THE INTELLIGENCE PROCESS AND THE VERIFICATION PROBLEM

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I. INTRODUCTION

This paper attempts to provide some background for serious and otherwise well-read students of arms control who lack direct experience with intelligence aspects of the verification and monitoring of arms control agreements.

I try to cover a very wide and complex subject from a definite point of view--control of weapons of mass destruction is a necessity but also extremely difficult given relations among states in general and between the two "superpowers" in particular. While governments are right to minimize the risks to their citizens, attendant on arms control, it is their responsibility and the responsibility of their policy and technical advisors to make the best possible use of their resources to make the world a safer place, i.e., to bring weapons of mass destruction under rational control.

The intelligence systems of all sides are necessary contributors to this goal. The primer on intelligence and the intelligence cycle described herein have universal applicability. If arms control policy is to be based on an understanding of reality and is to serve the end of making the world more likely to endure to its natural span, then we must recognize that we, the Russians and all nuclear states share the problems and processes of apprehending reality. To the extent that there are national distinctions in intelligence systems, they have to do with arrangements of and authorities granted to intelligence organizations.

The most "American" aspect of this paper is the final section in which are discussed a rationale for arms control and a suggestion for a direction which improvements in intelligence support to arms control might take. Essentially, I assert that the intelligence cycle needs to be made as interactive as possible in order to assure that the resources devoted to understanding the reality of foreign arms programs are used with maximum effect. The U.S. intelligence system is extremely powerful and competent as well as large and complex. Its management, therefore, must be finely harnessed to its objectives. Much improvement has occurred in recent years, but much more remains to be done.

Regarding arms control, neither despair nor unbounded optimism can be justified by intelligence systems alone. The U.S. approach has been to blend reasonable political calculation with reasonable expectations of intelligence. Taking advantage of learning to date, technology, and continued reasonable calculation, intelligence can continue to make a major contribution to arms control.

II. AN INTELLIGENCE PRIMER

The purpose of this paper is to shed some light on processes and techniques of monitoring and verifying compliance with arms control agreements. The writer bypasses the contentious and largely unproductive issues of ideology and political theory so as to highlight some possible means of coping with difficulties of learning about remote events. Many problems and dilemmas remain even at the technical level, but a better knowledge of these may contribute to an improved public understanding of the issues.

Intelligence is only a sub-set of all the knowledge we seek in order to survive. We begin indirectly to learn about the world while still in the womb. We begin to learn directly about the world after we are born by touching, tasting, seeing, hearing, and smelling it. As infants we learn about abstract qualities by experiencing their effects, i.e., we learn about gravity by falling down; we learn about heat by burning our fingers in pretty flames.

But, as we grow older, our experiential world constitutes an ever smaller proportion of the whole world we learn is out there but which we cannot or do not directly experience. I have never been to the Soviet Union, for example, but I believe there is such a place and even that I know something about it.

The condition we all share with government analysts and officials is the necessity to act as though indirect knowledge is the same as direct experience. Most of the time, with certain cautions and safeguards that we learn in order to qualify for the positions we hold, this assumption works well enough. But, direct experience nearly always is preferable to indirect learning.

Intelligence is no exception. In the present context, intelligence is an activity associated with learning about real things that are capable of causing enormous harm. At least part of the appeal of such measures as on-site-inspection is the desire, expressed or not, for direct experience.

But, intelligence for verification deals with precisely those matters that are most carefully guarded secrets of sovereign states. Not only is direct examination of the nuclear weapons of the other side highly unlikely, but even indirect information has been denied wherever possible. The degree to which both super powers have permitted each other to acquire certain information, as specified by the SALT agreements, for example, is a measure of the urgency of the threat felt by both of them.

So the question is, how do we learn about these remote and hidden matters that are crucial to our personal and global safety? More important, how do we learn about them in such a way as to be confident that our knowledge is not only a correct basis for national action, but is also perceived by the public as a prudent and desirable course of action despite the high expense and dangers incident to conducting extensive intelligence collection efforts in a world characterized by high international tensions?

The United States and USSR have signed a series of treaties that limit the testing, manufacturing, deployment, and use of a number of significant weapons.[1] All of these treaties derive their effectiveness from a high degree of accurate knowledge, independently acquired, about the relevant actions of the other.

It is universally agreed that good faith cannot be presumed on either side--the Russians have a list of alleged American violations of arms control agreements, and we have a list of theirs.[2] This leaves the

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[1]The 1982 Edition of *Arms Control and Disarmament Agreements*, U.S. Arms Control and Disarmament Agency, Washington, D.C., lists 12 distinct agreements, either bilateral or multilateral in which the United States and the USSR play key roles. These range from the 1961 Antarctic Treaty, which forbids nuclear testing on the continent, to the SALT II treaty, which though never ratified, is treated as though it were in effect.

[2]Thomas W. Wolfe, *The SALT Experience* (Ballinger Publishing Co., Cambridge, MA, 1979), p. 35. At the first Standing Consultative Commission meeting in 1974, the Soviets countered U.S. inquiries about some possible violations of SALT I with questions of their own about questionable U.S. practices. Additional questions have been raised recently, viz., deployment of "ABM tested" radar in Alaska, systematic violation of the principle of "confidentiality" and, perhaps most substantially, the deployment of large phased-array radars on the

treaties dependent upon the intelligence collection and analytical capabilities of the signatories. The questions of primary concern, as a result, boil down to these three:

- What information do we need to be sure we know what the other side is doing?
- How do we obtain it?
- How can we be sure that the information we receive is a proper basis for decisionmaking?

