Ad Hoc Group of Governmental Experts
to Identify and Examine Potential
Verification Measures from a
Scientific and Technical Standpoint

BWC/CONF.III/VEREX/8
24 September 1993

Original: ENGLISH

Fourth Session
Geneva, 13-24 September 1993

SUMMARY REPORT

INTRODUCTION

1. The Third Review Conference (September 1991) of the Biological Weapons Convention agreed to establish an Ad Hoc Group of Governmental Experts, open to all States Parties to identify and examine potential verification measures from a scientific and technical standpoint.

2. The mandate of the Group was as follows:

"The Conference, determined to strengthen the effectiveness and improve the implementation of the Convention and recognizing that effective verification could reinforce the Convention, decides to establish an Ad Hoc Group of Governmental Experts open to all States parties to identify and examine potential verification measures from a scientific and technical standpoint.

"The Group shall meet in Geneva for the period 30 March to 10 April 1992. The Group will hold additional meetings as appropriate to complete its work as soon as possible, preferably before the end of 1993. In accordance with the agreement reached at the Preparatory Committee, the Group shall be chaired by Ambassador Tibor Tóth (Hungary) who shall be assisted by two Vice-Chairmen to be elected by the States parties participating in the first meeting.

"The Group shall seek to identify measures which could determine:

- Whether a State party is developing, producing, stockpiling, acquiring or retaining microbial or other biological agents or toxins, of types and in quantities that have no justification for prophylactic, protective or peaceful purposes;

- Whether a State party is developing, producing, stockpiling, acquiring or retaining weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.

"Such measures could be addressed singly or in combination. Specifically, the Group shall seek to evaluate potential verification measures, taking into account the broad range of types and quantities of microbial and other biological

agents and toxins, whether naturally occurring or altered, which are capable of being used as means of warfare.

"To these ends the Group could examine potential verification measures in terms of the following main criteria:

- Their strengths and weaknesses based on, but not limited to, the amount and quality of information they provide, and fail to provide;

- Their ability to differentiate between prohibited and permitted activities;

- Their ability to resolve ambiguities about compliance;

- Their technology, material, manpower and equipment requirements;

- Their financial, legal, safety and organizational implications;

- Their impact on scientific research, scientific cooperation, industrial development and other permitted activities, and their implications for the confidentiality of commercial proprietary information.

"In examining potential verification measures, the Group should take into account data and other information relevant to the Convention provided by the States Parties.

"The Group shall adopt by consensus a report taking into account views expressed in the course of its work. The report of the Group shall be a description of its work on the identification and examination of potential verification measures from a scientific and technical standpoint, according to this mandate.

"The report of the Group shall be circulated to all States Parties for their consideration. If a majority of States Parties ask for the convening of a conference to examine the report, by submitting a proposal to this effect to the Depositary Governments, such a conference will be convened. In such a case the conference shall decide on any further action. The conference shall be preceded by a preparatory committee."

3. The Group held four sessions, from which three Summaries and a Procedural Report were produced and annexed as part of this Summary Report:

- VEREX 1 30 March-10 April 1992 (Identification of measures; Annex I);

- VEREX 2 23 November-4 December 1992 (Examination of measures; Annex II);
- VEREX 3 24 May-4 June 1993 (Evaluation of measures; Annex III);
- VEREX 4 13-24 September 1993 (Preparation of the report; Annex IV).

IDENTIFICATION AND EXAMINATION

4. During its first session the Group identified in all 21 potential measures suggested by individual delegations under the three broad areas of development, acquisition and production, and stockpiling and retaining, for later examination and evaluation against the mandate criteria. They were included in a list. The inclusion of a measure in this list constituted no judgement by the Group as to the usefulness of the potential measure in relation to the objectives stated in the mandate. Some potential measures included in the list were considered as individual measures which might be applied individually or with other individual measures in each category. Measures were divided as follows: off-site and on-site. They were grouped in a Chairman's paper in seven broad categories for the purpose of later examination and evaluation:

Off-site Measures:

- Information Monitoring:
  surveillance of publications;
  surveillance of legislation;
  data on transfers, transfer requests and production;
  multilateral information sharing.

- Data exchange:
  declarations;
  notifications.

- Remote Sensing:
  surveillance by satellite;
  surveillance by aircraft;
  ground-based surveillance.

- Inspections:
  sampling and identification;
  observation;
  auditing.

On-site Measures:

- Exchange visits:
  international arrangements.

- Inspections:
  interviewing;
  visual inspections;

identification of key equipment;
auditing;
sampling and identification;
medical examination.

- Continuous monitoring:
  by instruments;
  by personnel.

5. During the second session, the Group decided to modify the list of measures identified at the first session. The new list agreed upon by consensus is included in Annex II, pages 131-133.

