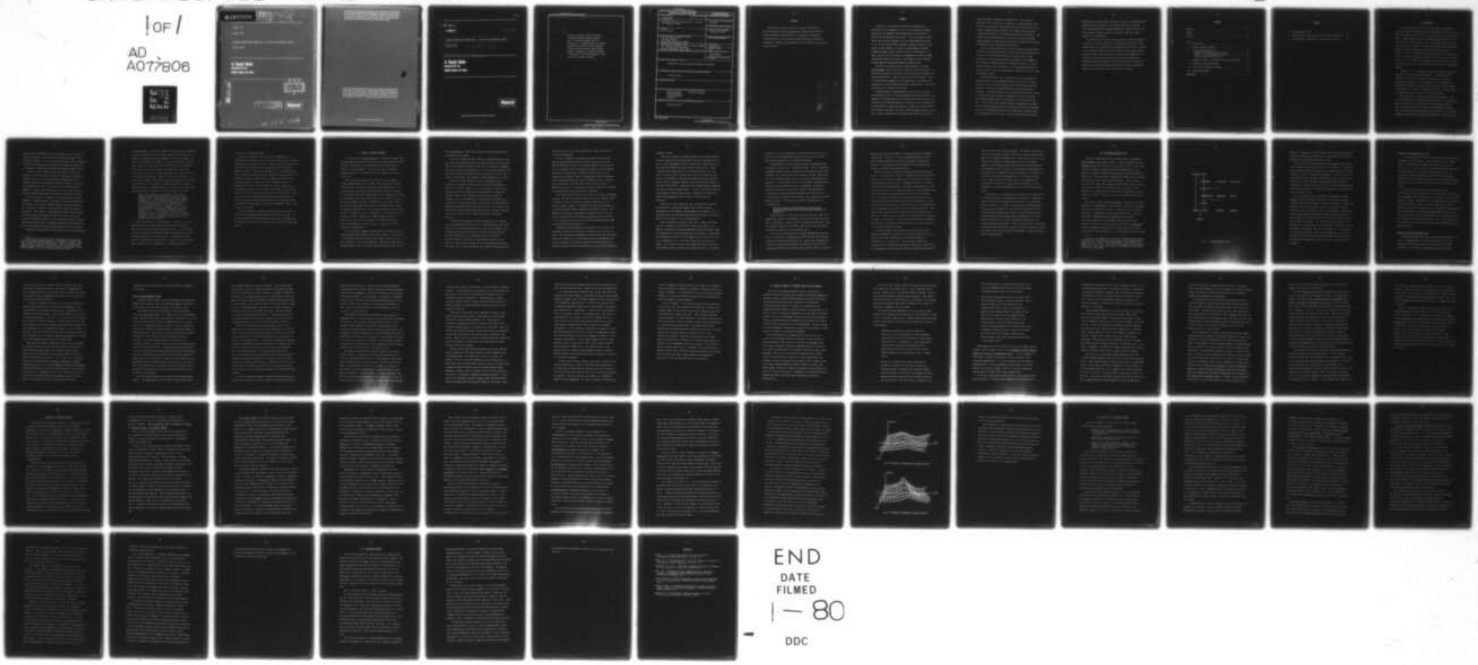
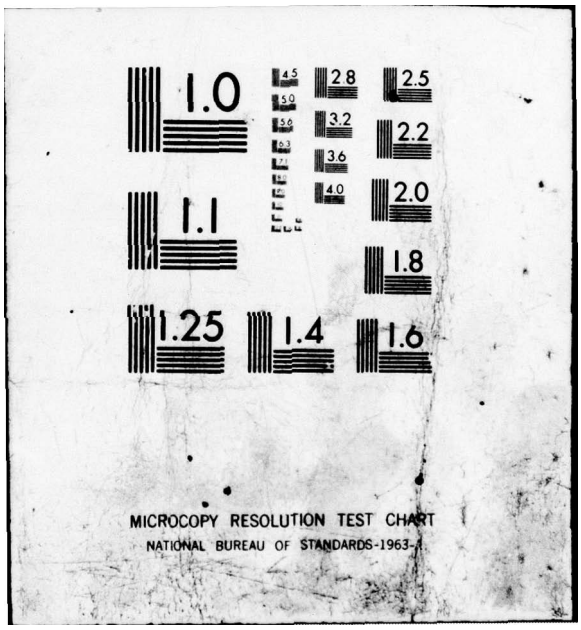
AD-A077 806 RAND CORP SANTA MONICA CA F/G 15/7
STRATEGIC WARNING AND GENERAL WAR: A LOOK AT THE CONCEPTUAL ISS--ETC(U)
OCT 79 R STRAUCH F49620-77-C-0023
UNCLASSIFIED RAND/N-1180-1-AF NL

1 OF 1
AD A077806



END
DATE FILMED
1-80
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
7.1
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

LEVEL II

N-1180-1-AF

October 1979

STRATEGIC WARNING AND GENERAL WAR: A LOOK AT THE CONCEPTUAL ISSUES

Ralph Strauch

A Rand Note
prepared for the
United States Air Force

Rand
SANTA MONICA, CA. 90406

The research reported here was sponsored by the Directorate of Operational Requirements, Deputy Chief of Staff/Research, Development, and Acquisition, Hq USAF, under Contract F49620-77-C-0023. The United States Government is authorized to reproduce and distribute reprints for governmental purposes notwithstanding any copyright notation hereon.

Published by The Rand Corporation

(14) RAND/N-1180-1-AF NH

(11) Oct[redacted]979

(12) 60

(6) STRATEGIC WARNING AND GENERAL WAR: A LOOK AT THE CONCEPTUAL ISSUES.

(10) Ralph/Strauch

(9) Interim rept.,

(15) F4962p-77-c-p023

A Rand Note

prepared for the

United States Air Force

Rand
SANTA MONICA, CA. 90406

296 600

Explores conceptual issues related to strategic warning of general nuclear war. A "threat/response cycle" is proposed as a conceptual model of warning situations and used to explore the differences between tactical and strategic warning. Response to strategic warning is discussed, as is the assessment of the utility of strategic warning.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER N-1180-1-AF	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Strategic Warning and General War: A Look at the Conceptual Issues		5. TYPE OF REPORT & PERIOD COVERED Interim 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Ralph Strauch		8. CONTRACT OR GRANT NUMBER(s) F49620-77-C-0023
9. PERFORMING ORGANIZATION NAME AND ADDRESS The Rand Corporation 1700 Main Street Santa Monica, California 90401		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Requirements, Programs & Studies Group (AF/RDQM) Ofc., DCS/R&D and Acquisition HD USAF, Washington, D.C. 20330		12. REPORT DATE October 1979 13. NUMBER OF PAGES 62
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for Public Release; Distribution Unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

No Restrictions

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Warning Systems
Passive Defense
Crisis Management
Strategy
Military Planning

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

See Reverse Side

DD FORM 1 JAN 73 1473

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

PREFACE

This Note was prepared as part of a study of "The Role of Strategic Warning in Conflict Management" conducted within Rand's Project AIR FORCE research program. It contains a preliminary conceptual survey of the strategic warning problem, and presents a conceptual structuring of and framework for the problem as a basis for future research.

SUMMARY

In spite of its potentially significant contribution to preconflict crisis management as well as to warfighting, strategic warning does not generally play an important role in studies of general war and strategic force issues. This is due partly to the belief that strategic warning is too risky and uncertain to count on, so that we should plan our strategic deterrent without it, and partly to other reasons. But while we cannot count on getting strategic warning, neither should we count on not getting it. We might, and if we did, our ability to recognize and exploit it might significantly affect the outcome. That being the case, strategic warning deserves more attention than it currently gets.

One way of conceptualizing the warning problem is through a threat/response cycle involving the collection and interpretation of observables generated by precursor events, followed by response to the then-perceived threat. Some writers use the term "warning" to refer to the observables themselves, while others use it to refer to the perception of a threat generated by their interpretation. This latter convention will be adopted in this note.

Different types of threat/response cycles can be identified, having different sorts of warning problems associated with them. The simplest is a single-track cycle in which the precursor events lead inexorably to the materialization of the threat, as if the precursors and the threat are simply positions on a single fixed "track" along which events are moving. But not all threat/response cycles are like this. Some are multitrack, in the sense that there may be several

possible "tracks" through the same precursors, some leading to materialization of the threat and some not. Threat/response cycles may also be reversible, in the sense that even if events are on the "track" leading to materialization of the threat, an appropriate response may be able to turn things around and avoid the threat. Most interesting threat/response cycles associated with the strategic warning problem are multitracked, and many are potentially reversible, contributing to the complexity of the problem.