These are intelligence questions. They are large, complicated and hard to answer, but not different in principle from the questions anyone asks when buying a house or car. But there are two main differences between seeking information to verify an arms control agreement and to buy a house. In buying a house, there are ethical and legal codes which provide a certain level of confidence in the information gathered, or they provide for legal remedies. Second, in the event of a poor job of house buying, the suffering is confined to one household.

In the intelligence business not only are there no codes to protect the unwary, but the other side may see advantages in perverting the knowledge available to us. Further, the consequences of an intelligence failure in so vital an area as arms control may powerfully affect the whole nation.

The uniqueness of the intelligence process lies in the resources governments are able to bring to bear and in the consequences that might follow from a failure to gather, analyze, and disseminate accurate information. Many problems of intelligence flow from this apparently obvious observation, especially those of security and secrecy. Intelligence, at least in the sense we are using the term here, concerns itself with discovering what others want to hide. The mere act of hiding can be threatening to one side and attempting to discover that which was hidden may be equally threatening to the other.

Atlantic, Pacific, and Gulf coasts. Code named *Pave Paws*, their declared purpose is early warning of sub-launched missile attack. See "Soviets Say U.S. Cheats on Treaties," *The Washington Post*, January 30, 1984.

Of course, governments have enormous resources relative to those of the typical house-buyer, but these resources are not infinite. They have to be measured against the variety and magnitude of the information needs. For a nation such as the United States with many and diverse interests around the world, resources are always insufficient. One may argue with the wisdom of U.S. interests or with the wisdom of the allocation made by the U.S. intelligence community, but these are marginal considerations. The general truth is that no feasible allocation of resources would cover all needs.

THE INTELLIGENCE PROCESS

Where resources are not sufficient, the intelligence process operates in a systematic way to insure that the available resources are distributed in such a way as to maximize collection against the "most important" problems. Determining just what the "most important" problems are is one of the most difficult challenges for the mamagement of intelligence collection.

The "Intelligence Cycle" allocates the resources available to the Intelligence apparatus, helps focus the efforts of intelligence collectors and helps control the monetary and political costs and risks inherent in such activities as intelligence collection. While the Cycle is presented as having five distinct steps, they, in fact, are all interconnected and a change in any one of them can directly affect any of the others.

- *Requirements development* is concerned primarily with analyzing needs for information and available means of collection so as to generate agreed lists of information needs that reflect an implicit distribution of available resources against the expressed needs of the ultimate users of intelligence--government decisionmakers.
- *Collection activities* accept the expressed needs for information and operate the organizations and equipment essential to the effective and timely acquisition of information relevant to them. Collection systems include

everything from subscriptions to publicly available news services and technical literature to the most advanced technology and scientific research. The proper management of finances, technical capabilities, and personnel to provide an acceptable amount of what is wanted is extremely challenging and occupies a large part of the intelligence community's budget and brightest people. Virtually by definition no more than a fraction of all needs can be satisfied because the statement of needs may be unconstrained by either capability or practicality.

- *Evaluation and Processing* are the elements of the cycle wherein the collected data is transformed into intelligence information. Much of the originally collected data must be evaluated in terms of its likely veracity and reliability. That which has been obtained, whether from human agents or technical means of collection, has to be assessed to be sure that no unexpected distortions have crept in or been introduced maliciously. Information from even well-established sources has to be monitored and evaluated. There are, after all, no guarantees that even an excellent source won't be wrong occasionally or won't go wrong as a result of causes ranging from wear and tear to subversion. Some information is collected in forms that are of little use without extensive processing. This includes such things as telemetry signals and encoded or encrypted material which may be relevant to verification but need highly accomplished processing before their substance is accessible to human analysis.
- *Analysis* is the process of assembling information relevant to the stated needs of government decisionmakers and applying to that data the best available techniques to extract from it an accurate depiction of objective reality. Thus, decisionmakers, in the face of all the other uncertainties of their trade, might have the best possible grip on reality to guide their policy.

- Without competent *dissemination*, the most brilliant and accurate analysis will never benefit the users of the intelligence. The large bureaucracy that accompanies the multifarious activities of intelligence collection and analysis means that information passing between elements of the apparatus is vulnerable to many misadventures. These can include information getting lost in the mail, as it were. But they can also include serious and very difficult- to-ameliorate problems. One difficulty is recognizing the relevance of many small details to the same substantive problem. Another difficulty is that with a large bureaucracy dealing with many problems and issues it is hard to ensure that just the right information gets to the most directly interested parties.

THE NEED FOR SECRECY

It follows from the preceding discussion of intelligence that without intelligence, monitoring and verification would not be possible. The arms control process depends on intelligence. But why is such secretiveness necessary?[3] Surely, it would be possible to do a better job of informing the public and thus win public support for the programs and expenditures necessary to make arms control work.

