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NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

A ... FOR RISK PREVENTION GAMES

... William M. Jones,
... Taylor

A RAND NOTE

A DESIGN FOR WAR PREVENTION GAMES

James P. Kahan, William M. Jones,
Richard E. Darilek

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PREFACE

This Note presents a design for computer-assisted manual politico-military games that simulate crises which the United States and the Soviet Union, as the world's reigning superpowers, might face. The games suggested by the design are ones that might shed light on the efficacy of various theoretical models aimed at reducing the possibility that such crises could escalate to nuclear war.

SUMMARY

The present Note has two major purposes: (1) To develop an integrative model of the Soviet-American relationship in crises which integrates the behavioral *processes* involved in the political decisions with the strategic, political, and military *substance* that is crucial to reality-based policymaking; and (2) to explore means of implementing the model in a technologically sophisticated, multi-party gaming design.

We consider some of the major models that analysts have posed to describe how wars grow out of crises. These models differ as to whether major wars arise out of intentional design or inadvertent consequences; depending on the model, one is led to a war-prevention philosophy of deterrence or crisis management, respectively. A deterrence philosophy is associated with Unitary Actor models of superpower behavior, while a crisis management philosophy is associated with Internal Dynamics models. We propose an Integrated Model of superpower crisis behavior that synthesizes the Unitary Actor and Internal Dynamics models, combining the intra-national with the international behavior of both superpowers.

The Integrated Model shows promise for fruitfully combining traditional foreign policy and strategic perspectives with behavioral and systems science concepts in the analysis of nuclear crisis prevention and management between the superpowers. We illustrate this potential in a discussion of how the Integrated Model would handle major issues in nuclear crises such as crisis decisionmaking, communication and perception, and international influence processes.

We then present a manual politico-military game design based on the Integrated Model, which would use empirically constructed data bases to inform and refine policy-oriented hypotheses. The game design is introduced after a brief general view of gaming, summarizing traditional means of gaming and their limitations, the requirements of our proposed gaming design, and the potential benefits of a technologically advanced approach. We present details of the new game design, and offer examples of recent computer software advances in gaming and data management at Rand that may be readily adapted for implementing the new design.

Finally, we illustrate how the proposed system might be applied to a study of an updated Cuban missile crisis and a study of the efficacy of proposed nuclear risk reduction centers.

CONTENTS

FIGURES

INTRODUCTION

In recent years, as military technology has moved forward rapidly and American-Soviet relations have oscillated between uneasy accommodation and overt antagonism, public attention has increasingly focused on the spectre of a nuclear war between the superpowers. This focus has manifested itself in both public debate and academic research on how best to avoid such a catastrophic event. As part of this research, the Carnegie Corporation commissioned The Rand Corporation to survey the recent behavioral science literature to determine whether any potential contributions toward preventing nuclear war could be identified. The resulting Rand Note (Kahan, Darilek, Graubard, Brown, Platt, and Williams, 1983), after observing that there were no "off the shelf" behavioral science findings that could immediately be applied to the prevention of nuclear war, examined several promising behavioral approaches that might usefully complement policy analytic work in that area. That Note recommended a general behavioral perspective that emphasizes the interactive nature of the superpower relationship, that is, how strategies, perceptions, communications, etc., between the two superpowers simultaneously interact and influence each other. This is in contrast to models which seek to understand either Soviet or American behavior without explicit consideration of the influence of the other side. Gaming was proposed as a flexible means of developing a unified approach to the problem.

Gaming, i.e., manual politico-military simulation exercises, has been useful in the past as a heuristic device for developing informal and intuitive insights, but it has rarely been used as a serious research tool. In large part, this is because games could not accommodate in a systematic and empirical way the complexity of most real-world national security situations. Recent technological advances reduce the severity of this constraint. We believe it is now possible, for example, to design a technologically sophisticated, versatile game structure that can be used to systematically analyze such topics as avoiding nuclear war. Such a design could be helpful in assessing the

behavioral principles behind bureaucratic decisions affecting paths to nuclear war and integrating those principles with the strategic considerations upon which decisions in crisis situations are based.

The present Note has two major purposes: (1) To develop an integrative model of the Soviet-American relationship in crises which integrates the behavioral *processes* involved in the political decisions with the strategic, political, and military *substance* that is crucial to reality-based policymaking; and (2) to explore means of implementing the model in a technologically sophisticated, multi-party gaming design.

PREVENTING NUCLEAR WAR

Our primary area of interest is the set of confrontation situations that can be reasonably presumed to raise the imminent prospect of nuclear conflict. A lower bound of this domain is third world terrorist events, "wars of national liberation," international conflicts that do not involve the armed forces of the U.S. or the U.S.S.R., etc. But even in these examples, important interests of one or both superpowers are involved.

The problem of preventing nuclear war has been continuously and intensively studied, virtually since the first use of nuclear weapons in 1945. Many approaches to the problem have been expounded. Some are based on the philosophy of deterrence, that is, inducing caution in a crisis by threatening unacceptable losses to a potential aggressor. Other approaches are based on a philosophy of crisis management, that is, reducing the chances for misunderstandings, miscalculations, or mistakes. The former seeks to create a situation in which nuclear war will be undesirable for all parties; the latter assumes that nobody wants a nuclear war, but it might happen anyway. The military and foreign policies of both superpowers have been driven by both philosophies, with the emphasis var, ing with the individuals in national leadership roles and the state of relations between the Soviet Union and the United States. Until recently, most strategy-based analysis has focused on deterrence-based policies, in which relatively concrete military force considerations dominate. Analysis based on crisis management has had more of an interdisciplinary focus, involving the collaboration of policy analysts with behavioral scientists.

A major issue that emerges from the contemporary research on the topic of preventing nuclear war is the intent attributed to the key decisionmakers on the question of war and peace. There is a general consensus that if nuclear war does occur, it will most likely result from the escalation of conventional hostilities. The outbreak of conventional hostilities is widely seen in turn as flowing out of a serious crisis. However, the intention of the leaders who would order the launch of nuclear weapons is widely debated.

Many scholars and analysts emphasize the concept of "inadvertent" war,[1] that is, a war that evolves out of the crisis behavior of national leaders and their advisors and was never originally intended or contemplated at the beginning of the crisis. These analysts (e.g., Hamburg and George, 1984; Lebow, 1981; Ury and Smoke, 1984) foresee a nuclear exchange evolving out of the dynamics of the escalation process during a crisis. The July Crisis of 1914 is often cited as an example of an inadvertent war, in which a variety of factors impinged upon crisis decisionmaking to trigger World War I. These factors included entangling alliances, rigid war plans and mobilization schedules, misperceptions and misunderstandings arising from stress and the press of events, and expectations that one's adversary would back down first (i.e., "brinksmanship"). Lebow (1981), in particular, champions the viewpoint that many of the major crises of the twentieth century, including July 1914 and September 1939, were brinksmanship crises. Adherents of the inadvertent war point of view believe that to better understand the measures needed to avoid nuclear wars, we need to develop a better understanding of decisionmaking dynamics, the workings of bureaucracies, the role of domestic politics, and other factors that promote "cognitive deficiencies" during crises.

An alternative school of thought downplays the notion that misperception and inadvertence during crises is the most likely path to war. As Blainey (1973, p. 249) puts it, "no wars are unintended or accidental." Rather, as Howard (1984, p. 22) states, "wars begin with conscious and reasoned decisions based on the calculation, made by bot

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[1] The material in this and the following paragraph is drawn in large part from Lorell and Brown (1985).

parties, that they can achieve more by going to war than by remaining at peace." Howard interprets the July 1914 crisis differently than Lebow; he believes that Germany consciously provoked war against France and Russia in 1914 for rational reasons of state, i.e., to maintain and enhance its power in an international system dominated by its adversaries. Fischer (1967) argues that Germany's leaders were willing to risk a general European war not because they erroneously anticipated that the other Great Powers would back down, but because they believed (incorrectly, as it turned out) that Germany could militarily defeat its opponents in a major war. Adherents of this viewpoint are primarily concerned with such issues as carefully defining and clearly communicating national interests, and developing the military capabilities and national resolve to assure the successful defense of those commitments.