While strategic warning has not been extensively studied by the strategic force planning community, tactical warning (warning that an attack is actually underway) has been, and has served to shape perceptions of the warning problem held by many in that community. But strategic warning and tactical warning are different in several important ways, so that perceptions of the warning problem derived from the study of tactical warning may be inappropriate for the study of strategic warning.

The threat/response cycle associated with tactical warning is single tracked, so that unambiguous warning is possible, at least in principle. But the threat/response cycle associated with strategic warning is multitracked, making unambiguous warning impossible in principle. The threat/response cycle associated with tactical warning is irreversible--when warning is obtained the attack is occurring. The response problem, then, is to respond to the attack given that fact. But the cycle for strategic warning is potentially reversible, so the response problem involves a balancing of the goal of reversing the threat (including deterring it) and responding in a manner which will be appropriate if it occurs. And finally, the tactical warning

problem may be viewed entirely within the context of a strategic force exchange, without reference to the larger political and military context within which that exchange takes place. This is not the case with strategic warning, which must necessarily take that larger context into consideration.

Our military forces provide varying levels of capability against a spectrum of possible threats over extended periods of time. This requires that the average level of capability be less than it could be if the spectrum of possible threats and times at which those threats are most serious could be narrowed. Warning can be thought of as a focusing process which performs such narrowing, and allows the capability against the threat at the time indicated by warning to be much greater than the average capability which could be maintained against that threat over time in the absence of warning.

CONTENTS

FIGURES

I. INTRODUCTION

In terms of its potential social and economic consequences, a large scale general war between the United States and the Soviet Union may be the most serious threat to U.S. national security which exists today. Perhaps because of these consequences, most people would rate such a war as a highly unlikely event. The damage resulting on both sides is seen as so great as to negate any potential gains which might otherwise accrue, deterring either side from initiating such a conflict. This is especially true during periods of relative calm in U.S./S.U. relations, when the incentives for either side to attack the other are low. It remains true, though, even during periods of severe confrontation or crisis, when the incentives to launch an attack might increase.

In spite of its low probability, however, general war remains an important issue for U.S. defense planners. A strong and viable strategic force is needed to maintain the deterrent to keep the probability of general war low. Beyond this, it is important to understand the dynamics of general war and of events likely to lead toward general war in order to manage such events, should they occur, in a manner most supportive of U.S. national interests.

One important set of questions concerning the dynamics of war initiation which has not received sufficient attention in the past are those surrounding the issue of warning of an imminent general war. These include questions of what kind of warning might be obtained, what might be done with that warning, and what value or utility those responses (and hence the warning itself) might have. There are also

deeper and more fundamental questions of what warning is and how we should think about it, what we should and should not expect from warning, and whether or not our current intellectual models of general war and our institutions for addressing the problems of general war are adequate to understand and exploit the warning we might receive.

Warning is often divided into two main types: tactical and strategic. Tactical warning is defined as warning that an attack is underway--that it has actually begun and is underway now--while strategic warning is warning that an attack is imminent or likely in the reasonably near future.* We shall see later that there are problems in trying to make these definitions too precise, but that they are nonetheless meaningful enough to be operationally useful.

Tactical warning is a subject of continuing concern within the community of defense planners and analysts concerned with general war and strategic force issues. Bombers depend on tactical warning for their survival, for without it they could be caught and destroyed on the ground. Some elements of the command and control system require tactical warning, and the performance of the overall system would certainly be degraded without it. And as missile accuracies increase, land-based missiles appear increasingly vulnerable and the interest in tactical warning as an aid to land-based missile survival increases.

Strategic warning, however, has received far less attention among

---

*Notice that the term "strategic" when applied to warning has a totally different meaning than when it is applied to forces or conflict. My use of the term "general war" in place of the more common term "strategic conflict" is dictated by a desire to minimize the semantic complications which inevitably arise in discussing concepts like strategic or tactical warning of strategic conflict.

strategic planners. There are a number of reasons for this, including a strong predilection for "worst case" analysis, and a reluctance to depend on anything as chancy and ephemeral as strategic warning. The Soviets are assumed to be capable of a surprise "bolt from the blue" attack, which U.S. forces must be prepared to absorb and respond to. If our forces can't do that, they are insufficient to deter the attack, and if they can, strategic warning does not appear as an issue in strategic force planning. Besides, it seems clear from past history that warning is unreliable and reliance on warning risky, even in the presence of large amounts of warning information. Roberta Wohlstetter (1962), in summarizing the conclusions of her study of the warning preceding the attack on Pearl Harbor, puts it this way:

> This study has not been intended as a 'how to do it' manual on intelligence, but perhaps one major lesson emerges from it. We cannot count on strategic warning. We might get it, *and* we might be able to take useful preparatory actions that would be impossible without it. We certainly ought to plan to exploit such a possibility should it occur. However, since we cannot rely on strategic warning, our defenses, if we are to have confidence in them, must be designed to function without it. . . . If the study of Pearl Harbor has anything to offer for the future, it is this: We have to accept the fact of uncertainty and learn to live with it. No magic, in code or otherwise, will provide certainty. Our plans must work without it.

From one perspective, this admonition is certainly a valid one. Human perception is fallible, and the interpretation of warning indicators is an uncertain and unreliable business. Our rock bottom deterrent to general war should not depend on warning, particularly on strategic warning, for its effectiveness. It should work, and we should be confident that it would work, in spite of carefully planned Soviet surprise or U.S. indifference to or misinterpretation of

indications of impending conflict.

But there is another side to this coin, exemplified by Wohlstetter's observation that, "We certainly ought to plan to exploit such a possibility should it occur." General nuclear war would not be an isolated event apart from the ongoing process of interaction between nations. It would be an integral part of that interaction, and a consequence of the actions and events which had preceded it. To effectively influence those events in a manner consistent with U.S. national interests--to deter or avoid an impending conflict if possible and to prepare for and manage the conflict otherwise--U.S. decisionmakers must be alert to events which suggest a drift toward conflict and must understand the significance of those events. This, in turn, requires an indications-and-warning apparatus which can detect and interpret the necessary indicators, and communicate that interpretation convincingly to relevant decisionmakers. That is what warning is all about.

This note presents a preliminary exploration into the nature of the strategic warning problem and some of the issues it raises. It does not attempt to resolve those issues, but only to identify them for further study and to indicate directions in which that study might proceed.

II. WHAT IS STRATEGIC WARNING?

At first glance, strategic warning is a deceptively simple term. The Department of Defense Dictionary of Military and Associated Terms (JCS Pub. 1) defines it as "a notification that enemy-initiated hostilities may be imminent." This is in contrast to tactical warning, defined as "a notification that the enemy has initiated hostilities."

But as soon as we begin to probe that definition somewhat, it becomes slippery and hard to pin down. What is meant by the term "notification"? Notification from whom, and on what basis? It is always the case that enemy-initiated hostilities "may be" imminent. To say otherwise would be to imply that we live, temporarily at least, in a perfectly safe world, and that there is no reason to have our missiles and bombers on alert, our SLBMs out to sea. Hence, "may be," as used here, must imply some increase in likelihood over and above the ongoing background level. But how much, judged according to what criteria? Finally, how soon is "imminent"? Is it within the hour, the day, or longer? This issue is hedged somewhat in the JCS definition by the qualification that, "This notification may be received from minutes to hours to days, or longer, prior to the initiation of hostilities."

For the military commander who must take action upon receipt of a warning message, these questions have obvious answers. "Notification" is notification from proper authorities, based on whatever criteria those authorities use to declare warning. "May be" and "imminent" are defined by those criteria, and their meanings should be made clear in

the warning message. This is the context, clearly, within which the JCS definition was framed.

But for the warning analyst, who must decide what meaning to give to various bits and pieces of data, for the political leader who must make crucial national decisions on the basis of incomplete, ambiguous and often contradictory information, or for the military commander who must take or advise preparatory steps on the basis of far less than formal "notification," this definition leaves something to be desired.

The point of this discussion is not to disparage the JCS definition of strategic warning, which serves well the purpose for which it is intended. Rather, it is to illustrate the difficulty in trying to settle on a single precise definition of a concept like strategic warning. The problem is really with the concept of "warning" itself. While the term is clear and readily understood, it connotes not a single meaning but a constellation of related shades of meaning which together defy precise specification. This causes little difficulty in normal usage, because the particular shading is usually clear from the context, but it makes the process of definition difficult.

A definition may capture one shade of meaning, in the same way that a photograph captures one view of a three-dimensional object, and may give a very good general impression of the overall meaning. But no single definition will capture the totality of meaning any more than any single picture can capture the totality of a three-dimensional object. This does not mean that definitions are not useful, any more than the limitations of pictures mean that they are not useful. But it does mean that we can't expect the same precision

of definition for a term like warning that we expect in the hard sciences or mathematics.