In a word, secrecy makes arms control possible. Much about the processes of acquiring information for verification purposes must be hidden. If one side knew how the other acquired information about it,

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[3]The question is given some point by the late 1984 uproar over the first secret payload scheduled to be launched on the space shuttle. A Defense Department spokesman announced that the next payload would be highly classified and that press speculation on its nature might bring official investigation. *The Washington Post* ran just such a story and the ensuing blizzard of charges and countercharges brought forth the fact that a number of publications had similar information, which fact became known to the authorities. The Secretary of Defense personally intervened and requested several news organizations to withhold publication. Those asked assented. The *Post* was not asked. I don't want to argue the merits of the case. I merely suggest that surely there is a better way--for example, to provide sufficient information to gain rational support for the government position without the Secretary of Defense having to chase every leak or threaten investigations.

it could better hide cheating efforts. Such a defeat for the collection effort would erode confidence in the quality of relevant knowledge. Secrecy is vital both to the quality of knowledge relative to arms control and the confidence that any government and people could have in the arms control process.

There is a catch-22 here though. In line with the foregoing, it would be difficult to complain of noncompliance, even where mechanisms like the SALT Standing Consultative Commission had been established to deal with compliance issues. It would be hard to make a complaint without telling the other side too much about how the data on which the compliant was based had been obtained. Indeed, this very consideration opens a field of play both sides may use. Since the treaty defines a set of facilities that are certain to be the targets of intelligence interest on the other side, it requires only common sense to see how that interest might be used to test and study the reactions of the other side.

The following discussion is an attempt to work a compromise between the need for secrecy and the need for public information. The elements of this compromise are that no real situations or intelligence collection systems are referred to and that my remarks about the intelligence process are highly generalized. The resulting discussion may lack concreteness, but I hope it will be coherent and useful.

III. THE PROBLEM OF VERIFICATION

We all could agree that nuclear weapons ought to be abolished or reduced, by many times, from their current levels and that achieving that objective ought to be the foremost international task of our time. Since agreement with these principles is nearly universal, why has progress toward reductions been so slight? The question is asked by people of all ages and levels of experience from grade school to internationally recognized leaders and responsible government officials.

There is no single explanation for the lack of real progress in reducing the most dangerous components of the super powers' arms. A good deal has to do with the differing cultural backgrounds, assumptions, and values each side carries into the negotiations. Sorting out the real and perceptual effects of this cultural baggage is the work of generations of anthropologists and political scientists.

While we wait for that research to be done, however, the weapons are real and present, their numbers grow, and governments pursue or defend their interests. High among the interests pursued are the issues of compliance and the right of each side to the independent verification that is central to arms control negotiations.

Verification has become a kind of touchstone in the West's public arms control debate. The qualifying word *verifiable* is inserted into all suggested treaty formulations. No position can hope for acceptance until verifiability can be confidently asserted.

Obviously one side would not sign an agreement of any kind if the compliance of the other(s) could not be verified. No presumption of good faith is made in arms control. Quite the reverse; we expect noncooperation, and it may be that the task of verification is simpler without cooperation, i.e., without having to second-guess the other side's offers of cooperation.

WHAT IS VERIFICATION?

Verification is the process of ascertaining the extent to which the parties to a treaty are abiding by its terms; as such, it is to one extent or another an element of all treaties.

What is different about verification in connection with arms control treaties is the magnitude of the risks incurred. Should one of the parties successfully violate the terms in such a way as to deprive the other(s) of the ability to defend itself (themselves) or meet obligations to nonsignatory allies, the very existence of the victim(s) could be put at risk.

Arms control negotiations are hard, in short, because they deal with questions of risk involving the very existence of nations. While this may provide grounds for debating either the continued relevance of the nation state or the sanity of continuing to believe arms control is possible, these are not the subjects here.

This much may be self-evident but it is worth making explicit because it highlights the fact that the problem of verifying compliance with arms control treaties has two parts:

- *Monitoring*-the function of collecting, analyzing, and reporting data on the relevant activities of the parties to an arms control agreement.
- *Verification*-the process of determining whether parties to an agreement are in compliance with their obligations.[1]

Several things stand out. First, the second term includes the first, which is why this paper uses verification as the general term for the area of its interest. Second, monitoring is a technical activity concerned with establishing objective facts. Verification is an interpretive activity calling for the making of judgements not only about the evidence but also about the meaning of the terms of the agreement itself. Third, to the extent that judgement about the meaning of the agreement is called for, the verification process as a whole is

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[1]U.S. Government Printing Office, *Security and Arms Control: The Search for a More Stable Peace*, September 1984, pp. 75-76.

the responsibility of the national political authority, not the intelligence agencies.

The role of intelligence, vital as it may be, is supportive. Only the elected leaders of the nation can carry the process through to completion, i.e., only the President can decide on the basis of evidence and interpretation what to *do* about continued and serious noncompliance. Much of the perceived frustration and disagreement over the utility of arms control agreements flows from differences over timing, methods, and extent of penalties imposed on the noncomplying party.

If noncompliance is to carry no penalty, the whole arms control process clearly is a dangerous, not to say irresponsible, exercise. This issue underlies much of the debate currently raging over arms control and verifiability.

Finally, verification must meet another criterion for effectiveness. If verification is to be useful at all, it must provide assurances of compliance in a manner that enables the parties to protect their own interests and to meet obligations to their own and allied citizens. It may be possible to gather evidence of noncompliance, yet not be able to do anything quickly or certainly enough to allow the victimized side to take offsetting action in good time.

IV. INTELLIGENCE COLLECTION

The approach to the problem of verification pursued here is strictly pragmatic. It takes the desirability of arms limitation, in which verification plays a central role, as a given. The problem is to make verification credible--to operate the intelligence cycle described above as well as possible.

