitude of the threat combined with the difficult circumstances the United States would find itself in would make it difficult for the Soviets to disregard the threat simply because the prewar threat had proved empty or was only partially carried out. The Soviet leaders would probably understand that the U.S. disposition to carry through its prewar threat was neutralized by its desire to avoid a decision leading to a continuation of the war with results that might well be disastrous to itself (as well as to the enemy). Since a partial strike with a threatened use of reserves -- once war has occurred -- is a rational means for pursuing national objectives in war, there is no necessary implication in the Partial Withholding Strategy that the United States would be unwilling to use its uncommitted strategic forces if the war continues and particularly if U.S. political survival is threatened. The Soviet Union cannot ignore the possibility that the first default may raise the likelihood that the intrawar threat will be carried out: the one who threatens will, with fewer alternatives available, feel compelled to act. The likelihood of this occurring would, <u>in Soviet eyes</u>, presumably depend on various factors, viz: (a) whether the Soviets had issued demands coincident

with their initial strike and what the character of the demands is; (b) the presumed U.S. image of the postwar world if the United States fails to carry out the intrawar threat should the Soviet Union continue the war; (c) whether the Soviets believe that "desperation" and "loss of self-control" may lead the U.S. government finally to execute the threat if the Soviets do not end the war; (d) whether the U.S. military forces, particularly the U.S. strategic forces, might not undertake autonomous action and strike should the Soviets reject the U.S. governmental offer; (e) what the state of SAC is after the S.U. strike (that is, which S_i obtains). Obviously, the stronger SAC is, the stronger the population threat. The effect of the threat may be reinforced by a Soviet desire to preserve immediate gains without having to pay heavily for them. Thus, if the Soviets attain S_{20} and S_{40}, they would already have achieved enormous military gains and probably territorial and political gains in Europe and elsewhere. On the other hand, if they attain only S_{60} and S_{80} they might well feel that "peace with honor" is a good outcome; (f) if the initial one-third limited U.S. attack was against population (PT-W), the Soviet Union will presumably attach greater credibility to the threat of fuller population attack than if the initial one-third attack was against military targets (MT-W).

One cannot by any means argue that these considerations would lead the Soviets to attach a high credibility to our intrawar threat. The threat (especially if it involved bombs

of very great megatonage) is not, however, of such minor significance as to render it a futile device. We must, nonetheless, recognize that if the Soviet surprise attack is very successful (S_{20}/S_{40}) and is followed by Soviet counterthreats to destroy U.S. cities in a second strike the U.S. leaders would need great courage to succeed in the war of threat and counterthreat. In the S_{60} and S_{80} cases, the prospect of Soviet rejection of a U.S. ultimatum is lower. The issuance of Soviet counterthreats in this case might be an attempt to initiate a war of threats which would settle into a tacit armistice.

3. The Proportion of Residual Forces Withheld

In the class of Partial Withholding Strategies under discussion, many variants are possible. For example, one might even have strategies of total withholding. We doubt, however, that total withholding after a Soviet first attack can be effective. Even if the Soviets complied with an ultimatum, the postwar prospects for the United States would be very bad indeed since the Soviet Union would have been able to make its attack with total impunity.

In the Partial Withholding Strategies the proportion of the residual SAC employed in the U.S. counterstrike could be varied according to the proportion of SAC surviving the Soviet first attack. In our discussions we have, for convenience, used one-third as the initial attack portion. It might be advantageous to make this proportion smaller as the degree of Soviet success in their initial strike decreases. (The absolute

size of the attack might nonetheless increase). The limited reprisal strike is intended to give special force to the threat and ultimatum aspects of the strategy. Therefore the attack should only expend that amount of the residual SAC which is needed to provide this reinforcement.

In the Partial Withholding Strategy Soviet acceptance of terms occurs in a situation in which a very rough balance of losses is maintained. Indeed if the Soviet Union limits its first attack to military targets (as we have assumed) and the Partial Withholding Strategy attacks population (PT-W), the United States will have inflicted sizeable population and capital losses on the Soviets in exchange for losses to SAC and a limited U.S. population loss. Depending on the particular S_i involved, it is quite conceivable that the longer range consequence of this trade-off favors the United States.

