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SECOND UNITED NATIONS REGIONAL CARTOGRAPHIC CONFERENCE FOR THE AMERICAS

Mexico City, 3-14 September 1979

Vol. I. - Report of the Conference

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SECOND UNITED NATIONS REGIONAL CARTOGRAPHIC CONFERENCE FOR THE AMERICAS

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Vol. I. - Report of the Conference



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NOTE

Symbols of United Nations documents are composed of capital letters combined with figures. Mention of such a symbol indicates a reference to a United Nations document.

The proceedings of the Second United Nations Regional Cartographic Conference for the Americas, held at Mexico City from 3 to 14 September 1979, are being issued in two volumes, as follows:

Volume I. Report of the Conference

Volume II. Technical papers

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CONTENTS

<u>Chapter</u>	<u>Paragraphs</u>	<u>Page</u>
I. ORGANIZATION OF THE CONFERENCE	1 - 17	1
Terms of reference	1	1
Opening of the Conference	2 - 3	1
Attendance	4	1
Adoption of the rules of procedure	5	1
Officers of the Conference	6 - 7	1
Adoption of the agenda	8 - 9	2
Report on credentials	10	3
Establishment of technical committees	11 - 13	3
Documentation	14	3
Work of the Conference	15 - 16	4
Vote of thanks	17	4
II. PROCEEDINGS OF THE PLENARY MEETINGS	18 - 27	5
Agenda items 1 to 5	18 - 19	5
Technical assistance (including training)	20 - 27	5
III. WORK OF COMMITTEE I: REVIEW OF TECHNIQUES AND RECENT DEVELOPMENTS IN BASIC MAPPING	28 - 55	6
Geodesy and ground control (including satellite)	29 - 44	6
Topographic mapping (including space imagery and conventional photography)	45 - 55	7
IV. WORK OF COMMITTEE II: CADASTRAL SURVEY AND URBAN MAPPING	56 - 66	9
V. WORK OF COMMITTEE III: MAP PREPARATION AND REPRODUCTION, THEMATIC AND SMALL-SCALE MAPPING AND STANDARDIZATION OF GEOGRAPHICAL NAMES	67 - 94	12
Map preparation and reproduction	67 - 74	12
Thematic and small-scale mapping	75 - 85	13
National and regional atlases	86 - 88	14
Standardization of geographical names	89 - 94	15

CONTENTS (continued)

<u>Chapter</u>	<u>Paragraphs</u>	<u>Page</u>
VI. WORK OF COMMITTEE IV: REVIEW OF THE LATEST TECHNIQUES AND RECENT DEVELOPMENTS RELATED TO HYDROGRAPHIC SURVEYING AND NAUTICAL CHARTING	95 - 101	17
VII. RESOLUTIONS ADOPTED BY THE CONFERENCE		19

Annexes

I. LIST OF PARTICIPANTS	32
II. LIST OF DOCUMENTS	50
III. RULES OF PROCEDURE	56
IV. REPORT OF THE UNITED NATIONS GROUP OF EXPERTS ON HYDROGRAPHIC SURVEYING AND NAUTICAL CHARTING	63

I. ORGANIZATION OF THE CONFERENCE

Terms of reference

1. The Second United Nations Regional Cartographic Conference for the Americas was held at Mexico City from 3 to 14 September 1979, in pursuance of Economic and Social Council resolution 2048 (LXII) of 5 May 1977.

Opening of the Conference

2. Opening the Conference, Mr. Miguel de la Madrid, Minister of Programming and Budget of the Government of Mexico, welcomed the delegates and observers and underlined the importance of the work undertaken in the field of cartography by the countries of the region and by the United Nations.

3. On behalf of the Secretary-General of the United Nations, Mr. Chris N. Christopher, Executive Secretary of the Conference, thanked the host Government, Mexico, for its hospitality and opened the proceedings.

Attendance

4. The Conference was attended by 138 representatives from 33 countries, one specialized agency and 6 intergovernmental and international scientific organizations. A list of the participants was circulated in document E/CONF.71/INF/10/Rev.1 and is presented as annex I to the present report.

Adoption of the rules of procedure

5. The Conference unanimously adopted its rules of procedure (E/CONF.71/2) (see annex III to the present report).

Officers of the Conference

6. The Conference elected the following officers:

President:	J. Alberto Villasana (Mexico)
Vice-President:	José Alberto González García (El Salvador)
Second Vice-President:	Ivho Ramón Acuña Tournaben (Uruguay)
Rapporteur:	Jorge Alberto Bavastro (Argentina)

7. Mr. J. Alberto Villasana, the newly elected President of the Conference, delivered an address in which he thanked the delegates for the honour bestowed upon him. He outlined some of the problems faced by the Second Conference and wished the delegates a fruitful session.

Adoption of the agenda

8. The Conference adopted the following agenda:
 1. Adoption of the rules of procedure
 2. Election of officers
 3. Adoption of the agenda
 4. Report on credentials
 5. Establishment of technical committees
 6. Country reports and progress made since the First Conference
 7. Review of the latest techniques and recent development related to:
 - (a) Geodesy and ground control (including satellite)
 - (b) Topographic mapping (including space imagery and conventional photography)
 - (c) Cadastral surveying and urban mapping
 - (d) Hydrographic surveying and nautical charting
 8. Map preparation and reproduction (automated cartography, land information bank, computer mapping)
 9. Thematic and small-scale mapping:
 - (a) Natural resources inventory and geoscientific mapping (including remote-sensing application)
 - (b) Small-scale mapping (including the International Map of the World on the Millionth Scale (IMW), the International Civil Aviation Organization (ICAO) and other international map series)
 - (c) National and regional atlases
 10. Standardization of geographical names
 11. Technical assistance (including training)
 12. Adoption of the report of the Conference.
9. The Conference decided not to discuss item 6 of the agenda as a separate items but to include in the debate of the other relevant items the reports submitted by various countries on the progress made since the First Conference.

Report on credentials

10. After the Credentials Committee of the Conference had examined the credentials of the representatives and found that all were duly accredited, the Conference approved the list of participants (see annex I to the present report).

Establishment of technical committees

11. The Conference established four technical committees and allocated agenda items to them as shown below:

Committee I	item 7 (a) and (b)
Committee II	item 7 (c)
Committee III	items 8, 9 and 10
Committee IV	item 7 (d)

Items 1 to 5 and items 11 and 12 were considered in plenary meetings.

12. The Conference also established a special working group to advise the Executive-Secretary on programmes for future United Nations regional cartographic conferences.

13. The following officers were nominated and subsequently elected to the technical committees:

Committee I

Chairman:	Cristian Alvarez (Chile)
Vice-Chairman:	Tex Ivanoe Turnquest (Bahamas)
Rapporteur:	Rubén Rodríguez (Argentina)

Committee II

Chairman:	Fernando Rubin (Costa Rica)
Vice-Chairman:	Osman Caraballo (Cuba)
Rapporteur:	Raúl Velazco (Mexico)

Committee III

Chairman:	Carlos Lemmerhofer (Guatemala)
Vice-Chairman:	Marcio Nogueira Barbosa (Brazil)
Rapporteur:	José Pérez Oraa (Venezuela)

Committee IV

Chairman:	Walter J. Chappas (United States of America)
Vice-Chairman:	Justus Wekker (Suriname)
Rapporteur:	Gerhard Dohler (Canada)

Documentation

14. A list of the documents submitted to the Conference was circulated in document E/CONF.71/INF/8 and is given as annex II to the present report.

Work of the Conference

15. In addition to its committee meetings, the Conference held five plenary meetings. The work of the Conference is summarized in chapters II-VI below.

16. On the occasion of the hundredth anniversary of the United States Geological Survey, R. Southard, United States of America, presented the Chairman and the United Nations Executive Secretary with a copy of Maps for America, a centennial volume retracing the map production of that agency from 1879 to 1979.

Vote of thanks

17. The Conference, at its closing meeting on 14 September 1979, adopted by acclamation a vote of thanks to the Government of Mexico for the excellent organization of the Second United Nations Regional Cartographic Conference for the Americas and for the hospitality extended to the participants; the Conference also expressed its appreciation to the President and to the officers and staff of the United Nations Secretariat for their hard work.

II. PROCEEDINGS OF THE PLENARY MEETINGS

Agenda items 1 to 5

18. The Conference dealt with agenda items 1 to 5 in plenary meetings.

19. At the final plenary meeting the Conference adopted resolution 1, in which it expressed its appreciation to the Governments of Argentina and Chile for their offers to act as host of the Third United Nations Regional Cartographic Conference for the Americas and recommended that the Economic and Social Council should arrange for the Third Conference to be held in 1984 (for the text of the resolution, see chap. VII below).

Technical assistance (including training)

20. Under agenda item 11, eight documents were submitted to the Conference. Six draft resolutions were considered and adopted as resolutions 2 to 7 (for the texts of the resolutions see chap. VII below).

21. During the Conference discussions were held on the transfer of technology from the developed to the developing countries by means of courses or seminars.

22. The Federal Republic of Germany proposed that the course for a master's degree in geodesy given at the University of Curitiba in Brazil should be upgraded to the doctoral level.

23. Similar offers of courses were made by the representatives of France, Mexico and the Netherlands.

24. The representative of the Philippines emphasized the need to structure training programmes to give priority to courses at the operational and technical levels, which were urgently needed by the developing countries, without necessarily sacrificing the master's and proposed doctoral courses, which were also desirable for professional development and excellence in surveying and mapping.

25. The Conference also discussed the need not only to have technical support but also to obtain economic backing for the conduct of those activities.

26. It was proposed that the technical training offered by European schools should be co-ordinated so as to avoid duplication of effort and ensure better guidance for potential fellowship or scholarship holders.

27. In pursuance of that proposal, arrangements were made to establish a working group consisting of France, the Federal Republic of Germany, Mexico, the Netherlands and the United Kingdom of Great Britain and Northern Ireland to implement the relevant proposals.

III. WORK OF COMMITTEE I: REVIEW OF TECHNIQUES AND RECENT DEVELOPMENTS IN BASIC MAPPING

28. The Committee considered the questions of geodesy and ground control (including satellite) and topographic mapping (including space imagery and conventional photography) under agenda item 7 (a) and (b). The Committee reviewed 27 papers on those questions. Three draft resolutions were submitted to the Conference, which were subsequently adopted as resolutions 8, 9 and 10 (for the texts of the resolutions see chap. VII below).

Geodesy and ground control (including satellite)

29. The United States of America submitted a paper entitled "Trends in geodetic techniques in the United States of America" (E/CONF.71/L.5), which dealt with new techniques ranging from the "total station" instrument, capable of measuring both angles and distance, to the future NAVSTAR Global Positioning System (GPS). The System will be operational in 1986.

30. In a paper entitled "National geodetic control diagrams - past, present and future" (E/CONF.71/L.17), the United States of America described the first surveys performed in New York in 1816 and 1817 and discussed subsequent horizontal and vertical network adjustments (NAD 1927-NGVD 1929) and preparations for obtaining the NAD 83 and NGVD 85 network results.

31. The Federal Republic of Germany, in a paper entitled "Experiences from Doppler positioning" (E/CONF.71/L.20), reviewed the Doppler campaigns conducted in that country in recent years and discussed its participation in various European projects. Concrete results and the conclusions deriving from those experiences were presented.

32. In a paper entitled "The application of the technique of motorized high-precision levelling" (E/CONF.71/L.25), the German Democratic Republic described a departure from traditional levelling techniques, involving the use of three motor vehicles from which levelling operations were carried out more speedily without any loss of precision.

33. France submitted a paper entitled "Navigation system for aerial work" (E/CONF.71/L.32), in which systems requiring a ground infrastructure and autonomous systems, such as the Omega, Trident, Doppler and inertial navigation systems, and their maintenance, were discussed.

34. In a paper entitled "Discussion of advanced techniques and new developments" (E/CONF.71/L.33), France described the work done at the National Geographic Institute of France in space geodesy by Doppler methods, using different techniques and ephemerides in France and other countries, and also considered future prospects.

35. In a paper entitled "Prospect for the formation of a geodetic data bank" (E/CONF.71/L.37), Mexico explained that the reason for setting up a bank containing

data on all geodetic surveys made was to avoid duplication of work and facilitate various activities requiring geodetic data.

36. A solution worked out by Rafael Sosa Torres of the Department of National Territorial Studies (Departamento de Estudios del Territorio Nacional) (DETENAL) for finding geoid heights, components of deviations from the vertical and gravity anomalies was presented in a paper entitled "Geoid heights, deviations from the vertical and gravity anomalies derived from the GEM 10 solution of the geopotential" (E/CONF.71/L.38), submitted by Mexico.

37. France submitted a paper entitled "Measurements of displacements of the Earth's crust - new measurements of the geodetic net established over part of the Afar Depression by the National Geographic Institute of France in 1972/73" (E/CONF.71/L.43), in which the geodetic net for triangulation and levelling in the area was described. Work done before and after a seismic episode was compared and substantial horizontal and vertical movements were reported.

38. In a paper entitled "The use of Doppler positioning by DETENAL" (E/CONF.71/L.47), Mexico described the work done by means of this technique for mapping on the 1:50,000 scale in areas with no geodetic control which are generally wooded and inaccessible.