6. Each measure was examined according to the mandate in order to determine: "Whether a State Party is developing, producing, stockpiling, acquiring or retaining microbial or other biological agents or toxins, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes.". Similarly, measures were examined to determine: "Whether a State Party was developing, producing, stockpiling, acquiring or retaining weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.".

7. A methodology for detailed examination of measures was agreed by the Group which included a definition, a description of the characteristics and technologies in terms of the state-of-the-art, the capabilities and limitations, and a discussion of potential interaction with other measures.

8. A number of national and background papers were presented by participants. Each measure was fully described and introduced for group discussion by a rapporteur (Annex II, pages 52-122). In all cases potential interaction with other measures was identified. Moderators, (Annex II, pages 127-133) designated by the Chairman, prepared discussion papers in the three broad areas of development, production and stockpiling to assist in the evaluation. The examinations represented a technical summary of the key factors to consider. These consensus summaries, discussed extensively by the Group, formed the basis of consolidated texts which could be used as a starting point for evaluation (Annex II, pages 46-148 and Annex III, pages 149-327).

EVALUATION OF MEASURES SINGLY

9. Each potential measure identified in the examination phase was evaluated singly in accordance with the mandate, i.e. its strengths and weaknesses based on, but not limited to, the amount and quality of information it provides, and fails to provide; the ability to differentiate between prohibited and permitted activities; the ability to resolve ambiguities about compliance; the technology, material, manpower and equipment requirements; the financial, legal, safety and organizational implications; and the impact on scientific research, scientific cooperation,

industrial development and other permitted activities, and the implication on scientific research, scientific cooperation, industrial development and other permitted activities, and its implications for the confidentiality of commercial proprietary information. On the basis of the Introductions submitted by the rapporteur, the Group discussed and evaluated the measures at both formal and informal meetings and adopted by consensus an evaluation report on each measure. Summaries of the Group's work in relation to the individual measures are contained in a shortened form in a table attached to this report. The complete summaries of the examination and the evaluation can be found in the Summaries of Annex II, pages 52-122 and Annex III, pages 154-273.

EVALUATION OF MEASURES IN COMBINATION

10. While recognizing the possible utility of other methodologies, the Group agreed to use one methodology to assess illustrative but not exhaustive examples of measures in combination. Although the Group recognized that a large number of combinations were possible, the systematic evaluation of all possible combinations was considered to be impractical without prejudice to any future ideas that may evolve on the subject. The Group agreed that, in general, the capabilities and limitations of a combination of measures equal the sums of the capabilities and limitations of the single measures involved in the combination. This cumulative effect of measures in combination was not addressed. The analysis was intended to investigate whether, in particular cases, the application of measures in combination produces enhanced capabilities and limitations that differ from a simple accumulation of the capabilities and limitations of the single measures involved (synergy).

11. The following five combinations were proposed as examples to illustrate the evaluation of enhanced capabilities and limitations of measures in combinations:

- Declarations/Multilateral information sharing/Satellite surveillance/Visual inspection

- Information monitoring (surveillance of publications/surveillance of legislation/data on transfers, transfer requests and production/multilateral information-sharing/exchange visits)

- On-site inspection (interviewing/visual inspections; identification of key equipment/auditing/sampling and identification)

- Declarations/Multilateral information-sharing/On-site visual inspection

- Declarations/Information monitoring.

12. The enumeration of these combinations was not meant to represent a proposal for combinations that would serve as a verification regime, since this is not part of the mandate of the Group (Annex III, pages 272-273). It was agreed that, in principle, States Parties could submit additional contributions related to the evaluation of measures in combination for consideration. In this context, the view was expressed that declarations and on-site inspections might be further considered at a later stage. The Group discussed and evaluated the examples of measures in combination and adopted a report by consensus (Annex III, pages 150-153).

13. All rapporteurs have identified off-site and on-site measures which interact with the single measures. The capabilities of single measures might be enhanced if they are combined with other off-site measures and other on-site measures.

14. The measure "Declarations" was most frequently identified for application in combination with other measures. The most frequently identified on-site measures in combination were on-site inspections (interviewing, visual inspection, identification of key equipment, sampling and identification, auditing). This does not mean that all the measures in parenthesis above always would be included in an on-site inspection.

OTHER ASPECTS

15. The 21 measures were grouped under the three broad areas of prohibition of Article 1 of the Convention (development; acquisition or production; stockpiling or retaining). Some measures were found to be useful for all three areas of prohibition, whereas some measures were considered useful only for one or two of the areas (Annex III, page 271; BWC/CONF.III/ VEREX/6/WP.176).

16. The Group decided by consensus to include a paper recording the results of consultations on the question of types and quantities of agents. These results could be further considered at a later stage (Annex III, page 153;BWC/CONF.III/VEREX/6). According to the paper, agreed lists, which are difficult to construct at this stage, are a prerequisite to the implementation of many potential verification measures.

