Counterattack or Delay: Characteristics Influencing Decision Makers' Responses to the Simulation of an Unidentified Attack

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Counterattack or Delay

CHARACTERISTICS INFLUENCING DECISION MAKERS' RESPONSES TO THE SIMULATION OF AN UNIDENTIFIED ATTACK

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This paper reports a secondary analysis of a series of simulation runs which explored the effects of a broad array of variables on a nation's response to an imminent strategic attack from an unidentified source. Seven variables appeared as important in determining whether a nation would counterattack or delay retaliation when given such a warning. These variables include availability of a weapon survivability system, the economic and force capabilities of the nation, the decision makers' perceptions of the degree of tension in the world and of the degree of ambiguity in the situation, as well as the decision style and level of self-esteem of the decision makers. The results suggest that factors other than the invulnerability of weapon systems are involved in maintaining the stability of deterrence in an extreme crisis.

During the 1969 congressional debate over appropriations for the antiballistic missile (ABM) system, a critical question concerned whether ABMs would significantly increase a president's choices or options in responding to an imminent nuclear attack. Partisans in the debate drew alternative interpretations from a hypothetical scenario that posed the issue. One version of the scenario involving a crisis with Russia in the mid-1970s appeared in a column by Stewart Alsop (1969):

> PLACE: The Cabinet Room of the White House during a meeting of the National Security Council.

The President is speaking when what looks like a large television screen in a corner of the room emits a loud buzzing noise, and black letters begin to race implacably across its surface: OSC [Orbital Survey Craft] identifies approx 500 surface missile firings, Siberian area.

THE PRESIDENT (presses a button): You're sure, general?

VOICE FROM SCREEN: Identification positive, sir. Almost immediately, new words appear on the screen: OTH [Over the Horizon Radar] positive identification 500-plus SS-9's on trajectory over Arctic on course toward North Central U.S. Impact approx 23 minutes.

THE CHAIRMAN OF THE JOINT CHIEFS OF STAFF: Looks like a counterforce strike, sir. Better get ready to empty the holes.

The President nods his head, says nothing. Eight minutes pass. . . .

VOICE FROM SCREEN: PAR [Perimeter Acquisition Radar] locked on incomers, sir, urgently request permission activate ABM.

THE PRESIDENT: Fire away, general.

CHAIRMAN, JCS: Mr. President, when are you going to empty those holes?

THE PRESIDENT (sits silent for a full minute, then presses a button): Air Defense, how many Minutemen do you estimate will survive?

VOICE FROM SCREEN: Four hundred minimum assured survival, sir.

THE PRESIDENT: Assured, general?

VOICE FROM SCREEN: Assured, sir. We're hoping 500.

Another agonizing minute passes.

THE PRESIDENT: Gentlemen, I have decided to try to ride this one out [copyright 1969, by Newsweek, Inc.; reprinted by permission].

Alsop's scenario may well have been influenced by an exchange that occurred two months earlier during hearings on the ABM conducted by the Senate Committee on Foreign Relations (U.S. Senate, 1969: 207-208, 213):

Senator SYMINGTON: Why would it not be possible when a missile attack of a preemptive strike was recorded, for the Minutemen to be launched to the targets to which it was planned they would go?

Secretary LAIRD: I would just like to say, Senator Symington, that that kind of a decision could be made, but I am not sure in my own mind whether the President on that kind of information would unload all of our silos. I think that this is a very difficult decision to make on that kind of information. . . .

Senator GORE: For instance, now, let's take a hypothetical case, a sergeant or a lieutenant or a Secretary of Defense, or whoever is out in Montana at the missile site, who finally gets the President of the United States on the telephone, and in an excited voice says, "Mr. President, the radars, 4 1/2

minutes ago, picked up three ICBMs coming over the horizon from the Soviet Union, they are in trajectory bringing them on top of us, which button do I push?" The President asks some questions, and he said, "Mr. President, I see three more. We have got 3 minutes left." "Well, do you see any more?" "Yes, Mr. President, there are three more and they are headed for North Dakota; which button do I press?"

Senator FULBRIGHT: The panic button. [Laughter.]

Secretary LAIRD: It is not any laughing matter. It is a deadly serious question, and it gets right down to the heart of the discussion here today. I can tell you that if I were sitting in the position of the President of the United States, I would like to be able to have an ABM to launch and not have to push the button for the strike. I would like to have that capability of being able to intercept some incoming nuclear warheads.

Despite his efforts, Secretary of Defense Laird failed to convince some senators that an ABM system—even assuming that it performed as its proponents predicted—would be a major consideration in a president's decision on a response to the initial warning of a nuclear strike on the United States.

Herbert York, a nuclear physicist who became a top official in the Defense Department under both Presidents Eisenhower and Kennedy and an advisor to President Johnson, shares the skepticism of certain Senators regarding the ability of ABMs to insure the stability of a deterrence system based heavily on ICBMs. He clearly states, however, the critical danger facing the land-based missiles of both the Soviet Union and the United States perhaps before the end of the 1970s (York, 1970: 178):

With presently planned warhead multiplicities and with foreseeable accuracies and reliabilities, each side will eventually be able to wipe out better than ninety-five percent of the other side's silo-based missile force in a surprise attack. The possibility of the Soviet's achieving such a capability against us in the mid-seventies was one of the reasons given by the Nixon Administration in 1969 for proposing deployment of the Safeguard ABM system. Indeed, the question is when, not whether, this can happen.

Among the ideas that have been advanced for protecting land-based missile forces, and thus extending the deterrence system that rests upon them, are the superhardening of the missile silos, the "Safeguard" ABM system, proliferation of ICBMs, and a shell game in which a nation has more silos than missiles and continuously shifts the location of its missiles. York concludes that none of these alternatives is a technically viable solution. According to York, the launch on warning solution posed by Senator Symington (quoted above) seems technically feasible but remains

unattractive on other grounds.[1] Confronted with the warning of a nuclear strike, will decision makers launch their missiles? What considerations will affect their decision? How important to that decision is the availability of an ABM system assuming that it increases the likelihood of survival for a portion of one's own ICBMs? In effect, as York (1970: 186) comments, we are "asking that a human being make in just a few minutes a decision to utterly destroy another country. (After all, there would be no point in firing at their empty silos.) If, for any reason whatever, he were responding to a fake alarm or to some kind of smaller, perhaps, 'accidental,' attack, he would be ensuring that a massive deliberate attack on us would take place moments later." Our own research on stress (M. Hermann, 1966) and crisis (C. Hermann, 1969) suggests that human decision making in situations such as that posed by the launch on warning dilemma is subject to a number of different influences.

Accordingly, the present study uses a man-machine simulation to explore some variables that may help to explain the decision made in response to an imminent strategic attack. The situation created in the simulation, however, departs from the scenario advanced during the ABM debate in one critical way. Participants in the simulation did not receive information about the source of the strike, thereby creating an uncertainty parallel to that which might be experienced by policy makers whose territory comes under attack in a world of n nuclear powers—a world that could exist in the 1970s or 1980s.

