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STRATEGIC AMBIGUITY, ASYMMETRY AND ARMS CONTROL: SOME BASIC CONSIDERATIONS

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PREFACE

This Memorandum is a theoretical analysis of some novel arms control questions that have arisen in the course of research on the RAND project, Alternative Central War Strategies (ACWS). It is part of a larger attempt to identify ways of discriminating between "cooperative" and "uncooperative" opponents, of perceiving common and conflicting interests among enemies. This study examines arms control agreements in which initial strategic postures are asymmetric and information about the intentions and capabilities of the Soviet Union is ambiguous. The study is complementary to, but independent of, a series of forthcoming ACWS descriptive and comparative works on the long run interaction of the force structures of the United States and the Soviet Union, given different strategic objectives.

The design of the study should be understood clearly. This Memorandum does not show, on balance, that the kinds of arms control agreements under analysis are bad for the United States. It does show that under some conditions some arms control agreements may be highly dangerous. The conditions and sources of dangers discussed here are, unfortunately, often ignored in both the academic and governmental discussions of arms control. In particular, it should be understood that some conditions and sources of danger can be controlled by the United States, but many cannot. The purpose here is to point out some of the conditions that the United States can and cannot control in a dynamic strategic process.

The analysis is designed to be of use to those in the Air Force who are concerned with force structure and arms control. In addition, the analysis may be of interest to the Department of Defense, the Arms Control and Disarmament Agency, and the State Department. In particular, if serious negotiations about central war postures emerge after settlement of the Cuban or Berlin crises, the analysis should help in pointing out ambiguities and risks in the content of proposed agreements as well as in the terms of inspection and verification.

Earlier versions of this Memorandum were read and carefully criticized by Allen R. Ferguson, Fred S. Hoffman, and William M. Jones of The RAND Corporation. Their comments are gratefully acknowledged.

SUMMARY

This study investigates the conditions under which some types of arms control agreements, even when there is adequate inspection and verification, may be used as a tool by the Soviet Union to achieve strategic objectives that are undesirable or dangerous to the United States, given current U.S. strategic superiority and the asymmetries in the force structures of both nations. Sets of objectives and postures are examined in a dynamic context to determine those sets that could produce future arms agreements and the types of agreements that might be produced.

The following model of the world is assumed:

(1) The United States currently has strategic superiority over the Soviet Union.

(2) Soviet weapons systems lag behind those of the United States in some of the following desirable properties -- invulnerability, reliability, controllability, firing time, and performance.

(3) Civil defense activity is currently at moderate levels in both the United States and the Soviet Union.

(4) Soviet military planners can count on more budgeting flexibility than their U.S. counterparts.

(5) The Soviet Union knows more about the U.S. strategic posture than the United States knows about the Soviet posture, and this condition will continue to hold in the future. Consequently, lags exist between Soviet actions and corresponding U.S. reactions.

Given these assumptions, on the basis of arms control negotiations, agreements, and information provided by inspection, it is difficult to distinguish between a case in which the United States seeks stable deterrence and the Soviet Union seeks superiority, and a case in which both sides seek stable deterrence. The information that would be provided to U.S. decision makers, given the model above, is not complete enough or fine enough for U.S. decision makers

to discriminate between the cases. Furthermore, it is rational for the Soviet Union, if it seeks superiority, to engage in some types of arms control agreements with adequate inspection and verification, provided some of the existing Soviet force becomes superfluous as new weapons are phased in. If this last condition holds, then there are large payoffs to the Soviet Union in using agreements about superfluous weapons or civil defense as bargaining counters and as devices to lull U.S. suspicions. Unfortunately, negotiations and consequent agreements in a case in which the Soviet Union seeks superiority might not differ appreciably from a case in which the Soviet Union seeks stable deterrence. It is possible to use arms control negotiations and agreements to increase strategic ambiguity and uncertainty, to generate "noise" about intentions and capabilities. Sometimes dangerous conditions may not be detected even with complete inspection of agreed limitations on force structure and with essentially perfect intelligence. Consequently, more attention should be paid to the substance of agreements and to the kind of information provided by adequate inspection and verification than is currently done.

CONTENTS

I. INTRODUCTION

Although recent literature on strategy and arms control has shown an increasing degree of sophistication, it is still characterized by speculation, analogies, and unproven theorems, rather than detailed analysis of specific strategic objectives and postures.[1] In the early stages of a science, this style of speculative-analogical investigation is necessary for progress,[2] but its extremely abstract level, symmetric behavioral assumptions, lack of concrete fact, and, in particular, absence of an explicit time dimension sometimes obscures important issues. Most analysis concentrates on deterrence at a point in time under symmetric assumptions about weapons systems and their deployment. While it is possible to analyze sets of strategic objectives and postures by treating them statically, the alternative time paths allegedly leading to a given set of postures are of some interest.