Verification presents a classic problem of intelligence collection. The United States already has a large and highly capable system to do the job. There are just two problems:

- The intelligence system has often failed.
- It is not obvious that the system we have is the best one for the job, especially in view of the controversy that currently surrounds the verification issue.

What follows is an attempt to answer the implied question: If we want arms control and if arms control requires verification and firm intelligence support, how can the necessary credible intelligence be provided?

Intelligence information is distinguished from all other kinds of information only by the purpose for which it is gathered--to inform and support government decisionmaking. This means that much ordinarily available information can become intelligence and that much intelligence, when taken out of its context, can appear quite ordinary.

This serendipitous aspect of information gathering is one reason that intelligence agencies gather information from the greatest possible variety of sources. The range of legitimate sources runs from the most obvious and openly available newspapers, dictionaries, and encyclopedias to the most discreet personal contacts, technical machines, and spies. Together, these collectors gather mountains of information, which intelligence analysts sort, classify, clarify, integrate, verify, and present to decisionmakers in credible and accessible form.

But, all available information that is of potential value to decisionmakers is clearly much greater than the ability of any intelligence agency to collect and process. Even the United States is able to acquire only a small percentage of all the information that might be available and also useful.

Thus, we arrive at the central reality of all intelligence activity: the need to choose and to set priorities. If it is not possible to gather everything, how is it decided what to gather? The intelligence community has elaborate staffs and methods to answer this question. It is the central question of intelligence (as it is, indeed, of every information-gathering and -analyzing endeavor).

The process of setting priorities for the collection activity of intelligence agencies rests fundamentally on a single event--a query from the potential user of intelligence. To some extent, this is an oversimplification. In the real world a certain portion of capabilities is aimed at protecting the sponsoring country against surprise by searching for previously unknown phenomena that might provoke previously unasked questions. In general, nevertheless, the collection task is too big and too expensive and the risks of compromise and provocation too serious to indulge mere curiosity or to proceed randomly.

FIFTEEN STEPS

The question only begins the process of producing intelligence. The cycle as described before is too simple. The actual process is more involved and includes at least 15 steps. There could be more or less. Certainly each step consists of elements, but 15 illustrates the complexity of the process well enough.

Each of the 15 steps can, for present purposes, be considered an independent event. In reality many of them may not be entirely unconnected, but the approximation is close enough. Accepting this assertion, one can estimate the probability that each stage in the cycle will be completed and treat the whole cycle as a set of contingent probabilities such that one can then estimate the probability that a given question eventually will yield relevant information to the original requestor.

The steps, brief definitions, and illustrations follow. Each could be the subject of a whole literature, but the point of this exercise is to illustrate that gathering or analyzing more information may resolve some questions, but certainly will exacerbate all the problems mentioned below. Something more has to be involved, and we will get to that next.

1. The Question.

Nothing gets done unless the question gets asked. Moreover, the more important the asker and the issue, the more likely the question will be to draw a response. Thus, the first element is the probability that a germane question is asked by a user of intelligence. In the arms control context, users include the President, the Secretaries of Defense and State, and officials all the way down to working-level analysts, all trying to understand Soviet intentions and activities.

2. Submission.

The conceiving of a question is no guarantee that it will be written down and submitted to those empowered to consider that question for incorporation into the requirements data base. So, the second factor is the probability that the question is submitted through requirements channels.

3. Acceptance.

Arms control is certainly a key collection area, but certainly not the only one. It may not even be the most important one. All questions submitted have to compete for a relatively fixed set of assets. Merely because the importance of a question is recognized is no guarantee that it will be accepted as guidance for collection in competition with all other questions.

4. Collection Action.

The real problems begin once a question has been accepted for collection and translated into a requirement. The collection system could hardly dedicate itself to answering questions one at a time--it would simply be impractical to build systems, train linguists, or recruit spies to answer today's set of questions. In this context, the import of these facts is that there are always more questions than can be answered at any one time. Numerous criteria are taken into account when deciding exactly which requirements will be laid on for collection at any moment, including time since last attempt, current situation, and past target behavior. So, there is a finite probability that collection action actually will be taken, i.e., a spy dispatched, a book bought, or a picture taken.

5. Target Activity.

To this point the collection process has been under our control. But, the target may not cooperate by doing what interests us just when we are ready to collect. Indeed, many activities of the highest interest tend to be rather short or rare. Missile tests, for example, do not occur every day, and when they do occur, last only a few minutes. Because crises, by definition, are unanticipated events, collection systems cannot be prepared or predeployed. Even when the signs have been read and collection systems tippetipped off, the unexpected still can result in cancellation. Of course, the target may be highly aware, detect collection preparations, and refuse to cooperate. There is, therefore, a finite probability that the activity of interest is occurring when collection action is taken.

6. Proximity.

Even if all else has gone well, we still have to get the collector into the right relationship to the target. For example, a satellite capable of taking photographs loses most of its value if it is on the

opposite side of the earth when the event occurs. The best spy does little good if the day before he does his job the target removes the "plans." The point is that it is not easy to so arrange affairs that our collector's position exactly meshes with the target's activity. So there is a probability that, given target activity, our collector will be properly positioned to "see" it.