Actual incidents already have occurred in which the recipient decision makers did not know what party initiated the attack they experienced. For example, in the midst of the Arab-Israeli War of 1967 jet aircraft suddenly attacked the U.S.S. *Liberty,* a communications ship stationed off the coast of Egypt on an intelligence-gathering mission. For a period of time top policy makers in the United States were unclear about the nationality of the *Liberty's* attackers. At first Secretary of Defense

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1. The launch on warning option could be performed on the basis of human authority—as in the scenarios by Alsop and Senate Committee—or it could be completely automated. York (1970: 185) finds the latter reprehensible. "People who think about such things envision a system consisting of probably two types of detection devices that could, in principle, determine if a massive launch had been made and then, somewhat later determine that such a launch consisted of multiple warheads aimed at our missile-silo fields. This information would be processed by a computer which would then launch the Minutemen so that the incoming missiles would find only empty holes; consequently the Minutemen would be able to carry out their mission of revenge. Thus, the steady advance of arms technology may be leading us not to the ultimate weapon but rather to the ultimate absurdity: *a completely automatic system* for deciding whether or not doomsday has arrived."

McNamara, among others, thought Soviet forces were responsible; then speculation turned to the Egyptians (see McNamara, 1968). Although it was Israeli pilots who fired on the *Liberty,* at the time such a source for the attack seemed implausible to American leaders. Fortunately, United States carrier-based aircraft—which were scrambled immediately—were not ordered to retaliate against the initially suspected sources. This example of uncertain and ambiguous cues is by no means unique in the nuclear age. Most other incidents have occurred when acts of nature or faulty technology have produced blips on a radar screen mistaken for the enemy.

The problem becomes far more acute if the number of nuclear powers expands.[2] A third nation might seek to precipitate a catalytic war between two hostile states to further its own objectives. Moreover, the probability of accidental war can be expected to increase as the number of nuclear powers increases—some of whom may develop relatively "cheap" nuclear weapons without the costly safeguards and command and control systems devised by the major states. The increased possibility of catalytic or accidental war in a world of n nuclear powers carries with it the increased likelihood of unidentified attack (see Abt, 1965), especially for those nations that lack the sophisticated technology or resources to deploy an early warning system capable of identifying the origin of a missile attack. Evidence that the Soviet Union and the United States recognize this growing problem appears in the first substantive agreement to result from their Strategic Arms Limitation Talks (SALT). Even before the treaty agreements were signed in Moscow, the two superpowers took steps to insure the uninterrupted operation of the "hot line" between Moscow and Washington and agreed to use the communication system immediately in the event that either nation experienced a nuclear explosion on its territory (Presidential Documents, 1971). For these reasons, it seemed important in talking about the role of ABMs in the mid-1970s and 1980s to consider a situation involving uncertainty as to the identity of the attacking nation.

To study the problem of the surprise strategic attack from an unidentified source we used the Inter-Nation Simulation (INS) as the research instrument. In effect, we reanalyzed data collected during an experimentally induced episode in a series of INS runs conducted for another project. At the end of each of ten trials or replications of that

2. Notwithstanding the nuclear nonproliferation treaty, the acquisition of nuclear weapons by additional nations in the foreseeable future remains a definite possibility. Israel, Japan, and India are three nations which have both the technical capability and some incentives for considering a nuclear force.

INS, the decision makers were told that their nation was to be attacked by a large military force from an unidentified source and that the attack would impact in ten minutes. In the present analysis we examine the decision maker's responses and seek to determine what variables were influential in the national decisions to retaliate against someone immediately or to absorb the strike before responding.

In thinking about this research problem we speculated that the decision to respond is the function of a number of variables, among which the availability of a system like the ABM that is intended to increase the survivability of a nation's strategic deterrent is only one—and perhaps not the most important. Therefore, an initial task involved the selection of variables from the INS data that could be hypothesized as a major component in such decisions. The research considered the effect on the decision makers' responses of eleven independent variables which have been grouped for purposes of discussion under six headings—weapon survivability (e.g., ABM, hardened missile silos), idiosyncratic attributes of policy makers, perceptions of the immediate situation, decision-making processes, national attributes, and relationships to the external environment. The measurement procedures for specific independent variables and the dependent variable appear after a description of the particular operating procedure in the simulation.

Method

INTER-NATION SIMULATION

The Inter-Nation Simulation (INS) (Guetzkow et al., 1963) combines the activity of human participants with a set of machine computations. The relationships between variables in the programmed calculations form the established part of this model of international relations and remain constant from one simulation trial or run to another. Participants are assigned in groups of two or more to one of several nations, assuming roles in foreign policy organizations of these nations. Both roles and nations are abstractions that represent generalized properties, rather than attempts to portray the details of a specific individual or political system.

The INS operates in cycles or periods each sixty to seventy minutes long. In every period the decision makers in a nation allocate the resources of their nation in an effort to achieve their selected objectives. To remain in office every government must successfully pursue at least one

objective—that of minimally satisfying the politically relevant elites in the society. Unless the national elites (military juntas, political parties, or other politically active sectors of society) are satisfied by the actions of the decision makers, they will withdraw their support from the government, thus allowing new policy makers to assume office. The elites or "validators" are symbolically represented in the programmed calculations which determine the validator's level of satisfaction from certain governmental actions. The elite's level of satisfaction, reported each period to the decision makers, depends primarily on the amount of consumer goods allocated to them and the relative military standing of their nation.

Nations have four kinds of resources: (1) "basic capabilities"—the natural, human, and industrial resources of a nation required for the production of the other three kinds of resources as well as additional "basic capabilities"; (2) "consumption satisfaction" units—the standard of living of a nation as reflected in the totality of goods and services available to the populace; (3) "nuclear force capabilities"—nuclear weapons systems; and (4) "conventional force capabilities"—all nonnuclear military components. Allocations of these resources in ways to increase the satisfaction of the validators or to promote other goals may involve internal development activities and a variety of interactions with other nations (e.g., trades, alliances, wars).

Once each period every nation summarizes the decisions it has made on a form subsequently run through the simulation's programmed calculations. On the basis of these programmed assumptions, the consequences of a nation's decisions are computed (1) to determine whether the government continues in office and (2) to fix the amount of each type of resource (net gain or loss) now available to the decision makers. The nations receive the results of these calculations and the participants repeat the cycle with a new round of interactions and decisions.

PROCEDURE

At the end of ten replications or runs of INS, decision makers were informed by message that their nation was being attacked by a very large military force from an unidentified source. The message read:

> Unidentified Attack Announcement: Your nation is being attacked by a very large military force from a source (or sources) which is not identified. Whether or not nuclears are involved is not clear. You may respond immediately, selecting the target or targets which you believe are the most likely sources of

the attack. In this case your retaliatory forces will be launched before you are hit by the enemy attack. Alternatively, you may absorb the attack, using for response those force capabilities not destroyed (either because you have defended them or because the attacking force was not sufficiently large enough to destroy all your military capability).

The simulation directors advised each group of national decision makers that the attack would impact on their country ten minutes after they received the warning. During this time they were allowed to confer with other members of their nation and to write messages both within and outside the nation. To preserve the ambiguity of the source, however, messages to other nations were not delivered. Thus, the decision makers received no replies to messages sent to other nations. After the ten minute interval elapsed, the simulation directors announced to all participants that the simulation was terminated—some fifty minutes before the schedule indicated it would end.