The problems we raise here are: Assuming that the United States is forced eventually into seeking stable mutual deterrence, what ambiguities and risks flow from initial strategic, technological, and economic asymmetries? What signals, if any, can the United States

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[1] Some relevant literature is contained in D. G. Brennan (ed.), Arms Control, Disarmament and National Security, George Braziller, New York, 1961; D. H. Frisch (ed.), Arms Reduction: Programs and Issues, Twentieth Century Fund, New York, 1961; T. C. Schelling, M. Halperin, Strategy and Arms Control, Twentieth Century Fund, New York, 1961. An example of a recurrent theorem is that arms control can be obtained only under a condition of stable mutual deterrence. See D. Kybil, "The Role of Stabilized Deterrence," in Frisch, op. cit., p. 136; O. Morgenstern, The Question of National Defense, Vintage Books, New York, 1959, pp. 312-321. But it is also argued recurrently that the purpose of arms control is to achieve stable mutual deterrence. There is some ambiguity in definitions and premises that needs careful analysis.

[2] The analytical style of much recent literature was set by T. C. Schelling's The Strategy of Conflict, Harvard University Press, Cambridge, 1960. Great insight into strategic problems can be gained through the use of analogy, but it is important to ask seriously whether the analogies Schelling offers -- two Western gunmen, a man and wife, lost, trying to find each other, etc. -- really correspond to facets of the strategic situation and not to take them for granted, for the analogies may condition the analysis.

read to determine Soviet intent and strategy and the evolution of Soviet force structure? And what "noise" can the Soviet Union generate to mask a strategy that is not mutually desirable? However, we shall not consider all the ambiguities and uncertainties generated by a stable deterrence strategy but only consider ambiguities arising from the relation between evolving force structures and arms control. The static implementations of stable deterrence strategies have been widely discussed in recent years -- e.g., invulnerable retaliatory capability for a given technology -- and are probably well understood by now.[1] But the problems of future force structure under changing technology and strategic asymmetries have not received the same attention. The possible conflicts between different parts of a strategy and the short and long run implementations have not been made explicit in the arms dialogue.

Ordinarily, arms control is viewed as an aid, converging two or more opposing sides toward a mutually desired set of strategic postures, provided that agreements are carefully designed, and adequate inspection and verification are permitted.[2] The convergence properties, however, are in question, when the initial strategic postures are asymmetric, there are lags in U.S. information flows, and the initial postures are not the desired postures. The problem is not just one of broken agreements or marginal cheating, but whether an agreement provides incentives for exploiting advantages not perceived or not used by the Soviet Union, and dulls American suspicions while the Soviet Union attempts to achieve strategic superiority at some future time. Solving this kind of problem involves determining those sets of strategic objectives and postures

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[1] The classic article is A. J. Wohlstetter's "The Delicate Balance of Terror," Foreign Affairs, XXXVIII (January 1959), pp. 211-234; and see T. C. Schelling, op. cit., pp. 207-229.

[2] For a discussion of political problems and judgments involved in certain types of inspection, see P. Y. Hammond, "Some Difficulties of Self-Enforcing Arms Agreements," Journal of Conflict Resolution, VI (June 1962), pp. 103-116; F. C. Ikle, Alternative Approaches to the International Organization of Disarmament, The RAND Corporation, R-391 (February 1962).

that are likely to produce future arms agreements and examining the types of agreements that might be produced.

But reasoning from particular strategies to plausible agreements is only part of arms analysis. Reasoning from negotiations and agreements to alternative strategies is also necessary. If it is impossible to distinguish the strategy behind an offer, or if identical offers could serve different strategies, then agreement involves some dangers. When uncertainty or ambiguity exist, arms control negotiations and agreements may be important sources of information about the opponent. Unfortunately negotiations and agreements can be used to generate ambiguity as well as dispel it. It is important to pay attention to the potential consequences of an arms agreement if there is adherence to the letter, rather than the spirit or intent, of the agreement. Are agreements in an asymmetric and dynamic context effective constraints on the evolving force structures of two nations even with adequate inspection and verification?

The converse of the constraint problem also exists -- evaluating the role of arms control in precluding flexible response, when the United States is confronted with rapidly changing political and military states of the world, or with technological breakthroughs. Intentions and capabilities change over time, and arms agreements may be binding on strategic posture at precisely the wrong time. Yet unilateral U.S. abrogation of an agreement that becomes dangerous could create violent political difficulties at home and abroad.

In the following analysis two cases are considered. In each case both the United States and the Soviet Union have single strategic objectives. Although this procedure avoids the problem of conflicting goals, the analysis is important, because the objectives or goals are often proposed seriously as reasonable in the real world. In Case I, the U.S. objective is stable mutual deterrence with some "insurance" in case deterrence fails.[1] The Soviet objective in Case I is

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[1] Stable mutual deterrence is said to exist when both the United States and Soviet Union continue to prefer striking second to striking

strategic superiority at the end of a certain time period, but given the initial asymmetries, the Soviet attempt to gain superiority must be made in such a way that U.S. suspicions will not be aroused. A corollary objective for the Soviet Union is to convince the United States that it is also interested in stable mutual deterrence. In Case II, we assume that both the United States and the Soviet Union are interested in stable mutual deterrence at every point during the time period under consideration.