7. Operation.

Having arrived at the right spot, there is no guarantee that the collector will operate as desired. Something could break, e.g., a reconnaissance aircraft could lose an engine and be forced to abort a mission. Even spies sometimes oversleep. Every collection system has, or soon develops, a performance record. Thus, the probability that it will operate normally can be estimated with considerable confidence.

8. Natural Interference.

Caught up in the marvels of technology, it is easy to overlook the perversities of nature. Many forget that at any given moment half the world is in darkness, defeating all sensors--such as eyes and nearly all cameras--operating in the visible light portion of the electromagnetic spectrum. But other kinds of interference also hinder operations, including sunspots, fog, wind, dust, and rain. Since these things occur naturally, historical records provide a basis for estimating the probabilities that each kind of natural interference will occur. One can then apply this experience to the particular collector being considered. After all, signal interception systems do not depend on light, and sunspots seldom disrupt photographic collectors.

9. Deliberate Interference.

The target may fail to cooperate. Intelligence is seeking to gather precisely what the target wants to hide. Assuming that the target has some awareness of our desire to collect against him, we should expect that he will take action to interfere. The presumption of

awareness is quite reasonable.[1] Interference can take many forms, ranging from covering things with canvas so they can't be photographed by spy or machine to making full scale dummies to foil accurate counts and locations of real equipment. These physical methods have electronic and information analogs: radio jamming and false radio signals in the case of the former, and classification stamps, safes, and false information in the case of the latter. While there is no certainty in predicting the occurrence and type of deliberate interference in any given instance, collection experience will have provided some insights into the target's style and repertoire--sufficient to enable us to make some judgements as to the likelihood that deliberate interference will be encountered.[2]

10. Transmission.

Assuming that all has gone well to this point, it remains to get the collected data from the point of collection back to people who can make sense of it and put it to use. Transmission may take many forms, including the relay of electronic signals from satellites, the return of film capsules from orbit, the mailing of letters containing concealed information by agents, or even the U.S. Mail delivering the latest edition of the *Petroleum Economist*. Again, each collection system has a performance record on which one can base an estimate of the probability that a collected item of information will be successfully transmitted to U.S. control.

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[1]Proof of the point is hardly necessary, but for an example of what the target of modern technical surveillance could know and how such knowledge might inform a cheater, one could hardly ask for better than the photographs in "Jane's Defence Weekly," August 11, 1984, cover and pp. 171-173.

[2]These two interference factors do not fit logically with the earlier and subsequent ones. The relationship between the probability of successful collection and the relevant factor, except for these two, is direct. In the case of these two, the relationship is inverse, that is, successful collection depends on the *absence* of interference.

11. Processing.

Once an important item of information has been received it may stand on its own. It may be easily intelligible to a reasonably well educated person and its importance and relevance to U.S. policy concerns may be self-evident. But, the usual case is not so clear-cut. It is astonishing how often non-English speakers speak and write in languages other than English. Photographs taken from great heights, or under poor conditions, or using nonvisible parts of the electromagnetic spectrum often require highly technical processing for their content to be made intelligible. Electronic signals containing highly useful information, such as telemetry or radar emissions, often require painstaking and lengthy analysis before their information content can be made useful to analysts and policymakers.

Here also, we have the performance record of the collection systems to guide us in estimating probabilities of success. If we want telemetry regarding certain missile tests, and if we can acquire the signals, we can estimate the probability that we will be able to penetrate the meaning of the signals.

12. Dissemination.

To understand the dissemination problem at this stage of the process, picture a very large, widely distributed, technically complex apparatus functioning continuously in pursuit of literally thousands of requirements that ultimately affect hundreds of American policy concerns. All of this accumulated data has to find its way to analysts who acquire, classify, analyze, and explicate the issues to which at least some of this information applies.

Because there is no certainty that this complicated sorting and distribution process will be successful, two methods are routinely used to help ensure that the process does work. The first method involves duplicative organization. All the members of the intelligence community have their own requirements for information and, hence, are on the collectors' mailing lists. The resultant probability that relevant

information, being disseminated in parallel to several organizations, will find its way to at least one or two of the "right" analysts in the community is rather high.

The second method is for analysts to create and maintain a network of working relations with other analysts concerned with the same or similar issues. One of the best measures of the good analyst is the size and quality of his personal phone book. The " Have you seen . . . ?" and "What do you think of . . . ?" call from a colleague has saved every analyst at one time or another. Estimating the probability that the dissemination apparatus will work promptly and effectively is difficult, but the clearer the issue the greater the chances that the system will work well.

13. Recognition.

Every profession has its logically and functionally coherent subgroups distinguished from one another by the different facts of their experience and contribution to the larger profession. In the intelligence business one division is that between analysts who write for users of intelligence and those who collect raw information.

Analysts want to construct coherent, rational, and useful analyses out of the bits and pieces of evidence that collectors provide or that their prior training and experience have given them. In fact, though they do not think of themselves as such, analysts are storytellers who serve their audiences by providing beginnings, middles, and ends to their analyses and motivations for their characters. No matter how much they try to reflect the chaotic state of the real world, their inescapable fate is to impose order on the evidence, if only to make it comprehensible.

Collectors are at the opposite end of the spectrum. Theirs is a world of fragmented high-volume flows of information and natural phenomena. They are searching for the particular data or phenomena their collection guidance tells them someone was willing to spend large amounts of money and manpower to gather. They have not the time, nor the charter, nor the data to assemble the larger picture. So they pass on the best assortment of bits and pieces that they have gathered that seem to them to address the requirements they have.