The applicability of this historical debate to the problem of avoiding nuclear war is questionable. Nuclear weapons have obviously changed things dramatically. But exactly how they have changed things and how they will affect the crisis decisionmaking of national leaderships are questions that have evoked inductive rather than empirical responses from analysts of both schools of thought. This is not surprising, since nuclear weapons have never been employed since World War II; one theory about avoiding nuclear war is as good as the next, since neither can be proved right or wrong. Unfortunately, this research, while often intellectually interesting, is typically not very useful to policymakers precisely because of its highly subjective, idiosyncratic, and non-empirical nature. An analytic tool is needed that can synthesize these approaches. A gaming model of the intra- and inter-governmental structure of the superpowers which permits a data-based study of hypotheses may be just such a tool. Such a tool could also create a new data base, an institutional memory, for crisis decisionmaking, a tool which is sorely lacking at this time (Smith, 1984).

IV. GAMING

"Gaming" refers to an exercise wherein a team of human players confronts a situation and develops actions that, in conjunction with the actions of the other teams and the rules of the game, produce a new situation (Bracken, 1984). In the games proposed here, the players would simulate, in well-structured, environmentally rich situations, not only the national commands of the superpowers, but also diplomatic, military, and intelligence agency decisionmakers.

THE STRUCTURE AND FUNCTION OF GAMES

The traditional manual politico-military game is a structured competitive/cooperative interaction whose immediate purpose is to assess the outcome of a hypothetical international confrontation and conflict situation. It is competitive in that the players come to the game with a desire to win and in that different hypotheses about the outcome of the situation are tested; it is cooperative in that the participants assemble to learn from each others' collective experiences and to refine their own techniques. The game is composed of "playing" teams and a control group. The playing teams typically play the role of top-level decisionmakers of the opposing nations. Teams can represent entire nations or organizational subunits of nations. For real policy analysis, players should have operational knowledge of the political, military, economic, diplomatic, and cultural capabilities and features (and the decisionmaking styles and propensities) of the entities they are to simulate, as well as common understanding of the likely propensities of the other playing entities.[1] This kind of knowledge mix enables the teams to override some of the simplifications and omissions that are inevitable in any simulated environment.

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[1]Of course, gaming is also a useful way to initiate novices into the complexities of real-world decisionmaking. Although this educational aspect of gaming could be an important application of any gaming facility, we restrict our present discussion to policy applications.

We believe that gaming could provide the flexible means of explaining the evidential base required to support sound, empirically-based policy recommendations. Because of the (fortunately) limited number of crises that are available for analysis, as well as the unique qualities of each, gaming can be used to examine systematically the effects of alternative procedures on crisis decisionmaking. Similarly, because deliberate misperception can be systematically introduced into a simulation, and because records of player perceptions can be made and retained, gaming provides a vehicle to study both the incidence and effects of misperception, as well as the situations in which deception is likely to be an appropriate and effective strategy. Gaming experiments, based on available hypotheses about both American and Soviet bureaucratic functioning, might reveal effective strategies for assuring better coordination within our own decisionmaking structure and for understanding the peculiarities of the Soviet decisionmaking structure. Finally, gaming-based research may be able to identify effective influence processes, as well as preference-revealing strategies that could lead to possible resolutions to conflicts of interest.

Influence

What are the most important influences on nations' behaviors toward each other? Deterrence theory is based on the use of threat to get another person or nation to behave in a certain manner. But threat is not the only way to influence policy; George (1980) has called for an "Influence Theory" that would synthesize deterrence with other, noncoercive, means. Some first steps toward such a theory are proposed in George's (1984b) analysis of the (sometimes conflicting) military and diplomatic strategies that the United States has employed in managing superpower crises. He points out that a combined military and diplomatic coercive strategy, which he favors as potentially more effective than either pure strategy alone, contains elements that the advocates of both the military and diplomatic options will decry as dangerous. Military advisory groups typically focus on the developing military situation, attribute to the opponent those propensities that are typical to military decisionmakers, and interpret potential diplomatic strategy in terms of its impact on military options. Diplomatic advisory groups, on the other hand, view military possibilities in terms of their "message value" and fear having their plans overtaken by the impetus of military events. National command level decisionmakers may have to either select and enforce their own strategy, choose among strategies recommended by the different subordinates, or construct a course of action that is a compromise (and not necessarily a happy compromise) among the recommended alternatives.

A VEHICLE FOR EXAMINING ISSUES WITHIN THE INTEGRATED MODEL

Thus, there is a need to study decisionmaking, communication, perception, and influence processes not only between nations but also among the component organizations responsible for collecting, processing, and interpreting information for national decisionmakers. The Interactive Model, as a hierarchically organized structure of superpower relationships, is more capable of capturing all of these processes than earlier models have been. But the complex situation posited by the Integrated Model requires greater methodological flexibility than has been found in earlier work.

seek completely open communications with extensive feedbacks to ensure understanding. The balance between pressures to ensure good communications and accurate perceptions and disincentives to reveal all to an opponent must be carefully analyzed.

Although it might seem that most of the concern in communication and perception focuses on the national leadership of the superpowers, it is equally important to examine the communications and perceptions among the agencies that support each major national command; after all, not even the most monolithic of modern nations truly "speaks with one voice." Steinbruner (1984) points out that we know little about how the *American* bureaucracy functions in crisis, much less how the Soviets operate.

Even when information is perfect, communication effective, and political infighting minimal, coordinating different parts of bureaucracies is a nontrivial problem, both theoretically and practically (e.g., Marschak and Radner, 1972). Moreover, even though there is typically one major channel of communication between nations that are potential adversaries, there may well be alternative subchannels whose messages may be at odds with the main message. The question then arises, what structures and procedures within national organizations might enhance or diminish the prevention and management of crises that threaten nuclear confrontation? Bracken (1983), in his discussion of command and control in American military planning, cogently discusses the issues and problems of operating a complicated military organization that must be receptive not only to general guidance from above, but also to a myriad of details from below that will influence how general decisions are implemented. Allison's (1971) classic analysis of the Cuban missile crisis found that the evidence supported three separate models of decision behavior based on rational actors, organizational dynamics, and bureaucratic politics. A more integrated model of decision behavior in crises would provide a better understanding of how superpower policy develops from the interplay of sometimes conflicting internal factions within governments.

predelegated can strongly influence the choices made in a crisis (see, e.g., Romero, 1984). The number and nature of the communications links between corresponding agencies of the two superpowers may also affect decisionmaking. For example, the Hotline between the American and Soviet heads of state is widely regarded as a successful crisis management device, and extensions of this type of communications link to the corresponding military establishments are under active consideration (Landi et al., 1984; Weinberger, 1983).

Communication and (Mis)perception

In any communication between or among parties, there is a danger that messages will be misperceived. We know from such diverse disciplines as international relations, organizational sociology, and social psychology that even when cooperatively motivated agents interact, communication problems can lead to misunderstanding and needless chaos, mistrust, and ill-feeling (e.g., Brewer, 1984). Historical analyses have documented the critical role of misperception in such policy disasters as Pearl Harbor, the Bay of Pigs, and the onset of World War I. In each of these situations, there were misperceptions not only in the way that the potential enemy was viewed but also within the bureaucratic hierarchy of the nations involved. Bialer (1983) enumerated the ways in which the United States misperceives the Soviets and hinted at how the Soviets misperceive the United States. George (1984a) details the specific ways American and Soviet policymakers misread each others' signals during the rise and fall of detente in the 1970s.