39. The USSR submitted a paper entitled "Topography, geodesy and cartography in the USSR" (E/CONF.71/L.57), describing the geodetic work done in the past few years to meet the needs of the national economy, in particular detail for certain areas.

40. In a paper entitled "Principal requirements to the geodetic networks for prognostic observations" (E/CONF.71/L.58), the USSR analysed the methods and precision of the networks needed for earthquake forecasting.

41. In its national report (E/CONF.71/L.64), Argentina discussed the geodetic and cartographic activities carried out in past years and future projects, mentioning the observance in 1979 of the first centenary of its Military Geographic Institute.

42. Spain, in a paper entitled "Recent advances in the new Spanish geodetic network" (E/CONF.71/L.73), reported on major developments in recent years, with emphasis on a standard base for electronic distance measuring (EDM) and participation in various European geodesy and satellite geodesy projects.

43. Argentina gave an account of its experience with high-precision measurements required for studies related to movements of the earth's crust and geodetic studies used in the prediction of earthquakes (E/CONF.71/L.81).

44. Canada submitted a paper entitled "The continuation of inertial and Doppler systems for secondary surveys" (E/CONF.71/L.91), which presented the latest results and performance achieved with this new technique.

Topographic mapping (including space imagery
and conventional photography)

45. The paper entitled "Orthophoto mapping in Sweden" (E/CONF.71/L.11) contained an analysis of the advantages of land-use map production using a computer-

controlled orthoprojector and discussed the need to have access to terrain elevation data with a high density. Examples of applications of large-scale mapping as a basis for thematic maps were presented.

46. In a paper on LANDSAT mapping and charting (E/CONF.71/L.13), the United States of America pointed out the radiometric advantages and the near-orthographic quality of the image, specifying its planimetric uses.

47. Methods for obtaining orthophotographic images from aerial photographs were analysed in a paper submitted by the United States of America on technology of image mapping (E/CONF.71/L.14). The development of new techniques, starting with LANDSAT I in 1972, and the equipment used, were also discussed.

48. The United States submitted a paper entitled "Joint topographic/bathymetric mapping in the United States of America" (E/CONF.71/L.15), in which it described the advantages of applying topo-bathymetric techniques as a means of developing the natural resources of the sea in coastal zones.

49. In a paper entitled "Status of stereo-orthophotography" (E/CONF.71/L.29), submitted by France, the possibilities of that technique were considered, including simple stereoscopic photo-interpretation, road projects, the environment, geomorphology, town and country planning and the like, as well as links with data banks.

50. The high resolution of images and the stereoscopic coverage of large areas of terrain and applications for the compilation and revision of topographic maps were discussed in a paper entitled "Terrain models and geometric correction of 'SPOT' images" (E/CONF.71/L.30), submitted by France.

51. Cuba presented a paper entitled "The importance of photographic control in topographic mapping" (E/CONF.71/L.50), in which basic aspects of the planning of technical projects and the content of such projects were discussed.

52. A paper entitled "Topographic mapping systems for developing countries: Mexico's experience over the past decade" (E/CONF.71/L.51) dealt with the problem of the need for a topographic information system for the purpose of making an inventory of natural resources. The inventory is considered essential for national development.

53. In "The potential of space imagery to solve cartographic problems" (E/CONF.71/L.54), the Federal Republic of Germany stressed the urgent need for cartographic coverage using space imagery, even in areas already mapped where updating is required.

54. "The topographic mapping of Suriname" (E/CONF.71/L.83) described the various tasks performed for the preparation of topographic maps at the scale of 1:50,000.

55. The demand for maps, mainly in Africa and South America, were discussed in a paper entitled "Rationalization of map production and map revision with modern automated and digitized photogrammetric instruments and technologies" (E/CONF.71/L.89, submitted by the German Democratic Republic. It was pointed out that the mapping process could only be accomplished slowly by conventional methods. The possibilities of satellite photographs for the production of maps at the scale of 1:50,000 were emphasized.

IV. WORK OF COMMITTEE II: CADASTRAL SURVEY AND URBAN MAPPING

56. The Committee considered the question of cadastral survey and urban mapping under agenda item 7 (c). Ten documents were discussed under the item and one draft resolution was submitted to the Conference, which was adopted as resolution 11 (for the text of the resolution see chap. VII below).

57. The United States, in a paper entitled "Cadastral survey and its cartographic portrayal in the United States of America" (E/CONF.71/L.7), reported that the Bureau of Land Management had been responsible for the cadastral survey of all public lands in the United States since 20 May 1785. It was reported that work was continuing on the basis of the original technical structure, and no other survey scheme had actually been considered to replace the rectangular cadastral survey. The primary unit of the public land survey system is the township - a square, six miles on each side, divided into 36 sections of one square mile each. Each of these is in turn divided into rectangular units. The basic public land survey records are the survey plat, the survey notes, the tract books, the serial registers and the patent records. At the present time these cartographic tasks have been incorporated into computerized systems at a scale of 1:24,000 and have proved to be fundamental in planning land use as a basic resource for development.

58. In a paper entitled "Land registration projects in the Caribbean region" (E/CONF.71/L.9), the United Kingdom noted that land was a fundamental asset in planning and managing economic and social development. The paper described the systematic introduction of legal cadastres in certain countries of the Caribbean area. It emphasized the need to use simple and inexpensive survey methods since most of the advantages arising from the introduction of the system arose from improved land registration procedures.

59. In a paper entitled "Production of planning documents for urban areas" (E/CONF.71/L.21), the Federal Republic of Germany summarized its extensive experience in that field and noted the need for producing series of maps for urban areas for administrative, economic and planning purposes, as reflected in the multipurpose nature of cadastral cartography projects. The paper recommended the production of basic maps on the 1:5,000 scale from which maps might be elaborated at larger or smaller scales for specific purposes through photographic procedures. Integral projection systems were recommended, and it was suggested that the base map should use a dimensionally stable transparent drawing base conducive to simple and economical reproduction. Basic urban maps, in addition to their systems of co-ordinates, should contain topography so that maximum use might be derived from the information provided. Furthermore, they should be updated periodically to increase their usefulness. The paper noted the economic advantages of photogrammetric survey for the production of urban maps over traditional topographic survey systems and the use of orthophotography for revising and updating information.

60. The Federal Republic of Germany, in a paper entitled "Establishment and maintenance of land-related information for a multipurpose cadastre based on EDP" (E/CONF.71/L.23), stated that the land register in that country was based on

cadastral information that recorded and described all landed property, property-related rights, buildings and current land uses. It is a multiple-purpose register, and as such provides data for various legal, administrative, planning, statistical and economic needs. It had assumed a key role in the field of property-related activities. Both with regard to the elaboration of cadastral property maps and updating operations that affect or modify land registration, these activities can be carried out only by specially authorized public or private surveyors or land registration authorities. All technical activities are structured on computerized area and co-ordinate calculation systems that constitute a land data bank based essentially on cadastral information. Cadastral and registration data are fed into the computerized system, within which a link between the two is established.

61. France, in a technical paper prepared by the National Geographic Institute entitled "GITAN system and urban data control" (E/CONF.71/L.28), described a modular information system for use by most computerized equipment, the system being structured on the basis of translation of cartographic data at the 1:25,000 scale into a digital and letter description, enabling data to be analysed with great flexibility. The system is particularly suitable for urban information on land tenure and use and for reproduction by data plotters on different scales and in various formats, thereby providing a flexible method of analysis and graphic, digital and literal representation.

62. Mexico submitted a paper entitled "Multipurpose cadastral information system in the state of Zacatecas" (E/CONF.71/L.41) describing how the Government of the State of Zacatecas, through its Cadastral and Public Registry Office, designed and began to implement this system, which illustrates the use of photogrammetry and the methods employed, with cartographic material supplied by DETENAL, so as to enhance the effectiveness of the project and avoid duplication of effort in basic cartography and a waste of resources, which have been channelled into improving specific cadastral information. The paper stressed the use of orthophotogrammetric techniques and the excellent indicators obtained in the collection of field data in predesigned formats to be used by local personnel and for future incorporation in computerized systems, thus facilitating the establishment and operation of a data bank on land use and tenure with fiscal and registration applications.

63. Cuba submitted a paper describing the experience gained in the various techniques used in determining controls by photogrammetric methods for the preparation of plans for various road projects (E/CONF.71/L.49).

64. The Federal Republic of Germany submitted a paper entitled "Education and training in surveying, mapping and cadastral assistance in regard to the possibilities of the Federal Republic of Germany" (E/CONF.71/L.60), in which the view was expressed that the cadastre was the most important prerequisite for the planning and programming of political, social, economic and educational development. The Federal Republic of Germany has a programme for the provision of training and educational scholarships and fellowships for foreign students wishing to acquire cadastral skills. High-level experts run these programmes and organize short courses and workshops. These are the most practical means of imparting cadastral and administrative skills. Each workshop covers a period of two to three weeks. At present the Federal Republic of Germany is supporting, by means of technical assistance, a project involving the College of Surveying and Cadastral Science in Costa Rica, assisting surveys and mapping in Brazil, and

integrating experts in Ecuador for cadastral work. It is also considering the possibility of establishing an institution or expanding an existing institution for education and training in multiple-use cadastral work, which could be useful for the institution of land-information systems.

65. Spain submitted a paper entitled "Mechanizations of the topographic and property-boundary cadastre" (E/CONF.71/L.70), reporting that the cadastre in Spain was at an advanced stage of organization, its main feature being its suitability for multiple applications. Maps are being drawn up by the National Geographic Institute on several scales. This cadastre serves registration and cadastral purposes and also has land-use functions. The combination of these functions is automated and the cadastre has two archives - one of which is an index of all the points determining each plot by co-ordinates, while the other contains planimetric details and details of the physical environment. Spain is planning to use orthophoto techniques for the establishment of the rural cadastre.

66. In a paper entitled "Cadastral surveying and mapping" (E/CONF.71/L.85), Suriname reported that economic development was stagnating in some parts of the country, partly owing to a lack of adequate knowledge of land tenure conditions and of relevant cadastral information. The cadastral project which is now being studied will cover planning aspects and the regulation of public services, and the cadastre will be set up by means of photogrammetric techniques and techniques for the densification of the national primary geodetic network. The paper stated that maps of urban areas would be made on the scale 1:1,000 and that maps of rural areas would be on the scale 1:1,200 and 1:1,250. Lastly, Suriname expressed interest in extending the cadastral programme to cover administrative practices and regulations for the continuous updating of cadastral information.

V. WORK OF COMMITTEE III: MAP PREPARATION AND REPRODUCTION,
THEMATIC AND SMALL-SCALE MAPPING AND STANDARDIZATION OF
GEOGRAPHICAL NAMES

67. The Committee considered the question of map preparation and reproduction (automated cartography, land information bank, computer mapping) under agenda item 8; the questions of thematic and small-scale mapping, natural resources inventory and geoscientific mapping (including remote sensing application), small-scale mapping (including the International Map of the World on the Millionth Scale (IMW), the International Civil Aviation Organization (ICAO) and other international map series) and national and regional atlases under agenda item 9 (a), (b) and (c); and the question of the standardization of geographical names under agenda item 10. Twelve papers were submitted under agenda item 8, 13 under agenda item 9, and six under agenda item 10. Eight draft resolutions were submitted to the Conference and adopted as resolutions 12 to 19 (for the texts of the resolutions, see chap. VII below).

Map preparation and reproduction

68. A paper submitted by the United States, entitled "Automatic cartographic development in the United States of America" (E/CONF.71/L.6), reported that the use of computer-aided equipment could reduce or eliminate labour-intensive steps in primary map production. The economical establishment of digital cartographic data banks is one of the most challenging goals at the present time.

69. In a paper entitled "A geographic information system for land-use data in the United States of America" (E/CONF.71/L.12), attention was drawn to the increasingly urgent need to facilitate the rational planning, management and utilization of natural resources and the environment in the United States. It was reported that various public and private organizations concerned with the planning and management of the region's environmental and natural resources had been deeply involved in the development of such systems.

70. The United States, in a paper entitled "Joint topographic/bathymetric mapping in the United States of America" (E/CONF.71/L.15), noted that more than ever before that country was concentrating its scientific and engineering capabilities on the development of the ocean's natural resources and on finding ways to preserve or reduce the impact of off-shore activities on its coastal states.

71. A paper entitled "The Ordnance Survey topographic database concepts of the 1980s" (E/CONF.71/L.26), submitted by the United Kingdom, reported that the progress achieved in computer technology and in the associated field of digital map production had led to the establishment of a new method for the production of maps by the Ordnance Survey during the 1970s. The priority need for the immediate future was to work out a second-generation production system as a means of achieving the required efficiency.

72. Two papers submitted by Mexico, entitled "Description of a system for geographical data processing" (E/CONF.71/L.39) and "Computerized mapping and geographical information systems" (E/CONF.71/L.40), recommended the use of computer technology to achieve the principal objective of making an inventory of that country's available and potential natural resources and to disseminate the information obtained. The papers provided an ample description of the system proposed.

