PREPARATORY COMMISSION FOR
THE COMPREHENSIVE NUCLEAR
TEST-BAN TREATY ORGANIZATION

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Annex II

Report of Working Group B to the Second Session of the Preparatory Commission for the Comprehensive Nuclear Test-Ban Treaty Organization

Introduction

Pursuant to the Report of the First Session of the Preparatory Commission for the Comprehensive Nuclear Test-Ban Treaty Organization, CTBT/PC/I/22, Working Group B met in Vienna from 7 to 18 April 1997.

The Working Group held 6 meetings under the chairmanship of Dr. Ola Dahlman of Sweden. Ms. Jenifer Mackby, Senior Political Affairs Officer of the United Nations Centre for Disarmament Affairs, served as Secretary of the Working Group.

Scientific experts and representatives of the following States Signatories participated in the work of the Working Group: Argentina, Armenia, Australia, Austria, Brazil, Bulgaria, Canada, Chile, China, Colombia, Croatia, Czech Republic, Egypt, Finland, France, Germany, Greece, Indonesia, Iran (Islamic Republic of), Israel, Italy, Japan, Lithuania, Morocco, New Zealand, Netherlands, Norway, Peru, Philippines, Poland, Republic of Korea, Romania, the Russian Federation, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, the United Kingdom of Great Britain and Northern Ireland, the United States of America and Vietnam.

During the session 51 papers related to the work of the Group were presented by participants and reviewed by the Group.

Ten task leaders (see Appendix I) led the discussions on the various tasks assigned to Working Group B and listed in CTBT/PC/I/22. These task leaders developed draft reports in advance of the Working Group B session, in an open process whereby experts representing State Signatories had an opportunity to contribute to the report drafting process from their home facilities. The draft task leader reports were discussed and revised in a number of informal expert meetings during the session, and are listed in Appendix II. These reports are resource papers for Working Group B and summaries of them are included as Appendixes to this Report.

Milestones

Working Group B developed milestones for the design, planning, installation, testing, validation, acceptance and initial operation of the various components of the verification programme. These milestones are established in such a way that the programme will be able to meet the Treaty requirements for operation at the time of entry into force. These milestones are presented in Appendix III. The Preparatory Commission should establish these as initial milestones, which should be reviewed at forthcoming Preparatory Commission meetings.

Results and Recommendations

The following results and recommendations (underlined) are listed in the order in which the corresponding tasks appear in the Programme of Work on Verification contained in CTBT/PC/I/22. Working Group B recommends that the Preparatory Commission take decisions where necessary on these recommendations.

General tasks:

A. *Establish an initial plan for the progressive commissioning of the International Data Centre (IDC) and the International Monitoring System (IMS) and for the implementation of related responsibilities*

Working Group B has established such initial plans, containing specific work plans for 1997 to be found in Appendix IV for IMS and Appendix V for the International Data Centre.

At its first session, the Preparatory Commission established a budget for verification for 1997 (CTBT/PCI/5/Rev.4) comprising site surveys and preparations, as well as acquisition and installation of seismic stations for the International Monitoring System, hardware and software for the International Data Centre, a communications line between Arlington and Vienna, and IMS and IDC training.

In the decision taken on the budget at the first session of the Preparatory Commission (CTBT/PC/I/5/Rev.4), $US 8,210,000 was allocated to the International Monitoring System. Of this amount, the $6 million allocated for the acquisition and installation of the seismic stations will be used according to a plan for specific investments to be proposed by Working Group B for consideration at the Second Preparatory Commission so as to reduce geographical imbalance in existing IMS coverage and to build on existing facilities. The same budget document allocates $4,350,000 for the International Data Centre.

The Working Group has developed a plan for making site surveys of 55 stations in 1997. The Preparatory Commission should task the Provisional Technical Secretariat to take responsibility for carrying out site surveys for the stations listed in Table 1 of Appendix IV. This could be accomplished through contractual arrangements with qualified and experienced governmental organizations, scientific institutions or private industry. The site surveys should be carried out within the budget presented in Table 1 and in accordance with established scientific standards.

Working Group B has also developed a plan for making investments in acquisition and installation of 18 seismic stations and one hydroacoustic station in 1997. The Preparatory Commission should task the Provisional Technical Secretariat with taking responsibility for acquiring and installing the seismic stations listed in Table 2 in Appendix IV. This could be accomplished through contractual arrangements with qualified and experienced governmental organizations, scientific institutions or private industry. The acquisition and installation of these stations should be carried out to meet the specifications defined in the task L below and within the budget presented in Table 2.

The Working Group developed a phased approach for the International Data Centre development (see Appendix V), including a plan for acquisition of the hardware and software (Appendix VI), cost estimates for each phase, including cost for capital investment and

operations. The Preparatory Commission should adopt this initial plan and should task the Provisional Secretariat to take the responsibility for carrying out in 1997 the tasks contained in this initial plan and to use this initial plan, until modified by the Preparatory Commission, as the basis for commissioning the International Data Centre. This document should be reviewed and updated as necessary as the commissioning progresses.

The Provisional Technical Secretariat should provide a status report on surveys, acquisitions and installations conducted and plans for future surveys to Working Group B at its meeting in August 1997.

A first preliminary outline of a programme and related costs of establishing and operating a verification regime that will meet the verification requirements at entry into force of the Treaty was discussed. Such a verification programme could be divided into sub-programmes on IMS, IDC, Communications, OSI, evaluation, and training and the associated costs could be subdivided into categories on investments, running costs, and costs for staff of the Provisional Technical Secretariat related to verification. The total remaining investments within such a verification programme amounts to $US M 130-140. The annual running costs of an operational system is estimated to be $US M 50 and the annual cost of verification related personnel of a fully staffed Provisional Technical Secretariat amounts to $US M 30-40. This can be seen as an initial basis for further consideration of the verification work programme and related costs.

B. *Establish a comprehensive training programme for the IDC and consider a comprehensive training programme for the IMS*

The Working Group developed a detailed plan for training of personnel (see Appendix VII) to meet the projected requirements of commissioning the International Data Centre. This plan also contains a specific approach for carrying out the training programme in 1997. The Preparatory Commission should task the Provisional Technical Secretariat to take the responsibility for carrying out the 1997 training programme contained in this plan using the funds in the 1997 Provisional Technical Secretariat budget allocated for the International Data Centre (CTBT/PC/I/5/Rev.4).

The Working Group discussed a training programme for the International Monitoring System. Proposals for the establishment of guidelines and principles for a comprehensive training programme should be presented at the third session of the Preparatory Commission so as to enable the Preparatory Commission to take decisions on the implementation of a comprehensive training programme for the International Monitoring System. The Working Group noted the willingness of several countries to contribute their expertise and instructors for such training programmes.

The Preparatory Commission noted favourably a proposal by Argentina to host in 1997 a regional training course on the operation of the International Monitoring System for trainees of States Signatories in Latin America.

The Working Group also noted the introduction of a Japanese training course as a national project and its willingness to maintain good communication with the International Monitoring System.

C. *Develop a proposal on how to provide expert and integrated advice on monitoring, data communications and analysis and for technical supervision of the IMS and the IDC implementation*

Working Group B and its task leaders are creating the desired framework for providing such advice to States Signatories and to the Preparatory Commission.

D. *Develop a plan for the Preparatory Commission to take responsibility for GSETT-3 and other ongoing tests.*

The Preparatory Commission should task Working Group B with overseeing, co-ordinating and evaluating the activities begun under GSETT-3 as well as the other ongoing technical tests until the end of 1997, on the same voluntary basis as has applied under the auspices of the Conference on Disarmament. Working Group B should submit proposals to the Preparatory Commission for consideration at its Third Session on the need for and basis upon which a continuation of these activities will be required in 1998.

E. *Develop data authentication requirements*

Working Group B recommends that all International Monitoring System data be authenticated. Authentication should be achieved through hardware or software authenticators at the stations and regional data consistency at the IDC. The initial requirements on authentication are to be found in Appendix VIII. For cost-effective implementation of authenticators, continued technical work is needed. The technical solution for data authentication should not impede the operational tasks at IMS facilities or at National Data Centres.

IDC tasks:

F. *Develop software and hardware specifications*

The Working Group has developed the overall hardware and software requirements for the International Data Centre (found in Appendix VI) linked to the progressive plan for commissioning the Centre, as contained in Appendix V. The Preparatory Commission should approve this plan to facilitate further development. The Preparatory Commission should task the Provisional Technical Secretariat to take the responsibility for carrying out in 1997 the tasks contained in this plan and to use this plan, until modified by the Preparatory Commission, as the basis for commissioning the International Data Centre.

G. *Develop and review an overall hardware procurement plan and review first order of equipment*

The Working Group has developed an overall hardware and software procurement plan for the International Date Centre, presented in Appendix VI. A specific plan for the 1997

procurement of the IDC hardware, software and a communications link to the prototype IDC is found in this Appendix. The Preparatory Commission should task the Provisional Technical Secretariat to take the responsibility for carrying out the 1997 procurement for these items in accordance with the plan using the funds in the 1997 provisional Technical Secretariat budget allocated for the International Data Centre (CTBT/PC/I/5Rev.4).

H. *Develop an outline for the operational manual for the IDC*

Working Group has developed an outline for the Operational Manual for the IDC, to be found in Appendix IX. This outline should be used as a basis for further development. The Operational Manual for the IDC must be approved by the first Conference of States Parties.

I. *Develop an initial IDC concept of operations document*

The Working Group was presented with an initial IDC Concept of Operations document (see Appendix IX) which was not discussed due to lack of time. This document should be revised and forwarded to the Preparatory Commission at its third session.

J. *Initiate work on event screening criteria*

The Working Group has developed a plan for the development of the standard event screening to be installed at the IDC (see Appendix V). This work is now progressing in accordance with the plan under the guidance of Working Group B.

IMS tasks:

K. *Support Working Group A in developing model agreements or arrangements to be concluded by the PTS in order to make site surveys, take an inventory of existing stations and install new stations or upgrade existing stations as IMS facilities*

Interactive consultations were held with focal points of Working Group A on technical issues related to model agreements or arrangements. Working Group B should continue such work, in particular by providing support on the issue of model agreements or arrangements for the operation of IMS stations.

L. *Develop station specifications*

The Preparatory Commission should adopt the specifications on seismic, infrasound, radionuclide and hydroacoustic stations as presented in Tables 3 to 6 in Appendix X of this report. The IMS stations should fullfil the specifications, which should be included in the Operational Manuals.

M. *Develop plans for taking an inventory of existing stations, including their quality and specifications, in order to assess the amount and costs of upgrade necessary*

Working Group B has developed plans, as presented in Appendix XI, based on an informal, initial inventory, which was used in the estimation of costs included under task A. The Working Group also developed a questionnaire on existing stations to be used as a basis

for taking an official inventory. The Preparatory Commission should task the Provisional Technical Secretariat to distribute this questionnaire to States Signatories and request responses in due time.

N. *Develop principles for the selection of sites for noble gas monitoring stations in the context of initiating work on a proposal on which 40 out of 80 radionuclide stations will have noble gas capability upon entry into force of the Treaty*

Working Group B discussed the principles for the selection of such sites, which will have noble gas monitoring capability upon entry into force of the Treaty (see Appendix XII). Working Group B should continue to develop these principles and initiate work on a proposal on which 40 out the 80 radionuclide stations will have noble gas capability upon entry into force of the Treaty.

O. *Develop an outline for the operational manual for each IMS technology*

Working Group B has developed an initial outline for the Operational Manual for the IMS technologies, to be found in Appendix XIII. This initial outline should be used as a basis for further development. The Operational Manual for the IMS must be approved by the first Conference of States Parties.

Communications task:

P. *Review communications requirements and identify potential options for global communications infrastructure establishment*

Preliminary functional and technical requirements were established (see Appendix XIV). Working Group B should complete these requirements, in close co-operation with the Provisional Technical Secretariat.

The Working Group has developed an initial plan for acquisition and implementation of a global communication infrastructure. (see Appendix XIV) The Preparatory Commission should adopt this plan. It should further task the Provisional Technical Secretariat to take the responsibility to begin work to implement the steps given in this plan to acquire the global communication infrastructure.

Working Group B developed a questionnaire to ascertain the volume of data States Signatories would like to receive from the IDC. The Preparatory Commission should task the Provisional Technical Secretariat to distribute this questionnaire to States Signatories and request responses in due time.

OSI task:

Q. *Establish initial proposals for guidelines and procedures for the conduct of an OSI and for OSI infrastructure to support the OSI regime*

Working Group B has developed and prioritized an extended tentative list of main subject areas as a basis for further development of guidelines and procedures for the conduct of an OSI.

Working Group B has also developed a tentative list of tasks and functions for OSI infrastructure to support the OSI regime. Both lists, which need further development, will serve as a preliminary basis for recommendations on relevant infrastructure elements, staffing plan, equipment procurement, as well as budget assignments. These lists are included in Appendix XV.

The Working Group considers that more detailed discussions of specific OSI technologies are required to facilitate the establishment of inspection equipment, specifications and initial requirements for procurement of this equipment, as well as progressive compiling of the OSI Operational Manual.

The Preparatory Commission should task the Provisional Technical Secretariat with organizing a seminar close to the meeting of Working Group B in August 1997 on these issues. The tentative agenda of this seminar needs further consideration.