The point to this long digression is that the relationship between the analyst's coherent questions and requirements and the fragments of data that cascade into his in-tray may be quite direct, but it may also be quite tenuous. Thus, there is only a finite probability that an analyst will recognize a given piece of incoming data as a response to his requirements.

14. Relevance.

Even after information has been received by a working analyst, the dynamics of the process may further confuse the situation. Months may have passed between the writing and acceptance of a requirement and the delivery of relevant data. In the meantime, the priorities of decisionmakers and bureaucracies change and personnel come and go. The problem addressed here is related to but distinct from the previous one. Whereas before, the problem was whether the analyst recognized incoming data as relevant to his requirements, the current issue is whether the analyst can recognize the relevance of information to the substantive issue at hand.

The analyst, therefore, must first sort the relevant from the irrelevant. Even if we have been fortunate enough to collect the desired data, its relevance and value may not be recognized at this crucial stage. If the data is not discarded outright, it may be incorporated into a data base. If the data is saved at this first cut, it may be available for subsequent detailed analysis. Data cut at the first level is gone forever.

There is a probability, difficult to estimate and varying from source to source, that the analyst will recognize an item of raw data as useful and relevant.

15. Requirement.

This may be the most critical of all. Intelligence, as we have seen, is a cyclical process. Ideally every incoming bit of information should generate a response in the shape of one or more of the following:

- New requirements generated by the improved knowledge derived from the received information
- Modifications to existing requirements flowing from improved understanding
- Cancellation of satisfied requirements
- Constructive comments intended to help collectors refine and sharpen their search

The ideal is no more common in the intelligence business than anywhere else. It is difficult to estimate a probability that incoming information will provoke follow-up action of some kind. Whatever the estimate is, it depends upon the particulars of the people, situation, and subject. For illustrative purposes, however, a guess or a range of guesses can be made.

COLLECTION PROBABILITIES

With a string of probabilities like this, each of which depends on the preceeding one, near perfection is required to ensure, at any appreciable probability, that the entire cycle will produce useful intelligence.

Table 1 presents a highly simplified representation of reality. Its only purpose is to drive home the point that the probability of successful collection of relevant information can be greatly affected by rather small changes in many activities of many different kinds conducted over a wide extent of time and geography. Moreover, improvements in any one element of the collection chain, in any realistic circumstances, may have a relatively small impact on the overall probability of success.

Table 1 shows seven illustrative cases in which different sets of assumed probabilities show the impact of individual changes on the overall probability of success. Even small changes in each step result in substantial changes in final probability. The first three cases, for example, assign uniform probabilities to each phase of the cycle of 0.99, 0.95, and 0.90. These "small" changes, when cumulated over the whole cycle, result in chances of success ranging from almost nine in

Table 1

PROBABILITY OF SUCCESSFUL INTELLIGENCE COLLECTION, GIVEN VARIOUS ASSUMPTIONS

	Case 1		Case 2		Case 3		Case 4		Case 5		Case 6		Case 7	
	Probability Event	Cum	Probability Event	Cum	Probability Event	Cum	Probability Event	Cum	Probability Event	Cum	Probability Event	Cum	Probability Event	Cum
1. Question asked	0.99		0.95		0.90		0.99		0.99		0.90		0.99	
2. Submitted	0.99	0.98	0.95	0.90	0.90	0.81	0.99	0.98	0.99	0.98	0.85	0.77	0.99	0.98
3. Accepted	0.99	0.97	0.95	0.86	0.90	0.73	0.99	0.97	0.95	0.93	0.80	0.61	0.99	0.97
4. Action taken	0.99	0.96	0.95	0.81	0.90	0.66	0.99	0.96	0.90	0.84	0.80	0.49	0.99	0.96
5. Target active	0.99	0.95	0.95	0.77	0.90	0.59	0.99	0.95	0.85	0.71	0.75	0.37	0.99	0.95
6. Collector in proximity	0.99	0.94	0.95	0.74	0.90	0.53	0.99	0.94	0.95	0.68	0.95	0.35	0.99	0.94
7. Operating normally	0.99	0.93	0.95	0.70	0.90	0.48	0.99	0.93	0.99	0.67	0.95	0.33	0.99	0.93
8. No natural interference	0.99	0.92	0.95	0.66	0.90	0.43	0.99	0.92	0.99	0.66	0.60	0.20	0.60	0.56
9. No deliberate interference	0.99	0.91	0.95	0.63	0.90	0.39	0.75	0.69	0.75	0.50	0.50	0.10	0.50	0.28
10. Data transmitted	0.99	0.90	0.95	0.60	0.90	0.35	0.99	0.69	0.99	0.49	0.95	0.09	0.99	0.28
11. Processed	0.99	0.90	0.95	0.57	0.90	0.31	0.99	0.68	0.99	0.49	0.95	0.09	0.99	0.27
12. Disseminated	0.99	0.89	0.95	0.54	0.90	0.28	0.99	0.67	0.95	0.46	0.90	0.08	0.99	0.27
13. Recognized	0.99	0.88	0.95	0.51	0.90	0.25	0.99	0.66	0.95	0.44	0.80	0.06	0.99	0.27
14. Relevant	0.99	0.87	0.95	0.49	0.90	0.23	0.99	0.66	0.85	0.37	0.80	0.05	0.99	0.27
15. Requirements revised	0.99	0.86	0.95	0.46	0.90	0.21	0.99	0.65	0.95	0.36	0.25	0.01	0.25	0.07

ten to as little as two in ten. Already the intelligence community is in a deep hole. Not many would argue that any of these are realistic cases.