17. Some national background and rapporteur's papers mentioned that microbial or other biological agents or toxins can be disseminated by weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.

18. In the course of an informal meeting, delegations discussed the experiences gained by the three countries concerned from two trial inspections carried out by the Netherlands and Canada, and the UK, respectively. Two working papers on trial inspections

were submitted - "Bilateral Trial Inspection in Large Vaccine Facility" (BWC/CONF.III/VEREX/6/WP.112) by the Netherlands and Canada, and "UK Practice Inspection: Pharmaceutical Pilot Plant" (BWC/CONF.III/VEREX/6/WP.141) by the United Kingdom. While work would be required on the question of protection of CPI in order to achieve consensus, the countries concerned in two national trial inspections informed delegations of their national findings that the access given had not compromised commercial confidentiality.

19. The Group examined the potential verification measures in terms, inter alia, of their impact on scientific research, scientific cooperation, industrial development and other permitted activities. In that context, delegations recalled Article X of the Convention according to which States Parties "undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the use of bacteriological (biological) agents and toxins for peaceful purposes", and the related provisions of the Final Document of the Third Review Conference, in particular those on the examination of means of improving related institutional mechanisms and those on the adoption of positive measures to promote technology transfer, consistent with all the other Articles of the Convention. Delegations recalled as well that the provisions of the Convention should not be used to impose restrictions and/or limitations on the transfer for purposes consistent with the objectives and the provisions of the Convention.

CONCLUSIONS

20. The Group identified, examined and evaluated from a scientific and technical standpoint in all 21 potential verification measures as well as some suggested examples of combinations of measures. Several of the measures evaluated singly have been identified as being closely related.

21. The findings of the identification, examination and evaluation of the 21 potential verification measures against the agreed mandate criteria indicated that capabilities and limitations existed for each measure in varying degrees, although reliance could not be placed on any single measure by itself to determine whether a State Party is developing, producing, stockpiling, acquiring or retaining: microbial or other biological agents or toxins, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes or; weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes.

22. Certain current scientific and technical shortcomings of some measures were appreciated. These included the acknowledgement that some technologies associated with particular measures are limited by the commercial availability of equipment, materials and stages of development.

23. The identified verification measures cover a variety of non-intrusive and intrusive measures. The Group described the capabilities and limitations of the measures and evaluated the impact on scientific research, scientific cooperation, industrial development and other permitted activities and their implications for the confidentiality of commercial proprietary information from a scientific and technical standpoint only. Some measures were considered inherently not capable by themselves of differentiating between prohibited and permitted activities.

24. It was difficult to assess accurately the feasibility and the effectiveness of all the 21 measures within the context and criteria laid down in the mandate for the Group. Concerns were expressed over the financial implications and the technical difficulties in the identification of biological agents.

25. Concern was also expressed that the implementation of any measure should ensure that sensitive commercial proprietary information and national security needs are protected. The issue of protection of CPI, some aspects of which were addressed in a preliminary way, needs further consideration at a later stage consistent with the effective verification needs of the BWC.

26. Taking into account already existing lists for different purposes (Annex III, pages 266-267; BWC/CONF.III/VEREX 6), illustrative lists of agents could be developed to support particular potential verification measures. Under the measure of "Declarations", data on production, including amounts of agents produced, may be collected. Under the measure of "Data on transfers, Transfer requests and on Production", data may provide background information for inspections and for other measures.

27. The development of equipment and technologies, which is difficult for some applications, is important to meet the needs of some discussed measures, and could support the technical applicability of these measures in the future.

28. Some of the measures which were identified were also subjected to an illustrative but not exhaustive evaluation of combinations of measures.

29. Some measures in combination may enhance the capabilities and/or reduce the limitations of the individual measures. However, some limitations inherent in individual measures could not be removed and in some cases combinations of measures may result in enhanced limitations. In certain cases the enhanced capabilities produced by combinations differ from a simple accumulation of the capabilities of the single measures thus creating synergy. Even if a combination does not create any synergies there will still be a cumulative effect of both capabilities and limitations.

30. Important positive and negative synergies which were not identified in the evaluation may exist for each of the combinations examined. From a technical standpoint some

combinations of some potential verification measures including both off-site and on-site measures could provide information which could be useful for the main objective of the BWC.

31. The Ad Hoc Group of Governmental Experts concluded that potential verification measures as identified and evaluated could be useful to varying degrees in enhancing confidence, through increased transparency, that States Parties were fulfilling their obligations under the BWC. While it was agreed that reliance could not be placed on any single measure to differentiate conclusively between prohibited and permitted activity and to resolve ambiguities about compliance, it was also agreed that the measures could provide information of varying utility in strengthening the BWC. It was recognized that there remain a number of further technical questions to be addressed such as identity of agent, types and quantities, in the context of any future work. Some measure in combination could provide enhanced capabilities by increasing, for example, the focus and improving the quality of information, thereby improving the possibility of differentiating between prohibited and permitted activities and of resolving ambiguities about compliance.