Working Group B tasks for the remainder of 1997

The Working Group reviewed and amended the tasks contained in CTBT/PC/I/22 for the remainder of 1997 as reflected below. Working Group B should present material and proposals at the Preparatory Commission meetings indicated. This list should be reviewed at forthcoming meetings of the Preparatory Commission.

Third Session of the Preparatory Commission

- Develop a proposal for a Work Programme with associated cost estimates for verification work by Working Group B and the Provisional Technical Secretariat for 1998

- Review Provisional Technical Secretariat staff plan for verification for 1998

- Submit proposals to the Preparatory Commission for consideration on the need for and basis upon which a continuation of the activities begun under GSETT-3 will be required in 1998.

- Develop the technical specifications for authentication

- Consider introduction of a quality assurance programme with associated standards for the implementation and operation of the verification regime, including cost estimates

For IDC

- Review the status of the initial plan for the progressive commissioning of the International Data Centre (IDC), including an evaluation report on the status of the prototype IDC analysis procedures, data processing capabilities, software and software documentation

- Develop an initial draft IDC Operational Manual

- Develop IDC concept of operations document

- Review progress on development of event screening criteria

For IMS

- Review the status of the initial plan for the progressive commissioning of the International Monitoring System (IMS)

- Establish a training programme for the International Monitoring System to be executed by the Provisional Technical Secretariat following approval by the Preparatory Commission at its third meeting

- Establish policies for procurement and installation of station equipment

- Develop initial draft IMS operational manuals

- Develop plans for certifying stations

- Provide advice on station configuration to fit the local environment for infrasound and hydroacoustic stations

- If necessary, continue to support Working Group A in developing model agreements or arrangements to be concluded by the Provisional Technical Secretariat with host governments in order to facilitate the setting up of the IMS

- Continue to develop principles for the selection of sites for noble gas monitoring stations and initiate work on a proposal on which 40 out of 80 radionuclide stations will have noble gas capability upon entry into force of the Treaty

- Develop initial procedures for the use of data from future co-operating national facilities and a programme for co-operation between the PTS and State Signatories for testing these procedures

- Evaluate official results of the IMS facilities inventory for the purpose of future planning

For Communication

- Complete the communications requirements and the plan for acquisition and implementation of the global communication infrastructure, as a basis for the Preparatory Commission to task the Provisional Technical Secretariat to proceed with all aspects of the communication infrastructure acquisition.

For OSI

- Establish more refined proposals for guidelines and procedures for the conduct of an OSI and for OSI infrastructure to support the OSI regime

- Establish initial requirements for procurement of OSI equipment and for logistics

- Develop an initial outline of an OSI operational manual

Fourth Session of the Preparatory Commission

- Develop a final proposal for a Work Programme for verification work by Working Group B and the PTS for 1998

- Review requirements for the procurement of equipment to be purchased in 1998 and make recommendations as appropriate

Method of Work and Timetable

The Working Group examined the method of work and recommends that it be continued as described in CTBT/PC/I/ 22 (page 24-25). Modern communications techniques should be further utilised and enhanced to allow for the transparency and participation of experts of States Signatories from their home facilities. The Preparatory Commission requests the Provisional Technical Secretariat to initiate, within existing resources, a test of an Expert Fax and E-mailing Network, and to report on its status to the Preparatory Commission during its third session. The test will be performed according to the draft guidelines, which could be modified by consensus. The Preparatory Commission would review these results and take further decisions as necessary.

As reflected in the report of the Preparatory Commission, CTBT/ PC/I/22, Working Group B should meet immediately following the Second Preparatory Commission, 20-23 May. The Working Group recommends that the Group meet 4-15 August 1997 to prepare for the third session of the Preparatory Commission. Working Group B will meet immediately following the third session of the Preparatory Commission, from 22 to 26 September 1997.

Appendix I

Task leaders

The following persons served as task leaders during this session of Working Group B. The letters refer to the tasks as presented in the paragraph entitled "Results and recommendations" of the main body of this report.

Dr. Ralph W. Alewine, III (United States), Tasks A (IDC), B (IDC) F, G, H, I, J*

Mr. Peter Basham (Canada), Task O

Mr. Yves Caristan (France), Tasks E and L

Dr. John Alwyn Davies (UK), Task A (IMS)

Mr. Manfred Henger (Germany), Task P

Dr. Robert Kleywegt (South Africa), Task D

Dr. Ken Muirhead (Australia), Tasks K and M

Mr. Antonio Oliveira (Argentina), Task N

Dr.Vitaliy N. Shchukin (Russian Federation), Task Q

Dr. Shigeji Suyehiro (Japan), Task B(IMS)

* Responsibility: Mr. WANG Hong, (China), Task J

Appendix II

Task Leader Papers

WGB/TL/1/Rev. 4	Working Draft, Report to Chairman of Working Group B from Task Team on Progressive Commissioning of the IDC and IMS
WGB/TL/2	Agenda on Commissioning
WGB/TL/3/Rev. 3	Initial Plan for the Progressive Commissioning of the International Data Centre
WGB/TL/4/Rev. 3	Establishment of a Comprehensive Training Program for the International Data Centre
WGB/TL/5/Rev. 3	Initial Hardware and Software Procurement Plan for the International Data Centre
WGB/TL/6/Rev. 3	Outline for the Operational Manual for the International Data Centre
WGB/TL/7/Rev. 2	Initial Plan for the Development of Event Screening Criteria
WGB/TL/8/Rev. 4	Task Leader Guidelines on IMS Specifications
WGB/TL/9/Rev. 3	Task Leader Guidelines on Authentication
WGB/TL/10/Rev.3	Prepcom Responsibility for GSETT-3 and other ongoing tests
WGB/TL/11/Rev.1	Plans for taking an Inventory of existing stations including their Quality and Specifications, in order to assess the amount and cost of upgrade necessary
WGB/TL/12	Support Working Group A in Developing Model Agreements or Arrangements to be concluded by the PTS in order to make Site Surveys, take an Inventory of existing stations and install new stations in the IMS
WGB/TL/13/Rev. 1	CTBT International Monitoring System- Seismic Station Inventory as at 8th April 1997
WGB/TL/14	OSI Expert Group, Organizational Questions and Objectives
WGB/TL/15/Rev.3	Initial proposals for guidelines and procedures for the conduct of an OSI
WGB/TL/16	Initial proposals for OSI Infrastructure
WGB/TL/17	Potential Options for Global Communications Infrastructure Establishment

WGB/TL/18	Map (GSETT-3 Reviewed Event Bulletin – 1995 & 1996)
WGB/TL/19	Map (The International Monitoring System for the Comprehensive Nuclear Test Ban Treaty)
WGB/TL/20/Rev. 1	Initial Concept of Operations for the International Data Centre
WGB/TL/21/Rev. 1	Draft Outline of IMS Operational Manuals
WGB/TL/22/Rev. 2	Requirements and Implementations of the IMS Global Communications Infrastructure
WGB/TL/23/Rev. 3	Principles for the Selection of Noble Gas Monitoring Locations
WGB/TL/24	Draft Report of the Informal Radionuclide Workshop on Radionuclide IMS Network Specifications
WGB/TL/25	IMS Training
WGB/TL/26/Rev. 1	Personnel + Equipment required for an IMS Site Survey
WGB/TL/27	Special OSI Exp. Meeting on Methodology, Technology + Equipment
WGB/TL/28	Draft IMS Station Inventory Questionnaire
WGB/TL/29	Main OSI Milestones for the period before EIF
WGB/TL/30	OSI Structures Evaluations
WGB/TL/31/Rev. 1	Report of OSI Task Leader to WGB

Appendix III

Milestones

Milestones	*1*	2	3	4
IMS	*Initial Site Surveys, Inventory IMS facilities, Start precurement*	Initial installation and upgrading, Start post 97 planning	Continue site surveys and equipment procurement	Progressive installations at stations Start transmission to IDC
IDC	Design & Planning/VIC Remodelling	Establishment of Initial Computer Facilities & Comm Links	Establishment of Initial Operations at the Vienna IDC	Initial testing of the Vienna IDC Hardware/Software
Communication	Design and Planning of GCI	Establish initial GCI Facilities	Establish GCI	Initial Testing of GCI at Vienna IDC and IMS elem.
OSI Boxes 2 through 5 are indicative milestones and could be revised in the future. They also do not cover administrative or legal tasks, which the Group recognizes, are important	Detailed description of methodologies and equipment specifications, Begin work on infrastr.	Equipment availability assessment, initial equip. list, start Op. Man.	Organise & Select equipment for procurement, renting or contracting. Determine infra structure	Individual testing of equipment and establish maint. Prog. Complete Prov. Op. Man.
Evaluation	Initial Plan for Evaluation	Establish Plan for Evaluation	Start Evaluation on functioning Elements of IMS, IDC and Comm	Further Evaluation on functioning Elements of IMS, IDC and OSI
Training	Initial Plan for Training Start Training Program IDC	Establish Plan for Training, Start Training Program IMS	Continue Training Program IMS, IDC Start Training Program OSI	Continue Training

Milestones cont.	*5*	6	7
IMS	*Certification of station performance and acceptance individual stations into IMS*	Validation and acceptance of all IMS networks	Availability of the IMS for Full CTBTO Operations
IDC	Full Scale Testing of Vienna IDC	Validation and Acceptance of Vienna IDC	Availability of the IDC for Full CTBTO Operations
Communication	Full Scale testing of GCI	Validation and Acceptance of GCI	Availability of the GCI for Full CTBTO Operations
OSI	Full Scale Test	Complete Operational Manual	Availability of the OSI for Full CTBTO Operations
Evaluation	Further Evaluation on functioning Elements of IMS, IDC and OSI	Present Status Report	Evaluation on All Elements of Verification System
Training	Continue Training	Continue Training	Full Training Program available and running

Appendix IV

The Progressive commissioning of the International Monitoring System

The IMS of the Treaty's verification regime is currently estimated to cost in excess of M$ US 100 for equipment and installation and have annual operating and maintenance costs, when fully established, of about M$ US 30. In March, Prepcom approved a budget for 1997 of M$ US 7.91, as follows, for the IMS, but qualified that it should be used to reduce geographic imbalance in the existing monitoring capability and to build on existing facilities.

	Site surveys M$ US	Installation M$ US
Infrasound	0.4	-
Hydroacoustics	0.52	-
Seismic	0.54	6.0
Radionuclides	0.45	-
	1.91	

The aim of the plan is to use the 1997 budget in the most cost effective manner for surveying new locations and for upgrading existing facilities. This must be undertaken in a cost effective manner and in developing the plan the following were considered:

- the sites to be surveyed and at which some installation or upgrade would be undertaken early would take into account plans developed by some States on a national basis;
- existing stations could be upgraded in order to reduce existing imbalance in capability ;
- new stations in remote geographical areas, where surveys would be difficult and costly, would not be considered for early surveying and installation;
- use would be made of expertise available in some States for the early installation of stations under their responsibility;
- attempts would be made to build up monitoring capability as uniformly as is reasonably possible compatible with cost effectiveness;
- attempts should be made to maximise the synergy between technologies;
- there should be little or no delay in installing equipment at a site surveyed and found to satisfy the site selection criteria.

Tables 1 and 2 list the locations for survey and investment respectively in 1997.

Table 1. Site Surveys to be funded by the PTS in 1997

IMS No	State	Location	Regional Group	Cost (1000$)
Seismic network				
First group				
PS12	China	Hailar	SEAPFE	100
PS23	Kazakstan	Makanchi	MESA	100
PS33	RF	Zalesovo	EE	100
PS43	Turkey	New site for array	NAWE	100
PS44	Turkmenistan	Alibeck	MESA	100
PS42	Tunisia	Thala	A	50
PS21	Iran	Tehran	MESA	50
PS25	Mongolia	Javhlant	SEAPFE	40
PS26	Niger	New site	A	100
PS37	RF	Ussuriysk	EE	130
Second group				
PS13	China	Lanzhou	SEAPFE	100
PS38	Saudi A.	New site	MESA	100
PS45	Ukraine	Malin	EE	100
AS28	Djibouti	Arta	A	30
AS33	France	Fr Guiana	NAWE	100
AS66	Morocco	Midelt	A	50
AS68	Nepal	Everest	MESA	50
AS120	Zimbabwe	Bulawayo	A	100

NB. No consensus was achieved on whether or not any expenditure should be devoted to the auxiliary seismic network in 1997. The five auxiliary seismic stations listed above are those whose survey is considered to be technically achievable in 1997.

Hydroacoustic

First group

HA4	France	Crozet Is	NAWE	400
HA5	France	Guadeloupe	NAWE	100

Alternative

(HA6	Mexico	Clarion Is.	LAC	100

if it is found that Guadeloupe cannot be the T-phase location to be surveyed in 1997)

Infrasound
Average cost of site survey is $ 30,000 per station

First group

IS1	Argentina	Paso Flores	LAC
IS7	Australia	Warramunga	SEAPFE
IS8	Bolivia	La Paz	LAC
IS9	Brazil	Brasilia	LAC
IS17	Ivory Coast	Dimbokro	A
IS24	France	Tahiti	NAWE
IS25	France	FR Guiana	NAWE
IS26	Germany	Freyung	NAWE
IS29	Iran	Tehran	MESA
IS34	Mongolia	Javhlant	SEAPFE
IS37	Norway	Karasjok	NAWE
IS43	Rus.Fed	Dubna	EE
IS45	Rus.Fed	Ussuriysk	EE
IS47	S.Africa	Boshof	A
IS48	Tunisia	Thala	A

Second group

IS10	Canada	Lac du Bonnet	NAWE
IS46	Rus.Fed.	Zalesova	EE

It may be that some States may wish to undertake site surveys using nationally available resources. These are not included in the above.