73. A paper entitled "The Cuban Institute of Geodesy and Cartography (ICGC) and the new Political and Administrative Division" (E/CONF.71/L.48), discussed the reasons for establishing a new political and administrative division more in keeping with the new conditions created by the far-reaching economic and social changes that had taken place in Cuba. The importance of the new division to cartography and the cadastre was also mentioned.

74. Two papers submitted by Spain, entitled "System of digitization and publication of cartographic bases at the National Geographic Institute of Spain" (E/CONF.71/L.69) and "SIGNA: Geographic information system of the National Geographic Institute" (E/CONF.71/L.71), pointed out that the development of digital techniques, the lower cost of integrated electronic components and the sophistication of graphic peripherals had had a notable influence on the development of cartography and on its current technological trends. Both cartographers and map users must realize the enormous possibilities of the new computer tools available and the advantages of finding solutions and developing cartographic products more in keeping with their demands and needs. A third paper (E/CONF.71/L.72) gave specifications and standards adopted in Spain for cartographic paper used for general purposes.

Thematic and small-scale mapping

75. A paper submitted by Mexico, entitled "Inventory of natural resources as part of a national information system" (E/CONF.71/L.36), contained an analysis of the factors that made the study of natural resources a necessity and also explained the reasons for employing particular methods and a particular form of presentation of the results obtained. The paper also commented briefly on the current status of the inventory in Mexico.

76. A paper entitled "Applications of LANDSAT imagery to the study and cartography of forests" (E/CONF.71/L.44), submitted by France, stressed the use of LANDSAT images in obtaining an objective and synoptic view of a country's forest resources and in detecting damages caused by fire.

77. A paper submitted by France, entitled "The geothematic (E/CONF.71/L.45), pointed out the importance of automatic visualization of statistical data, which was extremely useful in population and agricultural censuses.

78. A paper submitted by France entitled "Remote sensing of fresh-water springs in a marine environment" (E/CONF.71/L.46 and Add.1), discussed the methodology for locating fresh water springs in marine environments through the use of air-borne thermography, photo interpretation, existing maps and terrain reconnaissance, which in numerous cases had made it possible to detect potable water springs in significant quantities.

79. In a paper entitled "Present status of remote sensing work in Cuba" (E/CONF.71/L.52), reference was made to the multispectral surveys carried out under the INTERCOSMOS programme with experimental traverses covering the most typical geographical areas of the country.

80. A paper entitled "Thematic mapping of satellite image data with computers as interpretation material for geoscientists" (E/CONF.71/L.27 and Add.1), submitted by the Federal Republic of Germany, provided an evaluation of a data structure obtained from LANDSAT images, giving as examples the representation of a LANDSAT false colour composite for visual image interpretation, the computation of an edge-enhanced image and the multispectral classification of different types of land use.

81. The USSR, in a paper entitled "Utilization of space photo-images for the national economy" (E/CONF.71/L.59), reported that space images offered a great number of advantages over traditional methods, since expenses were reduced, data could be collected periodically and the use of such images could lead to space-dynamic cartography.

82. In a paper entitled "Thematic maps" (E/CONF.71/L.77) Guatemala reported that the National Geographic Institute had incorporated the use of LANDSAT remote-sensing data in the preparation of thematic maps. An example of visual analysis and digital analysis was provided by means of the LARYS system.

83. The United States of America, in a paper entitled "Minimum safe altitude warning system" (E/CONF.71/L.16), described the MSAW system designed to generate an alert to the air traffic controller when an aircraft descended below a safe altitude for a given area.

84. In a paper entitled "The world map 1:2,500,000 as a basic map for special purpose mapping" (E/CONF.71/L.24) the German Democratic Republic reported that the map had been prepared by the participating socialist countries in a relatively short period of time. The series consists of versatile maps of the physical, political, economic and geographical conditions of the earth.

85. France reported that LANDSAT satellites provided images that could be used for preparing photomaps at various scales up to 1:250,000. In a paper entitled "Use of an image-processing system for small-scale mapping on the basis of space images" (E/CONF.71/L.31), it was explained that by means of an interactive system of image processing it was possible to make geometric corrections, carry out the assembly of several images and produce masks that reduce editing, reproduction and printing operations.

National and regional atlases

86. In a paper entitled "Environmental maps and atlas" (E/CONF.71/L.68), Spain noted that the most characteristic feature of the dynamic environment colour maps was that each colour designated an element of the environment - cultivated areas, deterioration of the earth's surface, water and air pollution, and so forth. The paper explained that the data required for these maps was not easily obtained, and consequently it was not likely that regular use would be made of that type of cartography in the near future. Furthermore, such maps required periodic renewal.

87. In a paper entitled "National Atlas of Suriname" (E/CONF.71/L.82), Suriname noted that the shortage of trained personnel and financial support had made it necessary to postpone the compilation of the atlas. However, funds and personnel were currently available, so that a start could be made. When completed, the atlas would include 35 coloured and black and white maps at scales ranging from 1:5,000,000 to 1:500,000 and covering approximately 11 principal themes.

88. Several countries had prepared national atlases and atlases for specific areas. Some were exhibited as material for consultation, while others were mentioned in reports submitted by the countries. Information on the following publications was provided:

Chile: Atlas Escolar de Chile (1965), prepared for primary and secondary school levels;

Atlas de la República de Chile (1966, 1970 and 1972; new edition in preparation);

Atlas Hidrológico de Chile (1974), stressing current nautical cartography.

Cuba: Atlas Nacional de Cuba (1978), summarizing the country's development over the past 20 years;

Atlas Demográfico de Cuba (1979, first ed.), giving an idea of the present characteristics and future prospects for the population of Cuba by means of maps and charts;

Atlas Escolar de Cuba, published in collaboration with the Ministry of Education for the secondary school level.

Guatemala: Atlas Nacional de Guatemala; Atlas Hidrológico (first edition).

USSR: Geological and Geophysical Atlas of the Indian Ocean (1975);

Atlas of the Regions of the USSR, Showing Medicinal Herb Resources (1976);

Atlas of the Atlantic and Indian Oceans; Small Atlas of the USSR; Atlas of the USSR in the Tenth Five-Year Plan (1978);

Venezuela: Atlas de Venezuela (1969, first ed.);

Atlas de Venezuela (1979, second ed.), with emphasis on various aspects of the country's development.

Standardization of geographical names

89. The report of the United Nations Group of Experts on Geographical Names on the work of its Eighth Session (E/CONF.71/L.10) described in detail the work accomplished by the Group at its eighth session, which was held at United Nations Headquarters from 26 February to 9 March 1979.

90. In a paper entitled "Preparation of a concise gazetteer according to United Nations recommendations by EDP" (E/CONF.71/L.19) it was reported that the first partial edition for a sector (Land of Niedersachsen) in the Federal Republic of Germany, prepared by automatic data processing, had been presented at the Athens Conference. The graphic quality of future editions had been notably improved. Detailed instructions were provided for using the gazetteer.

91. It was pointed out, in a paper entitled "United States participation in international names programs" (E/CONF.71/L.66), that since the First United Nations Regional Cartographic Conference for the Americas, the United States had participated in various United Nations regional and bilateral programmes designed to provide assistance in devising new methods for the standardization of geographical names. Training programmes had been set up to instruct persons from other countries regarding the procedures in use in the United States in this field.

92. A paper entitled "Automated processing of toponyms" (E/CONF.71/L.75) described the results of an experiment that had been carried out, and presented the photocomposition results - lists of toponyms to be used in preparing the plates containing map names and reference indexes. France reported that the cumbersomeness of manual processing of toponyms in cartography had led to the study of the possibility of perfecting an automated processing system.

93. According to a paper entitled "Means of achieving the standardization of geographical names" (E/CONF.71/L.79), submitted by Mexico, confusion and disorder prevailed in the matter of geographical names. In view of the importance of the problem in the elaboration of useful cartography, it was considered essential to draw on standardized geographical names that would make it possible to locate, differentiate and delimit geographical features correctly.

94. In a paper entitled "Standardization of toponymy in Suriname (E/CONF.71/L.84), it was reported that the Surinamese Cartographic Committee, established in May 1979, had made an inventory of names on maps at various scales in co-operation with the district authorities. In September 1974, the First Seminar on the Standardization of Geographical Names had been held and had established the National Names Authority.

VI. WORK OF COMMITTEE IV: REVIEW OF THE LATEST TECHNIQUES
AND RECENT DEVELOPMENTS RELATED TO HYDROGRAPHIC
SURVEYING AND NAUTICAL CHARTING

95. The Committee considered the question of hydrographic surveying and nautical charting under agenda item 7(d). Ten papers were discussed under the item and two draft resolutions were submitted to the Conference and adopted as resolutions 20 and 21 (for the texts of the resolutions see chap. VII below).

96. The report of the Group of Experts on Hydrographic Surveying and Nautical Charting (E/CONF.71/L.1) was introduced by Dudley Russom, delegate from the United Kingdom and member of the Group of Experts. The paper emphasized the deficiencies in existing hydrographic surveys and in availability of data for use in producing modern charts. A serious deficit in hydrographic surveying and services to meet the needs of the developing countries was noted. Eight important recommendations were made for action to overcome the problem. Countries were urged to join the International Hydrographic Organization and utilize its services, as well as to take advantage of assistance from hydrographic offices with well developed infrastructure in all facets of nautical charting. The full text of the report is presented in annex IV below.

97. The United States of America presented four papers. The first of those, "A report on the adequacy of coastal hydrographic data for charting the Americas" (E/CONF.71/L.2), analysed the surveys used as a basis for existing nautical charts of coastal areas in the context of current requirements by deep-draft ships. The paper pointed out that two thirds of the coastal waters in the Americas were in need of survey, and called on national authorities to further develop hydrographic services to improve the quality of data for the safety of shipping and the management of marine resources and the coastal zone. The second paper, "A review of the bathymetric swath survey system" (E/CONF.71/L.3), discussed a 21-beam sonar sounding array now being evaluated by the National Ocean Survey. The array sounded a swath with a width 2.6 times the depth of water, equivalent to five or six times the bottom coverage given by the single narrow-beam echosounders currently employed. The system was reported to be fully automated, with the necessary correction factors (tide, vessel motion, etc.) interfaced. It was stated that the vertical range capability was between 3 and 610 metres depth and that the maximum horizontal range was 1,200 metres. Depth accuracy was ± 0.3 metres or 0.5 per cent of the depth, whichever was smaller. The system was expected to be operational soon. The third paper, "Airborne laser hydrography" (E/CONF.71/L.4), discussed the development for the Defense Mapping Agency of a scanning-beam pulsed laser system for utilization from a helicopter. Cost-effectiveness and deployment limitations were described, and system configuration given. It was noted that studies to date indicated that depth and location accuracies would meet International Hydrographic Organization standards. Utilization of the helicopter-borne laser sounder to augment conventional ship and sounding launch operations was expected to increase hydrographic data collection by 30 to 40 per cent. The system was scheduled for delivery in 1982. The final United States paper, "Joint topographic/bathymetric mapping in the United States of America" (E/CONF.71/L.15), described efforts by the National Ocean Survey and the United States Geological Survey to provide coastal zone planners and offshore resource developers with better information through a

series of special maps. The new product added bathymetric detail from nautical charts to the standard coastal area topographic mapping sheets at scales of 1:24,000, 1:100,000 and 1:250,000. The history of the programme was given, and a broad range of users noted. It was also reported that the Coastal Mapping Handbook had been published as a primer on mapping for those involved in coastal zone affairs.

98. The USSR introduced a paper entitled "New bathymetric chart of the world ocean" (E/CONF.71/L.56). The chart, in a set of eight sheets, covered an area from 82°N to 75°S latitude and utilized the Mercator projection. The excellent work was a joint effort by cartographers, geomorphologists and others within the Department of Navigation and Oceanography of the Ministry of Defence.

99. "Automatic data acquisition for hydrographic surveys in Spanish waters" (E/CONF.71/L.62) was discussed by Spain. The paper described the efforts of Spain to implement the system of new digital sounding equipment, modern positioning systems and appropriate computer software and hardware currently being utilized very successfully on board two of their survey ships to investigate the 3,500 miles of coastal waters for hydrographic and oceanographic purposes.

100. Canada presented a colour brochure, "The Canadian Hydrographic Service" (E/CONF.71/L.86), which gave an overview of the facilities of that organization. At the same time Canada discussed an addendum to their national report (E/CONF.71/63/Add.1). Existing hydrographic and cartographic training courses and a career programme for hydrographers were described, and it was stated that a career programme for cartographers was planned. The report noted that data acquisition would outstrip the capabilities of marine cartography unless good planning and co-ordination existed in all the work phases of nautical chart construction; application of the computer-assisted automated cartographic system used by the Canadian Hydrographic Service was outlined.

101. Ten nations reported on hydrographic matters during the presentation of national reports. The utilization of LANDSAT high-gain imagery for the revision of nautical charts, described by the United States in their paper "LANDSAT mapping and charting by the United States of America" (E/CONF.71/L.13) and noted in their national report (E/CONF.71/L.8), was discussed. Nautical charting matters were elaborated on by those nations having hydrographic services.