32. Based on the examination and evaluation of the measures described above against the criteria given in the mandate, the Group considered, from the scientific and technical standpoint, that some of the potential verification measures would contribute to strengthening the effectiveness and improve the implementation of the Convention, also recognizing that appropriate and effective verification could reinforce the Convention.

DISPOSITION OF THE REPORT

33. The Ad Hoc Group of Governmental Experts recalled that the Third Review Conference had decided the following with regard to the disposition of the work of the Group:

> "The report of the Group shall be circulated to all States Parties for their consideration. If a majority of States Parties ask for the convening of a conference to examine the report, by submitting a proposal to this effect to the Depositary Governments, such a conference will be convened. In such a case the conference shall decide on any further action. The conference shall be preceded by a preparatory committee."

Attachment to the Summary Report

(Table)

During Verex 3, all 21 potential verification measures, identified during Verex 1 and examined during Verex 2, were evaluated by the Group. To evaluate these measures an agreed methodology was applied based on the 6 mandate criteria. The criteria for evaluating the measures are:

1. Strengths and weaknesses based on but not limited to the amount and quality of information they provide and fail to provide.
2. Ability to differentiate between prohibited and permitted activities.
3. Ability to resolve ambiguities about compliance.
4. Their technological, material, manpower and equipment requirements.
5. Their financial, legal, safety and organizational implications.
6. Their impact on scientific research, scientific cooperation, industrial development and other permitted activities; and their implications for the confidentiality of Commercial Proprietary Information (CPI).

The first three criteria mainly represent the effectiveness of individual measures; the second three mainly represent their requirements and their impact. According to these criteria, capabilities and limitations were considered.

A general observation was made that reliance could not be placed on any single measure by itself to differentiate conclusively between prohibited and permitted activity or resolve ambiguities about compliance. The attached table is an extract of the complete evaluations made by rapporteurs during Verex 3, which can be found in Annex III.

TABLE

Measure	Definition	EVALUATION (Capabilities and Limitations)	
		Criteria 1 - 3 [1]	Criteria 4 - 6 [2]
Surveillance of publications	Selective scanning and analysis of publicly available printed matter and of the media with special attention to scientific literature related to activities in the biological field. (VEREX/9, Annex II, p.54)	It could provide useful information on relevant activities in State Party, but consistency in quantity and quality may vary. It may help in the selection of sites for inspections and in focussing ongoing inspection activities. The information provides only a partial picture of activities. This focussing could be done by using key identifiers. Not all types of relevant information are necessarily published. (VEREX/9, Annex III, p. 154 etc.)	If focussed this measure need not be very costly. Some personnel with specific expertise and a computer database would be needed. Translation services might be costly. The low level of intrusiveness of this measure is an advantage.
Surveillance of legislation	Collecting and analyzing of information with regard to legislation that exists in relation to the BWC or other areas of interest. (VEREX/9, Annex II, p. 56)	Could provide information on relevant activities of States Parties. However, the absence of legislation is not an indication of non-compliance. It may help in the selection of sites for inspections and in focussing ongoing inspection activities. The amount of information could be very large and the quantity varies per State. May help explain the nature of dual purpose activities. (VEREX/9, Annex III, p. 156 etc.)	This measure need not be very costly. Although the precise requirements pertaining to this measure still need to be determined, an investment into a computer/ database is needed. Translation costs may be substantial. Limited impact, if any, on permitted activities.
Data on transfers, transfer requests and on production	Collection and analysis of national export and import data, available or specifically requested, government and industrial production statistics, culture collection records and similar information. There may or there may not be an agreed standard for the availability of the nature of the information. (VEREX/9, Annex II, p.57)	It may be a background for further investigation. It may well be an effective measure if combined with other measures. It may help in the selection of sites for inspections and in focussing ongoing inspection activities. Because of the large amount of information available, a focussed survey may be necessary. This focussing could be done by using key identifiers to be determined. Information may be outdated quickly. The amount and quality of information may differ per State. May help in the analysis of dual purpose activities. (VEREX/9, Annex III, p.158 etc.)	If focussed need not be very costly. Not all information may be freely accessible. Some personnel with specific expertise and a computer database would be needed. Confidentiality concerns need to be considered. Data analysis and a continuing survey could be costly. There are no technological requirements. Material and manpower requirements are limited. In some cases the legal implications should be considered.