But what is the true importance of misperception? Soviet and American leaders frequently misunderstand and misperceive each other, yet through 40 years of tension, the two superpowers have avoided facing each other in a direct combat. Some analyses of both World War I and World War II (e.g., Blainey, 1973; Howard, 1984) have concluded that both wars would have occurred even had each side fully understood and correctly perceived the intentions of the other. Moreover, because of the inherent conflicts of interest underlying crises, each side has an incentive to make the other misperceive at least some of its positions and options. Thus, it is inappropriate to condemn misperception and to

III. ISSUES FOR PROCEDURAL STUDY

MAJOR ISSUES

It might be argued that the Integrated Model, while undeniably a true model of the superpower relationship, is not of much use analytically because most problems are just as easily approached from the Unitary Actor or Internal Dynamics viewpoints. In this section, we consider some of the major issues of nuclear war avoidance that are of current interest, and how an Interactive Model could aid in their analysis.

Crisis Decisionmaking

How does decisionmaking in crisis situations differ from decisionmaking in noncrisis situations? In situations where the pressure of time intrudes and where decisions have major consequences, conflicting demands for accuracy and immediacy arise. These conflicting demands both restrict the range of strategic options and constrain procedures that might be employed to derive strategies. Therefore, it is essential to study not only the available strategic options but also the processes that govern decisionmaking in crisis--how individuals and groups seek out and process information, how conflicting values are resolved, how strategies are set, etc. Although the unique qualities of each crisis dictate the operating procedures to be followed, it is important to determine (1) whether generalizations might exist across types of crises, (2) what these generalizations might be and how they can be exploited in policy recommendations, and (3) what their limits are.

To study crisis decisionmaking within the framework of the Integrated Model, the effects of different procedures such as alternative group decisionmaking rules, the availability of computerized or other decision aids, and specific training for crisis decisionmaking should be empirically examined and then related to the choice of strategic option. The paths of information up and down the decision hierarchy and the extent to which authority can be delegated and

a continuation of diplomatic negotiations as the primary means of
dealing with the situations presented for much the same reasons (if
continuation of negotiations is at all a reasonable option). The
national command level group, wishing to address the situation of the
moment and being little influenced by concerns for possible
disorganization and institutional norms, can be expected frequently to
opt for actions that may vary sharply from any that are recommended from
below.

We know of no attempts, to date, to create a politico-military game
using an Integrated Model. In the following section, we shall argue
that such a game is both important and feasible and can be the basis of
useful analysis.

interaction between the higher national command levels and (optionally)
the corresponding lower level agencies. Different levels within each
superpower can operate with some autonomy. The national command level,
at the top of the hierarchy, has many of the functions of the
traditional single leadership agent but is limited in its ability to
gain information and implement decisions; it must rely for information
on its subordinate agents and it must delegate authority to act in
certain areas. The problem posed to the national leadership can
therefore not be managed entirely from the top.

Teams representing agencies subordinate to the national command
(which we refer to as *specialized agents*) decide what information to
pass to the national command and are given opportunities to tailor their
recommendations to the national command level in accordance with the
functional norms of the agencies they represent. They can also
interpret any delegated decisionmaking and action authority received
from above, resulting in an implementation in the context of their
goals, which may well deviate from those of the national leadership. In
the Unitary Actor Model perspective, the single goal of a nation is
coherent, if complex: Act to favor national interests, but do not take
too great a risk of nuclear conflict in so doing, unless the nuclear
conflict itself is in the national interest. In the Integrated Model,
although each component of the leadership hierarchy will nominally have
that same goal, the specialized agents will interpret it from their own
perspectives. That is, military groups will view the situation from the
perspective of military prospects and risks. Each specialized group,
not seeing the entire picture, will interpret the national objective in
its own terms.

Thus military agency teams are likely to recommend military plans
of operations (although not necessarily combat operations) that have
been prepared and promulgated beforehand if such plans are not patently
inappropriate. Executing an existing plan is the least disorganizing
measure (other than no action at all, if that is a possible option), and
organizations are typically averse to anything that invites serious
disorganization. Military advisory agencies generally consider
themselves to be best qualified to select the best military action in a
situation. Diplomatic specialists can similarly be expected to opt for

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+++++++++++++++++++++++++++          +++++++++++++++++++++++++++++
+        RED Government   +          +        BLUE Government    +
+                        +          +                          +
+     +++++++++++++      +          +        +++++++++++++     +
+     +    Red    +      +          +        +   Blue   +      +
+     + National +>-------------------------->+ National +     +
+     + Command  +<--------------------------<+ Command  +     +
+     +++++++++++++      +          +        +++++++++++++     +
+        //\\            +          +           //\\           +
+       //  \\           +          +          //  \\          +
+      //    \\          +          +         //    \\         +
+      //     \\         +          +         //     \\        +
+     //       \\        +          +        //       \\       +
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+ ++++++       ++++++ +          + ++++++          ++++++ +
+ + Red +       + Red + +          + + Blue+          + Blue+ +
+ +Milit+------->+Diplo+ +          + +Diplo+------->+Milit+ +
+ +Estab+<-------+Corps+ +          + +Corps+<-------+Estab+ +
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+  \>---------------------------------------------->/     +
+                        +          +                          +
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Fig. 3 -- An Integrated Model of Superpower Relations

lines) are illustrative, not definitive. In this version, each element
on a side speaks with each other one on its own side, but speaks only
with its corresponding number on the other side. However, this symmetry
is not necessary. For example, there might be no communication between
elements at the lower level of the RED hierarchy, but only with the
national command level. Or, there might be communication between
diplomatic elements of both sides, but not between military elements.
The choice of communication structure could be a key element in the
analysis of a situation.

The national leadership, which is represented monolithically in the
Unitary Actor Model, is represented here by a hierarchical structure
consisting of a single national command level supported by two lower
levels. But unlike in the Internal Dynamics Model, there is explicit

American or the Soviet bureaucracy are considered dangerous and self-defeating.

Fewer gaming exercises have been based on the Internal Dynamics Model than on the Unitary Actor Model. One such exercise was the Crisis Game presented in November 1983 on the American Broadcasting Company television network. In this game, former government officials played the heads of the different agencies that advise the President and simulated an Executive Committee meeting centered around an Iranian crisis. The Russians were not represented by a corresponding team, but were part of the game administration mechanism; that is, Russian responses to the team's moves were simulated by the game directors. In such a game, interest naturally turns to the decision processes of one side being simulated.

AN INTEGRATED MODEL

The Unitary Actor and Internal Dynamic Models have each provided useful insights into the problem of nuclear war prevention. But there is a growing demand (e.g., Jervis, 1976; Steinbruner, 1984) for models that include both the international and intranational dynamics of the superpower relationship. For example, George (1984b) explores the way in which the interplay between conflicting military and diplomatic approaches to American crisis management affects U.S.-U.S.S.R. confrontations throughout the world. Figure 3 presents a model that attempts to capture both the internal workings of each superpower and the relationship between them in a single analytically tractable design. We term this the Integrated Model.[5]

The model shown in Fig. 3 portrays a version of the Interactive Model with six principal actors.[6] The communication links (dashed

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[5]The Integrated Model has also been (informally) tagged the "Sawhorse" model. The relationship between the superpowers forms the main crosspiece of the sawhorse (i.e., its working part), while the hierarchical structures on each end form the supports. As we shall see, it might be possible to strengthen the sawhorse by establishing additional linkages between the support systems.

[6]Again, the illustration is limited to the military and diplomatic subagents for simplicity. Our primary interest at present is in an eight-actor game consisting of national command, military, diplomatic, and intelligence agents on each side.