Each of the ten simulated international systems consisted of six experimental nations manned by five decision makers. The roles in every nation included (1) a central decision maker with ultimate authority for all governmental policies, (2) an internal decision maker in charge of budgetary allocations, (3) an external decision maker responsible for foreign affairs, (4) a force decision maker in charge of military matters, and (5) an aspiring decision maker to represent rival political leaders seeking power in the country. The unidentified attack was the last in a series of seven experimentally induced situations in this set of simulation runs. For a more detailed description of these particular INS runs, see C. Hermann (1969).

SUBJECTS

Some 325 petty officers, who were technical instructors or test examiners at the Great Lakes Naval Training Center, served as simulation participants. The mean age of the participants was 32.5; their mean intelligence score was 113.[3] The modal level of education was high school graduate.

3. Because of the intellectual skills required by the simulation, only individuals with normal or above normal intelligence were included as participants. A rough screening measure of intelligence, the thirteen-point information test (Pierson and Gorsuch, 1963), was used to ascertain level of intelligence.

DEPENDENT VARIABLE

The dependent variable in the present study was the decision made in response to the unidentified attack. Did a nation counterattack on warning or did it delay any military response? Conference transcripts, messages, and forms completed to initiate an attack were analyzed to determine the nature of each nation's reaction. Responses were classified into one of three categories: decisions to counterattack, decisions to delay retaliation, and uncodable as to the appropriate response. Twenty-one nations fell into the uncodable group because they did not reach an identifiable decision during the allotted time. The other 39 of the sixty nations involved in the ten simulation runs (65%) made responses classified as either a decision to counterattack or a decision to delay retaliation. Thirteen of these 39 nations (33%) attacked on warning without certain knowledge of the aggressor; whereas 26 (67%) did not. Intercoder reliability on the three-way classification of nations was .85 (Pearson product-moment correlation).[4]

The following excerpts illustrate responses in each of the three categories. The Enuk nation in the fifth run of the simulation decided to counterattack on warning. These decision makers indicated—on a standard form used to initiate military actions—that the bulk of their forces should be launched immediately against the largest nation in the opposite bloc. On the other hand, the decision makers in the Heon nation in the ninth run agreed in conference that "we should stand by and only retaliate when we know who our enemy is." Their response was classified as a decision to delay retaliation. An example of an uncodable response occurred in the tenth run among the participants in the Colo nation. They sent messages to the other members of their bloc such as the following: "Under attack, send aid immediately." Moreover, a message went to the permanent chairman of the international organization asking if he knew who had launched the attack against them. These messages represent all the activity Colo engaged in during the ten minutes. No internal conferences transpired nor did their head of state authorize the completion of an attack form.

The present analysis includes only those 39 nations that made a definite decision. The uncodable class of nations was not used because it contained several indistinguishable types—groups that asked for aid or information

4. Disagreements among coders centered on whether a nation had made a decision to delay a response or there was uncertainty about the decision (classified as uncodable). The coders did not disagree on when a nation had decided to counterattack on warning.

such as in the example given above, groups that failed to monitor accurately the time remaining to them but had intended either to counterattack or delay, groups that thought they had already decided to act but under stress failed to register their decision, groups that simply could not decide between two unpleasant choices, and groups that did not understand the options open to them.[5]

INDEPENDENT VARIABLES

The present study included eleven independent variables which the authors hypothesized might account for the response made to the unidentified attack. In addition to having expected explanatory power, the independent variables selected were those for which we had data from the simulation and which represented a broad range of potential explanatory phenomena. The categories into which the individual variables have been grouped—primarily for organizational purposes—reveal the breadth of factors taken into consideration. These organizing categories include (a) weapon survivability system, (b) idiosyncratic attributes of the policy makers, (c) perceptions of the immediate situation, (d) attributes of the decision-making process, (e) features of the nation or society, and (f) relationships to the external environment.

Weapon Survivability System

Antiballistic missiles represent one of a number of means that nations can theoretically use to protect their deterrence forces from complete destruction by a first-strike attack and thereby hope to maintain a viable second-strike capability. Other ways of defending retaliatory systems include increasing the quantity of missiles, hardening missile sites, dispersal and concealment of missiles, and making missile launchers mobile (see Singer, 1962: 50). In the simulation a generalized feature for the protection of retaliatory weapons, called FCN defense (or defense of

5. A reader of an earlier draft of this paper suggested that the uncodable group of nations be included in the analysis as a third category representing "no recognizable action." Such an idea was appealing to the authors, but because the uncodable nations did not form a coherent group—they included nations who sought aid or information, nations that made a decision but failed to record it, and nations that, in effect, misunderstood the situation as well as nations that were indecisive—we did not know how to interpret results for such a category and, thus, focused the analysis on nations that made a definitely codable response.

nuclear force capabilities), served as a single variable representing various weapon survivability systems.

(1) FCN defense. The proponents of the Safeguard ABM system hypothesize that this system will increase the probability of a decision to delay a response in the event of a strategic attack. (Recall the scenario by Alsop and the comments by Secretary Laird reproduced in the introduction.) The simulation permits a more general version of that hypothesis to be tested; namely, that some means of increasing the survivability of one's military retaliatory capability will decrease the tendency to launch on warning. Schelling (1966: 288) advances the same general proposition: "If a country's retaliatory weapons are reasonably secure against surprise attack, preemptive or premeditated, the country need not respond so quickly to alarms and excursions."

In the simulation, nations that possessed nuclear force capabilities (FCNs) could invest in a program which would increase the probability of their FCNs surviving if they were the target of an attack. The program—called FCN defense—did not guarantee that a protected FCN would survive, but did substantially increase the probability of survival. Of course, it made no sense for a government to consider such an investment unless it had a nuclear capacity. Nations could acquire nuclear weapons in two ways. If they had an industrial base (determined by total number of basic capabilities) beyond a certain threshold, they could produce their own nuclear weapons. All nations could receive nuclear weapons from alliance partners or others by means of trade or outright grant. On their periodic decision forms, governments possessing FCNs noted the extent of their investment in FCN defense. The amount of FCN defense recorded in the period immediately prior to the warning of the unidentified attack established the magnitude of the weapon survivability system available to the nation.

Idiosyncratic Attributes

Idiosyncratic variables are the characteristics of an individual policy maker—his personality, his social background, and his experience—that distinguish his policy behavior from that of other decision makers. From the cluster of potential idiosyncratic variables this study included two personality variables—self-esteem and cognitive complexity.

(2) Self-esteem. Self-esteem means positive evaluation of oneself. In part, self-esteem was included because M. Deutsch (1961) has proposed that this variable affects national policy during times of stress or crisis.

Moreover, Hermann and Hermann (1967) found that differences in the self-esteem of key decision makers in Europe during the summer of 1914 appeared relevant to the outbreak of World War I. Several studies (Block and Thomas, 1955; Cohen, 1959; Leventhal and Perloe, 1962; Silverman, 1964) have shown that persons high in self-esteem tend to use avoidance responses in dealing with stress while persons low in self-esteem use sensitizing or expressive responses. The individual high in self-esteem tries to ignore the presence of danger and to work on the stress situation in order to maintain his image of himself. The individual low in self-esteem, on the other hand, is alert to and overinterprets the potential threat, becoming behaviorally dependent and vulnerable to outside influence. An inverse relationship, therefore, was predicted between self-esteem and the response to the warning of an unidentified attack. Leaders low in self-esteem will overreact to the threat of attack and will counterattack on warning; those with high self-esteem will underreact to the threat and will attempt to maintain the status quo.