It should be noted that, given the objectives, we are confronted with analytical requirements that differ from the usual calculations of deterrence at a point in time.[1] At any given time the Soviet Union may be deterred from a first strike, and relevant calculations and intelligence may indicate this. But, at the same time, the Soviet Union may be making research and procurement decisions intended to decrease deterrence at some future time. If the United States is interested in stable deterrence, it is imperative that matching decisions be made, given the technological, political, and economic bounds on both sides.[2]

The following specific questions will now be examined:

(1) Is there any way to distinguish between Case I in which the United States pursues stable deterrence and the Soviet Union pursues superiority, and Case II in which both sides pursue stable deterrence? What information does the United States need to perceive which of the strategies the Soviet Union is following? Will the required information differ between Cases I and II?

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first in all possible military and political states of the world and under changing weapons technology and information flows.

[1] See D. Ellsberg, "The Crude Analysis of Strategic Choices," American Economic Review, LI (May 1961), pp. 472-478.

[2] For example, having some standby capacity in intercontinental missile production may be as important as having an invulnerable retaliatory capability. In other words, with the objective of stable deterrence, it may be necessary to hedge by using a modern mobilization base strategy where mobilization is a move precedent to or in response to a "peacetime attack on deterrence" rather than an initiation of war.

(2) Is it rational for the Soviet Union in Case I to engage in arms control agreements? In particular, is it rational to engage in agreements with inspection and verification?

(3) Would negotiations and consequent agreements differ between Case I and Case II? If Cases I and II differ, what are reasonable offers and agreement in each case?

(4) What risks does the United States take if tacit or explicit constraints are placed on its force structure?

These questions are interrelated, and they will be treated simultaneously in the subsequent analysis. In Section II, a series of specific military, political, and economic assumptions are made about the United States and the Soviet Union and about the relations between the two countries. Section III presents an analysis of some arms control agreements in a dynamic context and the answers to the questions above. Section IV contains a discussion of results.

II. STRATEGIC CONTEXT

In exploring the relation between stable deterrence, force structure, and arms control, a simplified strategic model for the United States and the Soviet Union will be used. While models alone are not a sufficient basis for policy, no policy can have a sound basis without some logical analysis of implementations. For theoretical purposes, it is neither necessary nor desirable to specify all real world relations between the two countries. Only certain structural characteristics need be specified. But the strategic context and technological structure actually used has to be explicit in order to avoid vague speculations. The aspects of the strategic context considered here are current U.S. strategic superiority, the technology of both sides, civil defense programs, budget constraints, and information flows.

A. SUPERIORITY AND PARITY

First, the United States is strategically superior to the Soviet Union and will allegedly remain so for some time in the future.[1] Superiority, like most strategic terms, is imprecise because it is related to intentions as well as capability. The term will be used

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[1] Deputy Defense Secretary Gilpatric stated recently: "As a result of our Strategic Force Study, we now have in our planning at least as far as 1965 a pretty definite force structure....We will have more than double the number of alert weapons that we have today by the end of 1965. Those warheads will be carrying a yield, a megatonnage, of more than twice what our present alert force can carry. In other words, we will have twice the striking power by 1965 that we have at the end of fiscal year 1962. That is why we feel that no matter what the Soviet can do, based on the intelligence we have today, that we will maintain the margin of superiority that we possess today." (Italics added.) Quoted in M. Brower, "Nuclear Strategy of the Kennedy Administration," Bulletin of the Atomic Scientists, XVIII (October 1962), pp. 34-41. The definition of superiority used here is not quite clear. The question is not whether the United States will have twice its present striking force in 1965, but whether the Soviet Union will have a retaliatory capability relatively invulnerable to counterforce and capable at a minimum of inflicting great civil damage.

in the following sense. By strict superiority for the United States is meant (1) the Soviet Union cannot conduct a counterforce first strike against the United States such that damage to the Soviet Union, should the United States choose to inflict it, can be reduced to very low levels, and (2) the Soviet Union possesses neither a damage limiting nor a punitive capability, should the United States strike first.[1] The definition of superiority is that the first part of the strict superiority definition holds and the Soviet Union possesses a punitive capability, but not a damage-limiting capability after a U.S. first strike. Nominal superiority means that part one of the strict superiority definition holds and that the Soviet Union possesses a damage-limiting capability and a punitive capability, but such that the residual civil damage potential of the Soviet Union is identifiably less than that of the United States after a U.S. first strike.[2] Finally, parity means (1) that the Soviet Union cannot conduct a counterforce first strike such that damage to the Soviet Union, should the United States choose to inflict it, can be reduced to very low levels and conversely that (2) the punitive and damage limiting capabilities of both sides are such that, should war occur, realized and potential civil and military damage, should either side choose to inflict it, would be extremely high and approximately the same.