We can't eliminate the problem by arbitrarily choosing one meaning and excluding the others, because there may not be other equally meaningful terms for the excluded meanings, and because the term is a commonly used one from which listeners will infer meaning according to context anyway. The best solution seems to be to recognize that different shades of meaning exist and to distinguish between them when necessary, without attempting to make or enforce a precise definition. Any definition, then, should be taken as a general description of the meaning of the term, and not as an attempt to delineate that meaning precisely and completely.

With those caveats in mind, let's return to the issue of defining warning. The central idea around which the concept of warning seems to coalesce is that of being put on guard, being made aware of a possible threat or danger. The information upon which awareness of the threat should be based is sometimes described as warning. This meaning of the term is illustrated by statements such as, "We had plenty of warning about Pearl Harbor but didn't pay any attention to it," or, "Warning of the attack was provided by photos showing enemy troop build-ups along the border."

Another view sees warning as the perception of the threat, the awareness on the part of some actor or perceiver that the threat is there. This view would be exemplified by the position that the United States (or relevant U.S. military and political decisionmakers) did not have warning of the attack on Pearl Harbor because they did not perceive a specific threat to Pearl Harbor in spite of the information

available to them.

This view of warning is adopted by Handel (1977) when he argues that the Israelis did not have warning of the 1973 Yom Kippur war, in spite of their knowledge of Arab war preparations, because they felt that they would eventually prevail should a war break out. Handel claims that the Israelis felt the Arab states knew this also, and could not conceive that the Arabs would start a war which they were sure to lose eventually. But the Arab leaders had an even stronger need to reassert themselves against Israel after the 1967 defeat, so that they could achieve a needed political and psychological advantage even with an eventual military defeat. Israel's inability to perceive this possibility, Handel argues, made it impossible for them to be warned of the impending attack in spite of all the military indications.

Another view, and an important one in organizational settings, sees warning as a formalized judgment about a threat, and the transmission of that judgment through appropriate channels. This is the meaning implied by the JCS definition discussed above, and the one implied in such usages as "war warning message."

Others characterize warning in other ways. Belden (1977) sees the need to respond, to take action to counter the threat, as an important characteristic which distinguishes warning from other forms of information use and interpretation such as forecasts. Notification that tornadoes are likely to strike Topeka soon is a forecast if you live in Washington, D.C., he observes, and warning if you live in Topeka. The difference is that in the former case there is no need for protective action implied by the information, while in the latter

case there is. More psychologically oriented writers may see it in terms of internal psychological processes, beliefs, or attitudes. Some of these perspectives are summarized by Pyles.

My own tendency is to see warning in terms of perception--the perception or awareness of a significant threat. This is, admittedly, a somewhat arbitrary choice, and others could perhaps be equally well defended. But it seems to me to be a natural one which captures the core of the warning concept as well as any other, and perhaps better than most. It also allows, and in fact encourages, the operationally useful distinction between the data or information on which the warning is based; the warning itself, which is the perception or awareness which springs from that information; and any action or reaction taken in response to the warning. This conception of warning leads naturally to a definition of strategic warning along the following lines:

> Strategic Warning Is The Perception Of A Significant Increase In The Likelihood Of The Near Term Initiation Of Hostilities.

This definition, of course, has its own loose ends. What is "a significant increase in likelihood," and how soon is "the near term"? What is "perception," anyway, and who is doing the perceiving? These are important questions, and deserve exploration in far more depth than will be possible in this preliminary note.

The first of these questions is largely subsumed by the second. That is to say that a "significant increase" and the "near term" are what the perceiver perceives them to be. They are the thresholds of increase in likelihood and nearness in time which he perceives as significant and hence from which he takes warning. They will vary for

different perceivers and perhaps for the same perceiver in different circumstances. There are, of course, important questions of what these thresholds should be in particular contexts, but those are questions of operationalizing the definition in an organizational setting, not definitional questions per se.

The issue of who is doing the perceiving, and thus of who gets "warned," is a complex one. There is a tendency to talk about nations as unitary actors and to attribute actions or perceptions to those unitary national actors--to say, for example, that the U.S. did this, or the Soviet Union thought that, or saw the situation that way. The unitary national actor is an abstraction which is often convenient and can be quite useful for some purposes, but that is not the whole story. On another level there is no unitary national actor, but a collection of agencies and organizations each responsible for a piece of the total national activity, and each pursuing its responsibilities in its own way and in accordance with its own needs and biases. These agencies and organizations are themselves not the ultimate actors or perceivers. They, in turn, are made up of suborganizations, and these of people, of individuals. It is these individuals who are ultimately the perceivers of warning and the deciders and actors who choose and carry out the response to warning.

An understanding of warning, then, requires consideration of individual perceptual processes and the way those processes relate to warning. But while consideration of individual perception is necessary, it is not sufficient. People acting as members of organizations act differently from people acting alone. Beyond that, it is meaningful and operationally useful to think of organizations as

actors and perceivers in their own right. This makes it necessary to consider the important organizational actors in the strategic warning game and the interactions between them. These include, but may not be limited to, the National Command Authorities; the intelligence community, and in particular the indications and warning portion of that community; political agencies such as the State Department; the relevant military commands and forces; and finally, the amalgam of all of these into the entity mentioned earlier, the unitary national actor. Some of the factors which influence the organizational perceptions of actors such as these and the importance of those perceptions in intense international crisis are discussed in Strauch (1976).

Perception, as I am using the term, relates to the entire body of activities and processes through which an individual or organization creates the view of the external world on which its decisions and actions are based. It is thus a very broad term, encompassing far more than passive observation. One particularly important set of issues which can appropriately be seen as issues of organizational perception concerns the transmission and communication of warning between individuals in the same or different organizations, and between different organizations. These and other issues of individual and organizational perception relating to strategic warning are beyond the scope of this note, but should be addressed in long-term research on the warning problem.

III. THE THREAT/RESPONSE CYCLE

One way of conceptualizing the warning problem is through the threat/response cycle shown in Figure 1. The cycle begins with some precursor events which occur prior to the threat itself. These could be troop movements or changes in military readiness prior to an attack, for example, or black clouds forming on the horizon before a heavy storm. The cycle shown illustrates the simple case of a unitary actor/perceiver and a single threatening event. In the case of a military attack, this actor might be a nation-state, while in the case of the storm it might be an individual out in the open. In the absence of any countermeasures by the actor (and possibly in spite of them) these precursor events are likely to be followed by the threat itself.*

The precursor events produce observables. These may be the events themselves (troop movements or storm clouds), or they may be secondary by-products of those events, such as a diversion of civil transport resources or a darkening of the sky and a growing chill in the air. Some of these observables may be collected, by the nation's intelligence apparatus in the military attack case and by the individual's senses in the case of the storm. They are interpreted, and the interpretation forms the actor's perception of the threat. Interpretation, like perception, is a term used here with a very broad

---

*Note here the ambiguity of language. The term threat is sometimes applied to the precursor events, rather than to the ultimately dangerous event. Thus we say the deployments, or the clouds, are themselves threats. Here I am using the term threat for the damaging event itself, the attack or the storm, and calling the things which come before it precursors.

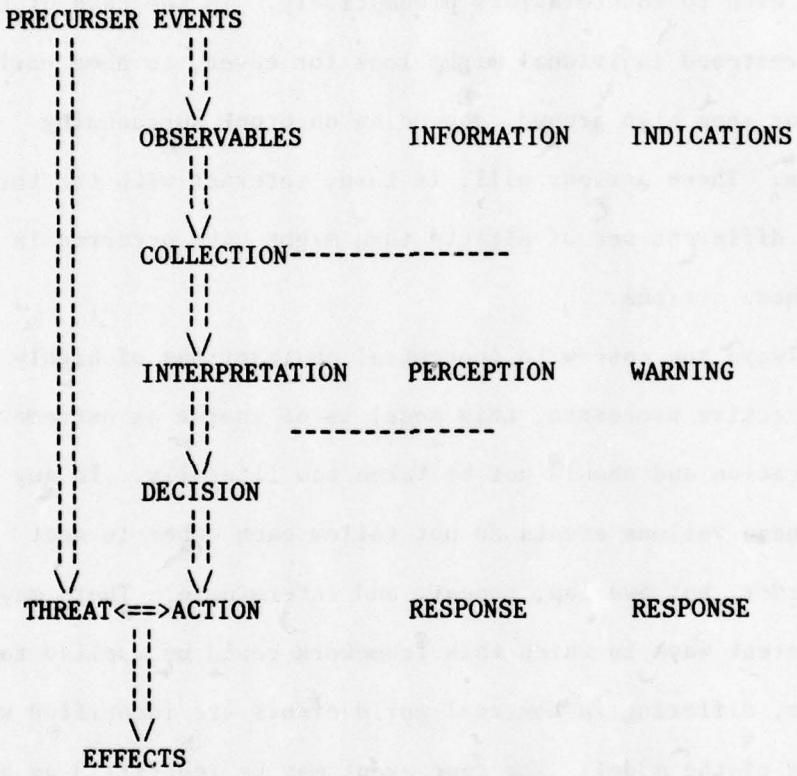


Fig. 1 -- Threat/Response Cycle

meaning, to encompass all those judgments and activities through which the actor puts the new observables in context with his current world knowledge and otherwise gives meaning to them.