Radionuclides

The budget allows the survey of about 9 sites at an average cost per station of $50,000. Sites for survey could be drawn from the following:

First group

RN8	Australia	Cocos Is.	SEAPFE
RN11	Brazil	Rio de Jan.	LAC
RN22	China	Guangzhou	SEAPFE
RN24	Ecuador Is.	Galapagos	LAC
RN30	France	Kerguelen	NAWE
RN36	Iran	Tehran	MESA
RN38	Japan	Takasaki	SEAPFE
RN43	Maurit.	Nouakchott	AA
RN45	Mongolia	Ulaanbaatar	SEAPFE
RN48	Niger	Bilma	AA
RN58	RF	Ussuriysk	EE
RN61	RF	Dubna	EE
RN65	Thailand	Bangkok	SEAPFE
RN74	US	Ashland,Ka.	NAWE
RN72	US	Melbourne, Fl	NAWE

Second group

RN3	Argentina	Bariloche	LAC
RN13	Cameroon	Doula	A
RN28	France	Guadeloupe	NAWE
RN31	France	Fr Guiana	NAWE
RN46	NZ	Chatham Is	SEAPFE
RN50	Panama	Panama City	LAC
RN59	RF	Zalesovo	EE
RN64	Tanzania	Dar es Salaam	A

There may be others that States may wish to undertake some survey at national cost.

Abbreviations for regional groups

A	Africa
EE	Eastern Europe
LAC	Latin America and the Caribbean
MESA	Middle East and South Asia
NAWE	North America and Western Europe
SEAPFE	South East Asia, the Pacific and the Far East

Table 2. IMS stations to be upgraded or installations to be undertaken in 1997 by funding from the PTS within the budget provided for this purpose shall be selected from:

IMS No	State	Station Name	Cost (1000$)

Seismic

PS2 Australia Warramunga 800
Rationale: Old array, needs no site survey. Needs procurement and installation of new equipment only for upgrading.

PS12 China Hailar 100
Rationale: Site identified as high priority for survey in 1997. 3C station will be upgraded to array at a later time, after 1997. Some equipment procurement, related to a 3C station could be undertaken in 1997 with remainder of investment (about $2000K) later.

PS14 Colombia El Rosal 100
Rationale: 3-C Site already surveyed, equipment available for installation by Canada. Installation can proceed quickly.

PS16 Egypt Luxor 1400
Rationale: New array required. New equipment can be procured readily.

PS17 Finland Lahti 70
Rationale: Existing array - no survey needed. Finland has developed plans for replacement seismometers, improved data storage and data transmission. Work can be undertaken using national funding in 1997.

PS18 France Tahiti 60
Rationale: Upgrade as 3C station. Site known and plans well advanced. Equipment available and could be readily installed.

PS21 Iran Tehran 300
Rationale: Site could be readily surveyed and equipment upgraded in 1997

PS23 Kazakstan Makanchi 1100
Rationale: New array required. Site to be surveyed in 1997. Equipment procurement in 1997 for installation as soon as possible.

PS25 Mongolia Javhlant 400
Rationale: Upgrade as 3C station can be done readily. Site to be surveyed in 1997. Survey to be followed soon by equipment procurement for subsequent installation.

PS26 Niger New 400
Rationale: This is a new site to be surveyed with high priority in 1997. Site preparation could commence and some equipment could be procured in 1997 for later installation of a 3C station, which will be upgraded to an array at a later time.

PS33 RF Zalesovo 500
Rationale: Station will be upgraded as a 3C station in 1997, and it will be upgraded to an array at a later time. Site survey in 1997 is identified as a high priority task. Some equipment could be procured but most investment expenditure (about $2000K) will be later.

PS35 RF Peleduy 1000
Rationale: 3C station to be upgraded to array. Site already surveyed and some preparation already undertaken in 1997 using non-PTS funding on the basis of bilateral Russian Federation/United States co-operation. Equipment identified for installation.

PS37 RF Ussuriysk 500
Rationale: Station will be upgraded as a 3C station in 1997, and it will be upgraded to an array, at a later time. Site survey in 1997 is identified as a medium priority task. Project development and site preparation could be done in 1997. Some equipment could be procured but most investment expenditure (about $2000K) will be later.

PS42 Tunisia Thala 200
Rationale: Plans well advanced on co-operative France/Italy/Tunisia arrangement. Some site upgrade in 1997 is possible.

PS43 Turkey Keskin 50
Rationale: Possible relocation of site to Keskin. Survey to be undertaken in 1997. Some site preparation and equipment procurement could commence in 1997.

PS44 Turkmenistan Alibeck 500
Rationale: Site to be surveyed in 1997 for an upgrade to an array. Some site preparation and equipment procurement could be conducted in 1997 for installation later.

PS47 US Mina 500
Rationale: Array. Site can be readily surveyed and prepared at low cost. Equipment already identified and available. This installation is planned to commence in 1997 using national funding.

PS40 Spain Sonseca 800
Rationale: Existing array station already sending data to IDC. No further survey necessary. Some equipment for upgrading the array is planned to be procured in 1997 using national funding.

AS40 Indonesia Cibinong 50
Rationale: No survey needed. Preparations have already been undertaken. France has plans to complete equipment installation in 1997.
NB. No consensus was achieved on whether or not any expenditure should be devoted to the auxiliary seismic network. The auxiliary station included above is one at which equipment installation is seen to be technically feasible in1997.

Hydroacoustic

HA11 US Wake Is. 600
Rationale: Existing station in Pacific Ocean. No survey needed. Equipment for repairs already determined. Will enhance further capability in Pacific Ocean. This repair will begin in 1997 using national funding.

A view was expressed that site surveys and upgrades of those 3C stations to be upgraded into arrays, that according to the Treaty could start operation as 3C stations, should be postponed to a later stage.

Appendix V

Initial Plan for the Progressive Commissioning of the International Data Centre

Introduction

This annex provides the initial Plan for the Progressive Commissioning of the International Data Centre as required in pagagraph 14a of the document CTBT/MSS/Res/1. The plan incorporates new programs and developments to be undertaken by the Preparatory Commission as well as the transition, as appropriate, of existing capabilities and procedures.

This initial plan should be reviewed and updated on a regular basis by Working Group B with input from the Provisional Technical Secretariat. Technical difficulties and financial constraints could alter the proposed plan. Working Group B should consider these factors as the plan is updated and forwarded to the Provisional Technical Secretariat for execution.

Additional details on the Initial Plan for the Progressive Commissioning of the IDC are provided in the Working Group B Papers listed below.

-- Initial Plan for the Progressive Commissioning of the IDC (WGB/TL 3/Rev.3)
-- Establishment of a Comprehensive Training Program for the IDC (WGB/ TL 4 / Rev.3)
-- Initial Hardware and Software Procurement Plan for the International Data Centre (WGB/ TL 5 /Rev.3)
-- Initial Plan for the development of Event-Screening Criteria (WGB/TL 7/Rev.2)
-- Requirements and Implementation of the IMS Global Comm. Infrastructure (WGB / TL 17 / Rev.2)

Approach to the Progressive Commissioning of the IDC

The commissioning plan contains seven separate phases, of which the first covers design and planning and the last the full availability of the IDC for CTBT Organization operations. A detailed description of these activities are provided in the text. These activities are outlined in Table 1.

Phase 1: IDC Design and Planning/Vienna International Centre Remodeling

This phase began with the resumed first Preparatory Commission and will last 4-6 months. The initial work starts on April 1, 1997. Work on these tasks is already underway.

The exact duration of Phases 1 and 2 will be dictated by the rate at which crucial decisions, including procurement, are made by the Preparatory Commission. They will also depend upon the rate at which the VIC facility remodeling can be carried out. The combined duration of the first two phases is likely to be up to twelve months.

-- An initial plan for the progressive commissioning of the IDC (this document) is developed for each of the major areas, and submitted to the Preparatory Commission for approval. These development plans include requirements, tasks, milestones, schedules and budgetary information.

-- Drawings and engineering specifications, prepared by prototype IDC staff in close coordination with IAKW, are approved by the Preparatory Commission and forwarded to the IAKW. It is anticipated that the construction work on the Vienna IDC floors would be completed by November 1, 1997.

-- Hardware and commercial software requirements are compiled, reviewed and finalized. A procurement process is established and coordinated with the procurement office in the PTS. A procurement plan including specific bill of materials and well-supported cost estimates is prepared. The procurement plan is put to tender.

-- The status of the existing applications software at the prototype IDC is documented and evaluated. Plans for the completion of the applications software are prepared and reviewed by Working Group B. Documentation and development continue, with revisions as necessary to meet changes in requirements, priorities and schedules. A new release of the software is tested and installed at the prototype IDC on a voluntary basis.

-- The new Global Communications Infrastructure (GCI) concept and procurement plan are developed and submitted to the Preparatory Commission by Working Group B for approval. Technology alternatives are considered, partially through a survey of international communications vendors. Tariff and licensing issues are explored.

-- A preliminary staffing plan is developed and revised as needed to meet changes to the concept of operations and the schedule for transition. Recruitment of staff needed for Phase 2 is initiated. A detailed training plan is developed and submitted to Working Group B by the PTS for approval. The 1997 training program is initiated.

-- Expert Groups, under Working Group B, are established to provide technical guidance to the development of the IDC; to review the progress of the IDC development; and, to prepare summary materials for use by Working Group B.

-- The detailed outline of the Operational Manual for the IDC is submitted to the Preparatory Commission for approval.

-- An initial IDC Concepts of Operations document is developed.

-- The prototype IDC continues gradual incorporation of data from all four monitoring technologies on a voluntary basis.

-- The prototype IDC continues to provide IMS data and prototype IDC data products to the treaty signatories on a voluntary basis.

Phase 2: Establishment of the Initial Computer Facilities and Communications Links

This phase is expected to cover four to six months.

-- The detailed progressive commissioning plan for the IDC is reviewed by Working Group B and updated as necessary for each of the major areas, including: requirements, tasks, milestones, schedules and budgets.

-- The remodeling of the IDC floors in the VIC facility is completed.

-- The 1997 computer hardware and commercial software procurement plan is executed by the PTS. The hardware and software, ordered through the tender process, are delivered to the VIC. The computer hardware and commercial software are installed and tested by the end of this phase.

-- A procurement package for the second computer hardware and commercial software acquisition is prepared in coordination with the procurement office in the PTS.

-- A high-capacity communications link between the prototype IDC and the Vienna IDC is ordered and installed.

-- A preliminary design specification is completed for the new communications infrastructure, and a request for proposals is advertised internationally. A tender offer acceptance test plan, including evaluation criteria, for the global communications infrastructure is developed by the PTS and submitted for review by Working Group B.

-- The initial version of the applications software (Release 1) is completed and tested at the prototype IDC. This release provides automatic and interactive processing for all technologies, and initial versions of event characterization and screening. At the end of this phase, this initial version of the applications software is reviewed by Working Group B prior to installation at the Vienna IDC at the beginning of Phase 3.

--Test and evaluate the standard event-screening methodologies and software using IMS and GSETT-3 data. Event-characterization parameters and screening criteria are defined. Experimental testing at the prototype IDC continues. Working Group B reviews the initial specifications of the event-characterization parameters, calibration terms and screening criteria, evaluations their performance, and develops refined plans. Initial screening capabilities are incorporated into Release 1.

-- Most of the hardware engineering and systems administration staff are employed, as well as initial data base administration and computer operations personnel. The recruitment of key staff in other areas continues.

-- A detailed plan for the 1998 training and certification program is prepared by the PTS and submitted to Working Group B for approval.

-- The prototype IDC continues the incorporation of IMS data from all four monitoring technologies and ongoing development. The prototype IDC continues full-scale operations to process the IMS data on a voluntary basis.

-- The initial draft of the Operational Manual for the IDC is prepared for review, revision and subsequent approval by Working Group B. Experiments are devised and conducted to test new operational concepts, as necessary.

Phase 3: Establishment of Initial Operations at the Vienna IDC

This phase is expected to last 3-6 months.

-- The detailed progressive commissioning plan for the IDC is reviewed by Working Group B and updated as necessary.

-- Additional remodeling at the VIC and furnishing of specialized workspaces are performed as needed.

-- The procurement plan for the second order of IDC computer hardware and commercial software is put out for tender. Upon delivery to the VIC, the equipment and software is installed and tested.

-- A procurement package for the third computer hardware and commercial software acquisition is prepared in coordination with the procurement office in the PTS.

-- Receive responses to the tender offer of the GCI; evaluate the proposals; select proposals for funding and negotiate contracts.

-- Install the GCI network management system.

-- The high-capacity communications link between the prototype IDC and the Vienna IDC begins use for trial data exchange.

-- The initial version of the applications software (Release 1) is delivered and installed at the Vienna IDC with the assistance of prototype IDC staff. Continuous real-time data are forwarded from the prototype IDC over the high-capacity link, and the initial automatic data processing is established and tested. The system is readied for initial testing of all processes, including interactive analysis, beginning at the start of Phase 4. The IDC staff assist in the operation and to provide on-site training and assistance to the new IDC staff.