Measure	Definition	EVALUATION (Capabilities and Limitations)	
		Criteria 1 - 3 [1]	**Criteria 4 - 6** [2]
Multilateral information sharing	The use of any voluntary international provision or exchange of information on medical, veterinary, agricultural, environmental safety standards, defence and waste management issues, etc. relating to materials and activities of potential relevance to the BWC. Such information sharing on a voluntary basis may or may not have an agreed standard for the nature of the information to be provided. (VEREX/9, Annex II, p.58)	May well be an effective measure if combined with other measures. May help explain the nature of dual purpose activities and provide indications of non-declared activities. However, this measure depends on the willingness of a State Party to provide information. The information may be inaccurate and generate unwarranted concerns. (VEREX/9, Annex III, p.160 etc.)	If focussed this measure is not very costly. The precise requirements of this measure still need to be determined. A computer/ database is needed. Legal implications and confidentiality concerns need to be considered; access to CPI can be defined.
Exchange visits (off-site)	Visits of experts arranged for scientific purposes by one country to comparable facilities of another country (States Parties) under bilateral or multilateral agreements. Exchange visits need not be restricted to declared facilities.(VEREX/9, Annex III, p.162)	It can provide a mechanism of transfer of technical information for a given area of study. The scope of the agreement will largely determine the amount and quality of the information exchanged. It may serve best as an enhanced CBM, expanding openness and transparency. Information is generally limited to scientific matters and in limited area specified in agreement. (VEREX/9, Annex III, p.162 etc.)	The potential loss of proprietary information is of concern. Financial costs could be a limiting factor. Legal factors such as rights of the exchange scientists and the protection of proprietary information must be considered. Visitor safety should be insured.
Declarations	Mandatory, periodic reporting on a regular basis of information considered to be of relevance for verification of the BWC. The nature of the events /items /facilities to be declared has yet to be fully defined. Notifications were considered to be a subset of declarations, concerned with the reporting of new or unforeseen events or forecast of events in order to pre-empt compliance concerns (VEREX/9, Annex III, p.166)	Provides a base line of information regarding all three areas of development, production and stockpiling. There is a need to consider in more detail exactly what items/events should be declared. Examination of declarations could disclose irregularities. They give a nation the opportunity to explain actions or events to States Parties which may otherwise cause compliance concerns. Information may be inaccurate or manipulated, and it is unlikely that any nation would declare a prohibited activity. A non-declaration of a facility known by other means could give rise to compliance concerns. Declarations may give an uneven picture of activity. (VEREX/9, Annex III, p.166 etc.)	The technology, material and equipment requirements would be low. Manpower requirements, financial costs, legal implications and the impact on CPI would depend highly on the nature of the items/events that should be declared. Manpower needs for processing returns may be substantial. A central processing body may be required to correlate and analyse data.

Measure	Definition	EVALUATION (Capabilities and Limitations)	
		Criteria 1 - 3 [1]	**Criteria 4 - 6** [2]
Surveillance by satellite	A variety of techniques operated by an artificial body placed in orbit around the earth or other planet that enable, to varying degrees, the detection, description, measurement or identification of some property of an object of interest without actually coming into physical contact with the object. (VEREX/9, Annex II, p.67)	It has a broad area coverage, but the possibility of detecting non-compliance with the Convention when it occurs or resolve ambiguities about compliance is low. Lack of information on distinct external signatures of microbiological activities. It might provide validation of information from other sources. The performance of optical, infra-red and multi-spectral sensors can be affected by daylight, meteorological and atmospheric conditions, in addition to inherent technical limitations with respect to "resolution". SAR has a 24-hour all weather capability, interrupted only by extreme weather conditions such as hurricanes. (VEREX/9, Annex III, p.174 etc.)	A dedicated system would be very costly. All services may be obtained commercially, precluding the need for an autonomous capability. The measure requires digital tape data, hardware and software as well as trained personnel. Some state-owned satellite enterprises apply limitations to the availability of imagery on their own country, at the present time. Manipulation and enhancement of digital data requires commercially-available specialized hardware and software, and trained personnel.
Surveillance by aircraft	A variety of techniques operated by manned and unmanned aerial vehicles, including airplanes, helicopters, airships, and balloons that enable, to varying degrees, the detection, description, measurement or identification of some property of an object of interest without actually coming into physical contact with the object. (VEREX/9, Annex II, p.73)	The assessed possibility that it will detect non-compliance with the Convention or resolve ambiguities about compliance was low. It might provide data of a quality that could be used to distinguish between prohibited and permitted activities at an open-air test facility. There is lack of information on distinct external signatures. There is inherent delay / warning. It can be affected by daylight, meteorological and atmospheric conditions. It may be very difficult to draw conclusions on the results of air samples about the source of material collected and about compliance. (VEREX/9, Annex III, p.181 etc.)	Legal implications, particularly those related to national sovereignty, and collection of information unrelated to the goals and objectives of the BWC would need to be addressed. The requirements for specialized equipment and personnel could pose considerable financial costs.