On the basis of his interpretation and perception of the threat, then, the actor decides what to do about it, and does it. In the case of the military attack the threatened nation might decide to increase readiness or even to counterattack preemptively. In the case of the storm the threatened individual might look for cover, go home earlier than usual, or seek high ground, depending on other surrounding circumstances. These actions will, in turn, interact with the threat to produce a different set of effects than might have occurred in the absence of those actions.

As is always the case with conceptual abstractions of highly complex interactive processes, this model is of course an extreme oversimplification and should not be taken too literally. In any real situation, these various events do not follow each other in neat sequential order, but overlap, repeat, and intermingle. There may be several different ways in which this framework could be applied to actual events, differing in how real world events are identified with the structure of the model. The same event may be identified as a precursor by one analyst and as the observable of some other precursor by another, for example. The value of the model lies in its ability to structure and organize events in conceptually meaningful ways, so that they can be more easily understood and dealt with, but it does not provide any uniquely correct way of doing so in any particular situation.

WARNING IN AN ORGANIZATIONAL SETTING

In an organizational setting in which different organizations are considered as distinct actors, other complexities arise. Various phases of the main threat/response cycle, such as collection, interpretation, decision, and action, would be separated, and would be the responsibilities of different organizational actors. The intelligence community might be responsible for collection and interpretation, for example, the NCA for decision, and the political apparatus and the military forces might share the responsibility for action.

These various actors would, at the same time, have threat/response cycles of their own, and these would be interlocking and overlapping. The response of one actor might create the precursor events for another. The response of a warning staff to intelligence indicating an enemy buildup, for example, might be to produce a warning notification for transmission to decisionmakers and others who need the information. This warning message might well be the first indication received by some of these others, hence playing the role of the "observable" in their threat/response cycle. These complexities are beyond the scope of this note, but should be addressed in future warning research.

PHASES OF THE THREAT/RESPONSE CYCLE

The threat/response cycle can be divided into three phases. The first is a stimulus phase, including the precursor events, the observables they produce, and the initial collection of those observables. The second is a perception phase, consisting of

interpretation and the more focused collection efforts which take place after the threat is noticed. The third is a response phase, which includes the actor's decision about what to do about the threat, the actions he takes to implement that decision, and the effects of those actions on future outcomes.

Collection is included in both the information and perception phases because some aspects of collection are independent of the interpretation of the information while others are dependent on and interwoven with interpretation. As the nation begins to see evidence of attack preparations, it will shift its collection efforts to search more closely for evidence to support or refute the possibility. When the individual first notices the approaching storm, he will shift more of his attention to it and become more attentive to signs related to the storm. This more focused collection effort taking place after the actor initially notices the threat seems more appropriately considered part of the perception phase than of the stimulus phase.

The view that warning is information would connect warning with the stimulus phase of the cycle--with the precursor events and the observables they produce--while the view that warning requires awareness would place warning in the perception phase of the cycle. Having adopted this latter position, I will refer to the information produced by the stimulus phase as warning information or warning indications, and will use the term warning for something which happens in the perception phase, when the warning information is interpreted as indicative of a significant threat. This convention will allow the distinction to be made between the information on which warning is based, the warning or perception of threat derived from that

information, and the decisions and actions undertaken in response to that warning.

TYPES OF THREAT/RESPONSE CYCLES

Different threat/response cycles have different characteristics. Among the most important types are those which might be described as single-track cycles, multitrack cycles, and reversible cycles.

The simplest type of threat/response cycle is what might be called the single-track cycle. In a single-track cycle the precursor events lead inexorably to the materialization of the threat, as if the precursors and the threat itself are simply positions on a single fixed "track" along which events are moving. Tactical warning of a Soviet nuclear attack on the United States is an obvious example of a single-track cycle. The precursor events which produce the warning information are the missile launches with which the attack is initiated. Once these launches take place the missiles will inexorably proceed to the ends of their ballistic trajectories and the attack itself will materialize. A mountain avalanche, beginning as snow breaks loose high on the mountainside and ending as the avalanche roars into and across the valley below would be another example of a single-track cycle. The precursor events (the snow breaking loose on the mountain) may well provide warning to those in the valley below. Once those precursors occur, however, there is little doubt that the warning will be followed by the threat and the avalanche will reach the bottom of the mountain.

Not every threat/response cycle is quite this straightforward, however. In a multitrack cycle, there may be several tracks which

pass through the same (or similar) precursors. These tracks would thus produce very similar warning information even though they might lead to very different outcomes. Consider, for example, waking up in the middle of the night and hearing noises in the house. On the one hand it could be a burglar stealing your property, and perhaps posing a serious threat to your personal safety. On the other hand, it might be one of the kids up going to the bathroom, or simply the beams in the house contracting as the temperature drops. Military maneuvers are another example of multitrack cycles. They may indicate, on the one hand, preparations for war and an intention to attack, while on the other they may be routine training and readiness activities.

Even if the indications point very strongly toward war, the probable nature of the upcoming attack may nonetheless be very much in doubt. In 1941, the signs of approaching war with Japan were evident to most observers, but the specific possibility of an attack on U.S. forces at Pearl Harbor was not. Indications of many kinds concerning Japanese war preparations and the likelihood of an outbreak of war in the near future were piling up in large numbers in early December 1941. The problem, however, of deciding precisely what those indicators indicated and of sorting them out and interpreting them in a manner that would have provided clear warning of the Pearl Harbor attack was an extremely difficult one. Pearl Harbor was not seen as a likely target for a Japanese strike, and it is probably reasonable that it was not, given the nature and content of the information then available.

As a more contemporary example, imagine that the Warsaw Pact was preparing for a large-scale attack on NATO and consider the problem of

predicting Soviet plans for a nuclear strike on the United States coincident with that attack. Even if no nuclear strike were planned, prudent military judgment (on the part of the Soviets) would require that Soviet strategic forces be brought to a high state of readiness "just in case." The set of indications produced would thus be very similar in either case, whether or not the strike was planned, in spite of the fact that the threat to the United States in the two situations is quite different.

The situation may be further complicated if the tracks are reversible--that is, if events can be "turned around" after a warning is received so that the threat itself never materializes. As an extremely simple example of a reversible threat/response cycle, consider the warning provided by the little oil warning light in most automobiles. When the light comes on, it gives warning indications of a potentially serious loss of oil pressure. Left unchecked, that loss could lead to major damage to the engine. If the warning is heeded and appropriate responses taken, however (perhaps no more than adding additional oil), that eventuality is unlikely to occur.

The Japanese attack on Pearl Harbor in December 1941 provides another example of a potentially reversible threat/response cycle. The fleet left Japan bound for Hawaii in late November, several days before the decision to go to war was made. When that decision was taken in early December, it was still a tentative one, subject to reversal up to the last minute should an agreement with the United States be worked out. But even without a political settlement, the mere fact of warning itself might have been sufficient to reverse the track and deter the attack. According to Belden (1977), the Japanese

fleet was under orders to attack only if it were possible to achieve surprise. If the fleet were to be detected by U.S. forces down to 24 hours prior to the attack, its orders were to claim to be on an exercise and return to home waters. The operation was only an "attack," in other words, as long as the United States received no advance warning. If warning had been obtained it would have been simply an "exercise."

The attack on Pearl Harbor thus combined the features of the multitrack and reversible cycles in what might be called a mixed multitrack reversible threat/response cycle. Many realistic situations, including the kinds of situations of interest in the strategic warning context, are likely to be of this type. That is to say that the warning indications received are likely to be ambiguous in the sense that they may come from a variety of different event tracks. Some of those event tracks, including those which present the most severe threats, are likely to be reversible given the right response actions early enough.

These different types of threat/response cycles pose different kinds of problems for and impose different kinds of demands on the actor being warned. The single-track cycle is, of course, the simplest. The actor must have adequate collection capabilities to detect and collect the observables and must be able to interpret that information quickly enough to make the resulting warning useful. Ambiguity, if there is any, is likely to arise from the collection process and, in principle, unambiguous warning is possible. If the cycle is not reversible, then the response effort should clearly be aimed at mitigating and countering the effects of the threat. While

there may be significant problems associated with deciding how to do this, the issue of objectives is likely to be fairly straightforward.