A month prior to the beginning of the simulation runs, prospective participants completed Cohen's (1953) thirteen-item, self-ideal discrepancy measure of self-esteem. This measure asks a subject to decide which statement in a set of five statements is most descriptive of his ideal self (how he would most like to be) and which is least descriptive. Similar ratings are made of the subject's view of himself (how he actually is). The smaller the discrepancy between descriptions of self and ideal self, the higher is self-esteem. By dividing the distribution of scores at the median, the experimenters classified simulation participants dichotomously as high or low on self-esteem. The reliability (internal consistency) of this instrument was .77 by coefficient alpha.

(3) Cognitive complexity. Cognitive complexity involves the integrative abilities of an individual—that is, whether he interprets stimuli unidimensionally or multidimensionally and how much discrimination he makes between stimuli within dimensions (e.g., dichotomous or more complex). The authors predicted a negative relationship between this variable and the decision to counterattack on warning. The more cognitively complex the decision makers (the higher their level of integration), the more likely they are to delay retaliation. Driver (1965) in a study using the Inter-Nation Simulation found that large countries containing decision makers with predominantly concrete information-processing systems (low level of integration) used aggressive responses more often in dealing with stress than large nations with abstract decision makers (high level of integration). Driver proposes that, when threatened, concrete decision makers recognize fewer nonviolent alternatives than do abstract decision makers.

Cognitive complexity was assessed by an impression formation measure developed by Schroder et al. (1967). Participants considered two sets of descriptive adjectives, the first set of adjectives inconsistent with those in the second set. They were asked to indicate in several sentences what their impressions would be of a person described by set 1 and a person described by set 2. Then they were told that the adjectives actually could be applied to one person and were asked to give their impressions of such a person. The adjectives used were: set 1—intelligent, industrious, impulsive; set 2—critical, stubborn, envious. Using rules developed by Schroder et al. (1967), coders classified responses to the combined list of adjectives dichotomously as indicating low or high integration. Intercoder reliability on a sample of sixty responses was .72 (Phi coefficient). This impression formation task correlates .99 with a more widely used measure of cognitive complexity, the Sentence Completion Test, also developed by Schroder et al. (1967). The participants responded to the impression formation task at the same time as the self-esteem measure.

Immediate Situation

The immediate situation describes the particular configuration of human and nonhuman factors that provide the stimulus or occasion for decision. The impact of the situation on the decision maker's choice depends on the properties of the situation as he perceives them, not as they might appear to some observer or other actors. We hypothesized that the responses to the unidentified attack would be influenced by two situational variables—the degree to which participants perceived the situation as ambiguous and the degree to which they perceived it as accidental.

(4) Perception of situation as ambiguous. A decision maker may define a situation as relatively unambiguous when all the perceived cues or signals appear to converge in support of a single interpretation of that situation. The more the perceived signals support contradictory interpretations or appear so few in number as to suggest no interpretation, the more ambiguous the situation is perceived to be. We predicted a negative or inverse relationship between the degree of situational ambiguity and the response to the warning of an unidentified attack. As ambiguity increases, the decision maker recognizes less consistent information about the identification of the possible aggressor and the resulting uncertainty acts as a brake on the initiation of irreversible action such as launching an attack. The U.S. response to the air strikes on the communications ship, the

Liberty, during the Arab-Israeli war of 1967 illustrates the rationale for this hypothesis. Although American officials speculated about the source of the attack, they perceived a high degree of ambiguity in the situation for a significant period of time and, accordingly, the United States delayed any response.

In the simulation, immediately after the ten minutes for decision elapsed and before they learned further information about the unidentified attack, participants completed a form containing a number of adjectives which might be used to characterize the situation they had just experienced. To indicate their perceptions of the event's ambiguity, the participants noted how applicable the adjectives "ambiguous/unclear" were in describing the attack. They selected one of four possible responses which included "not at all applicable," "slightly applicable," "moderately applicable," and "considerably applicable." A response of "not at all applicable" received a score of zero; a response of "considerably applicable" received a score of three; responses of "slightly applicable" and "moderately applicable" received scores of one and two respectively.

(5) Perception of situation as accidental. The degree to which the decision makers perceived the attack to be accidental served as the second situational variable. We hypothesized a negative relationship between the tendency to perceive the attack warning as an accident and the decision to counterattack immediately. The more accidental the policy makers perceive the impending attack to be, the less they risk further escalation and the more confidently they expect apologies, explanations, and compensations. The source of an accidental attack appears unlikely to initiate a second round of force unless it has, in turn, incurred some damage. An accidental occurrence between two parties can be understood as one that the leaders of neither side intended—it may have been triggered by nature, miscalculation, subordinates, or third parties. Such a situation precipitated by events can be contrasted with one deliberately set in motion by opposing decision makers. "If one is repeatedly challenged, or expects to be, by an *opponent* who wishes to impose dominance or to cause one's allies to abandon him in disgust, the choice is between an appreciable loss and a fairly aggressive response. If one is repeatedly forced by *events* into a test of nerve along with the opponent, there is a strong case for developing techniques and understandings for minimizing the mutual risk" (Schelling, 1966: 121).

In the simulation the means of measuring the accidental quality of the situation followed the procedure used with perceived situational ambiguity. The word "accidental" appeared on the form containing

multiple adjectives that the participants completed following the ten minute decision period. Using a four-point scale (described above under perceived situational ambiguity), they rated the applicability of this term to the attack warning they had just experienced.

Decision-Making Process

The sixth and seventh independent variables represent a cluster of properties identifying the manner in which a decision is made. Included· in this larger set of variables are such factors as the organizational configuration of the decision makers, their search for alternatives, their assessment and ranking of alternatives, and so on. From this cluster we selected two that seemed relevant to the response given to the attack warning—style of decision and number of alternative courses of action considered.

(6) Decision style. The decision style of a government concerns the amount of interaction among key officials in making a decision. We can determine the value of this variable by the response to the question: How much group interaction occurs at the highest level of government before the decision on how to react to a situation is made? A decision taken by a solitary, authoritative decision maker represents one extreme whereas a collective decision taken only after full consultation with and expression of views by all the leaders of government constitutes the other extreme. We hypothesized a negative relationship between decision style and response to the warning of an unidentified attack; that is, the more group interaction, the less likely is a decision to counterattack on warning. Although it may be unclear whether a nation's leaders take a greater risk by retaliating against targets which may not be the aggressors or by absorbing the strike with the consequent reduced capability to make any response in the future, it is arguable that one option prolongs uncertainty more than the other. To counterattack immediately resolves the issue. The retaliation may be directed at the wrong targets, but even so the agony of decision is over. The decision maker can do little more to affect the outcome. By contrast a decision to delay is a decision to live with uncertainty for an indefinite period—uncertainty about whether the nation will have the ability to respond after absorbing the attack, uncertainty about whether the nature of the aggressor will ever be clearer, and uncertainty about whether their government will continue in office after the attack. If we equate this increased uncertainty with increased risk, then the risky-shift phenomenon (Kogan and Wallach, 1967) suggests that

a group will be more prepared to take the risk than an isolated decision maker. Furthermore, the research on leadership in groups (see Gibb, 1969) suggests that under acute time pressures, more decisive behavior comes from the group with a central authority who takes responsibility for making the decision. As suggested above, the counterattack option appears more irrevocable and decisive.