Measure	Definition	EVALUATION (Capabilities and Limitations)	
		Criteria 1 - 3 [1]	Criteria 4 - 6 [2]
Ground-based surveillance (off-site)	Surveillance of a site of interest at some agreed perimeter surrounding a site or many kilometers distance either by remote sensing or by visual inspection. (VEREX/9, Annex II, p.79)	Sensing of open air test sites may be technically feasible and reasonable but there are only very rare cases where specially tailored ground-based surveillance may have some special value for the monitoring of large enterprises. It may assist targeting for inspections. Effluence of biological substances from sites of concern may be unlikely. No ability to resolve ambiguities or differentiate between permitted and prohibited activities. Optical and spectroscopic methods are not capable of identifying biological agents; generic bio-sensors have limited specificity and DNA probe sensors are not available for all biological agents. (VEREX/9, Annex III, p.191 etc.)	Sensitivity is limited. Availability of high specific detection probes is limited. In particular, a large variety of recognition materials are required. This measure could be intrusive and, if not focussed, expensive. Specialists for interpretation of data required. Surveillance would have to be based on international agreement. Impact on CPI unlikely. May require safety control areas. Sensor techniques for surveillance of sites from distance not available; spectroscopic methods are not able to identify specific biological agents; sensitivity of biosensors requires combination with a step for sample collection.
Sampling and identification (off-site)	To take samples of the area in the vicinity of a declared or undeclared facility without penetrating its boundary. (VEREX/9, Annex II, p.83)	The measure will usually provide information of rather poor quality, as the probability of obtaining a relevant sample is low. Using this measure alone can result in ambiguities, as e.g. the origin of any agent isolated may not be possible to clarify, and the risk of false positive as well as false negative tests may be very high. Different interpretations of the information are possible. Ability to differentiate between permitted and prohibited activities as well as resolving ambiguities is low. Could be of value in connection with open air sites. (VEREX/9, Annex III, p.197 etc.)	The costs will depend on the total number of inspections and subsequent number of samples. Small inspection teams will be required, but the chain of custody and laboratory analysis would be labor intensive. Safety problems for inspectors are generally low, except for open air test sites. Assays for identification are not developed for some agents. Minimal impact on permitted activities and CPI.

Measure	Definition	EVALUATION (Capabilities and Limitations)	
		Criteria 1 - 3 [1]	Criteria 4 - 6 [2]
Observation (off-site)	Monitoring a site to get a sense of activities being carried out in the facility and also to get acquainted with the external characteristics of the facility. (VEREX/9, Annex III, p.201)	The precision of the information about actvities at the site is low. But it can provide a general view of the site's characteristics. A good deal of information could be obtained about local diseases and epidemics or migration of inhabitants and environmental damages caused by the activity of the site. Its capability to distinguish between prohibited and permitted activities may be low. Also by itself it cannot determine compliance. If supplemented with on-site measures, however, it may resolve some ambiguities. (VEREX/9, Annex III, p.201 etc.)	The technology and material requirements are generally low. Manpower will play a crucial role. Access in some States may require national legislation. Long-term physical presence of observers could be costly and may also have public relations implications. Poor weather conditions, darkness and obscuring mass could impose limitations. Impact on CPI is low.
Auditing (off-site)	The critical examination, outside a facility boundary, in accordance with agreed standards and criteria, of documentary records, electronically-held data and manuals, to assess consistency of matters recorded and material accounted with declared purposes and permitted activity. (VEREX/9, Annex III, p.204)	Substantial quantities of information from many sources exist; data are available on production, stockpiling and possibly development and contributes to the build-up of a picture of normal activitiy. Data could be highly focussed and directed towards specific concerns. The scope and depth of information off-site may be insufficient to make any meaningful conclusions. Standards of record keeping vary. Seems to have value as a verification measure in a limited range of circumstances, and could be considered not as a primary measure but rather as a follow-up event. (VEREX/9, Annex III, p.204 etc.)	Technical and material requirements are minimal. Source information could have some impact on CPI. While source information could have commercial and proprietary value, procedures may be adopted that could reduce the risks of comprising commercially sensitive information. Broad range of knowledge required by auditors. Potentially some legal issues, i.e., may require consideration of national legislation and regulations.