VII. RESOLUTIONS ADOPTED BY THE CONFERENCE

List of resolutions

1. Third United Nations Regional Cartographic Conference for the Americas
2. Education and training
3. Organization of educational institutes
4. International Training Committee of the Pan-American Institute of Geography and History
5. Technical workshops
6. Exchange of information
7. Services of trained personnel
8. Satellite geodesy
9. Inertial geodesy
10. Remote sensing
11. Cadastral surveying and mapping
12. Automated cartography
13. Information on technology for the inventory of natural resources
14. Development planning
15. Directory of thematic mapping institutions
16. Census cartography
17. Aeronautical charts
18. Atlases
19. Geographical names
20. Technical assistance in hydrographic surveying and nautical charting
21. Exploitation of space imagery for nautical charting
22. Vote of thanks

Texts of resolutions

1. Third United Nations Regional Cartographic Conference for the Americas

The Conference,

Considering that the United Nations regional cartographic conferences for the Americas have normally been scheduled to take place at three-year intervals,

Bearing in mind that the Commission on Cartography of the Pan-American Institute of Geography and History holds its meetings every four years, the next being scheduled for 1982,

I

1. Recommends that the Third United Nations Regional Cartographic Conference for the Americas should be held in 1984;

2. Further recommends that after 1984 the United Nations regional cartographic conferences for the Americas should be held every four years;

II

1. Expresses its appreciation to the Governments of Argentina and Chile for their offers to act as host country for the Third United Nations Regional Cartographic Conference for the Americas;

2. Recommends that the Economic and Social Council should arrange for the Third United Nations Regional Cartographic Conference for the Americas to be held in 1984.

14 September 1979

2. Education and training

The Conference,

Recognizing that the Department of Technical Co-operation for Development of the United Nations Secretariat is publishing a report on education and training of manpower in surveying and mapping,

Recommends keeping the information up-dated by making revisions from conference to conference, and that future reports, in addition to including the names of training institutes, the subject-matter of the courses and the levels of education required and offered, should specify the addresses of those institutions and the languages in which the courses are conducted.

14 September 1979

3. Organization of educational institutes

The Conference,

Considering the need to train and educate specialists in surveying and mapping in their own region, and recognizing that regional training and educational organizations need technical assistance to meet those requirements efficiently,

1. Recommends that bilateral co-operation should be established in the field of training and education between institutes of developed countries and corresponding regional organizations;

2. Further recommends that the United Nations should encourage and support the establishment of regional centres of education with adequate staff and equipment in the field of surveying and mapping, including hydrography in Latin America, English-speaking and French-speaking Africa, and South-East Asia.

14 September 1979

4. International Training Committee of the Pan-American
Institute of Geography and History

The Conference,

Noting the notification from the President of the Pan-American Institute of Geography and History, Commission on Cartography, as to the Commission's intent to create an ad hoc committee of international training institutions, whose purpose is to provide a central co-ordinating body for the information concerning international training in geophysics, geodesy, photogrammetry, cartography and remote sensing that is available within the hemisphere and the sources of training fellowships that are provided by national and international organizations,

Considering the importance of providing training opportunities to all countries as an effective means of promoting technological transfer and the interchange of experience for research and development,

Decides to commend the Pan-American Institute of Geography and History for its efforts in creating the international training committee, and encourages the States Members of the United Nations to support that initiative.

14 September 1979

5. Technical workshops

The Conference,

Recognizing the urgent world-wide need to establish control surveys to generate topographic and thematic maps of various scales as the basis for a land information system,

Realizing that the necessary means to satisfy those needs can be better met by the exchange of the latest technical information on the decision-maker's level,

Recommends that workshops should be held for decision-makers and high-level managers in the fields of surveying, mapping and land information in order to introduce the necessary technical and administrative measures to them more easily.

14 September 1979

6. Exchange of information

The Conference,

Considering that the countries of the region have made considerable efforts to advance in the fields of surveying and mapping for the benefit of socio-economic development and that a balanced approach requires regular communication between specialists at various levels concerned,

1. Recommends that all technical assistance in surveying and mapping projects should include training aspects, with the objective of creating a level of expertise that will enable countries receiving technical assistance to continue surveying and mapping activities without external assistance;

2. Further recommends that the countries of the Americas should co-operate as much as possible with commissions responsible for education and training in such international scientific organizations as the International Association of Geodesy, the International Cartographic Association and the International Society of Photogrammetry, in order to promote education and training in surveying and mapping.

14 September 1979

7. Services of trained personnel

The Conference,

Recognizing that except in a few countries the education and training facilities now available to students and trainees from the developing countries appear to be largely adequate,

Further recognizing that it is proving difficult for those developing countries to retain the services of trained personnel in their governmental departments,

Recommends that the United Nations should take the initiative in setting up a special study group to investigate the reasons for the difficulties and to make recommendations on how they might best be overcome.

14 September 1979

8. Satellite geodesy

The Conference,

Recognizing the widespread acceptance and growing use of satellites in the establishment of geodetic networks,

Considering that countries have developed various observation and data-processing methods,

Bearing in mind that methods are designed to achieve different degrees of precision, depending on the objectives sought,

Recognizing that it is appropriate for countries interested in Doppler techniques to have information enabling them to adapt methods for the use of such techniques to their geodetic requirements,

Recommends that the participating countries should:

(a) Publicize the methods used and the results obtained by means of those techniques;

(b) Promote the exchange of instruments and software packages.

14 September 1979

9. Inertial geodesy

The Conference,

Considering that the use of inertial systems for secondary support purposes results in a saving of time and increased precision,

Recommends that research on these methods should be intensified and that the results achieved should be published so that countries will have criteria for their adoption.

14 September 1979

10. Remote sensing

A

The Conference,

Considering the need to prepare medium-scale and small-scale topographic maps or to revise them, and that it is not possible to achieve a rapid solution by conventional methods,

Recognizing the commendable efforts made by various countries and organizations to utilize information obtained by remote sensing techniques (aerial photography, space imagery and automatic remote sensing),

Recommends that countries with the needs referred to in the first preambular paragraph should co-operate in those efforts.

B

The Conference,

Considering that the exchange of experience in remote sensing is of paramount importance,

Also considering that it is appropriate to establish guidelines on systems, methods, presentation of results and the like,

1. Recommends that an expert group on the inventory of natural resources and environmental studies should be formed within the United Nations;

2. Further recommends that such a group, in addition to dealing with the continuing exchange of experience, should meet at intervals deemed appropriate in order to prepare a report periodically summarizing the progress made for submission to Member States.

C

The Conference,

Considering that a number of countries do not at present have a suitable topographic basis for the application of the results of their environmental studies,

Bearing in mind that some countries have launched or are about to launch remote sensing satellites which transmit land images and that systems are being developed for the capture, processing and presentation of such images,

Recommends that the United Nations should request those countries which have image-receiving and processing programmes to devise operational machinery to ensure that the images provided are of sufficient geometrical precision to be used more effectively as base maps.

14 September 1979

11. Cadastral surveying and mapping

The Conference,

Taking note of resolution 24 of 27 October 1973, adopted by the Seventh United Nations Regional Cartographic Conference for Asia and the Far East, 1/ resolution 22 of 28 January 1977, adopted by the Eighth United Nations Regional Cartographic Conference for Asia and the Far East, 2/ and resolutions 5, 6 and 17 of 19 March 1976, adopted by the First United Nations Regional Cartographic Conference for the Americas, 3/

Recognizing the need to develop modern technological and administrative procedures for producing and updating cadastral maps, land-ownership maps and land-use maps,

Further recognizing the specific contributions that are being made to cadastral work by the use of photogrammetric procedures and automated mapping,

1/ Seventh United Nations Regional Cartographic Conference for Asia and the Far East, vol. I, Report of the Conference (United Nations publication Sales No. E.74.I.7), pp. 36 and 37.

2/ Eighth United Nations Regional Cartographic Conference for Asia and the Far East, vol. I, Report of the Conference (United Nations publication, Sales No. E.77.I.12), p. 37.

3/ First United Nations Regional Cartographic Conference for the Americas, vol. I, Report of the Conference (United Nations publication, Sales No. E.77.I.13), pp. 23, 24 and 30.

Considering the results obtained in cadastral teaching and training and the need to strengthen the exchange of information at the international level,

I

1. Recommends promoting the establishment of a permanent committee for the Americas through a specialized organization, which on the basis of the main decisions taken at the Seventh United Nations Regional Cartographic Conference for Asia and the Pacific, held in 1973, the experiences of subsequent regional cartographic conferences and the results of the work accomplished in several countries of the Americas, will adapt the procedures used in cadastral surveying, title registration and automated mapping for the purpose of advising States or research and teaching institutions requesting such advice;
2. Strongly recommends the strengthening of educational institutions in the field of topography and cadastral survey (such as the institution in Heredia, Costa Rica) and the specific organization of workshops, seminars and short courses for cadastral and title-registration employees and officials as an efficient means of obtaining effective short-term results in training technicians specializing in those tasks and duties, parallel with the regular university-level and post-graduate courses offered in educational establishments;

II

1. Invites Member States in planning cadastral programmes, to provide such programmes with multiple objectives in order to avoid duplication of work to increase their scope of application and provide for substantial recuperation of the expenses incurred in formulating such programmes and keeping them up to date;
2. Recommends the use of orthophotogrammetry techniques in rural cadastral surveying, utilizing the experience of Member States that have successfully used these technical procedures, taking into account the fact that an orthophoto map combines the accuracy of a plan with the wealth of information provided by a photograph;
3. Further recommends that, in cadastral plans and projects due consideration should be given to the close relation between the registration aspects of land ownership and the administrative machinery required by States to establish the requirements and restrictions governing land use in the establishment of human settlements and the provision of ecological safeguards;

III

1. Recommends the holding of a seminar or specific workshop to establish land parcel identifiers that will make it possible to use computerized cartography systems;

2. Further recommends the association of cadastral work with compulsory land registration as a means of ensuring practical updating of the information involved.

14 September 1979

12. Automated cartography

The Conference,

Noting resolution 17 of 19 March 1976, adopted by the First United Nations Regional Cartographic Conference for the Americas, 4/

Also noting the contents of the papers discussed by Committee III of the Second Conference,

Recognizing that increasing use is being made of automated cartographic techniques within the American region,

Also recognizing the indications of a growing need for computerized geographical information and cartographic systems,

Observing that delays in the introduction of digitized data acquisition can cause problems in the future, in the form of massive requirements for digitization of graphic records,

Also observing that special care is necessary in making the choice of automated systems, with particular reference to their cost-effectiveness, their complexity and the problems of ensuring effective operation after acquisition,

1. Recommends continuing attention to the advice given in resolution 17 of the First United Nations Regional Cartographic Conference for the Americas; 4/

2. Strongly recommends that the countries of the Americas should continue to study the possible benefits of the applications of automation to cartography and take steps to implement automatic techniques appropriate to their requirements;

3. Further recommends that developing countries should take full advantage of existing opportunities for technical advice and assistance in the choice and acquisition of systems, while building up their own expertise in the subject.

14 September 1979

13. Information on technology for the inventory of natural resources

The Conference,

Considering that all countries should be kept informed of continuing advances in techniques used for the study of the environment and the inventory of natural resources,

4/ Ibid., pp. 30 and 31.

Also considering that there should be an international body to compile and disseminate information arising in connexion with such matters,

1. Recommends that machinery should be established within the United Nations to deal with information on technology for the inventory of natural resources and the study of the environment;

2. Also recommends that Member States should provide the United Nations with relevant information, and that the United Nations should be responsible for the dissemination of such information;

3. Further recommends that the United Nations should request Member States to designate offices to centralize information on new technology used in their country, to arrange for exchanges of such information with the United Nations, and to receive information from the United Nations and disseminate it within the country.

14 September 1979

14. Development planning

The Conference,

Considering that it is extremely important for environmentalists to be aware of the needs of development planners in various countries,

Also considering that it is equally important for planners to be aware of the potential applications of basic information relating to environmental studies and natural resources inventories,

Recommends that environmentalists should be invited to attend development planning meetings held under United Nations auspices so that they can demonstrate the potential uses of their studies and be acquainted with the needs of planners.

14 September 1979

15. Directory of thematic mapping institutions

The Conference,

Considering that there are a number of institutions throughout the world which already have facilities for thematic mapping by means of automated systems,

Further considering that there is a wide range of equipment that can be used for such work and that the various types of equipment serve different purposes and have different specifications and degrees of complexity,

1. Recommends that the United Nations should compile a directory of institutions which use automated systems for thematic mapping and would therefore be in a position to extend technical co-operation to specialists from other countries in the use of such systems;

2. Further recommends that it should distribute the directory to Member States so that they may all be aware of the training opportunities available and may select the institutions which, for their purposes, are the most suitable for the training of their personnel.

14 September 1979

16. Census cartography

The Conference,

Considering that in 1980 and subsequent years various censuses will be taken of the population, industry and commerce, agriculture and other social and economic conditions in the countries of the Americas,

Also considering that the results of those censuses should be duly represented in terms of space,

Recommends that the necessary machinery should be established in the countries of the Americas to ensure that when the results of social and economic censuses are reported they are reflected cartographically.