The above speculations may seem somewhat optimistic, and we do not mean to imply by anything we say that the outcome of the Partial Withholding Strategies is likely to be very good. But our interest in these strategies has in part stemmed from our unwillingness to avoid close study of the hardest cases, namely those in which only 20 per cent or 40 per cent of SAC survive the first Soviet attack. In these cases, the problem is to make the best of an admittedly bad situation. Short of a change in the U.S. military budgets that would permit the procurement of a numerically superior and well protected U.S. force, one must face the possibility that a Soviet first strike

might limit to modest goals any strategy followed by the United States. Our contention is only that in S_{20}/S_{40} the Partial Withholding Strategies deserve serious consideration in comparison with the all-out strategies. An all-out strategy may so quickly deplete the U.S. forces that survive the first strike that U.S. bargaining potential vis-à-vis the Soviets will be very low. Measures for the provision of a hard-core SAC force are especially complementary to the Partial Withholding Strategies.

Chapter 7

CONCLUSIONS

In this final chapter we have two aims:

1. To examine possible conflicts between implementing the aims of deterrence and the aims of fighting a war should deterrence fail;

2. To introduce one or two additional remarks about wartime strategy that seems especially appropriate to our concluding statement.

A. The Conflict Between Deterrence and Wartime Requirements

The objective of our analysis is the attainment of the best expected value at a future time point in terms of both the probability of war and the outcome of war should it occur. The formulation of this objective, together with some of our supplementary statements, strongly imply that a principal problem is to reconcile measures intended to reduce the probability of war with measures to raise effectiveness in fighting the war. To be sure, a maximization problem (under appropriate budget constraints) still exists even if all measures for deterrence and for fighting a war are nonconflicting (that is, do not have opposed effects) or even are mutually reenforcing. But these agreeable cases for maximization did not seem as crucial as those cases where measures to increase deterrence lessen effectiveness in fighting a war or measures to increase this effectiveness lessen our chances of successful deterrence.

We had anticipated that these more disagreeable cases would loom large in our final analysis and be difficult to deal with. It is sometimes assumed that one must make heavy-hearted choices between sacrificing deterrence for the sake of military effectiveness or military effectiveness for the sake of deterrence. As our analysis progressed, we were pleasantly surprised to note that our apprehensions on this score were not entirely justified. We found few instances of real importance where a conflict was difficult to resolve. This is especially so if one believes that capabilities are more significant for deterrence than threats or statements of intention; it is the latter that seem to create problems of conflict between deterrence and wartime strategy. Relatively few measures involve conflicts in the sense of opposed effects; and where such conflicts do exist the dominance of one measure over the other seems (to us) fairly clear-cut. The solution to the conflicts seems to be fairly easily arrived at.

We shall list a variety of prewar measures that people have discussed from time to time in order to enable the reader to examine more systematically the cases where a conflict between deterrence and wartime requirements may exist:

Provision of a minimum hard core population attack force
Dispersal of SAC bases
Relocation of SAC bases
Tightening of surveillance network in certain areas
Increasing the rapidity of SAC response
SAC airborne alert
Provision of recovery and regrouping facilities
Hardening SAC bases (A/c shelters and necessary operating, command and control facilities)

Hardening key defense installations
Increasing B-47 round trip capability
Increasing quick reaction forces on overseas bases
Overseas IRBM's
Improvement of strategic warning system
Increasing force size
Increasing flexibility among targets and target systems
Civil defense measures
Converting all or most of SAC into a population attack force
Making threats of city attacks

Most of these measures involve the improvement of our capabilities for fighting a war and thus are also at the same time deterrent (provided, of course, that the measures are known to and correctly evaluated by the enemy). There are difficult problems of allocating the resources of a given budget among competing measures, but it is evident that to the extent that the measures do improve our wartime capabilities (that is decrease the expected value of the enemy's result) they are at the same time deterrent. There is no conflict here in the sense that these measures while improving our fighting capabilities decrease our deterrent capability. Wartime capabilities contribute unequally to deterrence, and a problem remains of getting the greatest combined wartime and deterrent value out of a given selection of measures. Difficult as this problem is, it is less disagreeable than solving problems where, allegedly, the procuring of important wartime capabilities actually decreases our deterrent capability or where attempts to increase deterrence decrease our capacity to fight a total war.[1]

[1]We are concerned here quite generally with the relation of deterrence measures to measures for conducting war. Our view that

Are there important instances of such conflicts? The cases of actual or potential conflict are, we believe, confined to several measures that we will now briefly review.