In a mixed multitrack reversible cycle, on the other hand, the situation is far more complex. A multitrack cycle may contain enough ambiguity inherent within the events themselves to make interpretation a very complex and uncertain task. If the correct response varies considerably depending on which track actually obtains, there may be major penalties for a wrong guess. If the noise in the dark house really is a burglar, failure to do anything about it may result in a considerable loss of property. If the actor assumes that it is a burglar and it's not, on the other hand, he may end up killing a family member--something which seems to happen not altogether infrequently. If the situation is potentially reversible, the actor must decide how much of his effort to place on attempting to reverse the threat and how much to put into an appropriate response if the reversal is unsuccessful. In the simple example of the oil light going on, this is an easy choice, but in a more complex threat-of-attack situation it might not be. One reason for this is the potential conflict between actions designed to deter or otherwise prevent (reverse) the attack and appropriate responses to the attack if it cannot be prevented.

It should also be noted, perhaps, that in many situations these various characteristics (single versus multitrack, reversibility, etc.) may be not so much inherent characteristics of the situation itself as they are of the way the situation is viewed and structured for analysis. Very few situations, for example, are completely single-track and unambiguous. To treat a situation as single-track

implies a judgment that the particular track chosen is so dominant in the real situation as to make it reasonable to ignore all others for analytical purposes. How reasonable this is in a particular situation depends not only on the situation itself but also on the purpose for which the analysis is being conducted.

Thus, for example, a force posture planner concerned primarily with military force effectiveness in the event that a conflict does eventuate might see the threat/response cycle leading to general war as predominantly a single-track cycle. Other analysts with other objectives might see it quite differently. The analyst concerned with the warning process itself and with the collection and interpretation of warning indicators might choose to lay heavy stress on the ambiguities and uncertainties which affect those processes. He would thus see the cycle principally as a multitrack cycle. The geopolitical strategist concerned with the question of response options and deterrence of escalation, on the other hand, might see a problem in crisis management and focus on issues of reversibility of the main threat/response cycle. An example of this type of focus is Belden's (1977) "Decision Stairway" which tracks events as moving back and forth with time along a single dimension representing the probability of war and varying from zero to 100 percent.

IV. STRATEGIC WARNING IS DIFFERENT FROM TACTICAL WARNING

The tactical warning problem has received a great deal of attention within the strategic force posture and planning community in the past, and the strategic warning problem has received very little. The perceptions held by strategic analysts of the problems of obtaining and using warning in a general war context have been conditioned by this imbalance in ways which may be appropriate for the study of tactical warning and inappropriate for the study of strategic warning. Tactical and strategic warning raise very different kinds of issues, pose different kinds of problems for the analyst, and require different kinds of analysis for their understanding. Tactical warning is far more amenable to quantitative analysis, while strategic warning requires a broader, more qualitative approach.

Tactical warning can be analyzed within the context of an isolated force exchange, without consideration of other military or political aspects of the situation at the time the exchange occurs. This yields an important analytical advantage, because it provides a nice clean-cut problem with a well-defined structure and clear, sharp boundaries. The nature of the strategic warning problem, however, does not allow that luxury. There are no clear, sharp edges, and attempts to artificially define such boundaries seem as likely to get in the way of understanding the problem as they do to enhance that understanding. The more we look at the strategic warning problem, the more we are likely to find that it resembles the situation which Barry Commoner describes in ecology--that everything is connected to everything else.

To see this more clearly, consider the kind of well-defined model of strategic force interchange which is used in studying tactical warning. Examine some of the questions asked of the model, and see how the model performs in answering those questions. Then compare that with the kinds of issues which arise in looking at the strategic warning problem and see what kinds of broadening of the model are required to accommodate those new issues.

The canonical scenario employed in tactical warning studies assumes a "bolt from the blue" Soviet attack, usually against a subset of the U.S. military target system. Consider three principle features of that attack scenario in the analytical context within which it is usually studied.

1. Unambiguous warning of the attack in progress is desired, as well as some degree of attack assessment--evaluation of the size of the attack, the target system against which it is directed, etc. This warning comes from detection and evaluation of physical events associated with the attack, such as launch of Soviet ICBMs and SLBMs. (The threat/response cycle is single-track.)

2. The uses to be made of the warning center around response to the attack. The actions driven by the warning--flushing the bomber force, launching ICBMs on attack assessment, and the like, are straightforward and defined within the same basic force exchange context as the attack itself. They are, moreover, responses to the

fact that the attack is actually occurring, and do not in and of themselves affect the fact of that occurrence. (The threat/response cycle is not reversible.)

3. The attack and response are viewed in isolation--apart from any broader military or political context. This is feasible because the factors which need to be considered--the attack itself, the observables it generates, the responses made to the attack, and the like--all fall within the force exchange context. They thus can be studied without reference to any broader context. (A broader context might appear indirectly through examination of different alert levels or degrees of force generation. Analysis still takes place within the force exchange context narrowly defined, however, and does not directly reflect events in the broader world.)

What happens with each of those factors in the strategic warning problem? The first thing to note is that unambiguous warning requires unambiguous indication of unambiguous events. It is not enough, in other words, to detect the precursor events and interpret those detections unambiguously. It is also necessary that the precursors themselves have a clear and unambiguous relationship to the threat against which warning is sought. That is to say that unambiguous warning requires a single-track threat/response cycle.

In tactical warning that situation obtains. The events on which primary interest is focused--missile launches and trajectories--are

unambiguously associated with an attack in progress--so much so as to be tautologically equivalent to an attack in progress. Any questions concerning the ambiguity of warning, then, are questions relating to the indications process--to the abilities of the sensors to detect those events, of the interpretation software to interpret the detections properly, of system false-alarm rates likely to introduce ambiguity, and the like.

Moving beyond consideration of tactical warning alone, however, the situation becomes multitrack and reversible. Most of the precursor events which might be detected and interpreted no longer provide unambiguous indications of an attack in progress. One reason for this is that, with the possible exception of missile launches, most military actions remain revocable, almost up to the time that forces actually come into contact. Even bombers in flight can be recalled. Indeed, this is often cited as one of their unique advantages. Any event short of the commitment of forces to combat must necessarily be an ambiguous indicator of imminent conflict. The degree of ambiguity, of course, will depend on the particular event in question, and will be much larger in some cases than in others.

This leads us to the second difference between tactical and strategic warning identified above--the uses to which the warning can be put. When tactical warning is received the attack is underway and there is little that can be done to change that. The principal use for the warning, therefore, is to respond to the attack in progress. So long as an attack is revocable, however, that is not likely to be the case. A major use of strategic warning at the national level will be to trigger and guide actions intended to induce the opponent to

reverse his decision--to change his mind and call off the attack. Uses of warning information to increase readiness or otherwise prepare to meet the attack if those efforts fail may be quite important, though in some ways distinctly secondary.

If preparations for an attack had been underway and efforts (based on warning) to thwart those preparations and deter the attack were successful, the opponent might never admit that an attack had been planned. He might instead simply claim that the "warning" had been a misreading of the indications. Thus, ambiguity about what was seen and how real the warning was may remain even after the fact. The Japanese plans to abort the planned attack on Pearl Harbor and turn it into an "exercise" in the event of premature discovery of the attacking force are a case in point.

The interpretation of strategic warning indicators will depend significantly on the context in which those indicators are seen. An event which is highly threatening in one context may be routine in others. The movement of Soviet long-range bombers to forward staging bases will always be an event of concern to the U.S. warning system. The degree of concern should be different, however, if the move takes place in conjunction with announced military exercises during a period of relative international quiet than if it occurs at a time of high levels of international tension and is accompanied by strong threats. This means that the ability to interrelate a variety of indicators, to blend and synthesize diverse and unrelated facts and observations, takes on an importance in strategic warning which has no parallel in the canonical force exchange scenario. Strategic warning necessarily takes place in a broad political/military context and has little

meaning in the narrow and isolated strategic attack context often assumed to deal with tactical warning.

Thus far, strategic and tactical warning have been discussed as more or less separate and independent entities. It is important to remember that they are both complementary and interdependent, and neither can adequately substitute for the other. Tactical warning that a nuclear attack against the United States has now been launched and is underway is critical, no matter how strong the prior strategic warning indicators that the attack was coming. There is no way that strategic warning can eliminate the value of tactical warning and attack assessment. Even if we had a well placed, reliable source within the Soviet Ministry of Defense, from whom we knew precisely what their plans called for and when they intended to execute those plans, tactical warning sensors would still provide a degree of confirmation and credibility which would be otherwise unattainable. It seems extremely unlikely, in particular, that launch-on-warning or other battle-management-type decisions could ever be based exclusively or even principally on strategic warning information.