B. TECHNOLOGY

Implementation of objectives always takes place in time, and in a technological and political context. Both the United States and the Soviet Union are constrained by the properties of their weapons technology. At the present time, it appears that the Soviet Union

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[1] A damage-limiting capability refers to the ability to reduce an opponent's offensive forces by some mixture of counterforce and defense, active and passive. A punitive capability refers to the ability to use residual offensive forces to inflict civil damage.

[2] Residual civil damage potential refers to the possible use of residual strategic forces -- that is, forces remaining after all counterforce phases of a war have been completed -- to inflict a maximum additional amount of civil damage.

has not assigned the same weight to the need for a secure, reliable, retaliatory capability as has the United States, although the Soviet Union may be hardening some missile sites and developing missiles easy to handle and fire. Present Soviet retaliatory forces are "soft." Their missiles are liquid-fueled and have slow firing times.[1]

While it is often possible to make minor changes in a weapons system, incorporating "quantum jumps" in knowledge involves buying and installing new weapons systems. It is assumed that weapons at their moment of construction embody the latest scientific knowledge, but share only marginally in further improvements in technology. Technological inferiority is defined to mean that a lag exists between Soviet weapons and U.S. weapons in some of the following properties: invulnerability, reliability, controllability, firing time, and performance. This introduces another asymmetry, since the Soviet Union in either Case I or II must procure new weapons systems to achieve the postulated strategic objectives.[2] The period during which research and procurement is carried on we shall call the "research-procurement period."

C. CIVIL DEFENSE

The United States and the Soviet Union are not only constrained by their past strategies and technologies but by the vulnerability of the population and the economy as well. As initial vulnerability conditions, it is assumed that neither side currently has more than

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[1] For a description of the properties of current Soviet force structure and of future Soviet alternatives, see "Why It's Russia's Turn to Worry about a Missile Gap," U.S. News and World Report, LIII (December 3, 1962), pp. 45-48.

[2] In other words, we are concerned with the qualitative properties of weapons procured. The Soviet Union cannot achieve superiority by simply buying more of its inefficient systems. This contrasts, for example, to a quantitative arms race such as the Anglo-German race of 1904-1914 where each side simply procured larger and larger quantities of Dreadnoughts.

a modest civil defense program nor has made any extensive preparations for postattack reorganization and recuperation.[1]

The reason for considering civil defense here is that it is a necessary condition for a damage-limiting capability, and we are interested in examining civil defense ambiguities arising from the strategic and technological asymmetries.[2]

D. BUDGET CONSTRAINTS

It is also necessary to make an assumption about budget constraints for the research-procurement period. The U.S. economy is larger than that of the Soviet Union in terms of initial real GNP.[3] However, the U.S. economy is growing slowly and its people enjoy an extremely high standard of living. The United States often has great difficulty in increasing allocations to the public sector of the economy. While there seems to be no current difficulty in making marginal increments to the defense sector, this does not imply that political and economic difficulties would be absent as defense budgets increase.

For these reasons it will be assumed that Soviet military planners can count on more budgeting flexibility than their U.S.

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[1] Measures here range all the way from equitable stockpiling of surplus food to putting the economy or part of it underground. See, for example, O. Morgenstern, op. cit., pp. 126-133. See also Civil Defense - 1961, United States Government Printing Office, Washington, 1961; L. Goure, Civil Defense in the Soviet Union, University of California Press, Berkeley, 1962; S. G. Winter, Jr., Economic Viability after Thermonuclear War: The Limits of Feasible Production, The RAND Corporation, RM-3436-PR (November 1962).

[2] It is often argued that even a large civil defense program is not destabilizing when parity exists, but the properties of civil defense programs in which one side has strategic superiority are relatively unexplored.

[3] Some recent estimates indicate that the disparity may not be as great as currently thought. See A. Tarn, R. W. Campbell, "U.S. and Soviet Industrial Output," American Economic Review, LII (September 1962), pp. 703-727. Tarn and Campbell indicate that the ratio of Soviet to U.S. output may be as high as 75 per cent.

counterparts. In particular, we assume the Soviet budget is limited only by the minimum social subsistence level the population will tolerate. If growth occurs in the Soviet Union's GNP, defense planners, if necessary, can take a large part of the increment. Of course, in Case I, the Soviet Union must time its expenditures in such a way that suspicions are not aroused. And in Case II the timing must not convince the United States that the Soviet Union is unwilling to settle for stable deterrence. So the Soviet Union's total expenditures for the first part of the research-procurement period should be relatively small in either case, although certain portions, such as research and development, could be large.[1] Conversely, given the strategic and technological asymmetries and a larger economy, U.S. planners would have to avoid the appearance of an arms race.