Certain measures, such as keeping SAC planes on airborne alert or launching SAC planes (subject to recall) on minimal warnings, might be viewed as being counterdeterrent in the somewhat special sense of increasing the likelihood of accidental war. But such measures are also deterrent in that they lessen the enemy's expectation of achieving surprise or, at any rate, the most advantageous state S_i (a low level of SAC survival). There does not seem to be a sound basis for supposing that the increase in the probability of accidental war is sufficiently great to outweigh the deterrent value of such measures. (We are, of course, not arguing here that such measures are necessarily more desirable than other measures such as hardening or dispersal.) Since such measures obviously are of great survival value if war does come and since we may suppose their deterrent and counterdeterrent effects to be offsetting, we do not consider such measures to be instances

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conflicts between these two objectives are not very severe might seem to require some qualification were we to limit the discussion of this relation to programs initiated on a crash basis in a short time period (e.g. 1959-61). The constraints on what is feasible on a crash basis in a short period might seem to aggravate the problem of improving simultaneously deterrence and wartime capabilities. However, if the reader recalls the crash and interim measures suggested in Chapter 5 he will note that all of these measures are intended not only to deter the Soviets but also to provide capabilities <u>for use</u> in particular stages of a nuclear war.

of a conflict of deterrence and wartime capability in the sense in which the term "conflict" has been defined above.[2]

Provision of a minimum hard core force capable of attacking population targets might be viewed as an instance of a conflict of interest since such a measure might seem to benefit largely the interests of deterrence. The hard core force represents in our usage of the term a first minimum step in the hardening of SAC and thus is a direct contribution to SAC's capability to survive attack and thereby to its wartime capability. The organization of this minimum hardened portion of SAC for population attack could, however, in view of the population target system chosen for the force, appear to make no contribution to the actual fighting of a war. Such a view assumes, however, that making population attacks is not a part of the strategy of fighting nuclear wars. But this is not borne out by our matrices and our discussions of them. Although we assign a low utility, relative to other strategies, to the all-out pure Population Attack, it is apparent from our (to be sure, hypothetical) materials that population strikes cannot be ex-

[2]It is not at all necessary to the argument of the foregoing paragraph to deny that a high alert status of strategic forces might increase the probability of accidental war. Nonetheless, it is worth asking whether an increased probability of accidental war (which we have willingly conceded in our argument) may not be the opposite of what one should assume. When two opponents have their safety catches off both may be more disposed to avoid mischievous behavior that may inadvertently lead to bloodshed. Barroom violence and murder commonly involve not trigger-happy armed killers, but those whose state of disarmament and unpreparedness provokes the easy assumption that a little belligerent shoving and shouldering will do no real harm.

cluded as possible strategies in the form of a Partial Withholding Strategy (PT-W) and more particularly in the cases represented by Table 4B (where the Soviet second attack is against cities). In addition it must be remembered that we have been dealing only with a war in which the Soviets attack only SAC targets in their first blow. The possibility of city attacks or attacks on a few major organizational centers by the S.U. in its initial attack cannot, however, be excluded. In such instances the utility value to the United States of strategies involving population attacks would very likely improve relative to other strategies. Further, were SAC to attain a fair measure of flexibility in the two senses discussed earlier (among individual targets and among target systems) the hard core force might be more flexible than its publicized status as a population attack force would suggest. Finally, although its organization as a force capable of attacking populations is in part -- perhaps largely -- oriented toward attaining prewar deterrent effects, it can play a major role in providing intrawar deterrence (cf. Chapter 6) and where intrawar deterrence fails providing a population attack capability.