We read through messages and transcripts of conferences the participants initiated during the short period following the attack warning to determine if a given nation's decision makers generally discussed with one another the appropriate response. We interpreted the absence of any discussion of possible choices available to the officials of the nation as an indication of a single-decision-maker decision style. Therefore, responses were coded dichotomously as representing a collective decision style if there was interaction over the decision or a single-decision-maker style if there was no interaction over the decision. The coding emphasized whether the decision makers interacted in making the decision. If the exchange among the decision makers focused on execution of the decision rather than on what the decision should be, then decision style was characterized as involving no group interaction. Intercoder reliability for this measure was .62 (Phi coefficient).

(7) Number of alternatives. By number of alternatives we mean the number of different courses the decision makers considered as responses for dealing with the situation confronting their nation. This paper groups the possible replies to the attack warning into two categories. During the simulation, however, each group of decision makers may have recognized more or fewer options. We hypothesize that the fewer the alternatives, the more likely is a nation to counterattack when confronted with an unidentified attacker. On the assumption that the most probable human reaction to being struck is to strike back, we contend that if only one alternative is considered it is probably to counterattack. Only if the decision makers examine other alternatives is the delay option likely to be considered. As one of the present authors (C. Hermann, 1969: 155 ff.) has shown, a crisis such as the unidentified attack tends to increase the pressure on decision makers to come to a consensus; therefore, they are less willing in crisis decisions than at other times to argue against a proposed course of action. When everyone is disposed to agree with a proposal, the need to consider other alternatives disappears.

The number of alternatives considered by the decision makers of a given nation was determined by a content analysis of that nation's messages and the transcripts of any conferences during the short decision

period that followed the attack warning. A sentence contained an alternative proposal if it mentioned a procedure for treating the situation which confronted the nation. Two or more proposals constituted separate alternatives if they differed on any of the following features: (1) the types of action proposed; (2) the actors involved in the proposal; (3) the time specified for action; or (4) the situations of concern in the proposal. In order to control for fluency (some nations interacted more than others and, thus, had more opportunity to raise alternatives), the number of alternatives which a government considered during the decision period was divided by its total number of statements during the same period. This variable in effect assesses the relative emphasis the decision makers place on posing alternatives or, more specifically, the number of alternatives proposed per national statement. Intercoder reliability on this measure was .93 (Pearson product-moment correlation).

National Attributes

Any feature that characterizes the status or condition of the entire society falls within the category of national attributes. In brief, they represent properties that apply to all parts of the same country but that can differentiate entire nations from one another. Two variables in this cluster that serve as potential explanatory factors for the response to the attack warning are basic capabilities and force capabilities.

(8) Basic capabilities. The basic capabilities that a simulated nation possesses at the beginning of each period approximate the GNP of actual nations. Basic capabilities comprise the human, natural, and industrial resources of a simulated nation and its potential for the production of all possible goods and services. The relevance of such basic resources to the ability of a nation to wage war has long received emphasis in the study of international politics (e.g., Knorr, 1956). We predicted that the greater a nation's basic capabilities, the more likely were the nation's decision makers to counterattack on warning. This prediction rests upon two arguments. First, more economically developed nations will be better able to assume the expense of an attack because the military expenditure represents a smaller proportion of their national wealth. Second, the governments of wealthier nations as contrasted to poorer ones tend to assume that the world should be responsive to their world views and priorities, and they have a predisposition to use force as a means to that end (K. Deutsch, 1968: 88).

The number of basic capabilities possessed by the nations at the time of the announcement of the imminent attack was the measure used for this variable in the present analysis.

(9) Force capabilities. Two units—conventional and nuclear force capabilities—comprise the simulation equivalent of all military forces that a nation may possess. Conventional force capabilities (FCCs) represent all the nonnuclear components of a nation's military system; nuclear force capabilities (FCNs) refer to all nuclear weapon systems. As with basic capabilities, we predicted a positive relationship between the amount of force capabilities and the reaction to the warning of an unidentified attack. Our reasons for such an expectation parallel those advanced for the hypothesis involving basic capabilities. Nations with only a small quantity of force capabilities will probably be more cautious in expending those forces than nations with large military forces. Moreover, the more military forces a nation has, the more it can hold in reserve in the event that its initial views about the sources of the attack subsequently prove incomplete or faulty. To these arguments might be added a third, which in its simplest form contends that nations with powerful military forces are more likely than other nations to use them (e.g., see Wilkinson, 1969: 44-45; Yarmolinski, 1971: 32-37).

The sum of conventional and nuclear force capabilities which a nation had at the beginning of the attack period constituted the measure of this variable. Because nuclear forces are much more costly to produce and vastly more destructive they were weighted more to arrive at this combined total. In the summation all nuclear force units were multiplied by a constant representing the cost differential over conventional forces. Two important observations should be made about nuclear force capabilities in the Inter-Nation Simulation. First, as previously noted, nations had to achieve a certain industrial and scientific base, represented by a specified threshold of basic capabilities, before they could produce their own FCNs. Therefore, not all nations possessed nuclear forces. Second, in simulated war nuclear weapons differ from conventional forces only with respect to the magnitude of destruction. They explicitly do not differ with respect to speed of delivery, reliability, accuracy, or any other characteristics of alternative delivery systems.

External Variables

External variables include conditions and events outside a nation that affect its government's foreign policy behavior. These external conditions

need not be the same for all nations and, accordingly, can be distinguished from international system variables. For the purpose of explaining responses to the attack warning, we identified two external variables—the amount of perceived international tension in the world and the degree of a nation's isolation from other nations.

(10) Perceived international tension. By perceived international tension, we mean decision makers' estimates of how much the world is tending toward war at a given time. We hypothesized that the more international tension decision makers preceived to exist prior to the unidentified attack, the more likely the decision to counterattack on warning. In a world one already views as hostile the decision maker finds it easier to accept both the possibility of a belligerent action and the need to punish the offender. In the hostile and tense world, ingroups and outgroups have emerged; the unidentified attacker's probable identity seems more evident to the decision makers.

On the form which the simulation participants completed at the beginning of each decision period, they indicated whether the world was tending more toward peace or war. Each participant recorded his answer on a ten-point scale with complete peace at one extreme (score of one), and active war at the other extreme (score of ten). In the present analysis we used the responses the decision makers made shortly before the warning of the unidentified attack to indicate perceived international tension.

(11) International isolation. Isolation refers to a nation's withdrawal from interaction with other nations and its lack of participation in international affairs. We advanced the hypothesis that isolated nations would be more likely to counterattack on warning. We offer several reasons for such a prediction. The decision makers in nations that have withdrawn from interaction with other countries will be predisposed to see the world as hostile and unfriendly. Moreover, the nation will have a minimum of cross-cutting ties with other nations which serve as constraints on hostile action. This argument follows that of Singer and Small (1968: 249) who view "a welter of cross-cutting ties" and "shifting of friendships and hostilities" as a means of maintaining peace.