-- Release 2 of the applications software is prepared and tested at the prototype IDC. This more advanced version includes provision for more complex models of the earth, oceans and atmosphere, initial fusion capability, and improved event characterization parameters.

-- Continue to test, evaluate and refine the standard event-screening methodologies and software using GSETT-3 and IMS data. Working Group B will review the refined specifications, evaluate their performance, and develop refined plans. Refined event-screening capabilities are incorporated into Release 2. A baseline set of parameters and screening criteria is documented.

-- The prototype IDC continues the incorporation of IMS data from all four monitoring technologies and ongoing development. The prototype IDC continues full-scale operations and testing to process the IMS data on a voluntary basis.

-- An updated draft of the Operational Manual for the IDC is prepared and reviewed by Working Group B.

Phase 4: Initial Testing of the Vienna IDC Hardware/Software

This phase is expected to last 4-6 months.

-- The detailed progressive commissioning plan for the IDC is reviewed by Working Group B and updated as necessary.

-- The furnishing of specialized workspaces is performed as needed.

-- The procurement plan for the third order of IDC computer hardware and commercial software is put out for tender. Upon delivery to the VIC, the equipment and software is installed and tested.

-- The high-capacity communications link between the prototype IDC and the Vienna IDC is used routinely for providing IMS data to the Vienna IDC computers.

-- The IDC staff cooperates with the vendor(s) installing the global communications infrastructure on the development and installation of the IDC communications interface. Data from new IMS stations should be received in a test mode at the IDC over the global communications infrastructure.

-- An updated version of the applications software (Release 2) is installed at the Vienna IDC with the assistance of staff from the prototype IDC. Continuous real-time data are forwarded from the prototype IDC over the high-capacity link, and the data processing "pipeline" is established and tested. The system is readied for initial testing of all processes, including interactive analysis, beginning at the start of Phase 5. The staff posted from the prototype IDC staff are available to assist in the operation and to provide on-site training and assistance to the new IDC staff.

-- The Vienna IDC is operated on a regular processing schedule but analysis is only carried out part-time (e.g. 2-3 days/week). This will provide a basis for testing, evaluating and tuning all aspects of the system, as well as providing a testbed for training.

-- The next version of the applications software (Release 3) is prepared and tested at the prototype IDC. This release provides automatic and interactive processing for all technologies, and upgraded versions of event characterization and screening. This software is close to meeting all of the requirements for security and reliability and has all of the functionality as dictated in the Operational Manual. At the end of this phase, this version of the applications software is reviewed by Working Group B prior to installation at the Vienna IDC at the beginning of Phase 5.

-- Applications software is maintained at the IDC.

-- The standard event-screening criteria and procedures are optimized and documented. Initial tests are performed at the IDC, including integration of results from all IMS technologies. Working Group B will evaluate the results of the tests. Modification and improvements will continue. The modified screening software is incorporated into Release 3.

-- A draft IDC test plan for the Validation and Acceptance test is prepared and reviewed by Working Group B. This plan will provide the conditions under which an acceptance test could be conducted, including the availability of IMS data and the global communications infrastructure.

-- Additional monitoring operations staff and technical staff are recruited and hired.

-- The prototype IDC continues the incorporation of IMS data from all four monitoring technologies and ongoing development. The prototype IDC continues operations and testing as required to support the IDC.

-- The Operational Manual for the IDC is prepared to a "near-final" state and is reviewed by Working Group B. It will be important to solidify the operational concepts and procedures by the end of this phase so that the supporting software can be completed for use in the acceptance test.

Phase 5: Full-Scale Testing of the Vienna IDC Hardware/Software

This phase is expected to last 4-6 months.

-- The detailed progressive commissioning plan for the IDC is reviewed by Working Group B and updated as necessary.

-- Initial elements of the global communications infrastructure are in place. Data are received at the Vienna IDC from a number of IMS sites over these links.

-- The high-capacity communications link between the prototype IDC and the Vienna IDC is used as necessary to support the IDC.

-- An updated version of the applications software (Release 3) is installed at the Vienna IDC with the assistance of staff from the prototype IDC. Continuous real-time data are forwarded from the prototype IDC over the high-capacity link, and the automated data processing and analysis system is tested in a full operational environment. The staff from the prototype IDC are available to assist in the operation and to provide on-site training and assistance to the new IDC staff.

-- Formal security measures are in place to prevent external interference or compromise of IDC operations and products.

-- The Vienna IDC is operated full-time (i.e. on a 7-day/week schedule) during full-scale testing, evaluation and tuning. Towards the end of this phase the quality of the output (bulletins, etc.) from the IDC should equal or exceed that of the prototype facility, and raw data and products that were previously provided by the prototype IDC are now distributed by the IDC. Procedures are refined and revised as necessary in the light of accumulated experience.

-- The event-screening criteria and procedures, to be applied in the Validation and Acceptance test, are finalized. Working Group B will review the results from the full-scale testing of the IDC. Procedures are established for continued review and potential modification of the standard event screening-criteria.

-- The final version of the applications software (Release 4) is prepared and tested at the prototype IDC. This release provides automatic and interactive processing for all technologies, and upgraded versions of event characterization and screening. At the end of this phase, this version of the applications software is reviewed by Working Group B prior to installation at the Vienna IDC at the beginning of Phase 6.

-- The final IDC Validation and Acceptance test plan is prepared and reviewed by Working Group B. This plan will provide the conditions under which an acceptance test could be conducted, including the availability of IMS data and the global communications infrastructure.

-- The prototype IDC continues operations and testing to assist the evaluation of the performance of the Vienna IDC on a voluntary basis.

-- Most data should arrive to the IDC over the new GCI.

Phase 6: Validation and Acceptance of the IDC

The duration of this phase will be determined in the Validation and Acceptance test plan. It is expected to last 2-4 months. The activity in this phase will be particularly intensive in that it validates the capability of the IDC systems with a limited staff.

The objective of this phase is to verify and validate the capability of the IDC to meet all requirements. The phase will culminate with CTBTO "acceptance" of the IDC as part of the verification system.

-- An updated version of the applications software (Release 4) is installed at the Vienna IDC.

-- Software management and maintenance procedures are finalized and documentation is nearly complete.

-- Data from many IMS sites are received using the global communications infrastructure.

-- The event screening procedures will be carefully examined and their performance measured during the Validation and Acceptance test. The results will be reviewed by

Working Group B. Work on development and testing of the standard event-screening criteria are completed. The standard event-screening procedures and criteria are incorporated into the IDC Operational Manual.

-- The IDC systems acceptance test plan is executed and the results documented and reviewed with Working Group B.

-- No new Vienna IDC staff are added.

-- The last revisions are made to the Concept of Operations document.

-- The final version of the Operational Manual is prepared and submitted by Working Group B for approval to the Preparatory Commission.

Phase 7: Available for Full CTBTO Operations

The duration of this phase is open due to the uncertainty in the time between completion of the acceptance test of the IDC and entry-into-force of the treaty.

-- All aspects of the IDC system will be maintained and exercised.

-- Staff levels are maintained at the level of the previous phase until about three months prior to entry-into-force when the full complement of staff would be recruited and infrastructure completed to accommodate them.

-- The training program is continued.

-- The prototype IDC ceases operation.

-- The global communications infrastructure is operated and maintained.

Estimated Costs

The total capital investment cost to bring the IDC to full operational capability is about $9 million dollars. There will be a need for an annual capital investment of about $2 million dollars to maintain the IDC system. The annual operational cost when the IDC is fully operational will be about $3-4 million dollars and will require a PTS staff of about 125 people. The cost figures should be updated after additional investigation.

Projected PTS/IDC Staff Requirements

Table 2 provides the projected Vienna IDC staff requirements keyed to the development phases. The plan is based on the best information available today and should be updated and reviewed by the Preparatory Commission.

Standard Event-Screening

The procedures and criteria for event screening are to be progressively developed and elaborated with ongoing and iterative improvement and fine-tuning. The specific development steps are incorporated into the overall initial commissioning plan for the IDC provided above. The results are expected to be reviewed by the Preparatory Commission Working Group B at the end of each phase. The key aspects of a framework for event screening that must be developed, implemented, reviewed and agreed upon are:

-- The explicit forms of the standard event characterization parameters that will be used;
-- Criteria regarding the quality of the event characterization data;
-- The specific screening procedures, decision thresholds and confidence levels that will be utilized to obtain standard event screening results;
-- Calibrations terms to be applied, including treatment of regional variations where applicable;
-- The approach to combine the results from all the monitoring methodologies in the IMS;
-- A metric for measuring degree to which an event is screened;
-- Documentation of the software used for carrying out the standard event screening.

Table 1: Summary of Transition Phases

	1	2	3	4	5	6	7
Phase <> Development Track	Design & Planning/ VIC Remodeling	Establishment of Initial Computer Facilities & Communications Links	Establishment of Initial Operations at the Vienna IDC	Initial Testing of the Vienna IDC Hardware/ Software	Full Scale Testing of Vienna IDC Hardware/Software	Validation and Acceptance of Vienna IDC	Availability of the IDC for Full CTBTO Operations
Facilities and Infrastructure	Requirements for HW/SF established VIC remodelling Commissioning Plan Adopted	Complete most construction First hardware order Start installation	Additional furniture Second computer hardware order	Additional furniture Third hardware order	Facility complete	Facility complete	Regular O&M Final hardware order
Communications	Initial GCI concept Plan GCI procurement Industry survey Tariffs	Link to pIDC install GCI requirements GCI Tender offer prepared and advertised	Tender proposals for GCI evaluated Award GCI contract GCI network management	A few sites via new GCI IDC interface to GCI	Some sites via new GCI	Many sites via new GCI Data and products provided by Vienna IDC.	More sites installed Operate and Maintain Existing Sites
Applications Software	Requirements Plan for transfer Maintainability concept	Evaluate prototype IDC capability Recommend changes	Install Release 1 Testing Modifications requested	Install Release 2 Software Testing & Maintence Request/initiate modifications	Install Release 3 Full-scale test Modifications Acceptance Test plan	Install Release 4 Validation & Accept test	Modify as required
Staffing and training	Requirements & qualifications Hire first staff Training plan & schedule	Hire infrastructure staff Start training Recruitment	Training continues Recruitment	Plan for continuous staff training	Partial staff complement Continuous staff training implemented	Add/rotate/train as needed	Add/rotate/train as needed Recruit final staff
Support from prototype IDC provided on a voluntary basis	Ongoing operation, evaluation & enhancement Planning support Continued training	Ongoing operations and evaluation Prepare software Release 1 Provide documentation and training support	Provide Release 1 Prepare Release 2 Modifications as requested Documentation All data forwarded from pIDC on vol basis	Provide Release 2 Prepare Release 3 Upgrades and modifications as requested by Vienna IDC Most data forwarded from pIDC	Provide Release 3 Prepare Release 4 staff at IDC to assist Support IDC as necessary Data forwarded from pIDC as necessary	Software development complete Support IDC as necessary Software maintenance staff at IDC to assist	
Duration (estimate)	4-6 months, starting April 1, 1997	4-6 months	3-6 months	4-6 months	4-6 months	2 - 4 months	
Vienna IDC Staff	8	20	47	71	85	85	123

Table 2. Staff Requirements

Development Phase → Staff Function ↓	1	2	3	4	5	6	7
Management	3	5	7	8	8	8	12
Infrastructure/Comm.	4	10	16	17	18	18	22
Monitoring Operations	0	3	15	27	37	37	52
Scientific & Tech Methods	1	1	6	15	15	15	25
Customer Service	0	1	3	4	7	7	12
Total	8	20	47	71	85	85	123

Appendix VI

Initial Hardware and Software Procurement Plan for the IDC

Introduction

The hardware required to support the IDC functions are standard commercial equipment - no specialized equipment is needed. The software to perform the IDC functions is a combination of standard commercial products and special-purpose applications software.

Computer Hardware Requirements

The requirements for the IDC hardware are partitioned into development, integration, operations, and administration. The computer system is implemented by four interconnected Local Area Networks (LANs).

Additional details can be found in WGB/ TL 5/Rev.3. The IDC computer hardware infrastructure configuration requirements are listed as follows:

-- Operations LAN to support data acquisition, processing, analysis, archiving and reporting;
-- Integration and Test LAN to support full-scale testing and evaluation of system upgrades and modifications prior to implementation into operations, and to provide 100% redundancy;
-- Development LAN to support develop of applications software, analysis of systems performance and system tuning;
-- Administrative LAN to support the IDC administration computers;
-- Communications Interface and Firewall to support all external communications interfaces. Major elements of this partition must include a high availability, redundant router that interfaces all external network communications with the IDC and a two-stage firewall to isolate the IDC from external tampering.

Computer Software Requirements

The software functions of the IDC are partitioned into eight functional subsystems. Seven of these subsystems include the special-purpose applications software which must be developed specifically for the IDC. One subsystem, Commercial-Off-The-Shelf (COTS) would be purchased directly from commercial software vendors. The IDC computer software infrastructure configuration requirements include the following:

-- Automatic processing software
-- Interactive processing software
-- Distributed processing software
-- Data services software
-- Utilities
-- Shared Libraries
-- Commercial Off-The-Shelf (COTS) Software
-- Configuration Software Data

IDC Computer Infrastructure Procurement

As was described in Appendix V, the procurement and installation of the IDC hardware and software infrastructure are planned to occur in four distinct steps.