E. INFORMATION FLOWS

The final assumption made in this section is that the Soviet Union knows more about the United States than the United States knows about the Soviet Union. In particular, the United States will have less information about the relation of Soviet Union defense expenditures to GNP, research and development activity, and capacity in specific weapons systems than will the Soviet Union about the United States. The United States lack of information will give the Soviet Union opportunities for deception, but subsequent analysis will show that even where the United States has good information about Soviet Union activities, the Soviet Union's strategic objectives will remain ambiguous, for distinguishing Cases I and II presents difficult problems of interpretation.

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[1] In either case, a large R&D program could be interpreted as an attempt by the Soviet Union to diversify its retaliatory capability. The perceived need for hedging against future uncertainties coupled with the unspecialized character of strategic weapons may drown out potential signals from R&D activity.

For each set of U.S. observations, the United States must choose an available strategy, that is, a way to react to any possible data. But often observations will be ambiguous even with an advanced and extensive intelligence effort. Information about present postures and development and procurement decisions must be analyzed in order to make inferences about future strategies and capabilities. Given Soviet numerical and technological inferiority, interpreting intelligence data will be very difficult. Depending on the nature of U.S. intelligence operations and Soviet counterintelligence activities, intelligence could provide so much irrelevant information or "noise" that genuine signals of intention would be drowned out.[1]

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[1] A recent study shows how extremely ambiguous information could be even when a surprise attack was about to be launched within days or hours. See R. Wohlstetter, Pearl Harbor: Warning and Decision, Stanford University Press, Stanford, 1962.

III. ARMS CONTROL AND ALTERNATIVE STRATEGIES

A. STRATEGIC AMBIGUITY

Because the Soviet Union is inferior initially, the fact that, in the future, it may be doing extensive research on offensive weapons systems and, perhaps, engaging in a heavy civil defense program might not provide any indication of its strategy. The United States might expect and discount such behavior. At the beginning of the research-procurement period, U.S. knowledge would be quite ambiguous, even though intelligence operations might provide accurate information on Soviet activities. In fact, it is reasonable for the Soviet Union to provide the United States, overtly or tacitly, with accurate information on some of its policies and programs. There is, of course, no guarantee that all information will be accurate. In Case I the Soviet need to convince the United States that it is interested in the same world of stable mutual deterrence implies attempts at dissimulation and spoofing. These could result in apparent intentions and capabilities that are consistent with Case II for a good part of the research-procurement period.

If the United States does not perceive the possibility of ambiguity, and does not take actions corresponding to this possibility, it might be deluded until its security was endangered. On the other hand, should the United States conduct hedging operations, it might generate an arms race. At least this is what the United States may believe. For example, the United States may believe a hedge in the form of a slow, upward drift in the number of invulnerable intercontinental missiles would look ambiguous to the inferior Soviet Union. In this case, the United States could, alternatively, hedge by building standby capacity in offensive or defense systems, but using the capacity could involve substantial difficulties and much time.

B. FORCE STRUCTURE AND ARMS CONTROL

United States difficulty in determining the Soviet Union's strategies brings up the specific role of arms control in proscribing a sudden bid for superiority. Because the Soviet Union is attempting to delude the United States in Case I, it should certainly show some interest in arms control with adequate inspection and verification. The Soviet Union should show a similar interest in Case II, because this is one way of communicating interest in stable mutual deterrence. For example, in either Case I or Case II, an agreement to reduce some of the vulnerable forces on both sides and to acquire invulnerable ones is reasonable. Under the assumptions, no matter what the Soviet Union does with its initial force structure, it will remain strategically inferior for a time. An agreement simply to destroy some vulnerable weapons or to turn them over to an international agency may convince the United States that the Soviet Union is sincere. This kind of behavior, even though it might involve inspection only of force reductions, and not of the remaining forces, would tend to create expectations that the process would continue, and that, perhaps, proscriptions might be placed on remaining forces. Expectations may be strong, since the United States insists on step by step controls with adequate inspection and verification. For here is a first step.[1]

At this point we make the following classification of arms control proposals. We consider (1) agreements on the type, quality, quantity, and deployment of existing weapons systems, (2) limitations on procurement, (3) limitations on active and passive defense, (4) limitations on applied weapons research and development. Are there any agreements in these categories that would prevent the Soviet Union from implementing its strategy in Case I? Would such agreements differ from any mutually acceptable agreements in Case II? Finally,

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[1] An offer for general disarmament would generate suspicion in either case, unless one could show that for Soviet Union political objectives a disarmed world is superior to the present one. But this is dubious given the relative economic strength of the U.S. and the EEC.

are there any great risks for the United States should there be cheating?