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+++++++++++++++++++++++++++++++          ++++++++++++++++++++++++++++++++
+        RED Government       +          +        BLUE Government       +
+                            +          +                             +
+     +++++++++++++          +          +     +++++++++++++           +
+     +    Red     +         +          +     +    Blue     +         +
+     + National  +         +          +     + National  +          +
+     + Command   +         +          +     + Command   +          +
+     +++++++++++++          +          +     +++++++++++++           +
+          /  \             +          +          /  \              +
+         /    \            +          +         /    \             +
+        /      \           +          +        /      \            +
+       /        \          +          +       /        \           +
+      /          \         +          +      /          \          +
+     /            \        +          +     /            \         +
+    /              \       +          +    /              \        +
+   /                \      +          +   /                \       +
+  +++++++        +++++++   +          +  +++++++        +++++++    +
+  + Red +        + Red +   +          +  + Blue+        + Blue+    +
+  +Milit+        +Diplo+   +          +  +Diplo+        +Milit+    +
+  +Estab+        +Corps+   +          +  +Corps+        +Estab+    +
+  +++++++        +++++++   +          +  +++++++        +++++++    +
+                            +          +                             +
+++++++++++++++++++++++++++++++          ++++++++++++++++++++++++++++++++
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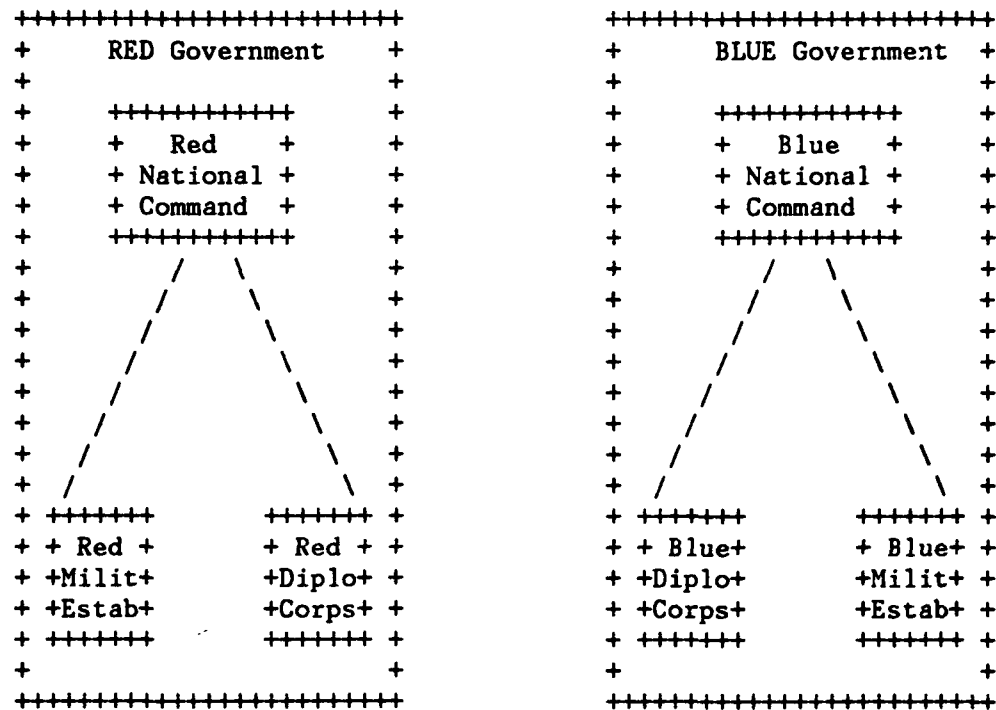
Fig. 2 -- The Internal Dynamics Model of Superpower Relations

higher level agencies receive conflicting recommendations from different
lower agencies, creating ambiguity as to the real nature of affairs.
The higher levels must decide which actions to reserve for themselves
and which to delegate to lower authorities. These delegations may
themselves be subject to misperception, leading to unintended actions,
uncoordinated initiatives, and loss of control.

The Internal Dynamics Model is the context which naturally gives
rise to a crisis management orientation to the question of how wars
originate. The misunderstandings, miscalculations, and mistakes that
arise out of ineffective or inappropriate internal relationships are of
central concern. More than that, it is necessary to guard against
inappropriate policies that arise in even healthily functioning
bureaucracies. Policy recommendations are sought that can clarify
communications between higher and lower levels of the hierarchy, so that
decisions may be made on a rational basis founded on veridical
perceptions. Proposals designed for avoiding nuclear war that ignore
possible misperceptions and misinterpretations within either the

THE INTERNAL DYNAMICS MODEL

Figure 2 portrays what we term an Internal Dynamics Model. The principal feature of this model is that the decision structure of the leadership of each superpower is a hierarchy of agencies. The determinants of a superpower's behavior with respect to its opponent are a result of internal forces within the hierarchy of agencies that affect the nation's perception of both its national interests and the international environment.[2] The advocates of an Internal Dynamics Model "share the view that one needs to go beyond the premises of the unitary rational actor and to examine political processes within nation-states in order to understand their foreign policies"[3] (Holsti, 1984, p. 554). The focus of analysis for this model is therefore on the behaviors and communications within each side, in an attempt to understand how these actions produce the national "behavior" of each.[4]

Within the context of an Internal Dynamics model, analytic focus is on the institutional biases that influence communications up and down the hierarchical lattice. The lower agencies selectively report information based on their own interests as they attempt to provide what they believe the higher level agencies want (or should want). The

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[2]For simplicity, only two internal influences are shown in Fig. 2--the military establishment and the diplomatic corps. In any well-developed Internal Dynamics Model, there are a multiplicity of agencies at the lower level of the hierarchy, including public opinion, domestic political forces, opposition parties, intelligence communities, and even individual personalities within the national leadership. Moreover, each element in the lower level of the hierarchy is itself hierarchically arranged; the "military establishments" of each superpower, for example, are composed of major force elements (Air Force, Strategic Rocket Forces, Navy, etc.). For our purposes here, however, we restrict our scope to the first two levels of the hierarchy.

[3]The Internal Dynamic Model has been expressed in differing ways by a number of authors. Allison's (1971) bureaucratic and organizational models, Janis' (1983) model of groupthink, and models of foreign policy decisionmaking by Halperin (1974), Neustadt (1970), and Snyder, Bruck, and Sapin (1962) are some examples.