The exchange of written messages provides a basic means of main-taining contact with other nations in the simulation. The total number of messages sent during the simulation by a nation to the other nations was used as a measure of isolation. The fewer external messages a government wrote, the more we regarded it as isolated or "isolationist." Thus, a nation with six external messages was considered more isolated or isolationist

than a nation with 48 external messages. This measure did not differentiate between a government that limited its contact with other nations by choice and one that was deliberately excluded. In other words, some governments with few communications to other nations might have received quite a few messages but elected not to reply (isolationist); other nations could have received as well as sent few messages (isolated).

Nation as Unit of Analysis

One additional issue concerning the independent variables requires attention. Because the decision either to counterattack on warning or to delay a response (the dependent variable) was a single, unitary action of the entire simulated nation, we needed a composite score for each nation on the independent variables instead of separate scores for individual decision makers. For five of the independent variables, however, the raw data consisted of scores for individual participants. Six variables—FCN defense, decision style, number of alternatives, basic capabilities, force capabilities, and isolation—had a single nation score. In order to transform three of the remaining measures (i.e., situation ambiguous, situation accidental, and perceived tension) from individual to aggregate levels, scores of the participants were averaged. Two restrictions were observed. We excluded scores for the aspiring decision maker because this individual opposed the existing government. Furthermore, we deleted scores for decision makers who subsequently indicated on a questionnaire that they had not written or talked with their associates about the attack warning, that is, had not participated in the nation's response to the warning of an attack. In sum, the composite or average scores included only the reactions of the participants who perceived themselves to have taken part in the decision-making process.[6]

A slightly different procedure was followed in deciding on a composite score for the two idiosyncratic variables. We assigned the simulation participants to nations according to test indications of their level of self-esteem (high or low) and type of cognitive complexity (abstract or concrete). As a result the decision makers of a simulated government were individuals with similar values on self-esteem and cognitive complexity. Therefore, the nation score was the predominant level of self-esteem or

6. As with any composite score which combines individual scores in hopes of representing a group score, the use of an average is not without problems. For example, heterogeneous and homogeneous individual scores can yield similar average scores. Further analyses are needed to check the effects of such problems on the results.

type of cognitive complexity of the decision makers who indicated they had participated in their nation's response to the attack warning.

Results

Table 1 presents the data relevant to examining the relationship between type of decision and availability of a weapon survivability system. These data include only those nations that had nuclear weapons—21 (54%) of the 39 nations. The other eighteen nations never achieved the basic capabilities necessary to produce their own nuclear weapons nor had they received such weapons from other nations at the time of the attack warning.

The Goodman-Kruskal (1954) tau or index of predictive association for the data in Table 1 is .33. This statistic indicates that information about the availability of a weapon survivability system reduces the probability of errors in predicting the type of decision by 33% on the average. An examination of Table 1 shows that with none or only some of their nuclear weapons defended the nations tended to counterattack (71% counterattacked and 29% delayed a response), whereas nations with all their nuclear weapons defended tended to delay a response (71% delayed a response and 29% counterattacked). Our hypothesis that a means of increasing the survivability of one's military retaliatory capability will decrease the tendency to launch on warning receives support from these data. Moreover, since the decision makers with FCNs apparently attempted to insure the survivability of their nuclear capability at an all or none rate (67% had all FCNs defended, 33% had none or only a few defended), the results also suggest that the more complete the protection the more likely the nation is to delay retaliation.

TABLE 1
RELATIONSHIP BETWEEN TYPE OF DECISION AND AVAILABILITY OF
WEAPON SURVIVABILITY SYSTEM FOR NATIONS WITH
NUCLEAR WEAPONS

Type of Decision	Availability of Weapon Survivability System		
	None or Some FCNs Defended	All FCNs Defended	Total
Counterattacked on warning	5	4	9
Delayed response	2	10	12
Total	7	14	21

We encountered a problem in examining the predictive relationship between type of decision and the independent variables in the study. In order to use all 39 nations and to compare the availability of a weapon survivability system with other independent variables, it was necessary to assign values to the eighteen nations that had no nuclear weapons and, therefore, no FCN defense. For the remainder of the analysis we modified the FCN defense variable from the way it is presented in Table 1. The new dichotomization of the variable separated nations with no defense systems (including nations without nuclear weapons) from those having a defense system (either partial or total).[7]

Table 2 contains the intercorrelations among all twelve variables. Four of the bivariate relationships with the decision made to the attack warnings are significant. The four independent variables involved are decision style, number of alternatives, basic capabilities, and perceived tension. The correlations suggest that the less group interaction among the decision makers in making the decision, the more likely a decision to counterattack; the fewer the number of alternatives considered by a nation's decision makers, the more likely a decision to counterattack; the greater the nation's basic capabilities, the more likely a decision to counterattack; and the greater the tension the decision makers perceived in the world, the more likely a decision to counterattack. The direction of each relationship is consistent with the hypothesis set forth earlier for that variable.

Because the degree of relationship among the eleven independent variables was not sufficiently high (.57 is the highest) to indicate that two or more measures were virtually synonymous, it seemed appropriate to use all the independent variables in a regression analysis. Table 3 summarizes the results of the regression analysis. The eleven independent variables accounted for 61% of the variance in the type of decision made in response to the warning of an unidentified attack. An examination of the

7. A question can be raised regarding the relationship presented in Table 1 with this redefinition of the FCN defense variable. Because fourteen of the eighteen nations without nuclear weapons delayed a response, the data in the two columns become more alike. The data then show seven or 32% of the nations without FCN defense counterattacked on warning and that six or 34% of the nations with FCN defense counterattacked on warning. This redefinition of the FCN defense variable does not provide as adequate a test as we would desire of the predictive ability of FCN defense when employed with the other independent variables. One option would have been to do the analysis with only 21 nations. For the use of regression analysis, however, the difference between the number of nations and the number of independent variables is small enough with 39 nations; we deemed it too small with 21.

TABLE 2
INTERCORRELATIONS AMONG VARIABLES (n=39)

	1	2	3	4	5	6	7	8	9	10	11	12
(1) Counterattack Decision	—											
(2) FCN Defense	.04	—										
(3) Self-Esteem	-.07	-.07	—									
(4) Cognitive Complexity	-.04	-.27	.18	—								
(5) Situation Ambiguous	-.28	-.10	-.42[a]	-.01	—							
(6) Situation Accidental	-.14	-.13	.18	.21	.22	—						
(7) Collective Decision Style	-.34[a]	.06	-.24	.16	.15	-.28	—					
(8) Number of Alternatives	-.37[a]	-.13	-.09	-.08	.12	.09	.28	—				
(9) Basic Capabilities	.33[a]	.45[b]	.01	.22	.10	-.04	.04	-.22	—			
(10) Force Capabilities	-.02	.57[b]	-.09	-.17	-.02	-.18	.01	-.18	.44[b]	—		
(11) Perceived Tension	.46[b]	.02	.02	.02	-.20	-.02	-.17	-.26	.21	.24	—	
(12) Isolation	-.15	.24	-.06	.04	.16	-.03	.07	.28	.13	-.19	-.37[a]	—

a. $p < .05$.
b. $p < .01$.

