AN INSPECTOR'S VIEW OF RECENT DEVELOPMENTS IN INTERNATIONAL SAFEGUARDS

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The opening for signature of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) on July 1, 1968, has stimulated very great interest in international safeguards on the past of those who previously considered their particular nuclear programs to be immune to the application of safeguards. Nuclear scientists and engineers in many countries who up until recently thought it inconceivable that their respective governments would accept safeguards on entire national programs have suddenly realized that they can no longer permit themselves the luxury of avoiding any responsibility for thinking seriously about the implications of the NPT.

One result of this sudden awakening has been the voicing of considerable dissent, some coherent, some not, about the desirability and viability of a system of international safeguards. Much of the coherent dissent comes from individuals who are genuinely dissatisfied with the continuing lack of quantification of the technical objectives of safeguards.

Fortunately, recent efforts to quantify the technical objectives of safeguards together with a complementary endeavour to define reasonable qualitative goals are beginning to bring some semblance of reality to the subject. These efforts will serve not only to mollify the coherent dissenter but even more important, to provide the safeguards inspector with a clearer picture of his task. As for the incoherent dissenter, nothing more need be said.

THE SAFEGUARDS INSPECTOR - AN ESSENTIAL ELEMENT OF ANY SAFEGUARDS SYSTEM

Perhaps one of the most controversial subjects in recent
months has been the role of the safeguards inspector. Much of this controversy has arisen because of the undeniable fact that every inspector is an individual and, consequently, the manner, stringency and extent to which he carries out his duties depends very considerably on his temperament, motivation and other personal attributes. Because of this element of human variation, some commentators have stated that the individuality of the inspector must be suppressed by stipulating rigorous rules of procedure and specifying precisely what the inspector must or must not do. As a result of personal experience in carrying out safeguards inspections in many different countries and in many different situations, we cannot accept this idea. In particular, we do not wish to see the reaction of an inspector to different situations become entirely normative.

In stating this view, we are fully aware, as noted earlier, of the several human frailties which must be borne in mind in assessing and defining the role of the inspector. For example, current safeguards procedures call for the examination of masses of data and information. As the volume of such information increases with the expansion of safeguards activities, not only will the limitation in the capacity of inspectors to communicate quickly and effectively become evident but also the variation in the selection process by which an individual inspector sorts and classifies such information will become apparent. In the ideal case, the result of the selection process will be an accurate summary of the important facts, however, on occasion, the selection will be performed in such a way as to justify the conclusions of the inspector or to protect or justify previous actions.
To some, the answer lies in the mechanization or instrumentation of safeguards. In our view this is only part of the answer since even a computerized data analyzer is limited by the capacity of the software developed by the human programmer. Furthermore, there is a limitation on the number of data sensors that can be installed in an instrumented safeguards system by virtue of cost and maintenance considerations.

On the other hand an inspector cannot be expected to have the acute depth of visual perception possessed by a chameleon nor the giant eyes of certain birds of prey. However, neither is he as slow moving as the lizard nor is his brain outweighed by his eyes as in the case of the hawk. Moreover, the inspector enjoys a harmonious relationship between his eyes and brain which enables him to distinguish between important and unimportant bits of information. After long exposure to large volumes of information of varying degrees of unreliability, the inspector develops a value system which he automatically applies to the evaluation of such information.

It appears to us then, that the answer to the problem of handling the masses of information that are currently required for international safeguards lies in the achievement of a balance between human inspectors and instrumented safeguards systems. Before this balance can be determined, however, the data and information requirements of international safeguards must be reassessed and necessary revisions instituted. Only that information of actual value to safeguards should be demanded and duplication avoided. Under these conditions full advantage can then be taken of the ability of the human brain to winnow masses of information, to select essential bits (using the remainder for comparison purposes or rejecting it as necessary) to arrive at conclusions and to make decisions.
One final word regarding the variation in safeguards implementation that could arise as a result of differences in attitude, training and motivation of inspectors. Unless it is made clear to the inspectorate that the indiscriminate application of safeguards provisions without regard to extenuating circumstances or unusual conditions will not be tolerated, there are bound to be situations in which serious dispute arises simply because of inflexibility on the part of the inspector. Given the adaptability of accepted international safeguards procedures and the capability of a properly trained and motivated inspector, there is little reason for concern over possible interference with the legitimate interests of a facility operator.

**COST - BENEFIT CONSIDERATIONS**

Safeguards critics have raised a storm over the question of how much a system of international safeguards will cost. In reply, it has been shown that cost estimates are below 1% of unit energy costs for a full-size nuclear power station and that safeguards costs will never exceed a pittance in comparison with national defence budgets. A further argument in defence of safeguards is that the costs should be considered in the same light as insurance premiums.