[4]Ideally, both RED and BLUE should be studied in the Internal Dynamics Model. However, possibly because most of the analysts are American or because more information has been available on the American system, the vast majority of Internal Dynamics analyses have only examined the BLUE (i.e., American) side.
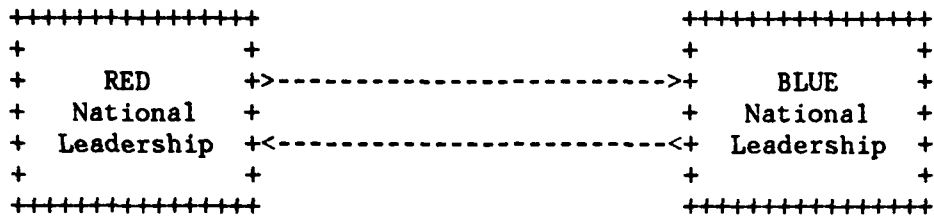
```
+++++++++++++++++                    +++++++++++++++++
+               +                    +               +
+   RED       +>--------------------->+   BLUE        +
+  National    +                    +  National    +
+  Leadership  +<---------------------<+  Leadership  +
+               +                    +               +
+++++++++++++++++                    +++++++++++++++++
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Fig. 1 -- The Unitary Actor Model of Superpower Relations

shifting allegiances of third parties, and the potentials for threat in
the situation) as well as the implied impact of moves, in the form of
bluffs, ploys and counterploys, and disinformation strategies. The
question of accurate perception vs. misperception of enemy behavior and
intent plays a central role in analyses of the world situation. Given
this orientation, the debate about solutions to the problem of avoiding
nuclear war tends to fall naturally into a question of the effectiveness
and applicability of deterrence strategies. On the one hand, proposed
policies that do not protect a nation against the worst-case
alternatives that might be in the national interest of the opponent are
dangerous; on the other hand, if both sides adopt the protective
strategies indicated, the overall risk of war may be that much
increased.

The Unitary Actor Model has generally served as the prototype for
politico-military gaming exercises. One group of people takes on the
RED role, another group takes on the BLUE role, and each group, largely
isolated from the other, discusses to a consensus what to do about a
crisis scenario presented by the game designers. Analysis focuses on
the resultant of the two consensus decisions, and the players are
typically free to set their own procedures for arriving at decisions.
In expanded versions of such games, other actors may represent lesser
states, for example Egypt and Israel in a Middle Eastern crisis
simulation.

MODELS FOR SUPERPOWER CONFLICT BEHAVIOR

Corresponding to the "inadvertent war" and "deliberate decision" orientations outlined above are implicit models of superpower behavior; each orientation views the world through a model that justifies its own conclusions. In this section, we describe these two models and offer a third model which integrates them.

THE UNITARY ACTOR MODEL

Figure 1 portrays what we label the Unitary Actor Model of superpower relationships, where two unitary agents, RED (the Soviet Union) and BLUE (the United States), oppose each other.[1] This model is associated with the deterrence philosophy and has in the past been most often used to analyze superpower relationships, both abstractly and in politico-military gaming exercises. It incorporates Allison's (1971) "rational actor" model. Although there is implicit recognition that the respective leaderships of the two sides subdivide the various tasks (e.g., moving troops, intelligence monitoring, strategy and planning, diplomatic communications, public (dis)information dissemination), it is assumed that any differences within each leadership are resolved at the time of any decision, and that the nation "speaks with one voice." The Unitary Actor Model thus focuses on the various behaviors and communications that a superpower takes with respect to its counterpart (as shown by dashed lines in Fig. 1).

Within the context of a Unitary Actor Model, attention is paid to the physical "moves" (e.g., mobilizations, troop movements, military and nonmilitary aid) that a superpower can make and the negotiating "moves" (such as proposed or signed treaties, official postures, and performances in world fora) that both publicly and privately define the meanings of the physical moves. Analysis is based in part on the "real" impact of moves (in terms of correlations of military forces, the

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[1]The model is not inherently limited to two agents; we restrict ourselves here for purposes of illustration and because we are primarily interested in the superpower confrontation.

The control group[2] has the responsibility of defining the game,
explaining the game to the players, conducting the game, interpreting
the moves of the players, and in all ways maintaining the functioning of
the exercise. Like the players, control group members should have
operational knowledge of the environment that they are simulating.

A playing team is presented with an initial situation (called a
"scenario") and must decide what actions it will take. These may be
military, economic, diplomatic, or intelligence actions, depending on
what the control group permits, and they may be fairly general or very
specific, again depending on how the control group has defined the
options. After a discussion (under rules that are rarely specified for
the players), a consensus is reached that is expressed in a "move paper"
that specifies (in sufficient detail for the control group to understand
and implement) the various actions and communications that the team has
decided upon. Once the control group has received the move papers from
all of the playing teams, it must decide what happened as a result of
all of the moves. In determining outcomes, the control group uses both
planned algorithms (for example, to determine the result of combat
encounters) and general principles (for example, to determine the result
of the unanticipated actions that occur in every game). These outcomes
are then used to frame a revised scenario, which is then presented to
the playing teams for their next move. A typical game will have from
four to ten moves, depending on the complexity of the situation, the
time available for playing the game, and the outcomes of the moves.

A playing team must rely on the control group to implement its
actions, so in a sense the control team acts as the surrogate
operational entity that implements the policies of the playing teams.
It becomes the responsibility of the control team thereafter to move the
pattern of operation with the passage of time.[3] Time and the passage of
time in such games is handled as follows. Game time "stands still"

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[2]This group is often called the "control team" although it is not a
"player" of the game in the sense that the other teams are (Luce and
Raiffa, 1957).
[3]This function of the control group is called "situation
projection."

during a playing team's decisionmaking periods. Game time is "jumped" between periods; a "jump" is the amount of elapsed time required to give the teams a significantly new decisionmaking situation with which to deal.

The essence of a free form game is thus the moving of teams of experts through a series of (simulated) developing crisis events, with time allowed for them to bring their expertise to bear on the developing issues and problems. They can also, on the basis of their knowledge of "real life" issues and agencies, supplement and compensate for the inevitable inadequacies that occur in every game structure and gaming process. The value of such games is that they focus the experts on a dynamic problem in an organized way. In addition, the game records, if systematically maintained can provide rich (if only suggestive) material for post-game analysis.[*]

EARLIER GAMES

Why, then, have research games not been conducted already? The answer, in part, is that they have been. Games addressing international crisis interactions have been conducted for some three decades and are an ongoing part of American military planning, and probably the Soviet planning as well. Much of this gaming experience is not formally recorded, however; it is fair to say that the actual experience on gaming is several orders of magnitude greater than the published record. However, although gaming as described here has been used with some success to explore aspects of nuclear conflict, it has fallen periodically into disfavor. Bloomfield (1984) and Bracken (1984) note some of the criticisms of games that explain why they have not lived up to their potential:

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[*]Post-game analysis has rarely been emphasized. This is, in part, due to the typically confused and incomplete nature of game records, along with the understandable tendency of analysts to infer more from the game than a dispassionate analysis can validly support. While a game may provide suggestive evidence about the interaction of conflicting ideas about possible courses of action, it is much too simplified an abstraction of the real world to give true evidence about the detailed behaviors of the agencies, groups, and individuals that would determine the outcomes of real crises.

1. The objectives of a game rarely include formal analyses of its processes and outcomes.
2. Even when analysis is intended, the data are often so unmanageable that analytic results cannot be produced.
3. Game behavior is necessarily different from real-life behavior.
4. By positing the wrong scenarios, games ask the wrong questions.
5. The outcomes of games are so dependent on the context defined by the scenario that generalization is impossible.
6. Most games are played once and not replicated in any meaningful sense.
7. Too many games (especially those played at universities) use college students or other poor surrogates for the superpower decisionmakers who make the real decisions.

While each of these criticisms is valid for at least some politico-military games, they do not, either separately or together, make a convincing case that gaming is an inappropriate tool for studying behavior in crisis situations. For the games built on the Integrated Model, each criticism may be refuted: (1) Current technology could afford the control group extensive computer assistance for message handling and recording, and particularly where different playing teams play different components of a bureaucratic hierarchy, it is appropriate and feasible to include formal analysis of game processes as an objective of conducting the game. (2) Even today, documented results of earlier games exist that could be analyzed (Bloomfield, 1984). But more to our present point, the principal advantage of using automated message handling systems is that more manageable data bases than those now used can be produced. (3) Many psychological studies, both experimental and observational, have demonstrated that with sufficient motivation and experience, people can behave in gaming situations in ways that closely parallel real-life behavior; indeed this capacity for play permits not only experimental gaming but also such diverse and important human endeavors as learning, psychotherapy, the theater, and sports. (4) It is of course true that asking the wrong questions will lead to the wrong answers. But a game based on theory-driven hypotheses that explores a