1. Agreements on Existing Weapons Systems

Looking at our fourfold classification, it is clear that (1) is not really an absolute constraint on the Soviet Union since, by assumption, it enjoys a degree of economic and technological choice. Initially, the Soviet Union has an inadequate first-strike capability and only a punitive second-strike capability; therefore its commitment to its existing forces other than in terms of sunk costs and bureaucratic inertia must be slight. The Soviet Union can go in either of two directions, modification of the existing force structure or a plunge into a new technology. The new technology will be more efficient[1] than the old one. Therefore, some of the Soviet Union's existing weapons are superfluous to its over-all strategy in Case I. Furthermore, since the Soviet Union's corollary objective is convincing the United States that it is genuinely interested in stable mutual deterrence, it would be logical to negotiate some reductions or limitations on existing force structures. A bargaining process could be conducted over the type of weapon, the trade ratios, and the type of inspection. And it would be reasonable to permit some inspection and verification of the remaining forces. It would not be reasonable for the Soviet Union to permit inspection of all its forces if it fears a U.S. first strike in the short run. But this is as valid a consideration in Case II as it is in Case I.

Agreements on the existing forces do not particularly bind the Soviet Union's future posture nor do they provide any indication of Soviet strategy. It is difficult to distinguish Case I and Case II from the Soviet Union negotiating position unless, paradoxically, one wants to argue that the more intransigent the Soviet Union is about arms control, the more it is interested in stable mutual

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[1] There are many definitions of efficiency in strategic discussions, depending on objectives or the level of task defined. An example is minimizing expenditure for given levels of damage potential against an opponent.

deterrence. In Case II, the Soviet Union might be willing to engage in agreements because some of the existing weapons are also superfluous or will become so, and because agreement shows good faith. While the Soviet Union in II might insist on very large reductions in U.S. strategic forces as compared to I, the resulting debate on this point could assume Talmudic proportions.

2. Agreements on Procurement

A distinction must be made between additional procurement of existing weapons systems and procurement of new weapons where research and development has been completed, and substantial new capacity exists. Agreements about the former have the same ambiguities as the force reduction agreements discussed above. The future Soviet Union posture is not constrained by such agreements. Considering the agreements about the latter, agreements not to procure new weapons systems and to dismantle capacity involve new ambiguities. Because such agreements may be painful to the Soviet Union, particularly where Soviet economic capacity is less than that of the United States, the Soviet Union demonstrates its good faith.[1] Yet if some of the new weapons are still relatively inefficient and unreliable, they are, for the purpose of the Soviet over-all Case I strategy, as superfluous as the existing weapons. For example, both the United States and the Soviet Union could engage in a process of dismantling new capacity in nth generation missiles without affecting their future strategic postures, if the future posture relies on missiles of the (n+1)th generation. But at any given time, even though the Soviet Union's new weapons may be inefficient and unreliable, they may increase the Soviet Union's deterrence of the United States. Unless one wants to argue that a willingness to dismantle capacity indicates Case I and refusal Case II, when the reverse may be true, ambiguity occurs once more. Dispelling the ambiguity

[1] The process here may resemble a Kwakiutl potlatch. One shows resolve by deliberately hurting oneself. See R. Benedict, Patterns of Culture, New American Library, New York, 1953, pp. 160-206.

involves very careful analysis of the weapons included in an offer. Could the capacity possibly contribute to future Soviet Union superiority? And if it is decided that a weapons system may contribute to the Soviet Union's future superiority, and production capacity is destroyed, what is the technological and economic flexibility of capacity in different, perhaps unrelated, systems in producing a proscribed system?

3. Civil Defense Limitations

The agreements discussed above are not really designed substantively to prevent the Soviet Union from achieving strategic superiority. If that is Soviet intent, inspections and verifications of the most rigorous kind will not produce stable deterrence. Unfortunately, category (3), agreements about civil defense, while operating in time, do not help in reducing ambiguity either.

Initially, as assumed above, the United States is superior to the Soviet Union without a large civil defense program, but the Soviet Union will require an extensive program in Case I, since the United States at the end of the Soviet research-procurement period should not have a first-strike capability, but will retain some punitive capability which would have to be blunted. But there are good reasons why an extensive civil defense program would be rational in Case II -- e.g., "insurance" against inadvertent or accidental war and fear of a U.S. first strike designed for maximum counterforce efficiency. Given initial U.S. superiority, even a massive civil defense program by the Soviet Union could be construed as defensive in intent. It is true that a Soviet fallout and/or blast shelter program is the kind of system taken in isolation that protects the population in the event that the United States strikes, avoiding cities. But the combination of a civil defense program plus a system of efficient active defenses could perhaps reduce potential punitive damage from a U.S. second strike to an "acceptable" level, although the U.S. damage potential would still be very great.[1]

[1] T. C. Schelling, "Dispersal, Deterrence, and Damage," Operations Research, IX (May-June 1961), p. 365. Of course, it is possible to

In Case I, the timing of the civil defense program depends on the lead time of civil defense with respect to the Soviet Union's evolving force structure. If technology and planning require that civil defense activity be started long before new weapons become operational, the following sequence for the Soviet Union seems reasonable. The Soviet Union adopts a large civil defense program. If some military targets are collocated with the Soviet Union's major cities, even some blast shelters should not seem too provocative -- if they ever do. Immediately after the civil defense program, assuming research and development were successful, the Soviet phases in new offensive capability and active defenses at missile installations and at cities. Conversely, if large quantities of civil defense can be acquired in a very short time, the Soviet Union can appear to be interested in Case II -- stable mutual deterrence -- for much of the research-procurement period.