We do not believe that there is any conflict of interest in the provision of civil defense capabilities.[3] The value of

[3] Clearly, however, there is a conflict at the present time between priorities of expenditure on civil defense and on other measures. This conflict seems to be easily resolved in favor of expenditures for rendering U.S. strategic forces invulnerable. This, of course, might not preclude some initial steps towards a more effective civil defense program.

civil defense during war resides in the greater flexibility which it contributes to the choice of a wartime strategy and the greater firmness or boldness with which strategies can be threatened or executed. Almost all the strategies we have discussed increase in value if backed by effective civil defense measures (just as a number of our strategies are rendered less effective if the Soviets improve their civil defense capabilities). We view the deterrent value of civil defense as deriving largely from these considerations, though the ability of the United States to engage in prewar strategic evacuation in time of crisis may also have a deterrent value for a war that might arise in a period of acute crisis.

If conversion of the entire SAC force into a population attack force were a necessary or highly desirable measure for effecting deterrence, we would indeed be faced with a serious conflict since such a measure would severely limit SAC's capabilities for various wartime strategies. We have already argued, however, that such an extreme measure has certain counter-deterrent aspects as well as deterrent features (cf. pp. 123-124). The conversion of the entire force into a population attack force is dangerous to the Soviets only on the supposition that a very large portion of the force would survive a surprise attack. But we have seen that in such a case the Mixed Target Strategy appears more powerful and more to be feared by the Soviets (it is at least as powerful). The capability for a pure population attack is useful for deterrence principally when

the Soviets are counting on knocking out most of SAC and when one wants to face them prior to the war with a hard core population attacking force, that is a force which is precisely the part of SAC the Soviet Union cannot count on knocking out. We believe, then, that it is not possible seriously to entertain the transformation of the whole of SAC into a pure population attacking force,[4] and that this potential conflict between the interests of deterrence and wartime capability is easily resolved.

There appears to be only one other measure (in the list on pp.182-183) in which a conflict between deterrent and wartime interests may exist. This is the explicit U.S. prewar threat that a Soviet attack will be answered by a U.S. attack on Soviet cities. This threat has a possible drawback if deterrence fails. A strong Soviet conviction that a nuclear attack will be answered by attacks on their cities may give the Soviets an increased incentive to include a few U.S. cities even in a first small surprise attack, or to achieve considerable civilian damage in this initial strike by employing very high yield ground burst weapons; or it may give the Soviet Union an increased incentive to include U.S. cities in their second attack. Even if the Soviets want to keep the war on a purely counter-

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[4] As we have noted earlier were all of SAC to be a population attack force, this might increase Soviet willingness to attack the United States if Soviet leaders should reach the point where massive civilian destruction in the Soviet Union is tolerable as long as Soviet military success is assured.

force basis, they may believe the prospect so small that they may be the first to abandon target restrictions. This possible consequence of prewar threats seems to be an unavoidable hazard. It is essential that the enemy entertain an expectation (not necessarily a certainty) that population reprisals will occur. Since the Soviet Union may suppose that they can, with high probability knock out most of SAC, and given our hypothetical S.U. utilities for these cases, it seems highly desirable that S.U. expectation should include a substantial probability of U.S. attacks on the S.U. civilian sector.[5]

Allusion is sometimes made to the "contradiction" between making threats against the enemy population and the impossibility or undesirability of executing them. For this reason it is argued that such threats carry a low credibility. First of all, as we have noted earlier, it is not clearly desirable to avoid all types of population strikes if we take our matrices at all

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[5]The threat of widespread civilian devastation is important; but it is not necessary -- and indeed not desirable -- to make this threat in such a way as to indicate that the United States would in all circumstances employ no strategy other than pure population attacks. The latter have their greatest value when a highly successful surprise strike deprives SAC of sufficient strength to make a counterforce attack very useful. The exclusive threat by the United States of pure population attacks may be interpreted, not unjustly, as a confession of weakness. It is useful to associate the threat against the civilian population with attacks against SUSAC and other military targets; always with the implication, of course, that if an enemy should by chance destroy a large part of our strategic force we would reply primarily with direct attacks on his cities. In view of the importance for a country that goes second of being able to combine military and civilian damage in a single attack (Mixed Target Strategy) it does not seem wise to stress the availability of clean weapons except in the context of limited wars.

seriously and if we take into account the possibility of Soviet population attacks on a first strike. Secondly, where population attacks are contra-indicated by our U.S. matrices, the existence of prewar population threats in no way constrains the United States to execute them. Obviously the actual omission of population attacks once war has begun has no bearing on the deterrent value of the prewar threat. This value is affected only by predictions by the enemy of their use, and the enemy cannot dismiss them as very improbable. The cases where their use by the United States is important for the enemy (a low level of SAC survival -- in other cases the U.S. has stronger strategies) are precisely the cases where our matrix shows them to have their greatest probability of actually being executed.