Case 4 assumes a probability of success of 0.99 with one exception. We assume that there is only one chance in four that, at the time we attempt collection, the target is taking some covering or evasive action--throwing a piece of canvas over the equipment of interest or something more elaborate. This single change knocks our chances of success down from almost nine in ten to between six and seven in ten. This may be more realistic, but probably not by much.

Case 5 makes a more "realistic" series of assumptions about each element of the cycle. It assumes near perfect functioning of the organizational and mechanical aspects of the cycle. The major changes are assumed to be in target behavior and the routine dissemination and processing parts of the cycle. Some, including me, would say that the estimated probabilities are still optimistic. The chances of success are down to about four in ten.

Case 6 makes a series of more pessimistic (more realistic?) assumptions about the likelihood of successful collection. The major differences between cases 5 and 6 involve the probabilities of natural and deliberate interference. Case 6 assumes that four times out of ten there will be bad weather or another natural problem and that the chances of the target taking some evasive or covering action are 50/50. These factors, together with some less sanguine assumptions about our bureaucratic processes, reduce the chances of successful collection to one in a hundred.

Case 7 merely shows that this reduction is largely due to the assumptions concerning interference. Some might argue that the low probability attached to the generation of new requirements in response to information received ought not to count as lack of success--information was received after all. The response harks back to the beginning of this section: The collection of information in support of any policy, but arms control in particular, must be viewed as a system. Small changes or variations in the functioning of the parts can have large effects on the functioning of the whole.

Many could argue with my definitions of the stages of the cycle, adding or subtracting a few or many. And it is true that the set of variables chosen are not truly dependent--the real world is much more complicated. It is equally true that the particular probabilities that I have applied are debatable. Identifying and coping with the complications might be a worthwhile enterprise. Certainly, many technical and organizational questions are implied in the approach used here.

One might easily reach either of two extreme conclusions:

- There is no hope of objectively verifying adherence to or violations of arms control pacts and one might as well not try. Either trust the other side because arms control is a mutual interest, or rely on one side's uncertainty about the other side's intentions and verification abilities to keep cheating under control. Alternatively,
- Verification is impossible. Uncertainties relative to the ability to catch the other side cheating before they had made fatal progress could never be eliminated. Thus, arms control agreements are a delusion and only work in favor of would-be cheaters by inhibiting the victim's reaction.

The argument is sometimes made that cooperative measures can substantially relieve the burden placed on independent verification procedures. The major cooperative measure referred to usually is on-site inspection. Clearly, some problems can be ameliorated if not eliminated by rapid and numerous inspections, but inspection is no cure-all. While an illegal silo could not be easily moved or otherwise hidden from an inspection team, it may be assumed that a thoughtful cheater would not attempt such an easily detected violation. And on-site inspections still presume an excellent intelligence system to tell them when to inspect and what to inspect for.

The point raised here is another catch-22 inherent in the process of negotiating an agreement in which compliance is crucial. The act of negotiating the terms of the agreement necessarily defines a state of

affairs the party intending good faith compliance considers advantageous to it. The same agreement, however, now constitutes a definition of the task confronting the party determined to cheat.

Rewriting the terms of treaties cannot cure for this problem. If you tell a determined cheater what you want to see, you should not be reassured because you see it. The proper response to this inherent problem is careful attention to the desired mix of independent channels of collection, and constant questioning, and skepticism regarding the information gathered and the resultant analyses.

V. A RATIONALE FOR VERIFICATION

Neither unmitigated trust nor unalloyed distrust is justified. In the first place, both these attitudes put the United States into sterile policy positions. The problem of reducing the risk of nuclear war is real, and the U.S. government cannot evade its responsibility to deal with it. More to the point, the dichotomy is a false one. Trust and distrust are not the only possibilities. If arms control is one way to reduce the risks of war, then it is the responsibility of statesmen to find ways to bring arms control about and it is the function and mission of intelligence collection and analysis to support statesmen in the endeavor.

The real problem is not whether we can detect suspicious or banned behavior. We have done that many times. There would not be today's hot debate on the verifiability issue if we had not detected serious violations in the Soviet Union and verified them well enough to alarm many intelligent and serious people inside and outside the Reagan administration.

The fact of the debate proves two things: First, arms control agreements are verifiable, and second, when possible violations are detected, the technical process of monitoring takes a back seat to more fundamental questions. The chief among them is What do we do now? Existing treaties allow one option--the aggrieved party can take his ball and go home in a process known as abrogation.[1]

Frustration over our apparent inability to do something about cheating, one suspects, finds expression in assertions that verification is not possible. If means to cope with the political problem cannot be found (and *that* is a serious enough problem to make arms control unacceptable), then the debate and the rejection should be based on those grounds and not on false grounds of unverifiability.

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[1]That this problem was recognized very early in the arms control era proves both the foresightedness of many of the leading thinkers of the early nuclear age and also the basic continuity that has characterized U.S. thinking and policy on strategic and arms control policy. Refer to Fred Ikle's article "After Detection--What?" in

The fact that the political problem remains unsolved is no reason to defer improving our monitoring and verification performance. The better we can do them, the more time political authorities will have to struggle with their problem and the more solid the evidence they will have on which to base their decision--sensible and worthwhile goals in their own right.