On the other side of the coin, adequate strategic warning may be necessary to make tactical warning effective. In the canonical scenario the principal issues considered are technological ones. They include sensing launch, processing the sensor information in order to assess the attack, and transmitting that information to the appropriate decisionmakers and force elements in time for action. The human decision problem is ignored. This is reasonable within the context of the kind of technological assessment usually provided by the analysis of tactical warning. In the larger and more complex real

world, however, the human decisions necessary to set in motion the responses required by a Soviet strategic attack on the United States are not likely to be taken easily and automatically. Those decisions are likely to be made quickly, indeed perhaps even made at all, only if the requirement to make them does not come as a complete shock "out of the blue."

This is not the place to address the issue of whether or not the United States needs or should have launch-on-attack assessment or similar capabilities. It is appropriate here, however, to suggest that such capabilities can never really be provided based on tactical warning alone. The time provided by the tactical warning systems will be useful only if the necessary human decisions can be made very quickly. But in spite of any technological and procedural capabilities for quick decision, it seems unlikely that a quick decision would occur if the first indication the President had of an imminent threat from the Soviet Union came in the form of notification that the attack was on the way and he had six minutes to decide what to do about it.

V. RESPONSE TO STRATEGIC WARNING

Strategic warning and tactical warning of a Soviet nuclear attack on the United States are different, and one of the principal differences is in the area of response to warning, of what can be done once warning is received. High-confidence tactical warning indicates that an attack is on the way and there is not very much that can be done to stop it. The objective of the response, then, must be to cope with the attack in a militarily effective way, through active and passive defense, counterattack, or other means. The details of designing and deciding on response to tactical warning may be exceedingly complex, but the conceptual problem is fairly straightforward.

Strategic warning, on the other hand, is far more likely to suggest that an attack might be on the way, or then again, it might not. Even if it is, it may still be possible to do something about turning things around before the attack occurs. Response objectives must include preparing for the attack in case it does occur, while at the same time avoiding overreacting in case it doesn't. Efforts may be made to turn the situation around, through deterrence or other means such as reaching an accommodation with the adversary, while at the same time preparing to deal with the conflict if those efforts fail. In some situations these various desiderata may complement each other, while in others they may be in conflict. Increased levels of military alert may serve to deter aggression as well as to provide increased capability to cope with it, but they may also serve to dangerously provoke an already tense situation. Preemptive attack may

be the most militarily effective response to warning in many circumstances, but at the cost of precluding the possibility of a peaceful resolution. Even conceptually, then, the problem of response to strategic warning is exceedingly complex.

This section will attempt to give some order and structure to that complexity, by identifing some of the important dimensions of response to strategic warning and outlining some of the important interactions between them.

Earlier, in discussing warning as a change in perception, I said that it was important to identify the actor doing the perceiving--the national entity, an agency or organizational entity, or some individual within such a structure. The same thing is true when considering the question of response. There are actors at all levels of abstraction who respond to warning--individuals, organizations, and the national entity--and it matters whose response is being considered. This is not to say that all responses of all actors at all levels of abstraction should (or even could) be considered in all analyses. But neither is it possible to focus on a single actor--e.g., the national entity--or small set of actors and consider only their responses. Rather, a variety of actors must be considered, in varying amounts of detail depending on the particular aspect of warning response being addressed. This preliminary exploration will focus principally on the national actor and the national response, and only secondarily on other actors as contributors to the national action. It goes without saying that the issues considered here all deserve exploration in far greater depth and detail than they receive here.

The national response to strategic warning of a severe threat such as a possible Soviet nuclear attack is not the kind of single, well-defined action the term "response" usually brings to mind. Rather, it is a complex collection of interconnected actions taken by various agencies and individuals, some simultaneous and some sequential, and with varying degrees of coordination and interconnection between them. These various individual actions, and lesser groupings of individual actions, can be thought of as components of the national response. The principal components into which the national response can be divided include the military, political, intelligence, and domestic components, and these may be further subdivided as appropriate. The degree of refinement to which such a division should be carried will depend, of course, on the particular issues under consideration.

The military component includes actions taken by various elements of the military forces and command structure, such as direct military actions, increases in readiness, redeployment of forces, contingency planning, and the like. The political component includes diplomatic notes and other communications (to allies as well as adversaries), formal declarations of hostilities, invocations of treaty provisions, and other acts of a political nature. (The term "political" is intended here to carry an international rather than intranational connotation.) The intelligence component encompasses the refocusing of the nation's intelligence and information gathering activities as a result of warning. It certainly includes changes in tasking of collectors and shifts in analysis and dissemination procedures, and perhaps should also be thought of as including individual and

organizational shifts in perceptual focus in response to warning--away from the previous ongoing "business as usual" and toward the threat and the problems it poses. The domestic component takes in those actions which are principally intranational in their effects, such as civil preparedness activities.

There are three broad classes of purposes which the response to warning may be intended to serve. These may be loosely described as deflection of the threat, contingency preparation, and direct response. The first and third correspond roughly to the "deterrence vs. warfighting" dichotomy sometimes encountered in the strategic literature, though that correspondence is not exact. The second involves the kinds of preparatory activities often associated with the subject of warning. Each of these broad classes, of course, contains a large variety of more specific sub-purposes and objectives.

Deflection of the threat involves influencing the course of events (in particular the opponent's future decisions and actions) in such a way that the conflict does not occur. This includes the idea of deterring the conflict, but is somewhat broader. Deterrence, as it is usually thought of, rests heavily on the element of threat or fear. It embodies the idea that the adversary is deterred by his fear of consequences. Deterrence is one way of deflecting a threat, but it is not the only way. Others include accommodation, compromise, and persuasion on grounds other than fear of consequences. And in practice, of course, the most effective is often a judiciously balanced mixture of all of these. To think purely of "deterrence" is to underplay the importance of these other elements in determining the response to warning in severe crisis.

With a threat as serious as general nuclear war, deflecting the threat is the most desirable thing to do--if it can be done without incurring unacceptable costs. But that may not always be possible, and in any case, it is not prudent to count on successfully deflecting the threat and to direct the entire response effort to that end. The possibility that the threat will materialize must be considered, and actions to cope with that eventuality may have to be included in the response. Some of these may be intended to meet the threat directly, while others may be designed to prepare for the possibility in ways that will make it easier to cope with the situation if it should materialize later. Bringing standby air defense units on the line might be an example of a direct response to the threat of air attack, while increasing the alert levels for SAC bomber crews might be an example of a contingency preparation. Except for extreme actions such as preemptive attack, the line between direct response and contingency preparation is not always a sharp one. There does seem to be a qualitative difference between the two, however, which is worth making explicit in a preliminary exploration such as this.

Some of the actions which make up the national response to warning may be taken in the furtherance of only one of these purposes, while others will contribute to each in differing degrees. Political negotiation, for example, contributes primarily to deflection, while changes in readiness or alert levels can contribute to all. Which contribution is seen as most important would, of course, depend on the particular contingency. One obvious and effective direct response to strategic warning of a Soviet nuclear attack, preemptive counterattack, is likely to be ruled out on moral as well as pragmatic

grounds so long as any possibility remains that the attack will not occur. For this reason, deflection and contingency preparation are likely to play a more dominant role in response selection than is direct response.

Military contingency preparations can be thought of as reconfigurations of the resources and capabilities which will be brought to bear if the conflict occurs, in ways intended to enhance those capabilities. They can be broken down conceptually into reconfiguration of forces, options, and information structure. Reconfigurations of forces involve physical changes in the effectiveness, disposition, survivability, etc., of the military forces available for use in the coming conflict, and are achieved by means such as increases in readiness, dispersal, and redeployment. Reconfigurations of options involve changes in the way those forces may be employed to deal with that contingency, broadening the set of options available and creating useful options which would not otherwise exist. Some reconfiguration of options occurs as a natural byproduct of the reconfiguration of forces, but additional highly important reconfiguration may result from good planning and related activities not directly affecting physical force configurations. Reconfigurations of information structures include changes in collection, analysis, and reporting procedures; establishment of contingency command, control, and communications structures; and even the shifts in focus of attention which normally accompany an intense crisis.

The capabilities created by these reconfigurations may differ significantly with respect to their specificity to the contingency at

hand. Some, such as increases in readiness levels, serve to enhance generalized combat capabilities across a broad range of contingencies. Others, such as localized alerts or preparation of new options and contingency plans, serve more to enhance the capabilities available to deal with the specific contingency actually occurring. In this way, the time provided by warning may be used to tailor the capabilities and options available more closely to the requirements of the threat. This increases the leverage those capabilities and options provide to deal with that threat.