Our analysis of the Soviet utility matrix suggests that discussions of deterrence place undue emphasis on what the United States should threaten in the prewar period. While this is not a negligible problem, it is clear that if the true S.U. utility matrix is anywhere near what we have supposed it to be, then it is not which U.S. strategy is threatened that is of major importance, but rather Soviet expectations about the size of the residual SAC force after the S.U. surprise strike. The expected value to the Soviets of a war is extremely sensitive to the size of this residual force and much less sensitive to the manner in which it is used. This can easily be seen by noting the large changes in Soviet utility as we move from column to column (differences in SAC survival rate) of

Table 3 (p. 31) whereas (on the whole) the changes in S.U. utility within any column (differences in U.S. strategy choice) are much less.

We conclude that conflicts between the interests of deterrence and of intrawar capabilities and strategies do exist, but that they are less numerous, less critical and more easily solved than we ourselves had originally supposed. Post facto the result does not seem surprising in view of the fact that military capabilities for wartime are also simultaneously strongly deterrent. The provision of a hard core force is not only a deterrent measure of considerable strength because it increases the likely survival rate of SAC, but also because it increases the range and effectiveness of the strategies available to the United States if war should break out. Only if such a hard core force were rather oddly conceived as having no or little utility in the event of war would its procurement pose a serious conflict between deterrence and wartime needs.

Our fairly optimistic view of the problem of reconciling the needs of deterrence and war capabilities does not, of course, signify that any measure that might be taken to improve the latter will also improve the former, or improve it sufficiently to give us a markedly more powerful deterrent capability. Increasing the size of vulnerable forces and increasing the range of current planes (for example) will in some degree reduce Soviet estimates of the expected value of war outcomes, but such measures compared with hardening a nucleus of SAC (and eventually, much

more than a nucleus) probably have relatively trivial deterrent effects. We would also argue that it is precisely the measures that are most likely to increase deterrence -- namely measures which gave SAC a high survival capability -- which are also the most effective measures in preparation for the failure of deterrence. For if war comes by an enemy first strike, the prime requirement is to have forces available in operational condition with which to fight. Having such forces available even after an enemy strikes first is also the consideration which will weigh most largely with the enemy when he decides whether or not to strike. At the same time force survival measures need not be predicated on a pure population attack strategy, and therefore do not impose limitations on a U.S. capacity to strike first if a critical situation so requires. Measures such as:

Providing a minimum hard core force
A more general hardening of SAC
Relocating SAC to give greater tactical warning
Provision of recovery and regrouping facilities
Increasing flexibility of SAC forces

and several others listed in pp. 182-183 are not highly specialized measures in terms of their strategic value. It is probably only the failure to give due emphasis to the problems that have to be met on the second, third, and fourth days of a nuclear war that makes some measures seem useful only for deterrence, or only for fighting a war in which the enemy strikes first, or only for fighting a war in which the United States strikes first. Detailed scenarios of wars projected beyond the initial

strikes of each side would, we believe, show that measures of the type mentioned above have a considerable variety of important functions for quite different political and military contexts. Thus even a "go-first strategy" for the United States could, we believe, be shown to benefit greatly from measures such as hardening and the provision of recuperation bases. But this problem is outside the scope of our paper.

If the foregoing evaluation of the severe conflict sometimes supposed to exist between the interests of deterrence and wartime requirements is at all acceptable, one is led to ask why a contrary evaluation is sometimes made. One reason seems to be that preoccupation with deterrence leads to neglect of a detailed analysis of nuclear war strategies. When analysis is made, it is not often pushed beyond the first U.S. counterstrike. The conception of war as mutual and sudden suicide, and as something which does not permit consideration of degrees of badness probably reenforces the deterrent interest to produce a neglect of the intrawar process. It is certainly not true, as certain publicistic and man-in-the-street reactions seem to imply, that once war comes "it makes no difference" what one does (which in effect is perilously close to saying it makes no difference whether ten, twenty, forty, eighty or more million Americans die or whether the U.S. retains or does not retain its political independence). There are few things so bad that not thinking about them won't make them worse. The avoidance in public and even technical discussion of the

objectives and strategies of nuclear war as they affect the course of the first, second, third and subsequent days of such a conflict would be more understandable if the implementation of deterrence and wartime requirements were in fact or even prima facie diametrically opposed.[6]