coherent world view in depth or contrasts two logically plausible but contradictory hypotheses has a strong likelihood of yielding insightful results. We shall explore examples of appropriate scenarios for study below. (5 and 6) The conclusions from any single game are of course limited to that game's limiting conditions. But if a sequence of games can be played, the consistent processes and outcomes over replications of the same scenario and over different scenarios can legitimately lay claim to generalizability. (7) While it is true that many games have used college students as players, others have used both American and Soviet expert policy analysts and even high level policymakers themselves. Reduced game time, an important feature of the game design we propose, should increase the willingness of busy people to participate.

A GAMING VERSION OF THE INTEGRATED MODEL

There is an extensive history of two-agent gaming in which the RED and BLUE teams are built along the Unitary Actor Model. In these traditional two-agent games, each of the agents is represented by a team of players who subdivide the various tasks (e.g., moving troops, intelligence monitoring, strategy and planning) informally. Typically, decisions are arrived at by a small subgroup representing the top national leadership, or by consensus among all the team members. All communications with the opponent are similarly concentrated at the top of the decision ladder and reflect a single position. Within-agent communications, information handling, and delegation of responsibility are managed informally and are seldom, if ever, recorded for later analysis. The control group acts as an interpreter of agent actions and transforms agent verbal instructions into game moves.

In a multiple-agent Integrated Model game, there are separate playing teams for each element of each decision hierarchy. These teams are autonomous in the sense that their decisions are made independently of any other team[5]; lower level agents must decide what information to

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[5]By autonomy, we refer here only to decisional autonomy within the game. The national command level may provide a lower level agency with orders, but that lower agency is "free" to obey or disobey those orders (albeit with consequences for disobedience) and, more importantly, will by the nature of the situation have some liberty to interpret those orders within its own understanding.

pass to the national command agent and must interpret and implement
their delegated authority received from above. From the players' point
of view, the game is not too different from the traditional one; each
team has a "move" to make. The complication of the hierarchical
structure is manifested when the control group determines how lower
level agency moves affect the meaning of the command level agency move,
and how these resultant "superpower moves" affect RED and BLUE outcomes.
The control team can intervene at many different locations, and it acts
as a filter for communications in addition to its former role as
interpreter and transformer.

To sketch out the characteristics of a control group support
package required to make this kind of game structure practical, it is
necessary to review in some detail the functions that group must
perform. The major game management function of the control group is to
handle messages from agent to agent (and to and from control) and to
maintain game records. In an Integrated Model game, efficient message
handling and record keeping are both important and a bit more difficult
than is the case in a two-agent game. Because there must be
interactions among the specialized agents and between them and the
national command agent before the whole team can arrive at a "national"
move, this consultive message traffic must be handled efficiently (and
the record must be efficiently maintained). In the multi-agent game,
requests for action flow among the command agent and specialized agents
during the decisionmaking periods. These interchanges are important
parts of the game record and must be maintained.

Turning to the substantive support and control functions of the
control group, it must keep abreast of the substantive problem solving
and decisionmaking of the agents, simulate staff support for the agents,
and respond to any queries they may submit concerning supplemental
situation information. In an Integrated Model game, supplemental
information requirements may be high. The control group must be
prepared to provide this information and support expeditiously, so as to
minimize time delays.

After the teams have made their moves, the control group must
project the scenario to the new situation (and advance game time to the
next apparent important decision juncture); develop a description of

this new decision situation (and prepare special, functionally related data and information relating to the new situation being prepared for each of the agents); and provide the information to all of the agents as the context for their next move period. This kind of projective procedure entails a complicated process of assessing the progress of the actions the teams have put in train, assessing the results of any interactions of military forces (and any other relevant operators), projecting the actions of those entities not controlled by the teams, developing the descriptions of significant exogenous events, and deciding on the length of elapsed time from the preceding situation to the new situation.[6] To make these decisions intelligently, the control group must be aware of the intents and concerns of the various agents. Although a carefully thought out decision and new situation development process would seem to be indicated, this is idle time for the playing teams, so expedition is necessary.

This summary description of the functions of the control group in a complex, multi-agent game provides the basis for describing the kind of "support package" that would be needed to make the game a practical possibility. For the message handling and record keeping requirement, a computer based message handling system is indicated. To allow the control team to respond quickly to the intermove queries of the playing teams and insure that the control team keeps abreast (substantively) of playing team operations, the message handling system must be organized so that any playing team to playing team message will be automatically routed to the game director (who can inspect the message and, as appropriate, forward it to its addressee). To meet the control team's "situation projection" requirement (between major play moves), two computer based support capabilities are indicated. The first is a set of tools that can be used quickly to project the physical features of the situation over the time lapse selected (from prior situation to new situation). These features would include representing the movements of forces and other assets that the playing teams' moves had put in train

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[6]The choice of time "jump" is a delicate decision, since the jump must be long enough to allow an importantly different set of problems to have developed without seriously overstepping intervening situations in which the teams may have been able to alter the course of events if they had been allowed to make a move.

and the outcome of any ongoing combat. The second tool is a computer based system to assist the control team in preparing the description of the new situation and to develop the detailed specialized descriptions and supporting data for the various subteams.

AN IMPROVED TECHNOLOGY FOR NUCLEAR CRISIS GAMING

The characteristics described above suggest the functional requirements of the technology required to conduct an Integrated Model game: message handling, data storage and retrieval, and decision aids. Fortunately, progress in computer technology, particularly in office automation and data management, has advanced the craft of the empirical gamer; new systems now exist that can overcome most of the criticisms of gaming as an empirical tool that were raised above. It is now possible to create a computerized "free form" politico-military gaming facility to model the complex nuclear crisis environment in a meaningful way.

Construction of a computer system to conduct Integrated Model games will involve in part borrowing general-usage software such as commercially available message handling systems and data managers, in part developing unique software for the specific task requirements at hand, and in part adapting software developed for other purposes. As examples of adaptable software, we discuss here three packages developed at Rand that have good potential for Integrated Model gaming. The first, developed for the Rand Strategy Assessment Center (RSAC), is a hierarchically organized package for completely automating politico-military games. The second is a generalizable data retrieval and storage system that allows users great flexibility in retrieving and grouping data. The third, also developed for RSAC, is a pattern matching program designed to aid the simulation of RED and BLUE national command levels in a two-team politico-military game. The first two systems will help in constructing an interactive game, while the third shows promise for assisting in the actual running of such games.

The RSAC Mark III War Gaming System

The RSAC Mark III system is a fully automated gaming system that simulates crisis and war situations between the superpowers. It is the outgrowth of several years' development, the objectives of which were described in Davis and Winnefeld (1983) and Davis and Stan (1984). The system allows fully automated gaming in which all national decisions are made by artificial intelligence models. Alternatively, it allows humans to play at any of many positions (e.g., a BLUE human team playing against an automated "RED Agent" or another human team). In one mode of operation, humans make all strategic-level decisions, while a variety of force models keep track of the situation and projected changes in situation and provide answers to various "What if?" questions. In another mode of operation, the analyst focuses entirely on the variables affecting decisions on grand strategy, escalation, and operational strategy. RSAC games can be rerun with different assumptions or can be "backed up" to key decision points to explore the implications of alternative decisions.

The decision models for BLUE and RED are hierarchical, with separate modules treating issues of interest to the national command level, global command level (an amalgamation of military and diplomatic agencies), and lower military levels. The higher the hierarchical level, the more global the perspective of the agent. At the "bottom" level, the force models that determine the course of a war are quite detailed and are based on the best available military thinking and data; these give RSAC simulations a realism well beyond that of typical war games. The political positions of third party nations are also simulated in Mark III and can change during the course of a game, either independently or in response to requests from either the RED or BLUE agents.

The use of a Mark III system in which human players take the role of national command and global command levels while lower levels are automated is of particular interest for the problem of nuclear war prevention. The system would have to be altered somewhat from its present focus on a European war arising from a superpower confrontation in Southwest Asia to encompass alternative scenarios and crises not