14 September 1979

17. Aeronautical charts

The Conference,

Noting the constantly growing need for aeronautical charts produced in accordance with the guidelines of the International Civil Aviation Organization in order to ensure maximum flight safety,

Recommends that Member States should intensify the production of the necessary charts to ensure safety, taking as minimum rules the standard recommendations on the production of such charts appearing in annex 4 of the International Civil Aviation Convention.

14 September 1979

18. Atlases

The Conference,

Considering that atlases are a multidisciplinary form of representing contemporary scientific knowledge of a country or region in geographical fields,

Also considering that atlases are useful in administrative, economic, cultural and other spheres of Government,

1. Recommends that the United Nations should promote the production of national and regional atlases for each country, to suit its own objectives and needs and to constitute an over-all geographical information system;
2. Also recommends the dissemination of such atlases among Member States and their major cultural institutions;
3. Recognizes that although it is not possible to ensure the standardization of such atlases, scientific exchanges in that field are desirable.

14 September 1979

19. Geographical names

The Conference,

Considering that:

- (a) It is of the utmost importance, in view of the demand for reliable and timely information, to design machinery to improve data capture, analysis and processing systems, on the basis of objective criteria and standardization criteria, so that information is suited to contemporary requirements,
- (b) There should be a legal framework for information activities at the national level, in all geographical fields, so that such information can serve the common purposes of economic and social development,
- (c) Experience has shown that geographical information problems can only be solved when there is a body of regulations governing activities relating to the compilation, analysis and processing of such information,
- (d) There is a need for awareness in government circles of the function and importance of general geographical information as a basic tool for the promotion of decision-making,
- (e) The factors involved in the standardization of geographical names are closely linked to the concept of geographical information, of which they form an integral part,
- (f) There is still a need to plan activities for the training of personnel with the necessary knowledge to carry out activities connected with the compilation, classification, representation and processing of geographical names,
- (g) In some countries the agencies responsible for the standardization of geographical names lack the necessary support and authority to perform their tasks,

1. Recommends that the countries of the Americas should establish regulatory organizations in the geographical field, paying special attention to the standardization of geographical names that the relevant regulations should cover such cartographic activities as geodesy and photogrammetry and provide for all

activities pertaining to knowledge of the geographical features of the countries concerned and that the body of rules compiled to govern geographical activities could be general in scope and application, due account being taken of the particular needs and characteristics of each country, and should be designed to cover the entire field of geography;

2. Further recommends that the United Nations should request priority technical and financial assistance for the standardization of geographical names;

3. Urges the United Nations Group of Experts on Geographical Names to prepare and issue a document for use by the decision-making authorities of each country and the social groups concerned with geographical problems, setting out all the social and economic advantages to be gained from the standardization of geographical names, at both the national and international levels;

4. Recommends that the recommendations on training in the subject of geographical names, contained in the documents issued in connexion with earlier conferences and meetings, should be duly implemented and that the necessary organizations should be set up to promote such training and increase its effectiveness.

14 September 1979

20. Technical assistance in hydrographic
surveying and nautical charting

The Conference,

Noting the report by the Group of Experts on Hydrographic Surveying and Nautical Charting, 5/ as well as resolution 7 of 19 March 1976, adopted by the First United Nations Regional Cartographic Conference for the Americas 6/ and the questions and reports discussed in Committee IV of the Second Conference,

Recognizing that a serious deficiency exists in the state of knowledge of hydrographic data and the development and application of nautical charting for safe navigation and the exploration and exploitation of the sea-bed,

Also noting that modern techniques are available to carry out surveys and produce nautical charts in a reliable and economical way,

Considering that all countries should make every effort to ensure the safety of navigation and the availability of definitive data for the community concerned with the sea-bed and its resources,

Also considering that optimum use should be made of the experience and knowledge of other countries and organizations in this regard,

5/ E/CONF.71/L.1 (see annex IV below).

6/ First United Nations Regional Cartographic Conference for the Americas, vol. I, Report of the Conference (United Nations publication, Sales No. E.77.I.13), pp. 24 and 25.

1. Strongly endorses the findings and recommendations of the United Nations Group of Experts on Hydrographic Surveying and Nautical Charting; 5/

2. Recommends that Governments of American countries should give priority to the establishment of hydrographic services where none now exist, or to the strengthening of operating hydrographic services in their countries;

3. Also recommends that the Governments concerned should take full advantage of all technical assistance available from the United Nations, its specialized agencies and the International Hydrographic Organization.

14 September 1979

21. Exploitation of space imagery for
nautical charting

The Conference,

Recognizing the unique contribution LANDSAT imagery now can make to the revision of nautical charts, as well as its potential for much greater effectiveness,

Noting that the United States of America has a programme to obtain such imagery over most of the earth's shallow seas,

Also recognizing that progress in the development of imagery application to nautical charts will be expedited by the innovative approaches of several nations,

Recommends that coastal State charting authorities should co-ordinate and collaborate in development programmes for the exploitation of space imagery for nautical charting purposes.

14 September 1979

22. Vote of thanks

The Conference,

1. Expresses its heartfelt thanks to the Government of Mexico for the excellent arrangements made for the organization of the Second United Nations Regional Cartographic Conference for the Americas and for the hospitality extended to the participants;

2. Also expresses its appreciation to the President of the Conference for the excellent way in which he conducted the meetings;

3. Expresses its gratitude to the officers and staff of the United Nations Secretariat for their hard work.

14 September 1979

Annex I

- LIST OF PARTICIPANTS

Members of the United Nations or of the specialized agencies

Argentina

Representative:

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Buenos Aires

Alternates:

Juan Francisco Sanmarco
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Representative:

Tex Ivanoe Turnquest
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Nassau

Brazil

Representative:

Lauro Escorel de Moraes
Ambassador of Brazil to Mexico
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Annex II

LIST OF DOCUMENTS

<u>Symbol</u>	<u>Title</u>	<u>Agenda item</u>
<u>Series E/CONF.71</u>		
E/CONF.71/1/Rev.1	Provisional agenda	
E/CONF.71/2	Provisional rules of procedure	
<u>Series E/CONF.71/INF</u>		
E/CONF.71/INF/1	Documentation for the Conference	
E/CONF.71/INF/2	Advance information regarding general arrangements of interest to the participants	
E/CONF.71/INF/3	Election of officers	
E/CONF.71/INF/4	Establishment of technical committees	
E/CONF.71/INF/5	La cartografía en Suiza	
E/CONF.71/INF/6	Opening statement by Chris N. Christopher, Executive Secretary of the Conference, on behalf of the Secretary-General of the United Nations	
E/CONF.71/INF/7	The International Cartographic Association	
E/CONF.71/INF/8	Provisional list of documents	
E/CONF.71/INF/9	Revista regional internacional de fotogrametria y exploración remota para America Latina (ISP)	
E/CONF.71/INF/10 and Rev.1	List of participants	
E/CONF.71/INF/11	Invitation to the Fourteenth International Congress for Photogrammetry to be held from 13 to 25 July 1980, Federal Republic of Germany	
<u>Series E/CONF.71/L.</u>		
E/CONF.71/L.1	Report of the Group of Experts on Hydrographic Surveying and Nautical Charting (United Nations Secretariat)	7 (d)
E/CONF.71/L.2	A report on the adequacy of coastal hydrographic data for charting the Americas (United States of America)	7 (d)
E/CONF.71/L.3	A review of the bathymetric swath survey system (United States of America)	7 (d)

<u>Symbol</u>	<u>Title</u>	<u>Agenda item</u>
E/CONF.71/L.4	Airborne laser hydrography (United States of America)	7 (d)
E/CONF.71/L.5	Trends in geodetic techniques in the United States of America (United States of America)	7 (a)
E/CONF.71/L.6	Automated cartographic development in the United States of America (United States of America)	8 (a)
E/CONF.71/L.7	Cadastral survey and its cartographic portrayal in the United States of America (United States of America)	7 (c)
E/CONF.71/L.8	Report on cartographic activities of the United States of America (United States of America)	6
E/CONF.71/L.9	Land registration projects in the Caribbean region (United Kingdom)	7 (c)
E/CONF.71/L.10	Report of the United Nations Group of Experts on Geographical Names on the work of its eighth session (United Nations Secretariat)	10
E/CONF.71/L.11	Orthophoto mapping in Sweden (Sweden)	7 (b)
E/CONF.71/L.12	A geographic information system for land-use data in the United States of America (United States of America)	8 (a)
E/CONF.71/L.13	Landsat mapping and charting by the United States of America (United States of America)	7 (b)
E/CONF.71/L.14	Technology of image mapping in the United States of America (United States of America)	7 (b)
E/CONF.71/L.15	Joint topographic/bathymetric mapping in the United States of America (United States of America)	7 (b) and (d)
E/CONF.71/L.16	Minimum safe altitude warning system (United States of America)	9 (b)
E/CONF.71/L.17	National geodetic control diagrams - past, present and future (United States of America)	7 (a)
E/CONF.71/L.18	Country report (Federal Republic of Germany)	6
E/CONF.71/L.19	Preparation of a concise gazetteer according to United Nations recommendations by EDP (Federal Republic of Germany)	8 (a), and 10
E/CONF.71/L.20	Experiences from Doppler positioning (Federal Republic of Germany)	7 (a)
E/CONF.71/L.21	Production of planning documents for urban areas (Federal Republic of Germany)	7 (c)
E/CONF.71/L.22	Extension of post-graduate training in geodesy at the Federal University of Paraná, Brazil (Federal Republic of Germany)	11

<u>Symbol</u>	<u>Title</u>	<u>Agenda item</u>
E/CONF.71/L.23	Establishment and maintenance of land-related information for a multipurpose cadastre based on EDP (Federal Republic of Germany)	7 (c)
E/CONF.71/L.24	The World Map 1:2,500,000 as a basic map for special purpose mapping (German Democratic Republic)	9 (b)
E/CONF.71/L.25	The application of the technique of motorized high-precision levelling (German Democratic Republic)	7 (a)
E/CONF.71/L.26	The Ordnance Survey topographic database concepts for the 1980s (United Kingdom)	8 (a)
E/CONF.71/L.27 and Add.1	Thematic mapping of satellite image data with computers as interpretation material for geoscientists (Federal Republic of Germany)	8 (a)
E/CONF.71/L.28	Le système gitan et la gestion des données urbaines (France)	7 (c)
E/CONF.71/L.29	Situation de la stéréo-orthophotographie (France)	7 (b)
E/CONF.71/L.30	Modèles de terrain et corrections géométriques des images spot (France)	7 (b)
E/CONF.71/L.31	L'utilisation d'un système de traitement d'images pour la cartographie à petite échelle à partir d'images spatiales (France)	9 (b)
E/CONF.71/L.32	Système de navigation pour le travail aérien orientation de l'Institut Géographique National (France)	7 (a)
E/CONF.71/L.33	Examen des techniques de pointe et des faits nouveaux (géodésie et stéréopréparation - notamment par satellite) (France)	7 (a)
E/CONF.71/L.34	United Kingdom report on cartographic activities in the Americas (United Kingdom)	6
E/CONF.71/L.35	El servicio geodésico nacional - una necesidad para el desarrollo (Mexico)	6
E/CONF.71/L.36	Inventario de los recursos naturales como elemento de un sistema nacional de información (Mexico)	6 and 9 (a)
E/CONF.71/L.37	Proyecto para la formación de un banco de dato geodésico (Mexico)	7 (a)
E/CONF.71/L.38	Alturas geoidales, desviaciones de la anomalías de la gravedad derivadas de la solución del geopotencial (Mexico)	7 (a)
E/CONF.71/L.39	Descripción de un sistema para procesamiento de información geográfica (Mexico)	8 (a)

<u>Symbol</u>	<u>Title</u>	<u>Agenda item</u>
E/CONF.71/L.40	Cartografía con computadora y sistemas de información geográfica (Mexico)	8 (a)
E/CONF.71/L.41	Sistema de información catastral con fines múltiples en el Estado de Zacatecas (Mexico)	7 (c)
E/CONF.71/L.42	Reseña de las actividades cartográficas realizadas en Chile (Chile)	6
E/CONF.71/L.43	Mesures des déplacements de l'écorce terrestre - nouvelles mesures sur le réseau géodésique établi à travers une partie de la dépression d'afar par l'IGN en 1972/73 (France)	7 (a)
E/CONF.71/L.44	Applications de l'imagerie Landsat à l'étude et à la cartographie des forêts (France)	9 (a)
E/CONF.71/L.45	La géothématique (France)	9 (a)
E/CONF.71/L.46 and Add.1	Telé-détection des résurgences d'eau en milieu marin (France)	9 (a)
E/CONF.71/L.47	The use of Doppler positioning by DETENAL (Mexico)	7 (a)
E/CONF.71/L.48	The Cuban Institute of Geodesy and Cartography (ICGC) and the new Political and Administrative Division (Cuba)	8 (a)
E/CONF.71/L.49	Una experiencia sobre la comparación de los métodos para la determinación del control fotogramétrico en la confección de planos para proyectos viales (Cuba)	7 (b)
E/CONF.71/L.50	Importancia del control fotográfico en la confección de los mapas topográficos (Cuba)	7 (b)
E/CONF.71/L.51	Sistemas de cartografía para países no desarrollados: la experiencia Mexicana en la última década (Mexico)	7 (b)
E/CONF.71/L.52	Estado actual de los trabajos de teledetección en Cuba (Cuba)	9 (a)
E/CONF.71/L.53	The Centro Interamericano de Fotointerpretación (CIAF) Project (Netherlands)	11
E/CONF.71/L.54	The potential of space imagery to solve cartographic problems (Federal Republic of Germany)	7 (b)
E/CONF.71/L.55	Informe Nacional (Cuba)	6
E/CONF.71/L.56	New bathymetric chart of the world ocean (USSR)	7 (d)
E/CONF.71/L.57	Topography, geodesy and cartography in the USSR (USSR)	6
E/CONF.71/L.58	Principal requirements to the geodetic networks for prognostic observations (USSR)	7 (a)