Measure	Definition	EVALUATION (Capabilities and Limitations)	
		Criteria 1 - 3 [1]	Criteria 4 - 6 [2]
Exchange visits - international arrangements	Visits of experts arranged for scientific purposes by one country to comparable facilities of another country (States Parties) under bilateral or multilateral agreements. Exchange visits need not be restricted to declared facilities. (VEREX/9, Annex III, p. 208)	It can provide a mechanism of transfer of technical information for a given area. Some difficulties exist in implementation on a multilateral basis. The scope of the agreement can impact the amount and the quality of information. This measure is unlikely to differentiate between permitted and prohibited activities and resolve ambiguities about compliance, this measure would serve best as an enhanced CBM, expanding openess and transparency. The non-intrusive nature of this measure and the capability of less developed countries to acquire technical information through this mechanism is a unique capability. (VEREX/9, Annex III, p.208 etc.)	The possible loss of proprietary information is of concern. Existing international organizations may support exchange programmes. Cost and legal implications could be limiting factors. Exchange visits are voluntary and reciprocal, these need not disrupt scientific program activities.
Interviewing (on-site)	One of the measures of fact-finding for on-site inspection. It is conducted with the personnel of the site. The objective is to gain information about the nature, scale and scope of the activities and also to assess the overall function of the site. (VEREX/9, Annex III, p.213)	A considerable amount of information may be established. Depends on access of personnel to information. The accuracy of the information is highly dependent upon the cooperation of personnel. The possibility of giving false information weakens the differentiation between permitted and prohibited activities. Its ability to resolve ambiguities about compliance js low, but may contribute to an overall judgement. (VEREX/9, Annex III, p.213 etc.)	It does not require specific material or technology. It requires trained, qualified experts and interpreters. It may interrupt the normal work of the site. There is the possibility of leakage of CPI. It could be costly. Access to facilities in some states may require national legislation.
Visual inspection (on-site)	Aimed at acquiring a general view of the site, facilities, equipment, materials and the degree of protection, safety measures and the peaceful activities which are being carried out. It includes taking note of the specificities and the characteristics of the equipment and the instruments. (VEREX/9, Annex III, p.217)	A large amount of information can be obtained, limited by the degree of access. May provide information on prohibited activities. But the dual-purpose nature of equipment may complicate interpretation of information and ability to resolve ambiguities about compliance. May provide information on production capacity and general capabilities. May provide information on possible undeclared actvities, but it is unlikely to provide information on removed equipment. (VEREX/9, Annex III, p.217 etc.)	It has a low capital investment requirement. The quality of the manpower available is of particular importance. CPI may be disclosed; contamination risk might be a limiting factor. It may cause an interruption of the routine work at the site and commercial confidentiality may be at risk. Inspector training is required and, in some facilities, in some States, may require national legislation.

Measure	Definition	EVALUATION (Capabilities and Limitations)	
		Criteria 1 - 3 [1]	Criteria 4 - 6 [2]
Identification of key equipment (on-site)	An essential part of identification of key equipment on-site is to confirm a facility's declaration and help to ensure that the equipment is not used for prohibited activities. (VEREX/9, Annex III, p.221)	Can provide substantial amounts of high-quality information, if carried out by experienced specialists. Properly trained individuals may not be available immediately. Assessment of facilities' capabilities is possible. The vast majority of key equipment in biological facilities is of dual-use nature. Portable equipment can be moved out of a facility to deceive inspectors. Lack of equipment or combination of equipment as well as capacity could be used as one important indicator when it comes to differentiate activities, but equipment is mostly of dual-use nature. (VEREX/9, Annex III, p.221 etc.)	There may be legal problems. Safety of inspectors must be considered. Proprietary information may be negatively affected. Financial implications should be taken into consideration. Costs can be high if a large number of inspection is carried out. Legal problems may be connected with on-site inspections as such and with the confidentiality of information obtained.
Auditing (on-site)	The examination within a facility boundary, in accordance with agreed standards and criteria, of documentary records, electronically held data and manuals, to assess consistency of matters recorded and materials accounted with declared purposes and permitted activity. (VEREX/9, Annex III, p.224)	Able to provide evidence on the linkage between events: people, activities and facilities and allow the testing of consistency and coherence. On its own would be unlikely to enable distinctions between prohibited and permitted activities and to resolve ambiguities about compliance. Unlikely to differentiate betweeen prohibited and permitted activities and to resolve ambiguities about compliance. (VEREX/9, Annex III, p.224 etc.)	Technological and material requirements are minimal. A broad range of knowledge is required. Procedures may be required to reduce the risks of compromising information. Commercial or other legitimate sensitivities may preclude access to all material in any one situation. Cost and national legislation and regulations may be limiting factors. Could cause some disturbance to staff.