The first hardware to be acquired is the minimum necessary to establish the basic IDC infrastructure to enable the first transition of the software to the IDC. Workstations and servers will be provided to support the expected staff of 19 and to support the initiation of the Phase 3 operations.

The second hardware procurement in Phase 3 will continue the infrastructure build up by establishing the four basic local area networks of operations, integration, development, and administration. The third hardware procurement in Phase 4 continues the build-up of the IDC infrastructure to support full-scale testing in Phase 5. The final hardware procurement provides for the acquisition of additional workstation and personal computers to support a fully-staffed IDC of approximately 125 people.

The applications software will be provided, without cost to the Preparatory Commission, drawing upon the applications software developed on an international basis for the GSETT-3 and its continuation. The initial version of the applications software would be provided as "Release 1" and subsequent improvements and upgrades provided as higher numbered releases. A total of 4 such releases are planned. After acceptance of the final applications software, by the Working Group B, maintenance of the applications software would become the responsibility of the PTS.

A detailed acceptance plan will have to be developed for the final acceptance of the hardware and software in the IDC. This plan would include the conditions for starting and concluding such a test.

Steps for the 1997 Hardware/Software Procurement

The computer hardware to be purchased in the 1997 procurement are depicted in Figure 1. The 1997 hardware procurement includes appropriate commercial off-the-shelf (COTS) software. This includes the commercial database management system, operating system, as well as a number of other elements The following steps should be followed to procure the necessary equipment during the Phase 2 development:

- -- Preparation of a solicitation package containing the necessary technical data
- -- Solicitation from qualified bidders
- -- Evaluation of proposals as to technical qualification, cost and selection of vendors
- -- Issuance of contracts for the equipment
- -- Acceptance of delivery and installation at the IDC

Because of the potential lead time for availability and delivery of the equipment, the procurement solicitation package should be prepared by the beginning of Phase 2 (October 1, 1997). The PTS would hold the contract for the delivery of the hardware and commercial software. Standard hardware maintenance services should also be purchased from commercial vendors and administered under the supervision of the IDC. Standard software maintenance services for the commercial software should also be purchased from commercial vendors and administered under the supervision of the IDC.

A hardware configuration compatible with the prototype IDC software would minimize both risk and expense in the transition of the software from the prototype IDC. The solicitation package

should include a requirement that the hardware to be offered is compatible with this software, or alternatively, to document what changes to the software would be necessary and their cost.

The demonstration and evaluation of a new infrastructure could increase the risk of, and substantially delay, the transition, and require a significant software conversion.

Similar considerations must be applied to the software infrastructure, primarily the relational database system. Although the existing applications software has been designed to operate with standard relational database management system interfaces, a change in the RDBMS could necessitate an extended conversion and test and evaluation period.

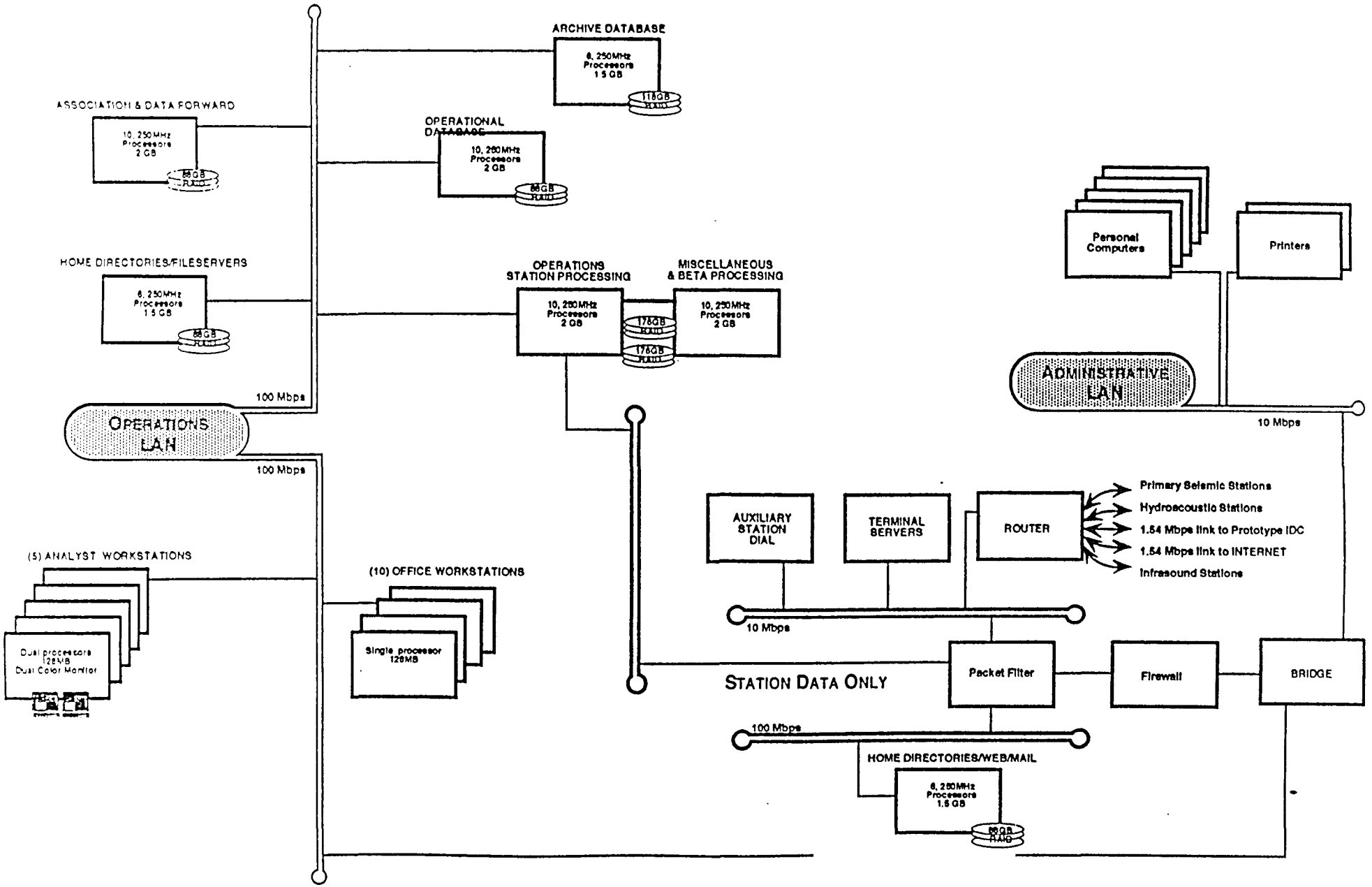

Figure 1. Initial International Da ation (1997 Acq

Appendix VII

Establishment of a Comprehensive Training Program for the International Data Centre

Introduction

In order to carry out its assigned tasks under the Comprehensive Test Ban Treaty, the International Data Centre (IDC) will require the services of a highly-qualified professional staff. A strong training and certification program is necessary to provide the IDC with the right combination of qualifications and experience to support the CTBT requirements. This training must also be continuing to ensure the availability of qualified personnel as PTS staff are replaced.

Over 75 staff have worked at the prototype IDC in support of the GSETT-3 during the past three years. About 40 staff have come from countries outside the United States. By the end of 1997, it is estimated that a total of 33 personnel from 18 countries on six continents will have trained at the prototype IDC for periods of six months or more.

Major Job Categories That Will Require Specific Training

The IDC training program should focus on providing a capability to perform IDC mission-unique functions -- i.e., those functions that are not widely available from outside sources. Approximately 70-75 specifically trained personnel will be required to staff the IDC fully by Phase 7 in the progressive IDC development plan. The major job categories at the IDC that will require very specific training include:

-- Monitoring Operations (IMS data analysts, data processing operators, quality assurance personnel)
-- Scientific and Technical Methods (including scientific assistants, evaluation, calibration and Customer Service scientists)

Approximately 50 trained personnel will be needed in the Monitoring Operations category, and approximately 25 trained personnel will be needed in the Scientific and Technical Methods and Customer Service category. The training period for IMS data analysts is about six months; for data processing operators it is about twelve months; and for the other training it is about three months.
Specific details on the training requirements by job category are found in WGB/ TL 4 /Rev.3.

To provide sufficient qualified personnel to staff fully the Vienna IDC by the end of Phase 7 of the progressive IDC commissioning plan requires that approximately 20-25 staff in the major job categories described above be trained or available each year.

Training for National Data Centre Personnel

The training and experience at the prototype IDC are relevant to carrying out some of the functions at National Data Centres. In order to assist States Signatories to develop the capability to receive, process and analyze IMS data at National Data Centres, it is recommended that training on IDC operations and technologies which might be applicable for use at NDCs be

included in the future Comprehensive Training Program, in addition to the training provided for IMS operations. Such training should not interfere with the IDC training.

1997 Training Program

Trained personnel in the Monitoring Operations group will be needed in the Vienna IDC during Phase 3 starting about April, 1998. The 1997 training program should be aimed toward supporting this need. Approximately 20 personnel should be trained in the 1997 program. Training would culminate in certification of the trainees as prepared for normal duty at the IDC. A procedure for certification will have to be discussed and developed. Training on the IDC operations for use at NDCs was not envisioned in preparing the Preparatory Commission budget for the IDC in 1997.

The 1997 training program should be implemented in accordance with the steps listed below:

May 16, 1997	1997 IDC training program approved at the second Preparatory Commission meeting
June 1, 1997	Announcement of training opportunities by the PTS to Signatories The announcement would include a description of the training to be provided and the required qualifications of candidates.
July 30, 1997	Final date to receive applications at the PTS Personnel Office Senior PTS staff would designate a "selection committee" to review applications and provide recommendations based on technical qualification and geographic distribution.
August 31, 1997	PTS Personnel Office notifies selected applicants
September 1997	Completion of arrangements with selected applicants The emerging PTS IDC staff would work with the staff of the prototype IDC to formulate a detailed program of training and schedule for completion and certification. The Program is to be presented to the Third PrepCom for approval.
October 1997	Begin training for first group of personnel It is anticipated that the first group of trainees would consist of about ten people. An additional ten trainees would follow.

Proposed Training Program for 1998 and Beyond

The IDC training program for 1998 and beyond would follow the procedures established for the 1997 program.

Appendix VIII

Data authentication

I. Purpose of authentication.

The objective of authentication is to ensure that data received at the IDC from IMS stations truly represent the signals being recorded at the station and that they have not been deleted and replaced by fake data. However, even if these conditions are met, stations can be locally blinded by actions which would artificially increase the natural background at the sites. The resulting signals, although authenticated, would be of little use to the IDC. Furthermore routine IDC analysis of geophysical and radiochemical consistency of station detections over the IMS network can be used as part of the authentication process. The objective is to provide an adequate level of data protection at a reasonable cost.

Authentication technical specifications should avoid a major and costly upgrading or redesigning of the existing stations or a significant cost increase for new stations to be installed. Similarly the authentication system should not unduly complicate the task of maintaining these stations. Specific technical solutions for the authentication system should not impede the use of data recorded at the station for current national tasks conducted either at the stations or at national data centers.

II Requirements.

Authentication at the IMS stations.

Authentication is required for each data stream coming from the IMS stations : primary and auxiliary seismic stations, hydrophones and T phase stations, infrasound stations, radionuclide particulate and noble gas stations. Digitizers and authenticators should be in a tamper protected housing. Active tamper detection equipment should be placed on boreholes, enclosures and vaults. All tamper detection signals should be transmitted to the IDC.

Authenticators should use a digital signature, public key/private key scheme in which the private key is known to no one and the public key associated with each private key is distributed at the time of generation of the private key.

Authentication at the IDC.

Routine analysis of the regional consistency of geophysical and radiochemical data is required to enhance detection of fake or missing data. This should be done by checking whether for a given event each station with a high probability of detection has actually detected a signal or not. Also there should be some analysis of isolated detections. For particulate monitoring, analysis of the decay of natural background on filters should be part of the authentication process.

Authentication of commands.

Commands from Host Countries or IDC sent to the stations should be signed. Stations should have the ability to recognize the corresponding signature. The IDC should have a copy of the

command sent to the station. Tamper protection should exist at NDCs and IDC to prevent local or remote activation of commands by non authorized users.

III. Specifications.

The present task should be continued for technical specifications to be adequately addressed with respect to cost effectiveness as expressed in paragraph I and IMS Operational Manuals. Basic parameters to be defined should include authenticator algorithm, software and hardware characteristics, key management issues, and tamper protection devices.

IV. Implementation.

Authentication should first be implemented in new stations. At new stations for which adapted authenticators do not exist, and to be installed in 1997 or 1998, authentication could be installed later on during upgrading. This also applies to stations which already exist.

V. Planning.

In order to develop, plan and implement authentication the following planning is proposed : design concept, establish specification, procure and develop subsystems, start implement on some stations, test, validate, initiate operation. Each one of these 7 phases may take 4 to 6 months.