<u>Symbol</u>	<u>Title</u>	<u>Agenda item</u>
E/CONF.71/L.59	Utilization of space photo-images for national economy (USSR)	9 (a)
E/CONF.71/L.60	Education and training in surveying, mapping and cadastral assistance in regard to the possibilities of the Federal Republic of Germany (Federal Republic of Germany)	11
E/CONF.71/L.61	Informe de la República Oriental del Uruguay (Uruguay)	6
E/CONF.71/L.62	La adquisición automática de datos en lavantamientos hidrográficos (Spain)	7 (d)
E/CONF.71/L.63 and Add.1	National report (Canada)	6 and 7 (d)
E/CONF.71/L.64	Informe nacional (Argentina)	6
E/CONF.71/L.65 and Add.1	Remote sensing possibilities and limitations (Federal Republic of Germany)	9 (a)
E/CONF.71/L.66	United States participation in international names programmes (United States of America)	10
E/CONF.71/L.67	Informe nacional (Mexico)	6
E/CONF.71/L.68	Mapas y atlas del medio ambiente (Spain)	9 (c)
E/CONF.71/L.69	Sistema de digitization y edición de bases cartográficas digitales en el Instituto Geográfico Nacional de España (Spain)	8 (a)
E/CONF.71/L.70	Mecanización del catastro topográfico parcelario (Spain)	7 (c)
E/CONF.71/L.71	SIGNA: sistema de información geográfica del Instituto Geográfico Nacional (Spain)	8 (a)
E/CONF.71/L.72	Papel cartográfico para usos generales: una norma Española (Spain)	8
E/CONF.71/L.73	Recientes progresos en la nueva geodesia Española (Spain)	7 (a)
E/CONF.71/L.74	Informe nacional de España en el período 1974-1979 (Spain)	6
E/CONF.71/L.75	Le traitement automatisé des toponymes (France)	10
E/CONF.71/L.76	Informe del Instituto Geográfico Nacional (Guatemala)	6
E/CONF.71/L.77	Mapas temáticos (Guatemala)	9 (a)
E/CONF.71/L.78	Centro Interamericano de Fotointerpretación (Colombia)	11
E/CONF.71/L.79	La normalización de los nombres geográficos: un mecanismo para lograrla (Mexico)	10

<u>Symbol</u>	<u>Title</u>	<u>Agenda item</u>
E/CONF.71/L.80	Modern components in the International Institute for Aerial Survey and Earth Sciences (ITC) courses in photogrammetry (Netherlands)	11
E/CONF.71/L.81	Mediciones de alta precisión en relación con los movimientos de la corteza terrestre (Argentina)	7 (a)
E/CONF.71/L.82	National atlas of Suriname (Suriname)	9 (c)
E/CONF.71/L.83	The topographic mapping of Suriname (Suriname)	7 (b)
E/CONF.71/L.84	Standardization of topcnymy in Suriname (Suriname)	10
E/CONF.71/L.85	Cadastral surveying and mapping (Suriname)	7 (c)
E/CONF.71/L.86	The Canadian Hydrographic Service - Service Hydrographique du Canada 1978 (Canada)	7 (d)
E/CONF.71/L.87	Rôle de la cartographie dans un pays en développement (Haute-Volta)	6
E/CONF.71/L.88	Computer-assisted interpretation of satellite imagery for determination of land-use data (Federal Republic of Germany)	8
E/CONF.71/L.89	Rationalization of map production and map revision with modern automated and digitized photogrammetric instruments and technologies (German Democratic Republic)	7 (b)
E/CONF.71/L.90	El paper del centro interamericano de fotointerpretación en la preparación de expertos Latinoamericanos (Colombia)	11
E/CONF.71/L.91	The combination of inertial and Doppler systems for secondary surveys (Canada)	7 (a)
E/CONF.71/L.92	A tape/slide cartographic learning package produced by the International Institute for Aerial Survey and Earth Sciences (ITC) (Netherlands)	11
E/CONF.71/L.93	Status of surveying and mapping activities in Liberia (Liberia)	6
E/CONF.71/L.94	Geographic and Cadastral Institute (Portugal)	6

Annex III

RULES OF PROCEDURE

Chapter I

REPRESENTATION AND CREDENTIALS

Rule 1

Each State participating in the Conference shall be represented by a head of delegation and such other accredited representatives, alternate representatives, experts and advisers as may be required.

Rule 2

The credentials of representatives, and the names of alternate representatives, experts and advisers shall be submitted to the Executive Secretary, if possible not later than 24 hours after the opening of the Conference. The credentials shall be issued either by the Head of the State or Government or by the Minister for Foreign Affairs.

Rule 3

The President and the Vice-Presidents shall examine the credentials and report to the Conference without delay.

Rule 4

Pending a decision of the Conference on their credentials, representatives shall be entitled to participate provisionally in the Conference.

Chapter II

OFFICERS

Rule 5

The Conference shall elect a President, two Vice-Presidents and a Rapporteur from among the representatives of the States participating in the Conference.

Rule 6

The President shall preside over the plenary meetings of the Conference. He shall not vote but may designate another member of his delegation to vote in his place.

Rule 7

If the President is absent from a meeting or any part thereof, a Vice-President designated by him shall preside. A Vice-President acting as President shall have the same powers and duties as the President.

Chapter III

SECRETARIAT

Rule 8

The Executive Secretary of the Conference appointed by the Secretary-General of the United Nations shall act in that capacity in all meetings of the Conference. He may appoint a deputy to take his place at any meeting.

Rule 9

The Executive Secretary or his representative may at any meeting make either oral or written statements concerning any question under consideration.

Rule 10

The Executive Secretary shall provide and direct such staff as is required by the Conference. He shall be responsible for making all necessary arrangements for meetings and generally shall perform all other work which the Conference may require.

Chapter IV

CONDUCT OF BUSINESS

Rule 11

Representatives of a majority of the States participating in the Conference shall constitute a quorum.

Rule 12

In addition to exercising the powers conferred upon him elsewhere by these rules, the President shall declare the opening and closing of each plenary meeting of the Conference, shall direct the discussion at such meetings, accord the right to speak, put questions to the vote and announce decisions. He shall rule on points of order and, subject to these rules of procedure, shall have complete control over the proceedings.

Rule 13

The President may, in the course of the discussions, propose to the Conference the closure of the list of speakers or the closure of the debate. He may also propose the suspension or the adjournment of the meeting or the

adjournment of the debate on the item under discussion. He may also call a speaker to order if his remarks are not relevant to the matter under discussion.

Rule 14

The President, in the exercise of his functions, remains under the authority of the Conference.

Rule 15

During the discussion on any matter, a representative may at any time raise a point of order, and the point of order shall be immediately decided by the President in accordance with the rules of procedure. A representative may appeal against the ruling of the President. The appeal shall be immediately put to the vote and the President's ruling shall stand unless overruled by a majority of representatives present and voting. A representative raising a point of order may not speak on the substance of the matter under discussion.

Rule 16

During the discussion of any matter, a representative may move the adjournment of the debate on the item under discussion. Any such motion shall have priority. In addition to the proposer of the motion, one representative shall be allowed to speak in favour of, and one representative against, the motion.

Rule 17

During the course of the debate, the President may announce the list of speakers and with the consent of the Conference declare the list closed. The President may, however, accord the right of reply to any representative if, in his opinion, a speech delivered after he has declared the list closed makes this desirable. When the debate on an item is concluded because there are no other speakers, the President shall declare the debate closed. Such closure shall have the same effect as closure by decision of the Conference.

Rule 18

A representative may at any time move the closure of the debate on the item under discussion, whether or not any other representative has signified his wish to speak. Permission to speak on the closure of the debate shall be accorded only to two speakers opposing the closure, after which the motion shall be immediately put to the vote.

Rule 19

1. No one may address the Conference without having previously obtained the permission of the President. Subject to rules 15, 16, 17 and 18, the President shall call upon speakers in the order in which they signify their desire to speak.

2. Debate shall be confined to the question before the Conference and the President may call a speaker to order if his remarks are not relevant to the subject under discussion.

3. The Conference may limit the time allowed to speakers and the number of times the representative of each State may speak on a question; permission to speak on a motion to set such limits shall be accorded only to two representatives in favour of and to two opposing such limits, after which the motion shall be put to the vote immediately. In any event, the President shall limit interventions on procedural questions to a maximum of five minutes. When the debate is limited and a speaker exceeds the allotted time, the President shall call him to order without delay.

Rule 20

Proposals and amendments shall normally be introduced in writing and handed to the Executive Secretary of the Conference, who shall circulate copies to the delegations. As a general rule, no proposal shall be discussed or put to the vote at any meeting of the Conference unless copies of it have been circulated to all delegations not later than the day preceding the meeting. The President may, however, permit the discussion and consideration of amendments or motions as to procedure even though these amendments or motions have not been circulated or have only been circulated the same day.

Rule 21

A proposal, amendment or motion may be withdrawn by its sponsor at any time before voting on it has commenced, provided that it has not been amended. A proposal or motion thus withdrawn may be reintroduced by any representative.

Rule 22

When a proposal or an amendment has been adopted or rejected, it may not be reconsidered unless the Conference, by a two-thirds majority of the representatives present and voting, so decides. Permission to speak on the motion to reconsider shall be accorded only to two speakers opposing the motion, after which it shall be immediately put to the vote.

Chapter V

VOTING

Rule 23

Each State participating in the Conference shall have one vote, and the decisions of the Conference shall be made by a majority of the representatives present and voting.

Rule 24

For the purpose of these rules, the phrase "representatives present and voting" means representatives present and casting an affirmative or negative vote. Representatives who abstain from voting shall be considered as not voting.

Rule 25

The Conference shall normally vote by show of hands, but any representative may request a roll-call. A roll-call shall be taken in the English alphabetical order of the names of the delegations at the Conference, beginning with the delegation whose name is drawn by lot by the President.

Rule 26

After the President has announced the beginning of the vote, no representative shall interrupt the vote except on a point of order in connexion with the actual conduct of voting. Explanations of their votes by representatives may, however, be permitted by the President either before or after the voting. The President may limit the time to be allowed for such explanation.

Rule 27

Parts of a proposal shall be voted on separately if a representative requests that the proposal be divided. Those parts of the proposal which have been approved shall then be put to the vote as a whole; if all the operative parts of a proposal have been rejected, the proposal shall be considered rejected as a whole. For the purpose of this rule, the word "proposal" shall be considered as including amendments.

Rule 28

When an amendment is moved to a proposal, the amendment shall be voted on first. When two or more amendments are moved to a proposal, the Conference shall first vote on the amendment furthest removed in substance from the original proposal and then on the amendment next furthest removed therefrom, and so on, until all the amendments have been put to the vote. When, however, the adoption of one amendment necessarily implies the rejection of another amendment, the latter amendment shall not be put to the vote. If one or more amendments are adopted, the amended proposal shall then be voted upon. A proposal is considered an amendment to another proposal if it merely adds to, deletes from or revises part of that proposal.

Rule 29

If two or more proposals relate to the same question, the Conference shall, unless it decides otherwise, vote on the proposals in the order in which they have been submitted. The Conference may, after each vote on a proposal, decide whether to vote on the next proposal.

Rule 30

All elections shall be decided by secret ballot unless otherwise decided by the Conference.

Rule 31

If, when one person or one delegation is to be elected, no candidate obtains the required majority in the first ballot, a second ballot shall be taken, which shall be restricted to the two candidates obtaining the largest number of votes.

In the case of a tie in the first ballot among the candidates obtaining the second largest number of votes, a special ballot shall be held for the purpose of reducing the number of candidates to two. In the case of a tie among three or more candidates obtaining the largest number of votes, a second ballot shall be held; if a tie results among more than two candidates, the number shall be reduced to two by lot.

Rule 32

If a vote is equally divided upon matters other than elections, a second vote shall be taken after an adjournment of the meeting for 15 minutes. If this vote also results in equality, the proposal shall be regarded as rejected.

Chapter VI

LANGUAGES

Rule 33

English, French and Spanish shall be the languages of the Conference.