involving military maneuvers.[7] The automated lower levels of the Mark III system could then be adapted to crisis management games in addition to war fighting ones, and the consequences of policy level decisions (not only at the national command level but also at the lower agency levels) could be examined in a consistent, detailed environment.

The CODA Package

The second package that could be adapted is a new data storage and retrieval system (Dewar and Gillogly, 1984) known as CODA (Concept Organization and Development Aid). CODA, developed at The Rand Corporation, is designed to aid small groups of researchers in incrementally developing a data base, recognizing that, over time, the investigators' beliefs about its important organizing principles will change. CODA allows user entry of data and user-generated tags (which may be thought of as generalized keywords) by which data can be recalled. CODA's basic novelty is that it is specifically designed to allow great flexibility in changing and rearranging the tags by which the basic data are retrieved.

This system would be useful in scenario construction. As a set of scenarios evolves, the dimensions characterizing the set are in flux, changing as the analysts refine their notions of what constitute the important variables to consider. Different theoretical perspectives result in different hypotheses which require different varying conditions to test. These conditions may overlap or even conflict, and it is important to maintain a coherent architecture for scenarios so that theoretical hypotheses can be systematically examined. CODA, because of its flexible means of assigning, changing, and rearranging labels, is particularly well-suited to this dynamic categorization task.

The RSAC Mark II Game Control Support System

The Mark II system, also developed for RSAC, is a support system that provides a format for how the game defines the current state of the world (Jones, LaCasse, and LaCasse, 1983). Mark II manipulates files of categorically described situations or patterns, each situation being

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[7]Indeed, such modifications are planned for future RSAC development.

associated with a prearranged set of instructions to the game control group. It organizes the world situation as a series of matrices, or "tableaux," whose rows consist of the different countries or areas of conflict and whose columns consist of generic categories of information appropriate to the game at hand, such as force capabilities, alliance preferences, nuclear capabilities, state of mobilization, force deployments, or any other variable that the game design group deems important. Given a particular configuration of tableaux, the system searches its memory for predefined patterns that are "closest" to the input configuration according to a "closeness-of-fit" metric, and displays the best-fit patterns.* Along with the patterns, the game control group will receive associated instructions that guide it in constructing the revised scenario from the original scenario and the player moves. These instructions may be edited and then sent to the various players.

The Mark II system may be immediately applied to manual Integrated Model politico-military games. It lends itself to more efficient game preparation and game conducting processes and provides an improved capability to support post-game analyses. Mark II is designed to assist the game design group in preparing for subsequent game operations. It provides a convenient way for game designers to record their tentative projections of the situations that the playing teams may create and to record the actions that the control team should take (including the information to be provided to the various teams and sub-teams) if such situations develop. Mark II allows the game control group to quickly characterize the sequential situations that actually develop and retrieve the "suggested" actions and messages that were planned for the most similar situations considered during the pre-game preparatory period. While it is unlikely that a situation developed during the game will be precisely foreseen and the "suggested" actions and messages retrieved appropriate in all details, the prepared actions and messages can be easily and expeditiously edited to fit the situation of the moment. This editing process is less conducive to error than the

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*The closeness-of-fit metric is itself a parametric model which may be altered depending on the criteria chosen as important for determining closeness.

alternative of deciding control group actions and creating the various
messages to the playing teams in the press of game control operations.
The Mark II system, used in this manner, offers two additional
advantages over a completely unassisted manual game. It provides a
complete record of the actions and messages generated by the control
group at every game situation juncture, which combined with the records
of team moves and messages provides a full and structurally organized
record for post-game analyses (and comparisons with other games). It
also permits the situations and associated control group actions and
messages that developed and were used in prior games to be evoked and
used in similar situations in subsequent games. This latter capability
is important for the analysis of a series of games conducted to explore
the effects of variations in allowable communications patterns, posited
pre-crisis agreements, etc.

In the Integrated Model gaming structure, the RED and BLUE national
command agents are each supported by three specialized agents that
provide information and receive delegated authority for military
strategy and planning, diplomatic communications, and intelligence
acquisition, respectively. The playing teams and control group would
use the software package in the following way:

1. The initiating scenario would be presented to the various
    agents. The control team would translate the scenario into the
    categorical format required by the matrices and enter it into
    the situation component of the pattern-matching system.
    Different teams, depending on what agency they represent, would
    receive different matrices representing different pieces of the
    scenario.

2. The RED and BLUE sides prepare their moves. In this process,
    there is extensive formal communication among the constituent
    teams of each side. When each team has made its move, the
    control group takes the totality of moves and, again,
    translates them into categorical form to enter into the pattern
    format of the system. This marks the end of a move. The
    estimated elapsed time for this step is one to two hours,
    perhaps less for later moves.

3. The control group enters the team moves, in categorical form, into the pattern-matching system. The computer program then searches its files for matches and associated "action instructions."

4. The "action instructions" associated with the closest pattern fit retrieved are recommendations to the game director on how far to advance time, what the new situation should look like, and such additional information as should be sent to the different teams. The control group examines the suggestions and either edits them to fit the actual game situation or creates a new set of information formats which it dispatches electronically to the teams. The estimated elapsed time for this control group work, including examination of alternatives, is about 30 minutes to one hour.

These time estimates suggest that this support package would reduce the time necessary for a hypothetical two-sided game with four teams on each side to two days. Furthermore, if it is felt that players would be biased if they knew that their moves were being categorized and machine processed, they need not know this.

But there are some obvious problems. It takes a great deal of effort and thought to build the initial files of patterns and instructions. These files multiply during exercise use, so they become a valuable analytic resource, but there is also a risk that the control group may lose track of what is happening. Any change in the elements of the pattern template entails correcting all the other patterns in the file in order to use them. In other words, there is an inherent requirement to identify, at the outset of file development, the agents that are to be played "forever." Also, specialized agents must be sufficiently coherent and their operational behavior well enough known for knowledgeable human teams to attempt to simulate them. While military agents, foreign service agents, and intelligence agents have been constructed before, Public Opinion agents and Electorate agents, for example, would require more background effort before implementation.

V. TWO ILLUSTRATIVE APPLICATIONS

After discussing the Integrated Model, how it could be implemented
in a politico-military game, and what the requirements of that game
might be, we present here two illustrations of how games based on the
Integrated Model could be used in practice to identify steps that might
prevent nuclear war between the United States and the Soviet Union. The
first is a game that examines how a contemporary version of the Cuban
missile crisis might proceed, and the second is a test of the possible
consequences of establishing a bilateral nuclear risk reduction center.

A NEW MISSILE CRISIS

We earlier alluded to the problems in using historical case studies
to project behavior in future situations. An interactive game would
provide a way to "modernize" the circumstances of a past event that may
be significant for present policy. The Cuban missile crisis of 1962 has
often been cited as one of the best sources we have for analyzing how
the two superpowers actually behave in a serious, potentially nuclear,
confrontation. Allison's (1971) exposition of the rational actor,
bureaucratic, and organizational models of decisionmaking, as well as
his conclusion that the application of all three models, and not any one
alone, was essential to an understanding of crisis behavior, used the
Cuban missile crisis as its primary example. Janis (1983) used the same
crisis as an example of how to appropriately avoid the dangers of
groupthink.

In this way, case studies of the Cuban missile crisis have provided
what is regarded as a sound basis for generating hypotheses about *why*
the superpowers, meaning both their national command authorities and
their constituent bureaucracies, acted as they did in a particular
crisis. These hypotheses are often generalized to suggest how the
superpowers might behave in a similar future crisis, but it is
reasonable to question whether the same results that obtained for the
Cuban missile crisis of 1962 would hold under present-day or future
conditions. Today, for example, the Soviet Union is no longer inferior

to the United States in strategic nuclear capability. In 1962, the
Soviets were definitely inferior in this respect and they knew it; this
could be one of the reasons why they first decided to install ballistic
missiles in Cuba and later decided to remove them in response to an
aroused United States. Moreover, Soviet naval and air assets today are
clearly better, more numerous, and more capable of effectively
challenging their American counterparts effectively at greater distances
from the Soviet homeland than they were two decades ago.

Using interactive gaming to reenact, with updated force postures on