Appendix IX

Outline for the Operational Manual for the International Data Centre, and Initial Concept of Operations for the International Data Centre

Part A. Outline for the Operational Manual for the International Data Centre

The Operational Manual for the International Data Centre (IDC) must capture clearly the concept for the IDC set forth in the Treaty, and document carefully those IDC functions believed by the States Parties to be most important. The first version of this document must be prepared for approval at the initial session of the Conference of States Parties. The Manual can be changed by the Technical Secretariat, subject to approval by the Executive Council. An IDC documentation library will contain more detailed material that would be referenced by the Manual. A plan and outline to use as a basis for further work on the Operational Manual are presented in paper WGB/ TL 5 /Rev.3.
A comprehensive plan to draft the Operational Manual was agreed:

-- Presentation of the detailed outline (this paper)	Phase 1 (Second PrepCom)
-- Presentation of the initial draft	Phase 2
-- Presentation of an updated draft	Phase 3
-- Presentation of the "near-final" draft	Phase 4
-- Presentation of the final version	Phase 6

The outline recommended for the Operational Manual is as follows:

Chapter 1. Introduction

Describes the position of the IDC in the CTBT Technical Secretariat, an overview of its main functions, and an overview of the document.

Chapter 2. Principals and Requirements

Describes the guiding principals and requirements for the IDC, expanding upon the Treaty text.

Chapter 3. Products and Services

Describes the content and extent of the IDC products and services required by the Treaty.

3.1 Standard Products, which include those products that the IDC provides on a routine basis, every day of the year. These products would include Integrated List of Signal Detections, Event Lists and Bulletins, Standard Screened Event Bulletins, and Executive Summaries.

3.2 Standard Services, which include those services that the IDC provides on a routine basis, every day of the year. Such services would include Data Collection, Authentication, Quality Control and Archiving; System Monitoring; Product Selection; and Product Dissemination.

3.3 Services Requested by a State Party or the CTBTO would include Special Data Management, Special Analyses, National Screened Event Bulletins and Technical Assistance.

Chapter 4. Operations and Procedures

Describes, in general, how the products and services of Chapter 3, as well as the supporting functions, are provided by the IDC.

4.1 Standard Products, including procedures for automatic event detection, location and characterization, analyst review and screening based on the seismic, hydroacoustic, infrasound and radionuclide data to produce the standard products.

4.2 Standard Services, including procedures for providing standard services, most of which can be provided in an automated manner by the IDC.

4.3 Services Requested by a State Party or the CTBTO, including procedures that could require significant human labor, and carry significant cost implications. Clear procedures for prioritizing and processing requests must be included.

4.4 Supporting Operations, including procedures for operation, maintenance, improvement and configuration control of hardware, software, communications, and documentation.

Chapter 5. Organization and Architecture
Provides a general overview of the organization, facilities, hardware and software infrastructure and system integrity mechanisms of the IDC.

Bibliography
Lists all documents referenced in the Operational Manual.

Possible Appendixes
Some details of the IDC operations may be so critical to States Parties that they should be described within Appendixes to the Manual. Procedures will have to be developed with regard to changes of the Appendixes or to the details contained therein. There will need to be consultations with Working Group A to determine the status of the annexes with respect to the Manual itself.

Part B. Initial Concept of Operations for the International Data Centre
A draft document on the IDC Concept of Operations (WGB/ TL 20 / Rev.1) was prepared by the Task Leader and introduced to Working Group B. However, there was no opportunity to develop further this document at this meeting. Comments on this paper will be accepted in preparation for further discussion and development of the Concept for Operations at the Working Group B meeting to be scheduled before the start of the Third meeting of the Preparatory Commission.

Appendix X

IMS stations specifications

Introduction

The IMS stations specifications are based on the Treaty Text and on reports by the Expert Groups of the Ad Hoc Committee in 1995 (e.g. CD/NTB/WP.283, CD/NTB/WP.269 and CD/NTB/WP.224).
These specifications are defined for the four required technologies : seismics (primary and auxiliary), infrasound, hydroacoustics (T-phase and hydrophones) and radionuclide (particulate and noble gas).

I. General requirements

1. Environmental specifications such as temperature range of operation, or down time are standard values. They might be adapted for specific sites where conditions are extreme (the Arctic region or Antarctica for example).
2. Data availability or timely data availability is computed over a period of one year. It is highly dependant on power failure, lightning and communication reliability.
3. To reach the required availability and limit future maintenance costs it is essential that stations be as autonomous and low consuming as possible. This will limit power backing equipment. Solar power should be preferred when possible. Stations should be hardened against lightning.
4. When indoors, systems requiring no or limited ambient room temperature control should be preferred.
5. Field communication equipment is part of the station. It should also comply with the above requirements.
6. Surveys should be conducted to ensure that siting does not alter station operational characteristics.
7. There should be some level of protection against physical damage to the field equipment.
8. New stations should comply with specifications. Existing stations should be upgraded to meet specifications. Planning of upgrading should be adapted to budget.
9. Certification procedures for compliance of station with requirements will have to be defined.

II. Minimum requirements for station specifications

Table 3. Specifications for primary and auxiliary seismic stations

Characteristics	**Minimum Requirements**
Sensor type	seismometer
Station type	3C or array
Position (with respect to ground level)	Borehole or vault
3 C Pass Band [1]	SP: 0.5 - 16 Hz + LP : 0.02 - 1 Hz or BB : 0.02 - 16 Hz
Sensor response	flat to velocity or acceleration over the pass band
Array Pass Band	(SP : 0.5 - 16 Hz LP : 0.02 - 1Hz) [2]
Number of sensors for new arrays[3]	9 SP (1C) + (1 SP (3C) + 1 LP (3C)) [4]
Seismometer noise	≤ 10 dB below minimum-earth noise at the site over the pass band
Calibration	within 5 % in amplitude and 5° in phase over the pass band
Sampling rate [1]	≥ 40 samples/s[5] LP : ≥ 4 samples/s
Resolution	18 dB below the minimum local seismic noise
System Noise	≤ 10 dB below the noise of the seismometer over the pass band
Dynamic range	≥120 dB
Absolute timing accuracy	≤ 10 ms
Relative timing accuracy	≤ 1ms between array elements
Operation temperature (° C)	-10° C to 45 °C [6]
State of health	Status to be transmitted to the IDC : clock, calibration, vault and/or borehole status, telemetry
Delay in transmission to IDC	≤ 5 min
Data frame length	SP : ≤ 10 s ; LP ≤:30s
Buffer at station or at NDC [7]	≥ 7 days
Data availability	≥ 98 %
Timely data availability	≥ 97 %
Mission capable arrays	≥ 80 % of the elements should be operational

1 For existing GTSN stations upgrading will need further consideration.
2 For 1C element of teleseismic arrays, the upper limit is 8 Hz.
3 In case of noisy sites or when increased capability is required number of sensors could be increased.
4 Can be achieved by a single Broad Band instrument.
5 This applies to 3C and regional arrays. For existing teleseismic arrays, 40 samples/s are necessary for 3C but 20 samples/s are suitable for other sensors
6 Temperature range to be adapted for some specific sites
7 Procedure for buffering to ensure minimum loss of data and single point failure should be addressed in the IMS Operation Manual.

Precision on station location	≤ 100 m absolute for stations (WGS84) ≤ 1 m relative for arrays elevation above sea level ≤ 20 m
Seismometer orientation	≤ 3°
Data format	GSE format
Data transmission	primary : continuous auxiliary : segmented

Data from auxiliary stations are essential for the IDC to achieve the required location precision for seismic events.
For existing auxiliary stations the minimum requirement for certification as an IMS facility is a 90 % data availability. Existing auxiliary stations will be upgraded over some period of time. When not otherwise specified in the above table upgraded or new auxiliary stations should comply with technical requirements adopted for primary stations in terms of operational characteristics. Overall auxiliary station reliability should match as closely as possible those of the primary stations.
When auxiliary stations have a dual use, priority access to data, status monitoring and command of the station should be given to CTBTO / IDC. This should be firmly established by National Authorities and accounted for in terms of communication field equipment.

Table 4. Specifications for hydroacoustic stations

T-Phase stations

T-phase stations are seismic stations specifically equipped to detect waves from underwater explosions. Data are continuously transmitted to IDC. Therefore their specifications are identical to that of primary stations except for some parameters listed below.

Characteristics	**Minimum Requirements**
Pass-band	0.5 - 20 Hz
Type	Minimum of one vertical component.
Sampling rate	≥ 50 samples per second

Hydrophones

Characteristics	**Minimum Requirements**
Sensor type	Hydrophone with wet end digitiser
Band Pass	1 – 100 Hz
Sensor Response	flat to pressure over the pass band
Number of sensors	1 operational sensor with 2 backup sensors per cable
Sensors location	in the SOFAR channel
Location precision	≤ 500 m
Number of cables	2 at a site when necessary to prevent local blockage
System noise	≤ 10 dB below Urick's deep ocean low noise curve
Calibration	within 1 dB no phase requirements
Sampling rate	≥ 240 samples/s
Timing accuracy	≤ 10 ms
Delay in transmission to IDC	≤ 5 min
State of health	Status to be transmitted to the IDC : hydrophone, clock, calibration, telemetry
Data availability	≥ 98 %
Timely data availability	≥ 97 %
Sensitivity	≤ 60 dB /μPa (one Hz band) ≤ 81 dB /μPa (wide band))
Dynamic range	120 dB
Data transmission	continuous
Data format	GSE format
Data frame length	≤ 10s
Buffer at dry end	≥ 7 days
MTBF for wet end equipment	20 years (to be confirmed)

Table 5. Specifications for Infrasound stations

Characteristics	**Minimum Requirements**
Sensor type	microbarograph
Number of sensors	4 element array[8]
Geometry	triangle with a component at the centre
Spacing	triangle basis : 1 to 3 km[9]
Station location accuracy	≤ 100 m
Relative sensor location	≤ 1 m
Measured parameter	absolute[10] or differential pressure
Pass-band	0.02 - 4 Hz
Sensor response	flat to pressure over the pass band
Sensor noise	≤18 dB below minimum acoustic noise[11]
Calibration	≤ 5 % in absolute amplitude[12]
State of health	status data transmitted to IDC
Sampling rate	≥ 10 samples per second
Resolution	≥ 1 count/1 mPa
Dynamic range	≥108 dB
Timing accuracy	≤ 1 ms
Standard temperature range	-10 °C to 45 °C[13]
Buffer at station or at NDC	≥ 7 days
Data format	GSE format
Data frame length	≤ 30 s
Data transmission	continuous
Data availability	≥ 98%
Timely data availability	≥ 97%
Mission capable array	≥ 3 elements operational
Acoustic filtering	noise reduction pipes (site dependent)
Auxiliary data	meteorological data[14]

8 In case of noisy sites or when increased capability is required number of components could be increased.

9 3 km is the recommended spacing

10 Used for daily state of health.

11 Minimum noise level at 1 Hz : ~ 5mPa.

12 Periodicity : once per year (minimum).

13 Temperature range to be adapted for some specific sites.

14 Once per minute.

Table 6. Specifications for Radionuclide stations

Particulate monitoring

Characteristics	**Minimum requirements**
System	manual or automated
Air flow	500 m^3/h
Collection time [15]	24 h
Decay time[16]	≤ 24 h
Measurement time [17]	≥ 20 h
Time before reporting	≤ 3 days
Reporting frequency	Daily
Filter	Adequate composition for compaction, dissolution and analysis
Particulate collection efficiency	for filter : ≥ 80 % at ∅ = 0.2 µm global [18]: ≥ 60 % at ∅ = 10 µm
Measurement mode	HP Ge High resolution gamma spectrometry
HP Ge relative efficiency	≥ 40 %
HP Ge resolution	< 2.5 keV at 1332 keV
Base line sensitivity [19 20]	10 to 30 µBq/m^3 for 140Ba
Calibration range	88 to 1836 keV
Data format for gamma spectra and auxiliary data	RMS (Radionuclide Monitoring System) format [21]
State of health	status data transmitted to IDC
Communication	two-way
Auxiliary data	meteorological data flow rate measurement every 10 minutes
Data availability	≥ 95 %
Down time [22]	≤ 7 consecutive days ≤ 15 days annually

15 Time specifications allow for an uncertainty of 10 %, except for the reporting time parameter.

16 This value can be reduced, down to a minimum of 6 hours, if a suspicious event is detected by other stations or techniques.

17 This value allows for authentication measurements for manual systems.

18 This global value includes the 80% filter efficiency and the collection efficiency of the incoming air circuitry.

19 The upper limit is intended for high background areas.

20 Certification procedures to be defined for baseline sensitivities (a posteriori MDCs) as well as the efficiency. Sample preparation losses should not affect base line sensitivities.

21 This format should make provision for auxiliary data, authentication data and state of health data.

22 Provision should be made for spare parts in particular areas where periodicity of transportation facilities is more than 7 days.

Noble gas monitoring

Characteristics	*Minimum requirements*
Air flow	0.4 m^3/h
Total volume of sample	10 m^3
Collection time	≤ 24 h
Measurement time	≤ 24 h
Time before reporting	≤ 48 h
Reporting frequency	daily
Isotopes measured	^{131m}Xe, ^{133m}Xe, ^{133m}Xe, ^{135m}Xe
Measurement mode [23]	beta-gamma coincidence or high resolution gamma spectrometry
Minimum Detectable Concentration [24]	1 mBq/m^3 for ^{133}Xe
State of health	status data transmitted to IDC
Communication	two-way
Data availability [25]	95 %
Down time [25]	≤ 7 consecutive days ≤ 15 days annually

[23] Calibrations need to be defined.
[24] MDCs for the other isotopes are not defined here since they critically depend on the detection system used.
[25] This is a goal to be reached.