In interpreting Soviet actions then, the United States finds itself in a dilemma. Depending on the lead times involved, civil defense activity by the Soviet Union is consistent with either Case I or II. But lack of civil defense activity may also be consistent with both cases. If the ambiguities had not been perceived by the United States, it could find itself vulnerable to a first strike such that its retaliatory capability could be reduced and where adverse asymmetries would appear in the intra-war residual damage potential of both sides. And this could imply a consequent reduction in the ability to carry on prewar, intra-war bargaining and negotiations. But recognizing the ambiguities will not resolve them. Even

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argue that deterrence may be enhanced when there is no civil defense program. An opponent may be deterred from counterforce operations because it is impossible to distinguish between counterforce and countervalue. The population in effect becomes hostage for the safety of a nation's weapons system. Contrary to the Schelling argument, an opponent may attack the weapons if he has a choice. In particular, where one side has superiority and the other side offers a choice, the superior side may simply take it, provided that whatever retaliatory capability remains in the attacked nation will not automatically be targeted against cities, but used to obtain a reasonable truce or war termination.

accurate information on the lead times involved would not help very much with the dilemma sketched above, and the United States would make its own decisions in the dark.

There are two alternatives in resolving the ambiguity. The United States can adopt the simple decision rule that when Soviet civil defense activity reaches a certain threshold, the United States takes appropriate countermeasures. These could involve a symmetric civil defense program, an increase in retaliatory capability, and so on. Given the ambiguity and the budget constraints operating on the United States, such policies could create both political and economic difficulties.

An alternative to the rule above might be an explicit agreement on civil defense activity. Proposals here could aim at assuring both sides an adequate number of hostages. For example, given the strategic objectives, but assuming some interest in damage limitation, should war occur, both sides might agree to shelter only the population near missile installations or in the most probable fallout paths if weapons were to be targeted.[1] Installation of large-scale active and passive defenses at major cities might be relatively easy to detect. And in the same vein both sides might agree to take only the minimum measures necessary to assure a viable postattack economy rather than putting the economy or part of it deep underground. Detection of violations of small preparatory measures would be difficult. But an attempt to put an entire economy or a subeconomy underground would hardly go unnoticed.

Unfortunately, such agreements, if successful, would reduce ambiguity only if civil defense requires a long lead time relative to the Soviet Union's new weapons. As noted above, civil defense is a necessary condition for the Soviet Union's damage-limiting capability

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[1] The United States might provide shelters for population solely in areas containing intercontinental missiles and for those areas which would be in the most probable fallout paths. But such discrimination, while perhaps technically feasible, could be inequitable and politically untenable.

in Case I, and an enforceable agreement would prevent the necessary condition from realization, if the lead time was long. On the other hand, if large quantities of civil defense can be acquired in a very short period, it would be rational for the Soviet Union in Case I to sign a civil defense agreement providing for inspection and verification, to adhere to the agreement through a large portion of the research-procurement period, and then to abrogate the agreement when its strategic forces were finally ready. Consequently, it would be extremely difficult to distinguish Case I from Case II on the basis of an agreement or the information provided by inspection.

4. Limitation on R&D

There is one final problem that must be investigated under ambiguity and asymmetry -- technological surprise. The technological surprise problem the United States faces is different under asymmetric postures from the one ordinarily discussed where two parties in a state of stable mutual deterrence attempt to remain that way under a rapidly changing technology.[1] It was noted above that the Soviet Union must carry out research and development in both Case I and Case II. Distinguishing a priori between weapons systems leading to Case I or Case II may be difficult. For example, an agreement not to promote research on boosters carrying large yield warheads, but permitting research on small boosters, assuming external economies in the production of knowledge, would not prevent the Soviet Union from acquiring some of the information necessary to build large ones, while it seems relatively easy to build clandestine production lines and to use a space program for testing. However, given an agreement, the United States may not take measures making some of its forces invulnerable to large yield weapons, because doing so, the United States may believe, would generate suspicion about announced objectives, and also might be very expensive. To take another example,

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[1] Frisch, op. cit., pp. 144-147 discusses technological breakthroughs involving counterforce offensive capabilities, active and passive defense, and countervalue capabilities when stable deterrence exists and the technologies of two opposing sides are roughly comparable.

banning research on all AICBM systems may not be reasonable, since an efficient system deployed at the missile fields increases the invulnerability of a nation's retaliatory capability. Yet there may be an external effect in that there are better city defenses, resulting in a diminished U.S. damage potential after a Soviet first strike.