Rule 34

Speeches made in one of the languages of the Conference shall be interpreted into the other such languages. Any representative may speak in a language other than a language of the Conference if he provides for interpretation into one such language.

Chapter VII

SOUND RECORDINGS

Rule 35

Plenary meetings and committee meetings of the Conference shall have sound recordings and such recordings shall be kept by the Secretariat in English only.

Chapter VIII

PUBLICITY OF MEETINGS

Rule 36

The plenary meetings of the Conference and the meetings of its committees shall be held in public unless the body concerned decides that exceptional circumstances require that a particular meeting be held in private.

Chapter IX

COMMITTEES

Rule 37

The Conference may establish such committees as may be necessary for the performance of its functions. Items relating to the same category of subjects may be referred to the committee dealing with that category of subject.

Rule 38

Each committee shall elect its own Chairman, Vice-Chairman, and Rapporteur.

Rule 39

In so far as they are applicable, these rules shall apply to the proceedings of the committees. A committee may dispense with certain language interpretations.

Chapter X

SPECIALIZED AGENCIES, OTHER INTERGOVERNMENTAL ORGANIZATIONS AND NON-GOVERNMENTAL ORGANIZATIONS

Rule 40

Observers of specialized agencies invited to the Conference may participate, without the right to vote, in the deliberations of the Conference and its committees, upon the invitation of the President or the Chairman, as the case may be on questions within the scope of their activities.

Written statements of such specialized agencies shall be distributed by the Secretariat to the delegations at the Conference in the languages and in the quantities that such statements are made available to the Secretariat.

Rule 41

Other intergovernmental organizations and non-governmental organizations invited to the Conference may participate in the deliberations of the Conference and its committees and upon the invitation of the President or the Chairman of a committee, as the case may be, may make oral statements on subjects in which these organizations have a special competence.

Written statements of such organizations on subjects in which they have a special competence and which are related to the work of the Conference shall be distributed by the Secretariat in the languages and in the quantities that the statements are made available in the Secretariat.

Chapter XI

AMENDMENTS

Rule 42

These rules of procedure may be amended by a decision of the Conference.

Annex IV

REPORT OF THE GROUP OF EXPERTS ON HYDROGRAPHIC a/
SURVEYING AND NAUTICAL CHARTING

CONTENTS

	<u>Paragraphs</u>	<u>Page</u>
ABSTRACT		65
INTRODUCTION	1 - 10	66
I. WHAT IS HYDROGRAPHY?	11 - 13	67
II. NEED FOR HYDROGRAPHIC SURVEYING AND CHARTING	14 - 19	68
Marine transportation.	15	68
Coastal zone management.	16	69
Exploration and exploitation of undersea resources . .	17 - 18	69
Environmental concerns	19	70
III. STATUS OF HYDROGRAPHIC SURVEYING AND CHARTING.	20 - 27	76
Status of hydrographic services.	27	81
IV. GUIDELINES FOR THE FORMATION OF HYDROGRAPHIC SERVICES	28 - 48	82
Hydrographic services.	28	82
The decision to establish a national hydrographic service.	29 - 30	82
Organization of a new hydrographic service	31 - 33	82
Objectives	34 - 38	83
Planned stage development.	39 - 42	84
Organizational structure	43 - 48	87
V. GUIDELINES FOR STRENGTHENING EXISTING HYDROGRAPHIC SERVICES	49 - 52	88

a/ The original text of this report, prepared by the Group of Experts on Hydrographic Surveying and Nautical Charting was issued under the symbol E/CONF.71/L.1.

CONTENTS (continued)

	<u>Paragraphs</u>	<u>Page</u>
VI. TRAINING	53 - 59	88
VII. INTERNATIONAL CO-OPERATION AND RESPONSIBILITIES. . .	60 - 61	92
VIII. RECOMMENDATIONS.	62	92

Appendix

RESOLUTIONS OF RELEVANT UNITED NATIONS CONFERENCES	94
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ABSTRACT

1. After examining the present status of hydrography in developing countries, the Group of Experts on Hydrographic Surveying and Nautical Charting finds serious deficiencies in hydrographic surveying and charting in many of those countries. The emergence of new needs in recent years further compounds the problem. It is emphasized that inadequate hydrographic services can lead to costly delays in resource exploitation and do restrict the growth of maritime trade.
2. In general, developed countries are no longer able to collect hydrographic data in the waters of developing countries and there is an urgent need for the latter to assess their current requirements for hydrographic services in order to cope with immediate and long-term needs.
3. The report defines the scope of hydrography and identifies its more important characteristics and applications, the latter principally relating to marine transportation, coastal zone management, resource exploitation and environmental protection.
4. The report offers guidelines for the establishment and strengthening of hydrographic services and emphasizes the availability of assistance for such projects. Attention is drawn to the importance of international co-operation in hydrography.
5. Those responsible at the highest levels of government should recognize that in the marine environment there can be no exploitation of resources without exploration and there can be no exploration without hydrography.

INTRODUCTION

1. Successive United Nations regional cartographic conferences have, over the past two decades, stressed the need for the establishment of hydrographic services in developing countries, in the interests of national economic development. In pursuance of this aim, a number of resolutions have been adopted by the conferences and submitted for the consideration of the Economic and Social Council of the United Nations. a/
2. The national reports presented to these conferences show that the majority of developing countries have no capability in hydrographic surveying and charting; in other cases, the hydrographic services are of a limited nature, and require considerable expansion in order to be able to meet national requirements adequately.
3. Economic development generates international trade, involving an increased volume of imports and exports. The volume and type of cargoes to be transported have necessitated the construction of specialized ships of considerable size - for example, bulk carriers, container ships, and very large crude carriers (VLCC's). For these ships to make speedy, safe and economic voyages, it is essential that adequate modern nautical charts be made available for navigation along the coasts and into ports.
4. Nautical charts are compiled from the results of systematic hydrographic surveys carried out by specialized agencies established for this purpose. The hydrographic surveys are also an essential source of data for the exploration and exploitation of the marine resources within the maritime zones of coastal States. These data are used to determine the extent and nature of the continental shelf, the 200-mile exclusive economic zone and sea-bed topography.
5. The Eighth United Nations Regional Cartographic Conference for Asia and the Far East, held at Bangkok from 17 to 28 January 1977, realizing the need to establish appropriate hydrographic services in developing countries, adopted the following resolution:

"The Conference,

"Noting the importance of hydrographic surveying and nautical charting to the safety of navigation, the economic benefits to be derived therefrom and the necessity of providing adequate charts for the exploration and exploitation of resources lying within the maritime zones of coastal States,

"Further noting that developing countries require guidance and technical advice in the formation of hydrographic services and the conduct of operations,

"Realizing that a group of experts could formulate such guidelines,

"Recommends that the Secretary-General be requested to convene a second meeting of the Group of Experts on Hydrographic Surveying and Nautical

a/ See the appendix below.

Charting, not later than March 1978, inviting experts from Member States of the United Nations in consultation with the International Hydrographic Organization." b/

6. The meeting of the Group of Experts on Hydrographic Surveying and Nautical Charting was convened at United Nations Headquarters from 5 to 16 December 1977 in accordance with Economic and Social Council resolution 2049 (LXII) of 5 May 1977, in which the Council requested the Secretary-General "to convene, in accordance with the recommendations of the Conference, a meeting of the Group of Experts on Hydrographic Surveying and Nautical Charting to be held at United Nations Headquarters not later than March 1978". The Group reviewed the work of the Ad Hoc Group of Experts on Hydrographic Surveying and Bathymetric Charting, c/ which had met at United Nations Headquarters from 31 March to 10 April 1970, and the resolutions of regional cartographic conferences especially concerned with the problems of hydrographic surveying and bathymetric charting.

7. The Group considered the current status of hydrographic surveying and bathymetric charting; the establishment of immediate and long-term hydrographic requirements of developing nations in the context of oceanic exploration and exploitation, taking into consideration economic and environmental elements, and attempted to formulate justification and guidelines for establishing and strengthening hydrographic services in developing nations.

8. The following experts participated in the meeting: Michael Bolton (Canada); Etienne J. Cailliau (France); Oliver F. Castro (Philippines); A. Edward Craig (United States of America); Mucio P. R. De Bakker (Brazil); Francis L. Fraser (India); Dudley Russom (United Kingdom); Takahiro Sato (Japan); and D. C. Kapoor (Adviser to the Group from the International Hydrographic Organization).

9. Chris N. Christopher and Max C. de Henseler, United Nations Secretariat, were Executive Secretary and Secretary of the Group, respectively.

10. The Chairman of the Group was F. L. Fraser; Michael Bolton acted as Rapporteur.

I. WHAT IS HYDROGRAPHY?

11. Hydrography may be defined as the science of measuring and depicting those parameters that are necessary to describe the precise nature and configuration of the sea-bed, its geographical relationship to the landmass, and the characteristics and dynamics of the sea. The parameters encompass bathymetry, geology, geophysics, tides, currents, waves and certain other physical properties of sea water. The primary use of the data collected is to compile graphic

b/ Eighth United Nations Regional Cartographic Conference for Asia and the Far East, Bangkok, 17-28 January 1977, vol. I. Report of the Conference, chap. IV, resolution 10.

c/ For the report of the Ad Hoc Group of Experts, see Sixth United Nations Regional Cartographic Conference for Asia and the Far East, 24 October-7 November 1970, Teheran, Iran, vol. II, Technical Papers, agenda item 13, pp. 347-360.

documents used by mariners and others concerned with the marine environment, such as ocean engineers, oceanographers, marine biologists and environmental scientists. One of the most important applications of hydrographic knowledge today is its use in the planning of marine resource exploration and exploitation.

12. In general, there are three aspects of hydrography: coastal, off-shore, and oceanic. Coastal hydrography is concerned with the development of ports and harbours, coastal erosion problems, the utilization of harbour and coastal conservation services and, especially, the safety of navigation in coastal waters. Off-shore hydrography is concerned with (a) the provision of hydrographic data as an extension of the coastal zone normally encompassing the continental shelf, (b) the development of mineral deposits, including hydrocarbons, and (c) provision of data for fisheries management. Oceanic hydrography is concerned with the acquisition of hydrographic data in the deep ocean areas for the depiction of sea-floor geomorphology. Hydrographic data collection is inevitably a slow and systematic process, as well as being expensive, and applies in varying degrees to the three aspects described above.

13. The relevant results of hydrographic activities are presented on nautical charts, which, although fundamentally similar in design to land maps, are significantly different in some ways. They are essential instruments of navigation. Furthermore, in hydrography, no survey can be regarded as having achieved totality in obtaining the whole picture of the sea-bed. Unlike a topographical survey, there is no current technique comparable to aerial photo coverage, since the sea-bed is obscured from the surface in all but very shallow and clear waters. Consequently, the results of even the most recent hydrographic surveys, conducted with the most sophisticated means, consist of samples of data to a density governed by the configuration of the sea-bed within the constraints imposed by time and resources. In many coastal areas, the effects of tides, currents, waves and discharges from rivers result in changes in the topography of the sea-bed. Such changes may significantly affect safe transit, particularly by large vessels, necessitating frequent monitoring.

II. NEED FOR HYDROGRAPHIC SURVEYING AND CHARTING

14. This section briefly outlines some of the major benefits to be gained from modern hydrographic surveying and charting. Principally these relate to marine transportation, coastal zone management, undersea resource exploration and exploitation and the protection of the environment.

Marine transportation

15. Navigational charts are essential for ships to transit the waters of coastal States and to enter and leave their harbours. Data acquired through modern hydrographic surveys may reveal that it is possible for larger vessels to enter commercial harbours, thereby enhancing the country's commerce. Primarily for economic reasons, today's ships are larger and fewer. If detailed hydrographic information is unavailable, the feasibility of such vessels entering ports cannot be ascertained, with the consequence that countries will have to rely on costly off-shore trans-shipment. Furthermore, modern charts provide the facility to establish sea lanes and traffic separation schemes compatible with international requirements and the interests of the coastal State. The availability of modern

charts may encourage large cruise ships to visit hitherto inaccessible areas, thereby promoting the national tourist industry.

Coastal zone management

16. Precise large-scale surveys provide the primary data for good coastal zone management, including the construction of new ports and enhancement of existing ones; the construction of training works to control coastal erosion; the reclamation of land from the sea; dredging operations to establish and improve channels; the establishment and monitoring of dumping grounds for industrial wastes; the exploration of the feasibility of tidal power; the extraction of in-shore mineral deposits, including sand and gravel; desalination projects; and aquacultural activities. Accurate delineation of the coastline, including islands and off-shore rocks, makes it possible to determine precisely the baselines to be used for the establishment of the seaward limits of national jurisdiction. The emerging Law of the Sea contains provisions which will place an obligation on coastal States to show these baselines and the outer limits of the territorial sea, exclusive economic zone and continental shelf on charts of adequate scale and to deposit these charts with the Secretary-General of the United Nations. Hydrographic services are the only agencies with the technical competence to prepare such charts.