Appendix XI

Plans for taking an inventory

Plans for taking an inventory of existing stations might include the following:

- Determine contact points in organisations responsible for stations through relevant government authorities in host countries. Note that while the other tasks which need to be undertaken to take a station inventory may proceed before, or in parallel, establishing formal contacts through host governments is seen as essential to "close the loop" between the PTS, the host government and the organisation responsible for the station. Until this loop is closed, information on some stations will only be able to be obtained on an informal and best efforts basis, particularly when the station is operated by a non government organisation, e.g., a university.

- Obtain required station specifications including requirements for data authentication, against which the inventory will be judged.

- Review information, which has already been obtained from preliminary inventory investigations so as to determine what additional information is required.

- Where unknown, determine from appropriate station operators or co-operating agencies, details of equipment currently installed, availability of spare parts, operational reliability, factors affecting operational reliability and what would be needed to upgrade stations to the required specifications and reliability.

- Obtain factors, which determine condition of a site and thus performance capability, e.g., noise sources, compile these into a list and endeavour to get them filled out by the organisation responsible for each station. Information thus obtained could be supplemented by obtaining data from individual stations and by analysing these data to obtain an appreciation of data quality. Note that this analysed information is available from the FDSN and the GSETT-3 IDC for many seismic stations.

- Determine from host authorities or co-operating organisations if there are plans for upgrading stations; this upgrading being required for national or co-operating agency purposes, If so, determine whether these plans are consistent both in specifications and timing with what is required and what portion of the costs of upgrading will be borne by the host country or co-operating organisation.

- Where appropriate, have technical experts (PTS or contractors?) visit stations to obtain further information.

- Determine list of equipment suppliers, together with specifications of the equipment and its cost and availability (lead time between ordering and delivery).

- Compile lists of what has to be done to upgrade stations to the required specifications, on a station by station basis.

- Establish the technical expertise which is available in host countries in order to establish what portion of an upgrade could be done in-country and at what cost.

- Where outside expertise is required, establish who this outside expertise will be and obtain estimates of what it would cost to perform the required services.

- Establish priorities in upgrading stations so that, when required, information can be provided on when costs would have to be incurred.

Appendix XII

Noble Gas Network

Background

Previous expert group meetings agreed that monitoring of noble gases would be a valuable element of the IMS radionuclide network.The value of the noble gas network would be in the detection of xenon isotopes released from a nuclear explosion carried out as:

an evasive test in the atmosphere under conditions in which rainout of particulates occurred;or

an underwater test in which there was a partial release of gases; or

an underground test in which there was a partial release of gases.

The experts determined that there were many advantages in co-location of the noble gas stations with particulate stations.

The CTBT contains a provision for a noble gas network of 40 stations.

In comparison with the monitoring of radioactive particulates there is a relative lack of technical expertise world-wide. Thus, there may be implications for the suitability of particular locations of noble gas stations and for the initial implementation of the network.

Criteria for the selection of locations for noble gas stations

The choice of locations for stations will depend on several factors:

- the effect on the overall performance of the network and the relative impact on the detection capability in the various testing scenarios;
- availability of infrastructure and potential logistical problems for station installation and operations;
- availability, either locally or nationally, of general technical expertise in radionuclide particulate or noble gas monitoring or, specifically, in noble gas monitoring.

It is likely that the choice of locations for noble gas stations will require some optimisation of these three factors.

Consideration of detection capability and network performance

With respect to the ultimate detection capability of the 40 station network, two possibilities should be considered as acceptable ones:

- to maintain as far as possible, a uniform global performance, acknowledging that the overall performance will be diminished in comparison with an optimised 80 station network;
- to achieve a better relative performance for one, or possibly more, of the scenarios, accepting a diminished detection capability for the other scenario(s).

Each of these possibilities has certain advantages and disadvantages. In the first case, whilst the concept of a uniform global detection capability is maintained, there will be a significantly poorer overall network performance for all release scenarios compared to the full 80 station network.

The second strategy would achieve a detection capability comparable to that of the 80 station network for one particular test scenario; for example, for underground tests, if emphasis is placed on locating stations on continental land masses. In this particular case, the disadvantage would be a significant reduction in the capability to detect tests in oceanic areas.

Infrastructure and logistics

Although factors related to infrastructure and logistics are significant in the siting of particulate stations, they probably will be more critical when choosing specific locations for noble gas stations, given the greater degree of complexity of the equipment. Accessibility to a site may be more important due to the need for more frequent inspection or servicing of equipment during the initial phases of deployment, and the need to assess the impact of local environmental factors on the operation of the equipment.

Operational experience

There is a need to increase the worldwide experience in noble gas monitoring and placing an emphasis on locations where technical and scientific support is readily available may assist in this aspect. In this respect, it may warrant locating some of the 40 stations at, or near to, radionuclide laboratories listed in Table 2B of the Appendix to the Treaty where it is expected that experienced technical staff are available.

It also may be useful to have a wide variety of operating environments to assess the effect on the equipment performance.It is worth considering locating noble gas stations covering a very broad range of operating conditions in terms of background radioactivity (both noble gas and radon levels), climate, and other conditions which may affect its performance. This would enable an assessment of the impact of such factors and, thereby gain operating experience under a variety of conditions. Contrary to this approach in some respects, would be to choose locations where the noble gas background was low, thereby ensuring the most sensitive detection capability in the network.

Possible approaches to the deployment of 40 noble gas stations

In order to define the locations for initial deployment of 40 noble gas stations as required by the Treaty, two approaches have been identified. The first approach would be based on the concept of achieving a optimum global performance.

The second approach would concentrate the detection on continents, but would accept a reduction in the ability for detection in oceanic areas.

These two approaches were discussed in detail by the expert group.

Further expert work on network analyses and modeling studies is required to determine precise station locations.

Appendix XIII

Outline for the Operational Manuals for the IMS

Operational manuals are required for the operation of the stations in each of the four IMS technologies. In the outline of the contents of these manuals below, first we present the section titles that will be common to all of the technologies, and then a list of the contents of operational manuals that will be peculiar to each of the technologies.

DRAFT OUTLINE

1. Overview

- general overview of what this document contains
- general description of the IMS
- description of the role and functions of the IDC
- description of the role of an NDC
- generic description of this station and how it interacts with the NDC and or IDC; this generic description will include the technical specifications that this station is expected to meet

2. Siting and Station Installation

- the rational behind the location of the station at this site
- a description of the site and surroundings that are important to its operation
- specific information on station location

3. Operations

- descriptions of sources of power and procedures for power blackout
- descriptions of key equipment
- calibration procedures
- system monitoring procedures
- specifications on how data should be compiled, recorded and maintained
- descriptions of communications equipment and procedures
- description of conditions under which station would contribute data as part of a Cooperating National Facility
- data surety, including authentication requirements, state of health reporting, data availability, and data access
- quality assurance procedures
- reporting requirements

4. Maintenance

- periodic maintenance routines
- unscheduled maintenance
- troubleshooting

Appendices

- appendices might include definitions of terms, references, key contact list, system security plan, and procedures for changes to the manual.

TECHNOLOGY-SPECIFIC CONTENTS

The following are some of the important technology-specific contents of the IMS Operations Manuals.

1. Seismic

- site survey requirements include seismic noise survey

2. Infrasound

- site survey requirements include local meteorological conditions

3. Hydroacoustic

- site survey requirements for hydrophone stations requires bathymetry modelling
- site survey requirements for T-phase stations requires the determination of the relative contributions of wind and surf noise

4. Radionuclide

- site survey requirements include investigation of meteorological conditions, natural background radioactivity, and sources of local man-made radionuclides
- operational procedures include special procedures related to sample collection, preparation, measurement (if done at station) and shipping
- maintenance procedures include sample verification runs

For the radionuclide IMS system there will be a separate operational manual for the certified radionuclide laboratories which will include sections on:

- description of the role of certified laboratories
- certification requirements
- operational procedures including sample chain of custody, radioanalytical techniques, reporting and sample archiving
- quality assurance requirements

Appendix XIV

Communications

The Global Communications Infrastructure (GCI) has as its fundamental objective to support all data exchange required by the CTBT. It is understood that the GCI will be implemented as a world-wide closed user group network. The underlying data transmission mechanisms can be based on a variety of communication techniques such as satellites (VSAT, INMARSAT, etc.), landlines and undersea cables.

Global Communications Functionality

The GCI must provide the communications infrastructure to enable the International Data Centre (IDC) to collect data from the IMS stations that are positioned around the globe to collect seismological, radionuclide, hydroacoustic, and infrasound data, as well as a variety of ancillary data, such as weather data, state of health information, etc. Additionally the GCI must enable the distribution of IMS data and IDC products to the States Parties, including the provision of technical assistance to receive IMS data at a National Data Center (NDC).

Data Collection: IMS Data to IDC

Data communication connectivity between the IMS monitoring stations and the IDC include

- Continuous transmission of raw data from a total of 121 IMS sites (5 hydroacoustic T-phase sites, 6 hydroacoustic sites, 60 infrasound sites, and 50 primary seismic sites).
- Transmission of spectral data at regular intervals from 80 radionuclide IMS sites and certified laboratories.
- Transfer of requested segments of raw data from 120 auxiliary seismic stations.

Estimates of the rates of data transmission for different station types are given in Table 1 in this **Appendix.**

Data from stations and laboratories should be transmitted to the IDC by the most direct and cost effective means available, including, if necessary, via appropriate communications nodes, as well as via NDC's.

Data Distribution: IMS Data and IDC Products to States Parties

A main function of the GCI is to provide all States Parties reliable, timely, and cost-effective access to all IMS data, raw or processed, all IDC products, and all other IMS data in the archive of the IDC to all States Parties. This fundamental principle of the CTBT makes it necessary to quantify particular GCI capabilities such as reliability and timeliness in order to determine the most viable communication technology solution. The GCI data dissemination function can be broken into two categories:

- Standard Distribution

This is the term used to describe the dissemination of a volume, with an agreed upon upper limit, of IMS data and IDC products that the IDC will provide daily to all StatesParties. Experience from GSETT-3 revealed that retrieval of seismic bulletins, lists of parameter data, and time segments of waveform data from seismic events in general does not exceed 100 MByte/day. This data volume corresponds to 1000 time segments covering an interval of 10 minutes each or to half an hour of raw data from all 29 seismic arrays. It is proposed to set 100 Mbyte/day as an upper limit for data provided by the IDC at no extra cost. However, the final size will depend on cost effectiveness and the requirements of States Parties. The specifications will be provided in the operations manual.

- **Enhanced Distribution**

This is the term used to describe the distribution of a volume of data and IDC products that exceeds the standard dissemination daily volume. Costs associated with enhanced dissemination will be the responsibility of the requesting State Party. An estimate of the required volume of the IDC data products to be distributed to the States Parties is given in Table 2 in the **Supplement.**

The daily volume chosen for the standard and enhanced distribution will affect the design of that part of the communications infrastructure for disseminating data and products. Detailed studies already performed have shown great cost variances for transmitting different amounts of standard distribution volumes. Therefore it is necessary that the states parties specify well in advance the average data volume required from the IDC. This information could be acquired by a questionnaire. The results of the analyses are necessary to tailor specific links of the GCI to the actual needs of the individual States Parties. Other constraints affecting the GCI ability to disseminate data include: geographic locations of States Parties with respect to the IDC, proximity of GCI network to existing/available communication infrastructures, and tariffs/fees in different countries.

Other Relevant Data

An additional category of data and messages to be handled by the GCI results from

- Requests generated at the IDC for auxiliary IMS data
- Requests generated by States Parties for specific IMS data, IDC products, auxiliary IMS data, and/or additional data from another State Party
- Reports associated with overall performance of the IMS, and IDC to States Parties
- Data associated with the monitoring of the IMS, IDC, GCI
- Other relevant data from States Parties and international organizations in accordance with the CTBT

The expected volume for these data types is low and can be classified as non-continuous data. Additionally, importance should be placed on choosing technologies for the GCI that will enable it to flexibly accept future States Parties needs such as: changes to the number of

monitoring stations, changes to the location of monitoring stations, changes to the number of States Parties receiving data and products, and requests for auxiliary data by multiple States Parties.

GCI Requirements

In order to meet the Treaty requirements, candidate communication networks (based on one technology or a combination of technologies) must be assessed for the GCI based on criteria that reflect CTBT objectives, such as:

- Global coverage
- Reliability
- Integrity/Security
- Verifiability
- Timeliness
- Assured delivery
- Adaptability
- Communication tariffs
- Cost-effectiveness

GCI Procurement and Implementation

The GCI architecture should be designed and developed by experienced vendors of global communication systems according to a detailed and accurate description of GCI functions and requirements compiled by the PTS. To include all the information needed by vendors for an offer that covers all the various aspects of the GCI, the invitation for tenders should be made in close cooperation with experienced communications agencies (INTELSAT, INTERSPUTNIK, etc.) and independent communication experts from States Parties.

At the same time a catalog with criteria for evaluating the offers has to be developed. In parallel with the installation and operation of IMS stations and laboratories, as well as the implementation of the IDC, the installation of the GCI systems must follow a well defined common time schedule. During the transition phase from GSETT-3 to the IMS a temporary high speed communication link between the PIDC and the VIDC should be established to enable the phase-in of VIDC operations.