both sides, a contemporary version of the Cuban missile crisis could
prove highly instructive.[1] The Integrated Model incorporates all three
of Allison's models of decisionmaking within its basic architecture:
the rational actor model is used primarily in national command authority
decisionmaking; the bureaucratic model is represented in subordinate
agent standard procedure and in interagency arrangements; and
organizational factors are encompassed in the individual teams that make
up each side. Such a game could suggest whether the crisis would be
likely to have the same outcome as in 1962. Then, the Soviets withdrew
in the face of American pressure. Now, it would be of interest to posit
the conditions of perceived force postures, intragovernmental
relationships within each superpower, and relationships among the two
national commanders under which similar outcomes might occur. By
varying these factors as starting conditions in a missile crisis gaming
series, some indication might be gained as to whether the continuing
American conventional superiority in an area so close to its borders
would give the United States an advantage, or whether the new strategic
nuclear balance between the superpowers now works to its disadvantage.
In particular, the game might provide a basis for assessing the extent
to which the framework constructed by Allison (1971) could be used to
explain the outcome of the 1962 crisis, or whether others' explanations
could be validated or refined in an updated rerun.

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[1]An extended illustration of what such a crisis might look like is
given in Kahan et al. (1983); that scenario could serve as the starting
point for a game such as the one considered here.

If the outcome of a game simulating an updated historical crisis is (through various repetitions and conditions) not the same as the outcome of the original crisis, then one or several interactive games may help identify the changed conditions that lead to this new outcome. Analysis of game play could reveal, for example, that the change in relative strategic or regional force balances was a critical variable. Alternatively, such analysis might indicate that particular bureaucratic or organizational perceptions of these or other external conditions, and not necessarily the conditions themselves, account for the change in outcome. Finally, historical crises that produce different results when reenacted under updated conditions can suggest new hypotheses for why things happen the way they do, and these hypotheses themselves can then be tested via additional simulations.

A TEST OF THE EFFICACY OF A NUCLEAR RISK REDUCTION CENTER

Our second example looks to a hypothetical future instead of the past for an initiating scenario. There have been from time to time proposed policy changes or new institutions that could help prevent nuclear war. These propositions are then debated, and it often seems that both the "pro" and "con" arguments have some merit. But absent implementing the proposition, the argument arrives at a dead end. Here, a semi-automated, multi-dimensional, integrated game of the kind described here would be uniquely qualified to shed light on the relative merits and hazards of such propositions. To illustrate this application, we shall consider the family of proposals now clustering around the concept of a "nuclear risk reduction center." The idea for such a center took hold initially in the U.S. Congress, with Senators Sam Nunn of Georgia, John Warner of Virginia, and the late Henry Jackson of Washington variously proposing the creation of an institution, either two parallel centers located in both Washington and Moscow or a single center situated at some neutral site such as Geneva, to be staffed jointly by Americans and Soviets.[2] The staff would include senior

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[2]For a good summary of the evolution and current status of this concept in the Congress and elsewhere, see United States Senate Committee on Foreign Relations (1984).

diplomatic and military representatives on both sides, and the purpose
of the center(s), wherever located, would be to provide additional tools
for exchanges of useful information, clarification of questionable force
deployments or other signals of intent, and continuing dialogue in both
peacetime and times of crisis.

Excursions on the concept of such a center have been run by study
groups at, among other places, Stanford University, Harvard University,
and The Rand Corporation. Stanford's group (Lewis and Blacker, 1983)
suggests that the United States and the Soviet Union should draw upon
the experience they have had with the Standing Consultative Commission,
which was established in 1972 with SALT I as a bilateral forum for the
regular exchange of information pertinent to the superpowers' strategic
interests as well as their arms control agreements. The Nuclear
Negotiation Project at Harvard (Ury and Smoke, 1984) recommends joint
American-Soviet facilities at each nation's capital, connected by
instant teleconferencing, where diplomats and military officers could
continuously monitor potential crises. The Rand study (Landi et al.,
1984), a systematic analysis of the concept of a crisis-control center,
observed that an improved network of direct communications, including
both military-to-military and embassy-to-home links as well as the head
of state "hotlines," might be preferable to any physically established
center.

The overarching hypothesis of the various risk-reduction proposals
is that successful management of a crisis, judged in terms of the
ability to both achieve national objectives and prevent nuclear war,
should improve with the addition of some new device, be it a single
center, two of them, or a direct communications network. Integrated
gaming is ideal for testing both this and related propositions. A
crisis game with a set scenario could be run with different types of
risk-reduction centers, examining variations in comparison to a "control
game" that has no such center. The center members would be bona-fide
players of the game, just like the national commands and specialized
agencies. A difference would be the open communications links the
center players would have with their co-member counterparts. Such a
game would enable us to gauge the likely effects of different types of
risk-reduction centers--whether they help, hinder, or have no effect at
all on successful management of the crisis.

Integrated Model gaming would also shed light on specific hypotheses, such as that of Landi et al. (1984), among others, that there would be disincentives to using such a center in crises where time is particularly urgent. Integrated gaming could be used to test whether direct communication links, established at different levels within national hierarchies (e.g., head-of-state, military-to-military) would be better for controlling and managing crises than established centers might be. This type of gaming can also help identify the various points in both crisis and pre-crisis periods at which one type of system might be preferable to another, and it can indicate whether risk-reduction centers and communications links together are better than either crisis management technique alone. These and other hypotheses can be tested effectively through integrated gaming precisely because the multidimensional features of this game adapt themselves so well to the multidimensional aspects of the actual situation and, thus, to assessment of current proposals for improving prevention of nuclear war.

VI. CONCLUSION

We have proposed here the use of basically manual, free form,
politico-military gaming as a means for coordinating the efforts of
knowledgeable and/or experienced analysts and practitioners to find ways
of reducing the threat of nuclear war. We believe that such games
should be structured on the more comprehensive Integrated Model instead
of on either of the two simpler Unitary Actor or Internal Dynamics
Models. The objective of such an endeavor would be to provide a
structure that can allow experts in issues and organizational processes
(for both the American and Soviet "sides") to apply their expertise and
knowledge to developing (simulated) confrontational crises. The
dynamics of a game, carried over a series of developing events, can
provide a record of the interactions at both the international and
intranational levels, which may produce suggestive "evidence" concerning
the likely efficacy of measures designed to reduce the probability of
confrontations leading to nuclear conflict.

The program we envisage requires that the game be structured to
reflect a model of the interactions of interest. The preparation and
running of such manual games is inherently expensive in terms of the
players' time, particularly if the players are high level experts. In
the past, such games were structured and managed so as to maximize the
usefulness of the time committed by the players, leading to the
selection of the Unitary Actor Model to portray the international
situation, as this is the structure that allows an unassisted, manual
control group to minimize the game time intervals between playing team
move/decision periods.[1] To break this barrier to the use of manual
games for the study of nuclear war avoidance requires the following
capabilities:

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[1]This is also the structure that is easiest for the control group
to address in making their pregame preparations. Pre-game control
preparations are analogous to the preflight preparations of a test
pilot. In both cases, contingency projections and planning of reactions
are valuable so that if a contingently projected situation does arise,
the response will be consistent with analytic objectives instead of a
spur-of-the-moment decision.

1. The use of a game structure that allows the simultaneous simulation of both the international interactions that are the essence of crisis behavior and the intranational interactions on both sides that lead to the choice of national policy and behavior.

2. The flexibility to employ the same game structure for different scenarios and to systematically modify the characteristics of the game, so that suggested facilities and procedures over a range of possible world situations can be systematically explored.

3. The retention of the better features of the manual format, including the use of experts who play though a developing context and have enough time to bring their knowledge and experience to bear.

4. Assistance for the game organizers in their essential pregame explorations of and preparations for the moves that the playing teams may make during the game.

5. A way to make pregame contingent preparations quickly available to the control group as the teams make their moves.

6. A way of recording the various moves of the playing teams (and the control group) in the sequence in which they were made, so that they can be used for post-game analyses.

Although the system has not yet been developed that possesses all of these capabilities, we believe that such a system is possible. Its implementation will require a concentrated, interdisciplinary effort involving contributions from the combined knowledge of the fields of gaming, computer science, individual and small group decisionmaking, military science, political science, Soviet studies, and foreign policy.

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