It may be useful to think of response to warning as a <u>focusing mechanism</u>, which brings together and focuses capabilities to deal with the extant threat in the same way that a magnifying lens gathers diffuse rays of light and focuses them on a single point. This allows a greater capability to be brought to bear against the threat when its likelihood of materializing is high, than could be maintained against that threat on an ongoing basis during periods when it is but one of many low-probability possibilities.

Let's explore that idea a bit. If we were prescient and knew for sure when and how the next war would start, we could devote all our defense resources between now and then to meeting that particular threat. Instead of maintaining expensive but unnecessary forces on a continuing worldwide basis during peacetime, we could focus our entire defense effort to provide peak capabilities the day the war was to start. Whatever our overall defense budget, we could obtain far more capability from it in this way--capability to fight that particular war, that is--than we do by using most of it to procure and maintain peacetime forces that never see combat.

But however attractive such a strategy might be in an ideal world in which we were prescient, it is not a rational strategy in the real world, where we are not. The uncertainties are inherently too great, and the probable interactions between the risk of war and the strength of our defenses against war too strong. War is not something which happens on some particular day chosen by a control team, but is the result of a complex process of perception and interaction between nations. The likelihood we will be attacked is influenced by our adversaries' perceptions of our strength, so that military forces may be necessary to deter war even if that war never comes. The option to know when and how the "real threat" will occur and to focus all effort precisely on that time and contingency simply does not exist in the real world, so that forces and capabilities in being must be maintained against a range of possible threatening contingencies.

The situation is depicted schematically in Figure 2. Think of the threat axis not as a unidimensional axis but as representing a complex multidimensional space of possible threats. These persist over time, defining a continuing-threat space depicted as the horizontal plane. Military preparations, including states of readiness, contingency planning, and deployments as well as weapon system procurements, provide capabilities to deal with these threats, represented in the figure by the capabilities surface. The height of this surface will reflect many factors such as perception of the seriousness of various threats, ease and cost of providing capabilities against them, and total resources committed to defense. The volume under the surface will reflect the total resources committed to defense over the period of interest, and will also be

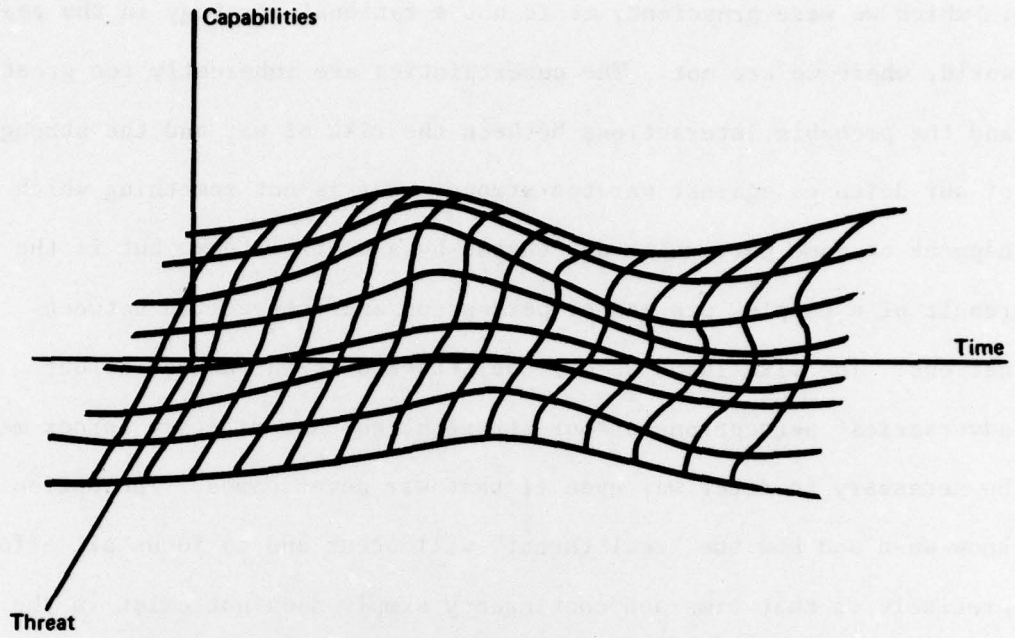


Fig. 2 — Distribution of capabilities in the absence of warning

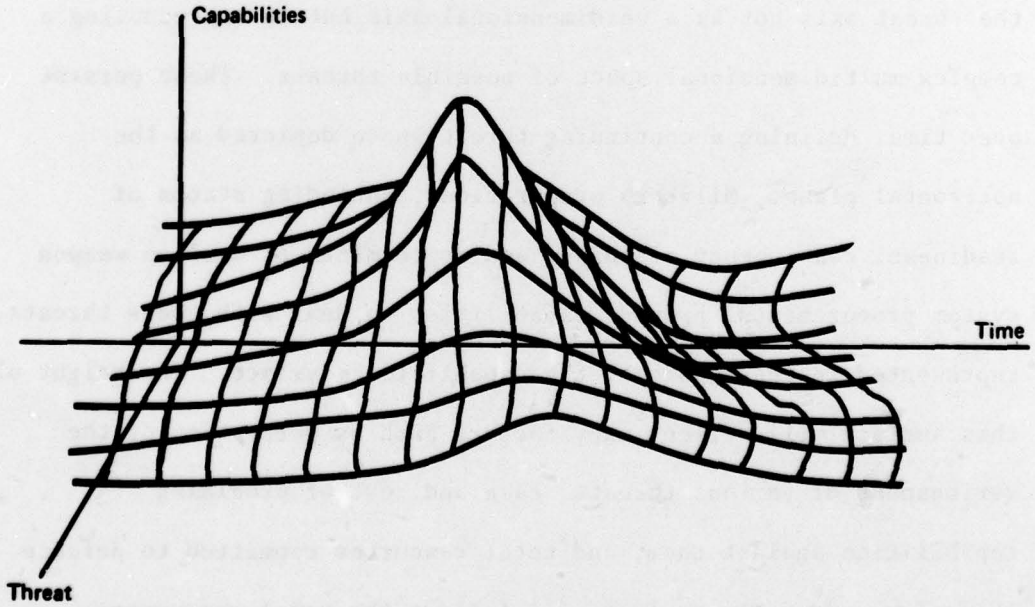


Fig. 3 — Distribution of capabilities in response to warning

affected by the way those resources are allocated and the relative costs of various capabilities.

The distribution of capabilities over potential threats will not be uniform across the threats, but will be more uniform than would be appropriate in the presence of information more sharply delineating particularly likely threat/time contingencies. Warning provides such delineation, identifying a particular threat as far more likely at a particular time that would have been the case a priori, without the warning. Response to warning can then reshape the capabilities surface in a manner more appropriate to the resulting threat perceptions, as shown in Figure 3. In this way it may be possible to provide a level of capability to meet that threat which would be impossible to maintain on a continuing basis.

VI. THE UTILITY OF STRATEGIC WARNING

An overall assessment of the utility of strategic warning includes three principal components:

1. Identification of individual threat cases or classes of threat cases in which strategic warning might play a significant role.

2. Assessment of the utility of strategic warning in these various individual cases.

3. Combination of these individual assessments into an overall assessment based on the likelihood and importance of the individual cases as well as the utility of warning in each.

Each of these components is itself complex and difficult, requiring careful and considered subjective judgment as well as objective analysis. Some aspects of the second component, assessment of utility in individual cases, may be quantifiable; but the first and third, and significant aspects of the second, are driven by qualitative factors which are probably not amenable to quantitative analysis. The quality of any overall assessment is heavily dependent on how well these qualitative factors are handled. The biggest pitfall in the path of good assessment is probably the temptation to avoid the difficult qualitative issues and focus attention on analytically tractable portions of the problem.

In principle, these components appear to be three independent steps which could be performed sequentially in the order indicated. Any completed analysis of the utility of strategic warning which follows this structure is likely to be organized and presented in a manner which suggests that that was the way it was done. That appearance, however, is illusory. In practice, the three are likely

to be interconnected and inseparable during the process of analysis, and to be separated and brought clearly into focus as distinct components only during the "neatening up" process at the end. This is, of course, frequently the case in the analysis of complex issues, and in this sense the warning problem is in no way unique. The process of human planning and analysis in general, in fact, is more haphazard and opportunistic than the cleaned up and structured end product of that process frequently suggests (Hayes-Roth and Hayes-Roth, 1978), and it is only through such a process that people do come eventually to understand complex and difficult problems (Strauch, 1974). It is important to recognize this explicitly as a counterbalance to the temptation to impose a great deal of structure on the problem at the outset, in the hope that doing so will assure a well-structured problem at the end.