B. Wartime Strategies and the Civilian Sector

We believe that the reader would benefit very little from a summary of our discussion on deterrent measures and the choice of strategies. Our analyses have dealt with so many conflicting considerations that a reasonably accurate summary is not readily made or else would be so long that it would be of little value. We wish, instead, in these final pages to draw attention to a persistent problem in our discussions, one that inevitably looms large in studies of nuclear war, namely the role that concern for the civilian sector of the nation plays in calculations concerned with strategy in nuclear war.

The role of the civilian sector in nuclear wars manifests itself in two ways in our paper: in analyses of the use of population attacks to subdue the enemy and in analyses of strategies that attempt to lessen the likelihood of massive population

[6]It is entirely possible that a budgetary conflict may exist in making choices between provision for one's first reply strike capability and provision for additional requirements for a post-first-strike-capability. But we do not believe that these possible budgetary conflicts have been examined or are at the root of the failure to take intrawar strategy and requirements more seriously.

losses in one's own nation. We believe that it is the function of an analyst of nuclear wars to search as diligently as he can for strategic possibilities that reduce U.S. civilian losses, just as it is his function to search for strategies that provide good military and political results. The nuclear war we have dealt with is a total war and a total war requires that due attention be paid to the variety of stakes that render it total. But it is only too obvious that it is not easy, particularly in a war in which the enemy strikes first, to find strategies that do not gravely risk enormous losses to one or another of these stakes.

We have wrestled persistently with the problem of seeking out strategies that might preserve the civilian sector from losses of the greatest magnitude without compromising hopelessly other national interests. Because of this we would like to state that we are by no means persuaded that concern for the civilian sector must inevitably be the dominant consideration in a choice of wartime strategies. There are other values or national interests (primarily political survival and independence) in fighting a nuclear war initiated by the enemy that cannot be disregarded even if the cost is many millions of lives. We would not presume to lecture the reader on these great issues. We are interested, however, in remarking that the capacity for sacrifice that a nation brings to moments of great crisis deserves a respect that should preclude the easy utilization of it to simplify the problem of the conflicting

strategic implications of the several national interests pursued in a nuclear war. If strategies are to be chosen which increase greatly the risks of enormous civil destruction (as they may very properly have to be chosen), there is an obligation for the strategist to show plausible grounds for believing that these strategies have some prospects of producing terminal war states and post war developments that with respect to the maintenance of national independence and power are superior to those strategies which might seem, because of their concern for population losses, to be lacking in boldness. In addition, we have tried to show that quite apart from the population survival problem some of these "weaker" strategies (for example, Partial Withholding) attempt, by reserving a final threat of some magnitude, precisely to assure political independence should the military situation become critical.

There is a strong human propensity to avoid decisions that are difficult, especially when the alternatives are highly disagreeable. Many of the issues that have arisen in our discussion of wartime strategies make it understandable that there should be considerable reluctance to arrive at contingent decisions. If there is some prospect that the need to act on these decisions may never arise or that changes may occur that will at least alter the terms of reference for the decisions, the incentive to defer the choice is much increased. In many circumstances of private and perhaps public life as well there may be a deep wisdom in waiting for the future to force our hand.

Decisions which it may be unbearable to make or to live with, if one attempted to make them in advance, may be possible when the moment of action comes.[7] Decisions in advance may be more compromised by regrettable considerations than one made at the moment of response. Nevertheless it does not seem wise or courageous to defer contingent strategy decisions in this manner, if only for the reason that those on whom the responsibility for the decision rests may no longer be open to effective communication when the moment of response comes.

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[7] "Dear God! Eraste, be satisfied with what I am now doing; don't start trying to test how resolutely I will behave in the future; don't undermine my sense of duty with extreme and terrible proposals which, perhaps, we may never have need of; and if, in the end, we must do these things let me at least be drawn into them by the force of circumstances." Molière, Monsieur de Pourceaugnac, Act I, Scene 2.