The examples above illustrate that designing unambiguous agreements on research and development activities that are effective constraints is difficult. The difficulty is compounded by the structural asymmetries. The meaning of the Soviet Union's applied research projects is unclear. A system that initially appears retaliatory in nature may be transformed into an efficient counterforce system or may provide leads toward efficient counterforce. Some pure research projects may appear to have no military function at all, yet turn out to be dangerous to the United States at some future time. In any case, inspection and verification are difficult, because the objects of inspection are unknown, and even if known they may be interpreted as part of the Soviet Union's effort to achieve stable deterrence rather than superiority. The technology of weapons systems does not provide unambiguous information about the strategies leading to patterns of research.

If the United States perceives the ambiguity, it may elect to carry out an extremely diversified weapons research program. Yet with its initial strategic and technological superiority, such behavior may convince the Soviet Union that the United States intends to retain superiority, thereby provoking an arms race. And the United States, because of the postulated economic constraints, is not well equipped for an all out arms race even though its economy is larger, and even though its future output could grow faster than that of the Soviet Union.[1]

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[1] For a theoretical discussion of the relations between arms control, force structure, and resource allocation at a micro-economic level, see A. R. Ferguson, "Mechanics of Some Limited Disarmament Measures," American Economic Review, LI (May 1961), pp. 479-488.

IV. DISCUSSION OF RESULTS

The characteristic feature of the analysis has been the high degree of ambiguity characterizing signals about intentions and capability generated by two nations transforming their strategic postures. Ambiguity has its costs, and some specific types of arms control agreements were considered in narrowing the range of alternative postures open to both sides. In a dynamic strategic process, very few of the arms control measures considered appear to be effective constraints on Soviet behavior.

The following model of the world was assumed:

(1) The United States currently has strategic superiority over the Soviet Union.

(2) Soviet weapons systems lag behind those of the United States in some of the following desirable properties: invulnerability, reliability, controllability, firing time, and performance.

(3) Civil defense activity is currently at moderate levels in both the United States and the Soviet Union.

(4) Soviet military planners can count on more budgeting flexibility than their U.S. counterparts.

(5) The Soviet Union knows more about the U.S. posture than the United States knows about the Soviet posture, and this condition will continue to hold in the future. Consequently, lags exist between Soviet actions and corresponding U.S. reactions.

Under these assumptions:

(1) It is extremely difficult to distinguish between Case I in which the United States pursues stable deterrence and the Soviet Union pursues superiority, and Case II in which both sides seek stable deterrence. The information that would be provided to the United States, given the model, is not complete or fine enough for U.S. decision makers to discriminate between the two cases.

(2) It is rational for the Soviet Union in Case I to engage in arms control agreements of the kind discussed above, if some of the existing Soviet force becomes superfluous as new weapons are phased in. If this holds, then there are large payoffs to the Soviet Union in Case I in using agreements about whatever weapons are superfluous as bargaining counters and as devices to lull U.S. suspicions.

(3) Negotiations and consequent agreements of the type discussed here might not differ appreciably between Cases I and II.

(4) If tacit or explicit agreements of the type discussed here are placed on the force structures of both sides, the United States might find itself vulnerable to a first strike resulting in adverse asymmetries in its intra-war damage potential. This would imply a corresponding reduction in the ability of the United States to carry on prewar and intra-war bargaining.

These conclusions do not imply that all arms control agreements are infeasible or undesirable, given the objective of stable mutual deterrence. They do imply that care must be taken in designing agreements so that they are effective constraints. This will involve very detailed analysis of the opponent's economic and technological flexibility. It will also involve designing negotiations and agreements that extract large amounts of information despite the Soviet Union's best efforts at increasing ambiguity, uncertainty, and noise. During negotiations it may be as important to propose a series of agreements believed to be unacceptable to the other side as to obtain actual agreements. A well-designed series of unacceptable proposals may provide vital information, because of the pattern of rejections and because of the overt interactions between two opponents. Any actual agreements should be designed functionally to narrow the number of strategies the Soviet Union can employ while the agreement is in force and to signal that it is indeed violating the agreement or adopting a strategy undesirable to the United States.

Conversely, a nation genuinely interested in stable mutual deterrence must retain some degree of flexibility in its own posture.

Things are not always what they seem, and while the world may appear to be converging toward mutual deterrence, or even a disarmed world, it may not be so. At least, some careful analysis may indicate that observations are consistent with a number of alternative strategies, that policies may be geared to the wrong strategy, and that the costs of a mistake may be extremely high.

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