The interconnections between the first and third components above are particularly strong. The identification of individual cases for analysis is inseparable from judgment about the likelihood and importance of those same cases. Analysis is not a free good, but a commodity which costs time and effort as well as money. It will not be applied lightly to cases which are judged to be relatively unlikely or unimportant. A priori judgments about the weight which individual case assessments are likely to have in the overall assessment will thus affect which individual cases are considered and how those cases are treated.

To complicate matters further, judgments about the likelihood and importance of individual cases are themselves likely to be highly dependent on the method of combination to be applied--the third

component. Different ways of combining the individual case assessments into an overall assessment will suggest very different sets of individual cases as "worthwhile" for individual assessment. To see this, consider three different combination methods, expected utility analysis, worst-case analysis, and potential utility identification. These different methods appear to lie along some kind of common spectrum, with expected utility analysis in the middle and the others at either extreme.

Using expected utility analysis, the overall utility of strategic warning would be obtained by averaging the utilities of individual cases weighted according to their probabilities. Ideally, this is a quantitative procedure, but it can also be carried out qualitatively if the various elements of the assessment cannot be fully quantified. In either case, the overall utility can be thought of as the sum of terms corresponding to the individual cases. Cases contributing significantly to this overall utility include those having relatively high probabilities and those with relatively low probabilities but high individual utilities. The overall expected utility will thus be sensitive to the range of cases considered and the probability distribution assumed over that range, as well as to the individual utility assessments for the significant cases. At the same time, it is not likely to be extremely sensitive to the results for any single case.

Worst-case analysis focuses on the individual case or class of cases for which the utility is likely to be the least, thus yielding a lower bound on the utility of warning across the spectrum of cases. It is likely to be extremely sensitive to the choice of the "worst

case" and to the individual utility assessment for that case, but will be largely insensitive to the broader range of cases considered or to individual assessments in these other cases.

Potential utility identification attempts to demonstrate utility by exhibiting a reasonably plausible case or class of cases for which the utility is potentially high. It is sensitive to the assessments for these individual cases and to the judgments made about "reasonable plausibility," but, like worst-case analysis, is relatively insensitive to cases other than those specifically focused on.

These three different methods of combining individual case utility assessments, then, imply very different approaches to the identification of significant individual cases for analysis. Expected utility analysis requires the identification of a broad spectrum of significant cases, and some sort of relative likelihood assessment across those cases. (If the overall assessment is to be quantitative, these relative likelihoods must be numerical probabilities, an even more demanding task.) The other two methods only require the identification and individual assessment of one or at most a few cases, whose likelihood is adjudged significant enough to satisfy the requirements of the method. This is a far less demanding task than identifying and analyzing the full spectrum of cases.

The requirements for analysis of the individual cases are different too. Using expected utility analysis, a means of assessing the utility of warning in individual cases which makes those assessments comparable across the spectrum must be found. But the range of cases which might be considered is so diverse and the ways in which warning might play in those cases so different as to make a

comprehensive yet comparable assessment across this spectrum extremely difficult. With the other methods, only a few cases are treated, so that the need for comparability across a broad spectrum does not exist. All that is needed is a way of assessing and characterizing the utility of warning in those cases.

The simplest approach, intellectually, is the worst-case approach. If this approach is adopted and a plausible "worst case" in which warning makes no difference can be found, then the utility of warning can be assessed to be nil, and the problem can be dismissed. This is what has been done, in effect, with strategic warning of general war by the strategic force planning community. The Soviet "attack from the blue" has been adopted as the canonical "worst-case" attack against which everything else is to be measured. Almost by definition, strategic warning has no utility in that scenario, so has no overall utility according to a "worst-case" assessment.

Potential utility identification, on the other hand, requires demonstrating a positive utility for warning. This can be more difficult, especially if the demonstration must be unambiguous and the analysis is restricted to the force exchange context within which strategic force and conflict issues are often treated. It may be relatively easy to identify cases in which warning could make an important difference, but difficult or impossible to convincingly show that it would, given the dependence of warning and how it is used on the vagaries of human perception and decision processes and the variety of failures of those processes which have been demonstrated historically. It may be that the best which can be actually shown is that warning might make an important difference in some critical

situations. But given that possibility, the risks of neglecting warning may be great to take.

Each of these approaches to combining individual case assessment has its strengths and its weaknesses, and no one of them can be clearly superior to the others. In practice, then, in this as in so many things, the best approach may be a judiciously chosen mixture of all. Warning is too complex a subject, perhaps, to admit to a simple, precise, and unambiguous characterization of its utility. Different aspects of that utility or lack thereof can be evaluated or demonstrated in different ways, with the final integration of those aspects necessarily taking place in the mind of the perceiver, based on the way he weighs and integrates the factors involved. The best that analysis can do is to support this process, by clarifying some of the issues and presenting them in a manner which facilitates synthesis, a process which must necessarily be ultimately judgmental.

Ultimately, the apparent utility of strategic warning is likely to depend heavily on the threat judgments the perceiver brings to bear. If the "out of the blue" attack is seen as the principal threat, the utility of strategic warning is likely to appear low, no matter how that utility is analyzed. If the major threat is seen as arising in the context of U.S./Soviet confrontation during intense crisis, with crisis management and deterrence of general war remaining a critical national objective even up to and through the initiation of nuclear hostilities, then strategic warning is likely to appear important and perhaps critical throughout that process. Understanding the utility of strategic warning in such a context, however, is likely to require a considerable broadening in our intellectual perspectives

for addressing U.S./Soviet nuclear conflict, to encompass the political and behavorial aspects of conflict decisionmaking to a far greater extent than is now the case.

VII. CONCLUDING REMARKS

This note has attempted to explore some of the conceptual and analytical issues which arise in the study of strategic warning. The subject is difficult and complex, and the picture painted here may appear somewhat bleak--at least with respect to the possibility of quantifying strategic warning capabilities and their worth in the manner that is often done for, say, tactical warning capabilities. Some might conclude from this that strategic warning is too risky and undependable to be counted on in a general war context, that we should continue to depend on tactical warning and to leave strategic warning alone.

Such a conclusion would be, I think, a mistake.

We cannot depend solely on strategic warning of impending general war, for we may not have it. But then again, we may; and if we do, it can make a major difference. Decisions of war and peace can be made intelligently only by leaders who understand the situation in which they find themselves, and the options and opportunities that situation presents. In any international crisis approaching general war, warning information of various kinds will be developed and will play an important role in providing that understanding as the crisis develops and resolves itself--one way or the other. It is important that we be able to make the fullest and best use possible of that information at that time. That is what strategic warning is all about.

One of the major barriers to understanding the role of strategic warning in the general war context may be the conceptual paradigm for

thinking about general war which has become the standard among strategic analysts. In that paradigm, strategic forces are sent against their respective targets (including the opposing forces) to achieve clear objectives, measured by well-defined objective functions such as the fraction of the opposing target system destroyed or the relative force remaining at the end of the exchange. The opposing nations are viewed as unitary rational decisionmaking entities, bent on achieving the maximum "score" in the particular game represented by the exchange. Any larger social or political context is abstracted out as irrelevant.

This paradigm has its value--indeed, it has proved amazingly useful to the strategic planning community over the years it has been in use. But it is a poor paradigm within which to think about the issue of *strategic warning* precisely because it abstracts away the elements of the problem which are most important to that issue. These include (but are not limited to) the larger political context within which the potential conflict develops; the organizational and human context within which information is collected, interpreted and communicated; and the problems of conflict decisionmaking in an ambiguous, fluid, and possibly reversible multitrack threat situation.

To understand strategic warning and its role in general war, then, we must address it within a richer paradigm capable of more fully representing the problems and the possibilities it presents. This note has attempted to begin the development of such a paradigm. Much remains to be done, and a great deal of further effort will be required. Strategic warning is complex and difficult to understand,

but considering the alternatives, trying to do so is certainly worth the effort.

REFERENCES

Belden, T. G., "Indications, Warning and Crisis Operations", International Studies Quarterly, 21:181-198, 1977.

Handel, M. I., "The Yom Kippur War and the Inevitability of Surprise", International Studies Quarterly, 21:461-502, 1977.

Hayes-Roth, B., and F. A. Hayes-Roth, Cognitive Processes in Planning, The Rand Corporation, R-2366-ONR, December 1978.

Pyles, Ray A., Strategic Warning: Organizational and Individual Barriers, With Examples for the Mayaguez Incident, The Rand Corporation (forthcoming note).

Strauch, Ralph E., A Critical Assessment of Quantitative Methodology as a Policy Analysis Tool, The Rand Corporation, P-5282, August 1974.

Strauch, Ralph E., Information and Perception in Limited Strategic Conflict: Some U.S. and Soviet Differences, The Rand Corporation, P-5602, February 1976.

Wohlstetter, R., Pearl Harbor: Warning and Decision, Stanford University Press, Stanford, California, 1962.