However, these arguments have proven no more effective than those of the pharmacologist who has been unsuccessful in defending the use of a new drug. Even the most beneficial of drugs cause adverse effects in certain instances or when used to extreme. Similarly, international safeguards will provide benefits to most nations most of the time. But there is no way in which 100% assurance can be given to facility operators that safeguards will create only beneficial effects - that is, no way unless the assurer has escaped reality.
SAFEGUARDS RESEARCH AND DEVELOPMENT

Research and development programs directed towards the improvement of international safeguards are in an abysmal state partly because of the disinterest on the part of many, partly because of the low priority attached to such programs but mostly because of the widespread attitude of "letting Sam or Ivan do it".

It is acknowledged that several nations have embarked on safeguards research and development programs which hold considerable promise. Unfortunately these nations have not been joined by others capable of making a significant contribution.

One profound difficulty that faces the safeguards inspector is the problem of assessing the effectiveness of various safeguards measures or systems currently being proposed. Evaluation tests, even when carried out under the most meticulous of conditions and according to rigorously defined procedures are susceptible to erroneous or ambiguous results. If this inherent weakness of test programs is combined with the overenthusiasm of the program sponsor, acceptance of a "new" procedure or technical innovation may take place even though the procedure or innovation is worthless or impractical. The final test of such a new procedure or innovation should be an extended test and evaluation period during which the new procedure is used on the appropriate facility by safeguards inspectors. Since this evaluation period should take many months or even years it is obvious that we cannot expect a flood of new procedures to arise immediately from the research and development programs presently underway.
REVISION OF ESTABLISHED PROCEDURES

Various proposals have been made in recent months regarding the revision of established safeguards procedures. We cannot fault such proposals if they are based upon actual operational experience, technological advances, definition of quantitative safeguards objectives or similar soundly-based reasoning. However, in certain instances it appears that the proponent wishes to weaken the safeguards principle or provision under discussion or to achieve a placebo effect by instituting changes designed to secure wide-approval but which, in reality, result in completely worthless or impractical measures.

It is our opinion that the IAEA Safeguards system as it presently exists represents the best possible compromise between the technical ideal and the political reality. This system has been argued over and discussed by many knowledgeable people for many years and is very flexible in nature. Its provisions are in general permissive and allow the inspectorate very wide latitude in determining the techniques actually applied. It is a credit to those responsible for the original drafting and revision of this system that no changes will be required in it to accommodate the new instrumental inspection techniques which are under development.

THE EURATOM PROBLEM

It is obvious now to everyone in the international safeguards field that one of the most difficult problems created by the NPT will be the compromise which will have to be reached between the Euratom nations and the IAEA if NPT is to be a success. It is our personal opinion that it is almost equally obvious to those countries
outside the EURATOM group that the onus is on the EURATOM countries to make a sincere and intensive effort to demonstrate to other parties that their safeguards system is both satisfactory and effective.

It is a curious fact that the credibility of the EURATOM safeguards system in the eyes of outside observers is probably now at a peak and it can only decrease no matter which way the European Common Market develops politically. If the European Common Market should show a tendency to become more politically aligned that it is at present, then the EURATOM safeguards system would be reduced to self inspection and would not be acceptable to the International Community. Conversely if the Euromed countries should show a tendency to split further apart politically and break up then the probability that the EURATOM safeguards system would remain effective would also decrease and the EURATOM safeguards system would again be less acceptable to the International Community.

It is up to the Euromed nations to make serious concessions in their negotiations with the IAEA. The Euromed nations should keep in mind the fact that if their safeguards system is as effective as they would have outside nations believe, then the transition from these safeguards to acceptable international safeguards will be very easy to accept, especially compared to a nation which is required to make the transition from no externally applied safeguards whatever to complete international safeguards on all nuclear activities.
The purpose of the NPT is to prevent the proliferation of nuclear weapons nations and the document contains more or less suitable (depending on your point of view) provisions for reaching this end. Not directly written into the document, but contained by implication, is the expectation that it will also prevent the unnecessary proliferation of safeguards. By this we mean that it should simplify the many overlapping and potentially conflicting systems of safeguards which have been applied by the nations fortunate enough to be material suppliers.

Japan is a good example of a nation with this problem because she now has trilateral agreements involving the IAEA with the USA, U.K. and Canada, each slightly different from the other. Japanese facility operators are now faced with the problem of keeping their inventories divided into these three classifications. Since the USA has supplied much of Japan's enriched uranium and plutonium and Canada has supplied much of Japan's natural uranium, the normally simple blending operations encountered in a fuel fabrication shop become a bookkeeper's nightmare.