TABLE 3
REGRESSION ANALYSIS ON TYPE OF DECISION (n=39)[d]

Variable	Expected Sign[e]	Mn	SD	Regression—All Variables				Regression—Variables p <.10[f]			
				B	b	s	t	B	b	s	t
FCN defense	–	.44	.50	-.07	-.07	.18	0.37				
Self-esteem	–	.51	.51	-.31	-.29	.14	2.11[b]	-.35	-.33	.13	2.56[b]
Cognitive complexity	–	.56	.50	-.13	-.12	.15	0.84				
Situation ambiguous	–	1.17	.68	-.33	-.23	.11	2.10[b]	-.37	-.26	.10	2.72[c]
Situation accidental	–	.25	.37	-.11	-.14	.20	0.71				
Collective decision style	–	.62	.49	-.29	-.28	.15	1.93[a]	-.32	-.31	.12	2.61[b]
Number of alternatives	–	.35	.22	-.15	-.33	.32	1.02				
Basic capabilities	+	15,675	9,940	.53	.03	.008	3.21[c]	.47	.02	.006	3.45[c]
Force capabilities	+	5,378	7,872	-.39	-.02	.01	2.20[b]	-.34	-.02	.008	2.50[b]
Perceived tension	+	5.69	1.42	.27	.09	.05	1.91[a]	.32	.11	.04	2.51[b]
Isolation	+	41.87	7,873	-.07	-.02	.04	0.43				

Dependent Variable: Type of Decision

Mean						.33				.33	
Standard Deviation						.48				.48	
F-Ratio						3.77				6.58	
Degrees of Freedom						11/27				6/32	
Standard Error of Estimate						.30				.32	
R^2						.61[b]				.55[b]	

a. $p < .10$.
b. $p < .05$.
c. $p < .01$.
d. Mn = mean; SD = standard deviation; B = Beta weight; b = partial regression coefficient; s = standard error of the partial regression coefficient; t = t-value of partial regression coefficient (t-values may differ from b/s ratios in table because of rounding).
e. Based on decision to counterattack receiving code of 1; decision to delay retaliation coded as 0. Positive relationship indicates higher independent variable, more likely to counterattack; negative relationship indicates lower independent variable, more likely to counterattack.
f. This regression analysis includes only those variables from the all variable analysis which had t-values with a probability of $p < .10$.

beta weights in the third column of Table 3 indicates that the basic capabilities variable with the largest beta weight (.53) was the most important in explaining the type of decision made. From its beta weight, force capabilities was next in importance; then follow in order perception of the situation as ambiguous, self-esteem, decision style, and perceived international tension. Beta weights show how much change in the dependent variable is produced by a standardized change in one of the independent variables when the other independent variables are controlled. As noted in Table 3, these six variables had t-values indicating their regression coefficients were significantly different from zero at the .05 probability level or approached that level (p < .10). For two of the variables (force capabilities and isolation) the sign of the regression coefficient was opposite that predicted.[8]

In order to examine the effect of the six variables with the largest beta weights—those having t-values which were significant or approached significance—a second regression analysis was performed. Table 3 also contains the results of this regression analysis. These six variables accounted for all but six percent of the variance explained in the original regression analysis. Furthermore, the beta weights remained approximately the same as in the previous analysis and all six variables retained their statistically significant relationships with the dependent variable.[9] In summary, counterattacks on warning tended to be launched by nations with substantial economic capability but little force capability whose decision makers were low in self-esteem, perceived the situation as relatively unambiguous, interacted very little in making decisions, and perceived a high degree of tension already existent in the world.[10]

8. Mayer and Burgess (1970) have recently voiced concern over the use of nominal measures as dependent variables in regression analyses. They argue that a nominal dependent variable automatically violates many of the assumptions of regression analysis and propose the use of discriminant analysis when problems involve nominal dependent variables. To examine the similarities between our results as presented and those from a discriminant analysis, such an analysis was performed on the present data. Using the twelve original variables, the percentage of nations which were misclassified in the discriminant analysis was five percent (according to their discriminant scores these nations should have chosen the opposite response than the one they made); 95% of the nations were correctly classified. The generalized Mahalanobis D^2 or measure of distance between nations that counterattacked on warning and those that delayed a response was 56.86. Interpreted as a chi-square, this D^2 is significant (p < .01). The six variables that contributed the most to the discrimination between nations that counterattacked on warning and those that delayed a response were the same six significant independent variables in the regression analysis. According to their multivariate F values, the other five variables

A comparison of the bivariate and regression results reported in Tables 2 and 3 shows that three of the four variables significantly related to type of decision in the bivariate analysis remain so in the regression analysis. These three variables are decision style, basic capabilities, and perceived tension. Number of alternatives, which is significantly related to response in the bivariate analysis, does not emerge in the regression analysis. Number of alternatives has less effect in conjunction with the other variables.

An examination of the residual variance, or the differences between the actual and predicted decisions of the nations, based on the six variables in the second regression analysis indicates that these six variables predicted more accurately the nations that counterattacked on warning than those deciding to delay their response ($t = 5.84$, $df = 37$, $p < .01$). The mean residual for nations that counterattacked was $-.03$; the mean residual for nations that delayed their response was $-.49$. Perhaps some of the nations presently classified in the "delayed response" category should be in the uncodable group of nations. In other words, some of our coding inferences may be erroneous with the result that the predictability of the "delayed responses" group was reduced.

Are there other variables not already considered which might account for the pattern of residual variance? Particular consideration should be directed to two variables that are a function of the simulation. Even though the experimental situation remained the same in the ten runs of the simulation, the distinctive evolution of each simulated world resulted in differences between runs and between nations. For example, the simulation staff felt that in some systems international conditions had

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could have been deleted from the discriminant analysis with little loss in discriminating power.

9. It is important to note that something was already known about the behavior of the variables in the six-variable regression analysis before the analysis was performed; therefore, the meaningfulness of standard significance tests is open to some question.

10. Some comparison of the predictive ability of the weapon survivability system variable in its original form (i.e., for the 21 nations with nuclear capability) with the other variables is possible by performing a multiple regression analysis for the six variables with the largest beta weights in Table 3. Availability of a weapon survivability system is inserted as a seventh independent variable. Such an analysis reveals that these seven variables account for 63% of the variance in type of decision made in response to the warning of an unidentified attack by nations with nuclear weapons. An examination of the beta weights shows that self-esteem has the largest beta weight ($-.53$) followed by basic capabilities (.45), force capabilities ($-.39$), perception of the situation as ambiguous ($-.35$), perceived tension in the world (.29),

emerged such that the unidentified attack seemed more consistent with prior developments than in other runs. Moreover, the six nations began the simulation run with different capability levels and different abilities to generate goods and services. In order to ascertain the effects these two variables might have on the analyses presented in Table 3, we recalculated the original regression analysis with a set of run dummy variables and then with a set of nation dummy variables. (In other words, the regression was recomputed after denoting whether a group of decision makers was in or was not in a particular nation or a particular run by assigning a "1" if they were and a "0" if they were not.) Introducing run and nation as dummy variables made little change in the original regression analysis. Furthermore, there were no significant differences between runs and between nations in their relationship to type of decision. Both variables added little in accounting for the residual variance.

Other attempts to explain the residual variance also proved futile. For example, variables such as general involvement in the simulation (observers' ratings of the participants' involvement in their role and their nation's activities across the simulation run), type of government (whether the nation had an open or closed government based on their decision latitude), and presence or absence of nuclear forces accounted for only one or two percent of the unexplained variance.