In accordance with the planning, design, construction and operation of the IMS stations and the IDC, the development activities and milestones for the GCI implementation is subdivided in seven phases:

Phase 1 - Design and Planning of GCI
Phase 2 - Establish Initial GCI Facilities
Phase 3 - Establish GCI
Phase 4 - Initial Testing of GCI at Vienna IDC
Phase 5 - Full Scale Testing of GCI
Phase 6 - Validation and Acceptance of GCI
Phase 7 - Availability of GCI for full CTBTO Operations

Details on work within the individual phases are given in the working paper WGB/TL/22/Rev.2.

Supplement to Appendix XIV

Table 1 - Data Rates for Different Station Types

Station Type:	# of Stations:	Sensor Data Rate:	Compressed Data [8]: (w/Overhead)	Data Rate/ Station [9]: (w/Headroom)	Total Data Rate:	Volume per Day: MBytes/day
High Volume Continuous		kbps	kbps	Kbps	kbps	
Seismic Arrays[1]	29	14.4	8.6	13	377	3,883
Hydrophones[2]	6	11.5	6.9	10	62	643
Low Volume Continuous		kbps	kbps	Kbps	kbps	
Seismic 3-C[3]	21	3.8	2.3	3.4	72	742
Infrasound[4]	60	1	0.6	0.9	54	556
T-Phase[5]	5	2.4	1.4	2.2	11	119
High Volume Non-continuous						
Seismic Auxiliary[6](Active Regions)	60	5 MBpd	3 MBpd	n/a	n/a	180
Low Volume Non-continuous		Mbpd	Mbpd			
Seismic Auxiliary[6](Inactive Regions)	60	0.5	0.3	n/a	n/a	18
Radionuclide[7]	80	0.6	0.6	n/a	n/a	48
kbps = kilobits per second, Mbpd = MegaBytes per day						

The assumptions upon which the data requirements are estimated is as follows:

-- 1. Seismic Arrays: for a 12 element (1 channel each) array & 1 3-Component, @ 40 samples/second, 24 bits/sample, see notes 8 & 9 for compression, overhead, and headroom

-- 2. Hydrophones: for 2 channels, @ 240 samples/second, 24 bits/sample, see notes 8 & 9 for compression, overhead, and headroom

-- 3. Seismic 3-C: for a 3-c, @ 40 samples/second, 24 bits/sample, see notes 8 & 9 for compression, overhead, and headroom

-- 4. Infrasound: currently continuous data transmission is planned, however transmission may become non-continuous if deemed more suitable; the nominal continuous data rate will be based on a 4-element array, @ 10 samples/second, 24 bits/sample, see notes 8 & 9 for compression, overhead, and headroom

-- 5. T-phase: for 2 channels @ 50 samples/second, 24 bits/sample, see notes 8 & 9 for compression, overhead, and headroom

-- 6. Seismic Auxiliary: for an average of 50 events/day @ active seismic stations and 5 events/day @ inactive seismic stations, @ 100 kBytes/event, see notes 8 & 9 for compression, overhead, and headroom

-- 7. Radionuclide: 620 kBytes/day/station—data for a 24-hour period is transmitted 1-2 times per day,

-- 8. Compression = 50%, protocol & authentication overhead = 20%

-- 9. Data link headroom (failure recovery & housekeeping) = 50%

Table 2 - IDC Product Data Rates

IDC Product	Daily Volume per State Party:
<u>Standard Distribution</u> • Bulletins (~1 MByte/day) • Lists (~5 MBytes/day) • Segments (~2MBytes/event ≅ half an hour time segment of 10 channels)	**10 -100 MBytes/day**
<u>Enhanced Distribution</u> • Continuous raw data for desired stations • Segments in excess of standard service volumes (e.g. segments for all events)	Up to **10 GBytes/day** **(all raw data);** mostly continuous data; total equivalent to 1 Mbps continuous data

Appendix XV

Part I. Initial Proposals for guidelines and procedures for the conduct an OSI

The main subject areas with additions, agreed by OSI experts on preliminary basis.

Categorisation and prioritisation is established for the further development of guidelines and procedures. Primary customers are indicated.
Category: Adm = Administrative, Leg = Legal, Tech = Technical, Log = Logistical, Pol = Political; the most important aspect is underlined.
Priority: High, Medium, Low
Customer: ISP = Inspected State Party, SP - State Party, Team = Inspection Team, TS = Technical Secretariat, PTS = Provisional Technical Secretariat, DG = Director General

Subject area	Priority	Category	Customer
1. Procedures for implementation of inspection activities and techniques in the conduct of an OSI (Part II, paragraphs 69 and 70 of the Protocol to the Treaty)	High	Tech	Team
2. Procedures for overflights and the use of inspection equipment during overflights *(Part II, paragraphs 71 to 85 of the Protocol to the Treaty)*	High[26]	Tech Adm Leg	Team TS ISP
3. Procedures for collection, handling and analysis of samples as per requirements of the Treaty, including relevant scientific criteria and guidelines *(Part II, paragraphs 97 to 104 of the Protocol to the Treaty)*	High[26]	Tech Leg	Team DG TS ISP
4. Procedures for selection and a list of core and auxiliary inspection equipment and detailed specifications thereof *(Part II, paragraph 36 of the Protocol to the Treaty)*	High	Tech	TS SP PTS
5. Procedures related to the implementation of the inspected States Parties' rights during the OSI *(Article IV, paragraph 57 of the Treaty and Part II, paragraphs 61 and 88 to 90 of the Protocol to the Treaty);*	High[27]	Legal Tech	ISP Team
6. Procedures covering confidentiality issues *(Part II, paragraph 6o (h) of the Protocol to the Treaty)*	High	Legal Adm	Team ISP

[26] The non-technical part of this task do not need to be handled with high priority.
[27] High priority will be realized if any State Signatory presents detail proposals for this procedures

7. Procedures for documentation and sealing to authenticate certification of inspection equipment; and procedures to calibrate, maintain protect and retain custody over the approved inspection equipment, including special procedures for certification and checking the equipment that is not commercially available and/or specifically designed at the request of the Preparatory Commission or CTBTO *(Part II, paragraphs 36 to 40 of the Protocol to the Treaty)*	Medium	Tech Legal Adm	TS SP PTS
8. Procedures for the checking, and if necessary, storing of inspection equipment at the point of entry *(Part II, paragraphs 38 and 51 of the Protocol to the Treaty)*	Medium	Tech Legal[28]	Team ISP
9. Procedures for the certification of laboratories designated to perform different types of OSI-related analysis *(Part II, paragraph 103 of the Protocol to the Treaty)*	Medium	Tech	TS DG PTS
10. Guidelines for preparing the initial inspection plan *(Part II, paragraph 103 of the Protocol to the Treaty)*	Medium	Tech Adm/Log	Team TS
11.Procedures covering OSI team safety and health *(Part II, paragraph 60 (h) of the Protocol to the Treaty)*	Medium	Tech Adm	Team TS,ISP
12. Procedures related to the managing duration, extension and termination of an inspection, including duration of specific activities (as appropriate) *(Article IV, paragraphs 47 to 50 of the Treaty)*	Medium	Tech Legal Adm	Team TS DG ISP
13. Procedures for communications by the inspection team, including for the due approval and certification of communication equipment *(Part II, paragraph 62 of the Protocol to the Treaty)*	Medium	Tech Adm Legal	Team TS ISP
14. Procedures for the training and qualification of inspectors *(Part II, paragraph 25 of the Protocol to the Treaty);*	Medium	Adm/Log (Tech in execution)	TS PTS
15. Formats for OSI team's preliminary findings report *(Part II, paragraph 109 of the Protocol to the Treaty)* and formats and procedures for handling the inspection report and other relevant information *(Article IV, paragraphs 62 to 64 of the Treaty)*	Medium	Adm Legal Tech	Team TS ISP
16. Procedures for storing and handling the OSI data and samples after the completion the inspection *(Article IV, paragraph 14 b) and g) of the Treaty and Part II, paragraphs102 and 103 of the Protocol to the Treaty)*	Medium	Adm Legal Tech	TS

28 In this case legal aspect is particularly important.

17. Formats and communication procedures for OSI requests, mandates and notifications, and procedure for drawing up the inspection mandate *(Part II, paragraphs 41 to 43 of the Protocol to the Treaty)*	Medium	Adm Legal	SP DG TS
18. Procedures for use of non scheduled aircraft and agreement on routings *(Part II, paragraph 35 of the Protocol to the Treaty)*	Medium	Legal Adm Log	TS ISP
19. Procedures of consultation and clarification upon receipt of an on-site inspection request *Article IV, paragraphs 42 to 44 of the Treaty)*	Medium	Legal/Pol	DG TS ISP
20.Procedures covering safety and preservation of the human and natural environment (*Part II, paragraph 60 (h) of the Protocol to the Treaty)*	Low	Tech Legal	Team
21. Procedures and formats for the nomination and designation of inspectors and inspection assistants *(Part II, paragraphs 14 to 22 of the Protocol to the Treaty)*	Low	Adm/Log	TS SP
22. Procedures for the reimbursement of inspected State Party costs associated with OSI (including for the itemization of expenses and of payments) and for other administrative arrangements *(Part II, paragraphs 11 and 12 of the Protocol to the Treaty)*	Low	Adm	TS ISP
23. Procedures and formats for designating, recording and consulting on points of entry *(Part II, paragraphs 32 to 34 of the Protocol to the Treaty)*	Low	Legal/Pol	TS SP
24. Procedures for the inspection of areas beyond the jurisdiction or control of any state *(Part II, paragraphs 105 to 108 of the Protocol to the Treaty)*	Low	Legal/Pol Adm Tech	DG, TS Team SP
25. Procedures for conducting the inspection when inspected area extends to the territory or other place under the jurisdiction or control of more then one State Party *(Part II paragraph 5 of the Protocol to the Treaty)*	Low	Legal/Pol Adm	TS Team ISP
26. Procedures for a situation where beyond the border measurements, outside the inspection area, are needed in connection with ongoing OSI *(no reference)*	Low	Legal/Pol Adm	Team DG, ISP SP
27. Procedures for participation of observers (nomination, acceptance, non-acceptance, and notifications) *(Article IV, paragraph 61 of the Treaty and Part II, paragraphs 63 to 68 of the Protocol to the Treaty)*	Low	Legal	ISP RSP

Part II. OSI PTS Infrastructure
Indicative PTS functions associated with standing and field inspection capabilities

Introduction

In this paper, the Expert Group attempted to establish an initial listing of PTS functions to be further developed by the Expert Group, in order to provide an outline of the corresponding infrastructure required to support the OSI regime.

This first list cannot be exhaustive at this stage and could be modified during subsequent analysis.

This paper does not represent a work program but is intended to draw from the list of guidelines and procedures included in the first part of this Appendix.

The group has considered an initial list of TS functions (after EIF) but did not complete this work in this session.

Each chapter title below includes references to the Treaty (T), Protocol (P) or Prepcom Document (PD, CTBT/MSS/RES/1).

PTS functions to be performed before Entry Into Force T II.D.43 (F); PD 15

During the period of the PrepCom, the PTS will need to evolve into the future organisation and develop the infrastructure required to support the OSI regime.

An initial staffing plan should be drawn up by the PTS, based on recommendations by the PrepCom, in anticipation of performing the functions that the OSI component of the TS ultimately will be required to support. Thus during the period of the PrepCom, the PTS should hire personnel with the skills and experience required to develop the capabilities to perform the functions identified below.

Personnel and Training PD. 15 (b)
- Compile list of potential inspectors for possible training and future nomination
- Implement a training program for potential inspectors to ensure that OSI capabilities will be operational at EIF
- Develop the capability to conduct training, including mock inspections

Equipment and supplies T II.6, P.II.B.36-40; P II.E.69-70,79; PD.15 (a)(ii)(c)
- Select, procure, and test equipment according to procedures and specifications developed by Working Group B.
- Establish a facility for storing, and develop the procedures and the capabilities to certify, test and maintain such equipment
- Identify and take measures for development of unique equipment when appropriate

Laboratories P.II.E.102 (b)(c)(d)
- Prepare initial list of laboratories for certification based on recommendations by States Parties
- Develop and test procedures for certification

Data and documentation *T IV.A.14 (a)(b)(g); T II.D.44; PD.15 (a)(i)*

- Assist with the preparation of the Operations Manual for the approval by the Conference of States Parties
- Establish rules for data documentation and archiving according to procedures developed by the PrepCom
- Establish links between IDC and provisional Operations Centre
- Ensure access to all types of data[29] that could support OSI regime, such as weather data

Data Processing, modelling and interpretingPD.15 (a)(i)

- Select, procure and test software for OSI purposes
- Identify and take measures for development of unique software when appropriate

Logistics and Transportation P.II.B.35

- Create a provisional Operations Centre with appropriate communications
- Develop plans and capabilities for providing the logistical and transportation support needed for inspection teams, equipment, data or samples to be analysed.

Communications *P.II.E.62*

- Implement plans and establish capabilities for communications
- Select, procure and test communications equipment according to procedures and specifications developed by Working Group B

Operational functions PD.15 (a)(i); P.II.B.15

- Identify and hire personnel to perform PTS functions related to OSI
- Identify PTS staff that could serve as inspectors after EIF

[29] The types of data are to be agreed by the Working Group B