We in Canada intend to make every effort to simplify the safeguards required under NPT and we are now carefully examining the provisions of our bilateral and trilateral agreements to see how this can be done. We hope that other supplier nations will join us in this effort to make the safeguards applied to a non-nuclear weapon signatory to the NPT more streamlined and simplified rather than more complex.
There are several criticisms of present safeguards systems which should be laid to rest forever. These questions and criticisms have arisen partly from ignorance of the present safeguards system, partly from the lack of experience which many countries have had in the field of safeguards, and partly from the desire to criticize the safeguards system in an attempt to reduce its effectiveness.

To start with we must do away with many arguments such as the following: "it is not fair" - this criticism arises from the difference in safeguards provisions required between nuclear and non-nuclear signatories to the NPT. It is certainly true that it is unfair to subject non-nuclear signatories peaceful nuclear activities to inspection and to omit the peaceful nuclear activities of nuclear weapon nations. However, if you know of any agreement reached in the field of international politics on the basis of what is fair, rather than when was the best compromise available between the various political requirements which existed at the time, please let us know. Fairness is not a prerequisite to the settlement of international disputes and it certainly is not a usual ingredient in international political agreements. To make this criticism even less valid the two Western nuclear weapon states, the United Kingdom and the United States have volunteered to place their peaceful nuclear activities under the IAEA system. This certainly removes most of the basis on which this criticism is founded.
Another form of criticism which is generally levelled at the International Atomic Energy Safeguards System is of the form, "There is no point in applying these strict safeguards to me, I could not possibly divert material because too many people would have to be compromised"; or "I could not possibly divert material in this fashion because it would raise the price of power"; or "We could not divert material - we have no reprocessing plant and no plutonium production facilities - what would we do with the diverted material"; or finally "We have publicly stated that we will not construct nuclear weapons therefore why bother us with safeguards". These criticisms are obviously not based on a real appreciation of either the intent or the actuality of the present international safeguards system. The main purpose of the international safeguards system is to prevent the diversion of nuclear material into a weapons program. However the secondary and almost as important purpose is to convince the third party nations that such material has not been diverted. This is analogous to the principle that we follow in our courts that justice must not only be done but it must appear to be done.

It should be obvious to any person with a detached viewpoint that a non-nuclear weapon state may have accepted safeguards for some reasons beyond the altruistic desire to prevent the spread of nuclear weapons. Either the State has no native nuclear materials and has accepted safeguards so that it can be assured of the supply of nuclear materials from supplying nations or else it needs to import the technology of other nations on the same basis or else it wishes for political reasons to maintain the status of a non-nuclear weapon state. It is obvious therefore that if such a state decided to
attempt to divert materials from a national facility under international safeguards that neither the cost nor the number of people who must be compromised would be a factor of concern.

In the present international situation there are many nations who are distrustful or suspicious of some of their fellows. The IAEA must therefore apply satisfactory and effective safeguards to all non-nuclear weapon state signatory to the treaty if the NPT is to be a success in the eyes of all signatories.

**INDUSTRIAL ESPIONAGE**

We think that the fear of industrial espionage being conducted by international inspectors has been pretty well laid to rest, but in case there are a few doubters left in the audience we will try to assure them briefly. In the first place the inspectors are, in general, honourable men chosen for their knowledge and skill and sworn to keep confidential information obtained in their safeguards duties. There may be a spy among them, but if we represented a competitor seeking information about your new widget we would either hire or subvert one of your own men and obtain factual, detailed information rather than depend on estimates obtained from the passing glance of a person relatively ignorant of widget technology. If you still insist that your new widget is absolutely top secret and must not be exposed to prying eyes then we would point out that the inspection procedures implemented by the Agency are perfectly capable of bypassing your widget assembly areas by use of material balance areas compatible with your desires. However the safeguards inspector becomes justifiably suspicious when he is informed that the entire operations of a plant are secret and no access can be granted. The suspicion aroused in our minds is that the process being guarded is
not new, but so obsolete that the management don't want the secret to leak out to their competitors, or even worse, their shareholders.

CONCLUSION

In conclusion we would like to make an appeal to the members of this organization. You represent perhaps the most concentrated body of experience in the quantitative handling of nuclear materials which exists in the world to-day. We appeal to you to become interested and become involved in the safeguards research and development programs which are in progress now, become active in the test and evaluation of instruments and techniques that arise from these programs in the future and do your best to ensure that the future critical choices of safeguards methods and techniques are based on sound **quantitative** criteria.