Measure	Definition	EVALUATION (Capabilities and Limitations)	
		Criteria 1 - 3 [1]	Criteria 4 - 6 [2]
Sampling and identification (on-site)	The act of taking samples on the inspected site, analyzing these samples either on the site using appropriate methods or to transfer these samples from the site for identification or further investigations in appropriate laboratories. (VEREX/9, Annex III, p.228)	It could provide key information to resolve certain ambiguities about compliance because of the possibility of identifying the nature of an agent. Can provide information of significant quality and quantity, in particular because of the possibility of obtaining an independent confirmation of analytical results in the event that findings are disputed. A negative result does not necessarily rule out prohibited activities and may not resolve all cases of non-compliance ambiguities. The efficiency of this measure would be enhanced from a prior indication of the agents one is looking for. Ambiguous results would be reduced if more than one analytical technique and several samples from the same site were used. There is a need for an environmental profile of the site. Key issues are the chain of custody and the use of good sampling and identification practices (GSIP). (VEREX/9, Annex III, p.228 etc.)	Currently available materials would allow many of the on-site presumptive tests to be performed. There is a need to establish infrastructure for training and deployment of inspectors. Creation and maintainance of a sophisticated field laboratory or an independent laboratory could be very costly. There is a risk of loss of CPI, but the use of equipment and methodology from the site could reduce the costs and protect confidentiality. The need to preserve intellectual, individual and commercial proprietary rights in the case of legitimate activities, means the obligation to use special technical and legal procedures for processing samples, particularly if there are grounds for removing samples from the site for subsequent analysis.

Measure	Definition	EVALUATION (Capabilities and Limitations)	
		Criteria 1 - 3 [1]	Criteria 4 - 6 [2]
Medical examination (on-site)	The collection of information about the activities of a facility by auditing medical and occupational health records of the work force; examination of recent and past cases of diseases; taking and analyzing body fluids and other clinical materials; and surveying the immunological status of the work force versus epidemiological background data. (VEREX /9, Annex III, p.238)	By its ability to detect human exposure to agents of concern, medical examination may be a useful measure. Possibility of incorrect or falsified reported epidemiological data or medical records. Reference laboratory analysis can be expected to detect and identify an agent of concern. Examination of meticulous bona fide records could help determine prohibitied activity. Low signficance of immunological tests for endemic diseases Common epidemics or mass immunizations with the same type of agents could prevent association with BW activity. (VEREX/9, Annex III, p.238 etc.)	There is a potential impact on human rights for legal, ethnic, religious or personal reasons. Sensitive laboratory methods do not exist for rapid detection and identification on-site for most agents. Very few medical samples can be tested on-site, and transport of samples and chain of custody could require material and logistical support. Will require highly qualified specialists. Confirmatory off-site laboratory analysis could be costly. Exposure is possible and liability costs may result. Considerable impact could result from false positive information.
Continuous monitoring by instruments (on-site)	Activity conducted on a continuing basis using devices or instruments with the specific role of monitoring ongoing processes, parameters or agents, occuring in key equipment of a particular facility, and/or storage rooms or special storage facility, or testing areas. (VEREX/9, Annex III, p.247)	It is technically applicable at any facility. Ability to differentiate between prohibited and permitted activities is low because it is unlikely to determine the purpose of a dual-use process solely by data collection. No existing instrumentation is sensitive or specific enough to independently identify non-compliance through the measurement of process parameters, or identification of agents. (VEREX/9, Annex III, p.246 etc.)	Many in- and on-line monitors are commercially available. Some monitor devices might not operate without the continuous assistance of personnel. Possibly needs high investment, development and operation costs. Specific antibodies as well as probes are available for several but not all agents or toxins. The technology would need further development. The measure would pose risk to intellectual rights and CPI. Risk of contamination and/or disruption of batch or continuous processes.

Measure	Definition	EVALUATION (Capabilities and Limitations)	
		Criteria 1 - 3 [1]	Criteria 4 - 6 [2]
Continuous monitoring by personnel (on-site)	Activity conducted on a continuing basis using observers or other highly qualified experts with the specific role of monitoring ongoing processes, parameters or agents, occuring in key equipment of a particular facility, and/or storage rooms or special storage facility, or testing areas. (VEREX/9, Annex III, p.254)	Provides a fairly high degree of knowledge on the general activities undertaken at a facility. Specialized personnel could assist in differentiating between permitted and prohibited activity. However, on its own it is unlikely to determine the purpose of a dual-use process. Specificity of current methods could limit the quality of information. (VEREX/9, Annex III, p.254 etc.)	Communication, language and cultural difficulties might occur. Costs may be very high, legal implications substantial and the risk of interference with permitted activities and infringement of commercial proprietary rights considerable. May cause contamination of processes. Personnel may need to be immunized against BTW agents or local diseases.

1. Criteria 1-3:
   1. Strengths and weaknesses based on but not limited to the amount and quality of information they provide and fail to provide.
   2. Ability to differentiate between prohibited and permitted activities.
   3. Ability to resolve ambiguities about compliance.

2. Criteria 4-6:
   4. Their technological, material, manpower and equipment requirements.
   5. Their financial, legal, safety and organizational implications.
   6. Their impact on scientific research, scientific cooperation, industrial development and other permitted activities; and their implications for the confidentiality of CPI.