The method of supporting arms control flows from a reinspection of the probabilities in Table 1 and a recognition that the dismal performance reflected therein applied only to a single iteration of the collection cycle with reference to a single requirement. In reality, of course, the cycle is continuous and services many requirements every day. If the probability of success is low each time, the probability of success increases with each iteration. By the hundredth or thousandth time around the probability may be high enough to provide the necessary assurances.

Time is a key factor. The shorter the elapsed time between asking the question and receiving an answer, especially if the answers are fragmentary or indirect, the greater the likelihood that the rest of the collection cycle will succeed or, at least, focus rationally on the issues at hand. The more dynamic the cycle is, the greater the number of opportunities there will be for us to acquire useful information or, at least, the greater will be the chance that would-be cheaters will make mistakes or that we will get lucky.

Time also plays a role on a larger scale. It takes time to execute a deception--to cheat. It takes time for each unit--ICBM, ABM radar, whatever--to be completed. It takes time for the hidden units to build to a capability that credibly threatens to upset the balance sanctioned by the arms control agreement being monitored and verified. The question is, What is the best use of that time? One good use, among many candidates, is the enhancement of intelligence collection and analysis, a continuing activity of those parts of the intelligence community responsible for supporting the American position in arms control.

Foreign Affairs, January 1961, pp. 208-220, which explores the issue in ways entirely relevant to current problems.

The improvement of the intelligence process requires a profusion of sharp questions and requirements for information that reflect keen insight into the kinds of actions the treaty is intended to control. A good understanding of the other side's military and political objectives in signing the treaty, as well as his forces and activities related to them and to the treaty under consideration, are also essential to an adequate stock of good questions. To the extent that we lack the stock of questions and insights, we can place less confidence in the verification process; i.e., even the best intelligence system could be misdirected and used ineffectively.

The usual approach to judging the adequacy of verification can be reduced to a simplistic example. Suppose one party to an arms control treaty was sufficiently dissatisfied with it to make a conscious decision to cheat--to use the treaty to immobilize the other side while it obtained an advantage. The cheating side would take a finite time to carry this out, during which it would attempt to prevent the other side's acquiring knowledge of the true state of affairs. The usual formulation holds that the cheat must be detected before his cheating becomes militarily significant.

"Militarily significant" is a phrase that masks the problem. It doesn't matter if we catch the cheat before his activities become militarily significant unless we are able to accomplish something to our advantage in the time between our detecting his activity and the cheater's attaining his objective. The choices, when faced with cheating, are scant:

- Get the offender to stop and undo the gains of his cheating
- Field a countervailing capability
- Find virtue in the new status quo.

Since this paper is not concerned with considering policy issues, the question is, On the basis of what information is that decision to be made? Restated in other language, the question becomes, How frequently must how many questions (requirements) be distributed across how many independent sources of information over how long a period for the U.S.

government and people to be assured that we will detect any cheating not only before it becomes militarily significant, but also in sufficient time for the United States to debate, choose, and implement a countering course of action?

Obviously the question has no real answer. There are too many variables and too many of them are not under the verifying side's control. Judgements have to be made on the basis of real knowledge of real collection capabilities and the facts of the other side's actions. These decisions have a large political input--political in the sense of apportioning scarce resources against strongly competing needs. Intelligence resources are always in short supply. Not only are there more facts available than there are collectors to gather them and analysts to make sense of them, but the issues that are at the top of the current concerns of our government leadership vary over time. Arms control is not necessarily the most important issue and so does not necessarily have unlimited command of intelligence resources.

And let us not denigrate the political in the more mundane and partisan sense. The questions at issue deal with the very nature and existence of the oldest and most successful democracy the world has known. It is entirely appropriate that the issues be debated in detail and with care. But, we should be clear at all times what the issue is.

The United States has an intelligence apparatus capable of marvels. But it is not a miracle factory. In response to most of the more difficult questions, it succeeds in providing incomplete and ambiguous information. But all endeavors that depend on gathering information, whether intelligence or social science research, must rely on partial and less than totally credible information.

If the intelligence side of the arms control monitoring and verification apparatus is unable to deliver definitive answers, the U.S. intelligence community, as best it can, adheres to a strategy and an approach emphasizing a broad application of all available collection and analytical resources in a coherent manner. This includes a dynamic and interactive requirements element of the intelligence cycle.

Making the requirements cycle still more interactive and easily accessible to analysts and decisionmakers alike probably is one of, if not the most fruitful field for improving the performance of

intelligence in monitoring and verifying arms control agreements. But the best requirements in the world won't gather any information unless the collection and analytical capabilities are there as well.

The foundation of sound intelligence, as of sound policy, remains finding answers to a few simple questions:

- What are my goals?
- How will I know when I have achieved them?
- What will I do then?

Verification is hard because there is distrust on both sides; we would hardly need arms control agreements if that were not so. Having no way to establish trust, we must refine the process as well as possible in the full knowledge that successful verification cannot be guaranteed.

But, with a pragmatic and clear-eyed approach to defining arms control agreements, we have tools that give us rational choices between the extremes of mere trust with its danger of lost independence and endless distrust with its almost inevitable growth of nuclear danger.

THE INTELLIGENCE PROCESS AND THE VERIFICATION PROBLEM

Fredric S. Feer