Discussion

In the introduction we reproduced a scenario that suggested a weapon survivability system, like ABM, would allow a head of state to decide to

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decision style (−.23), and availability of a weapon survivability system (−.19). The first four variables have significant t-values or t-values approaching significance (p < .01). These four variables seem most important in predicting the type of response for the 21 nations with nuclear weapons. Although not in the same order, these same four variables appeared most important in predicting the type of decision for the whole sample also (see Table 3). Moreover, the reversal in the direction of sign between hypothesis and outcome for force capabilities in the regression for the whole sample occurs as well for the nations with nuclears to protect. These results, like those for the whole sample, indicate that factors other than a weapon survivability system are important—if not more important—in determining what nations will do in response to a warning of an unidentified attack. A word of caution needs to be added to any interpretation of the results just reported for the 21 nations with nuclear weapons, since not all of the independent variables were included in the regression analysis and the difference between number of nations and number of independent variables in the regression analysis was quite small. The data, however, do suggest that a similar pattern of results occurred for the nations with nuclear weapons to protect as for the whole sample of nations.

"ride out" a surprise attack on the strategic weapons of his country rather than launch retaliation on warning. Although considerable agreement exists that improvements in technology could pose dangers to land-based ICBMs in the foreseeable future, critics have charged the ABM would not function adequately to protect them. We have sidestepped the questions of ABM feasibility and asked: How much difference would it make in the decision makers' response assuming ABM or some equivalent system existed? Might not other factors play an even more decisive role in determining the response? Furthermore, we added a condition that seemed to us to be an increasingly likely characteristic of any surprise attack in a world of n nuclear powers—uncertainty about the identity of an aggressor.

Our study indicates that a weapon survivability system in which the decision makers of a nation have confidence will increase their tendency to delay any military response. Within the constraints imposed by our small sample, the data suggest that it would be a factor of some importance in the decision. This assertion seems appropriate even though the FCN defense variable was relatively unimportant in explaining the type of decision in the 39 nation regression analysis—probably because the analysis included nations that had no opportunity to acquire such a system. When examining the availability of a weapon survivability system for nations that had nuclear weapons, those with FCN defense were more likely to delay a response.

This result, however, does not present the entire story. Over sixty percent of the variance in the choice of response among our simulated nations could be explained by variables other than a weapon survivability system. Because the present report is an analysis of data from a set of simulation runs conducted for other purposes—which resulted in the existence of some nations with no chance to obtain a FCN defense—we do not have as good a direct test of the predictive ability of the weapon survivability system variable when employed with the other variables as we would like. The results seem sufficiently clear, however, to raise the suspicion that factors other than the availability of ABMs (or other means of insuring the invulnerability of deterrent forces) could be of primary importance in determining the response to a situation such as that confronting the simulation participants. One may be reluctant to end yet another study with the cliche that more research is needed, but that certainly appears to be the case in this instance.

Turning to the hypotheses advanced about the effect of the independent variables upon the decision, we face mixed results. Although nine of the eleven hypotheses were supported in the predicted direction, only

five of these hypotheses were important in describing the nations' behavior. When faced with an unknown aggressor's impending attack, the nations that immediately counterattacked had substantial basic capabilities and decision makers who were low in self-esteem, who perceived little ambiguity in the unidentified attack situation, who seemed to interact very little in making decisions, and who perceived the world situation to be tense. Moreover, one of the results in the reverse direction from that predicted in our hypothesis also contributed substantially to explaining the decision. When controlling for the above-mentioned five variables, governments in nations with larger force capabilities tended to delay a response rather than to counterattack. With the advantage of hindsight this finding seems reasonable. Decision makers in nations with relatively large military forces may be more confident that some useful proportion of their capability will survive the attack; whereas those with small force capabilities may calculate that even a modest attack will completely destroy their potential retaliatory force. Schelling (1966: 231) makes the point that retaliatory forces should be "so adequate in number that they [decision makers] need not react with haste or fear of not being able to react at all." Despite the fact that only about half of the variables we expected to influence the nations' decisions did in fact have an influence in the direction predicted, we should note support for our judgment that a broad array of variables tend to affect nations' reactions to an imminent strategic attack. Rather than being confined to one or two clusters of variables, the major contributors are distributed among all the types of variables—idiosyncratic variables, situational perceptions, national attributes, decision processes, and external influences.

Before concluding, several comments about the design and methodology used in this study seem appropriate. Secondary analysis of research, such as that reported in this paper, often presents the researcher with a design not quite as he would prefer it. We have indicated several difficulties that faced us: the absence of an FCN option for some nations, the failure to introduce alternative delivery systems and other relevant features of nuclear capability, and the confounding of two problems—the importance of a weapon survivability system in reacting to any attack and in responding to an unidentified attack on a strategic system. (With respect to this last point, we contend that both issues have importance for the future, but it might be desirable to study them separately.)

Matters such as those described above are design problems and can be overcome in subsequent research if the basic questions appear of sufficient importance to warrant additional investigation. Less easily surmounted are

problems intrinsic to the use of simulation as a research tool. Can the severe crisis atmosphere that could certainly surround a decision such as that posed in this study ever be reproduced in a laboratory setting? Are the inevitable simplifications necessary for any simulation introducing systematic errors into the observed results? Of what value are results from participants without high governmental experience, all of whom have been embedded in the same culture and society? Questions such as these have been explored in detail elsewhere (see C. Hermann, 1972, 1967) and cannot adequately be reproduced here. No one can shrink from these difficulties, but two observations seem appropriate. First, simulation allows us to raise questions that might not otherwise be apparent. For example, if policy makers really are concerned about increasing their options in such extreme situations as posited in this study, our results and others like them (e.g., Crow and Raser, 1964; Friedell, 1968) might be able to call their attention to factors besides complex hardware that can be expected to influence the outcome. Some of these factors can be manipulated or influenced by the policy makers themselves, giving them levers with which to alter the situations they face. Second, problems such as the one we have posed can be studied in only a very limited number of ways. Unless we elect to ignore the problem, we must make prudent use of every technique for expanding our understanding of the issues involved.

Should these findings be substantiated in further studies, what is their significance? The 1972 Moscow Treaty resulting from the Strategic Arms Limitation Talks virtually eliminates the use of antiballistic missiles as a major system to protect strategic deterrent forces. Both the United States and the Soviet Union are limited to a maximum of 100 ABM launchers at a single ICBM site with an equal number deployable at a second site intended to defend each nation's capital. As noted at several points in this paper, ABMs represent only one possible weapon survivability system. The search on both sides to insure invulnerability of strategic forces continues vigorously. For example, the U.S. development of the Trident submarine launched ballistic missile system which involves larger, more silent submarines carrying longer-range missiles is an attempt to keep ahead of possible developments in anti-submarine warfare that might increase the vulnerability of the Polaris-Poseidon systems. The present research is not concerned with the importance of both sides maintaining invulnerable deterrent forces under current international conditions. The research does suggest, however, that many factors other than the physical properties of weapon systems that increase their invulnerability are involved in maintaining the stability of deterrence in extreme crisis. Furthermore,

situations such as the one postulated in this study regrettably are not impossible for either the Soviet Union or the United States. They may be even less remote possibilities for other adversaries who acquire nuclear weapons without an expensive detection capability. To assume the stability of deterrence based upon strategic weapons regarded as highly invulnerable, without taking account of these other elements that can affect the decisions made in extreme crises, courts disaster.

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