Exploration and exploitation of undersea resources

17. The emerging Law of the Sea is likely to confer upon coastal States sovereign rights to the resources of the sea and the continental shelf on an unprecedented scale. Coastal States shall enjoy these rights in a 200-mile-wide exclusive economic zone. The figure below illustrates the approximate extent of the 200-mile limit and table 1 gives the approximate order of magnitude of the areas of the sea that would fall within the national jurisdiction of coastal States. Coastal States, especially developing ones, have a great opportunity before them to develop these areas. However, the acquisition of these undersea areas carries with it the onus of conducting national surveys for the exploration and exploitation of resources. An idea of what is involved in these surveys is briefly outlined in the next paragraph.

18. The landmass of a coastal State extends into the sea to form the continental shelf, the upper layers of which are usually composed of sedimentary deposits that have accumulated over millions of years. Sedimentary areas have the potential for rich mineral deposits, particularly hydrocarbons, which need to be identified and located by surveys. In the initial stages, the surveys are of a preliminary nature to provide a broad reconnaissance coverage of the exclusive economic zone. The surveys should obtain bathymetric, geomagnetic, gravimetric and seismic profiling information. The data must be translated into a suitable form - for example, into thematic maps to identify areas of interest. It is common practice to obtain bathymetric and geophysical data at one and the same time because it is more economical to do so than to acquire the information piecemeal. These surveys constitute the initial phases of resource development in the economic zone and should be undertaken by the hydrographic services of coastal States. The participation of geophysicists and geologists is essential for the processing and analyses of the results of geophysical surveys. The advantages to be gained by a coastal State conducting its own surveys of the

resources in the economic zone are considerable. Data pertaining to resources are extremely valuable and make it easier for coastal States to obtain better terms when awarding contracts for the exploration and recovery of the resources than if such data were available only to the contracting firm.

Environmental concerns

19. The increasing rate of pollution in the world's oceans is of major concern to all countries. Marine transportation and the extraction of undersea petroleum resources are responsible for a percentage of the pollutants entering the oceans, but most of the pollutants emanate from land-based sources. In order to trace the path of pollutants, whether originating from the land or from sources at sea, the tidal and current patterns in both the coastal and off-shore areas must be known. It is the responsibility of the national hydrographic service to obtain the basic observational data and to conduct the subsequent analyses from which predictions for both tidal and current movements can be made. These predictions, combined with appropriate meteorological observations, make it possible to predict the movement of oil spills in order that the appropriate preventive and clean-up measures can be taken. The predictions, combined with bathymetric information, allow for the judicious selection of ocean dumping sites for deleterious materials such as mine tailings. An appropriate site could have harmful effects on the local fisheries or even result in the dumped material's eventually being redeposited on the country's shoreline.

Figure. 200-mile exclusive economic zone (unshaded area)

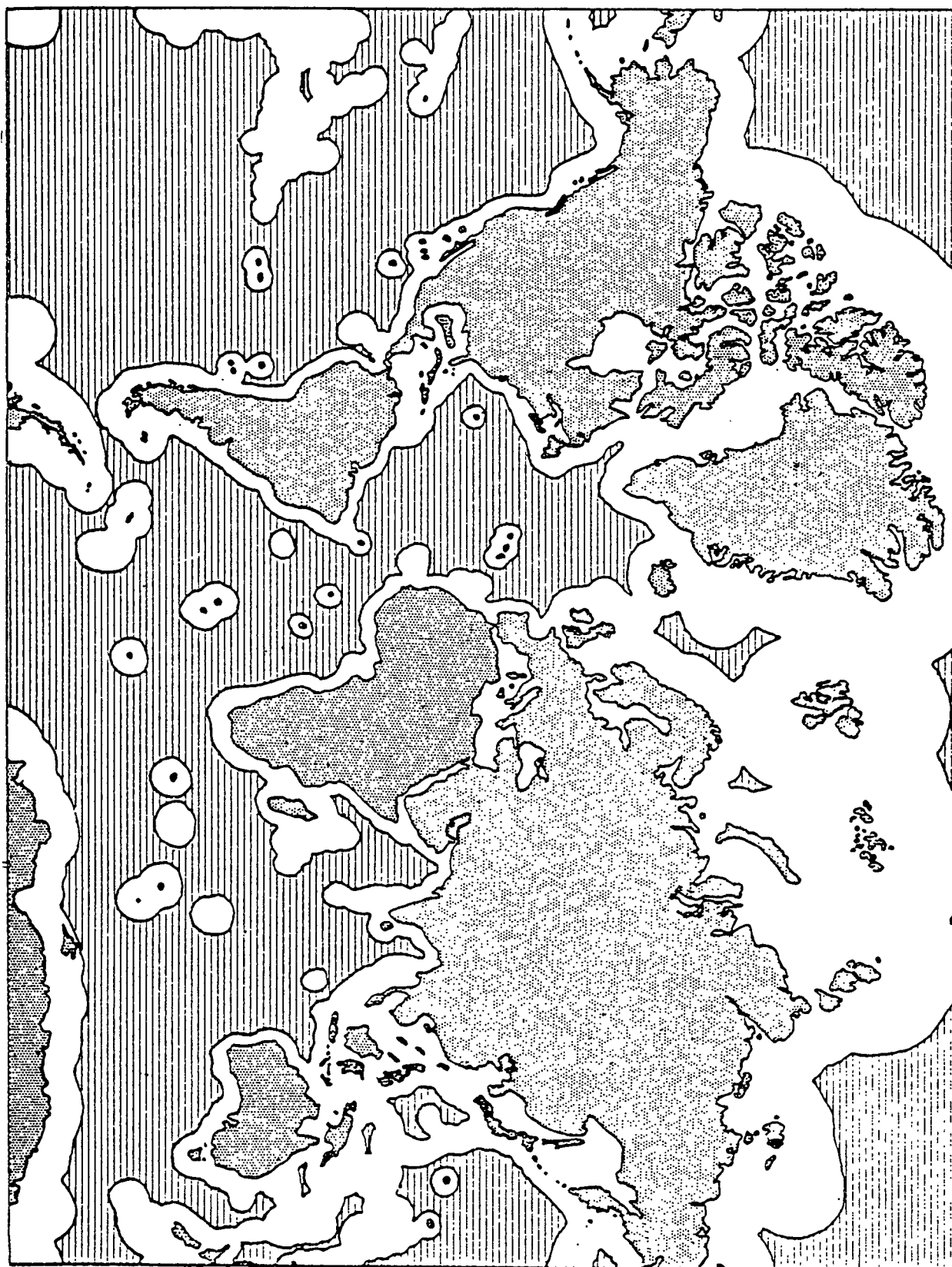


Table 1. Theoretical allocations of sea-bed to coastal States within a 200-mile exclusive economic zone d/

Country <u>e/</u>	Total land area	Exclusive economic zone	Percentage of areal increase
(Thousands of square kilometres)			
Albania	28.7	12.3	43
Algeria	2 381.7	137.2	6
Angola	1 246.7	506.1	41
Argentina	2 776.9	1 164.5	42
Australia <u>f/</u>	7 686.9	7 006.5	91
Bahamas	13.9	759.2	5 448
Bahrain	0.6	5.1	827
Bangladesh	144.0	76.8	53
Barbados	0.4	167.3	38 825
Belgium	30.5	2.7	9
Benin	112.6	27.1	24
Brazil	8 512.0	3 168.4	37
Bulgaria	110.9	32.9	30
Burma	678.0	509.5	75
Canada <u>g/</u>	9 976.1	4 697.7	47
Cape Verde	4.0	789.4	19 572
Chile	756.9	2 288.2	302
China	9 597.0	1 355.8	14
Colombia	1 138.9	603.2	53
Comoros	2.2	228.4	10 519
Congo	342.0	24.7	7
Costa Rica	50.7	258.9	511
Cuba	114.5	362.8	317
Cyprus	9.3	99.4	1 075
Democratic Kampuchea	181.0	55.6	31
Democratic Yemen	287.7	550.3	191
Denmark	43.1	68.6	159
Djibouti	22.0	6.2	28
Dominican Republic	48.7	268.8	552
Ecuador	283.6	1 159.0	409
Egypt	1 001.4	173.5	17
El Salvador	21.0	91.9	437
Equatorial Guinea	28.1	283.2	1 010
Ethiopia	1 221.9	75.8	6
Fiji	18.3	1 134.7	6 210
Finland	337.0	98.1	29
France <u>h/</u>	547.0	341.2	62
Gabon	267.7	213.6	80
Gambia	11.3	19.5	173
German Democratic Republic	108.2	9.6	9
Germany, Federal Republic of	248.6	40.8	16
Ghana	238.5	218.1	91
Greece	131.9	505.1	383

Table 1 (continued)

Country <u>e/</u>	Total land area	Exclusive economic zone	Percentage of areal increase
(Thousands of square kilometres)			
Grenada	0.3
Guatemala	108.9	99.1	91
Guinea	245.9	71.0	29
Guinea-Bissau	36.1	150.5	417
Guyana	215.0	130.3	61
Haiti	27.8	160.5	578
Honduras	112.1	200.9	179
Iceland	103.0	866.9	842
India	3 280.5	2 014.9	61
Indonesia	1 904.3	5 408.6	284
Iran	1 648.0	155.7	9
Iraq	434.9	0.7	-
Ireland	70.3	380.3	541
Israel	20.7	23.3	113
Italy	301.2	552.1	183
Ivory Coast	322.5	104.6	32
Jamaica	11.0	297.6	2 715
Japan	372.3	3 861.1	1 037
Jordan	97.7	0.7	1
Kenya	582.6	118.0	20
Kuwait	17.8	12.0	67
Lebanon	10.4	22.6	218
Liberia	111.4	229.7	206
Libyan Arab Jamahiriya	1 759.5	338.1	19
Madagascar	587.0	1 292.0	220
Malaysia	329.7	475.6	144
Maldives	0.3	959.1	321 843
Malta	0.3	66.2	20 943
Mauritania	1 030.7	154.3	15
Mauritius	1.9	1 183.0	63 432
Mexico	1 972.5	2 851.2	145
Morocco	446.6	278.1	62
Mozambique	783.0	562.0	72
Netherlands	40.8	84.7	207
New Zealand	268.7	4 833.2	1 799
Nicaragua	130.0	159.8	123
Nigeria	923.8	210.9	23
Norway <u>i/</u>	386.6	2 024.8	524
Oman	212.5	561.7	264
Pakistan	803.9	318.5	40
Panama	75.6	306.5	405
Papua New Guinea	461.7
Peru	1 285.2	786.6	61
Philippines	300.0	1 890.7	630
Poland	312.7	28.5	9

Table 1 (continued)

Country <u>e</u> /	Total land area	Exclusive economic zone	Percentage of areal increase
(Thousands of square kilometres)			
Portugal <u>j</u> /	92.1	1 774.2	1 927
Qatar	11.0	24.0	218
Romania	237.5	31.9	13
Samoa	2.8	96.0	3 378
Sao Tome and Principe	1.0	128.2	13 303
Saudi Arabia	2 149.7	186.2	9
Senegal	196.2	205.7	105
Seychelles	0.4	729.7	19 407
Sierra Leone	71.7	155.7	217
Singapore	0.6	0.3	59
Somalia	637.7	782.8	123
South Africa <u>k</u> /	1 222.2	1 016.7	83
Spain <u>l</u> /	770.8	1 219.4	158
Sri Lanka	65.6	517.4	789
Sudan	2 505.8	91.6	4
Suriname	163.3	101.2	62
Sweden	450.0	155.3	35
Syrian Arab Republic	185.2	10.3	6
Thailand	514.0	324.7	63
Togo	56.0	1.0	2
Trinidad and Tobago	5.1	76.8	1 498
Tunisia	163.6	85.7	52
Turkey	780.6	236.6	30
USSR <u>m</u> /	22 402.2	4 490.3	20
United Arab Emirates	83.6	59.3	71
United Kingdom <u>n</u> /	286.7	2 336.5	1 227
United Republic of Cameroon	475.4	15.4	3
United Republic of Tanzania	945.1	223.2	24
United States of America <u>o</u> /	9 372.0	7 825.0	83
Uruguay	177.5	119.3	67
Venezuela	912.0	363.8	40
Viet Nam	332.6	722.1	217
Yemen	195.0	33.9	17
Yugoslavia	255.8	52.5	21
Zaire	2 345.4	1.0	-

(Foot-notes on following page)

Foot-notes to table 1

d/ Figures should be considered as order of magnitude values only. Land area values are taken from the Statistical Yearbook, 1974 (United Nations publication, Sales No. E/F.75.XVII.1). Exclusive economic zone values have been taken from International Boundary Study, series A, Limits in the Seas, No. 46 (Washington, D.C., Office of the Geographer, Department of State, Bureau of Intelligence and Research, 1972). Contributions from the International Hydrographic Organization were greatly appreciated.

e/ The term "country", as used in this table refers also to territories or areas.

f/ Exclusive economic zone includes Papua New Guinea.

g/ Exclusive economic zone includes Hudson Bay.

h/ Excluding Overseas Departments, namely, French Guyana, Guadeloupe, Martinique and Réunion.

i/ Including Svalbard and Jan Mayen.

j/ Continental Portugal, including the Azores and Madeira.

k/ Including Walvis Bay.

l/ Including the Balearic and Canary Islands and former Spanish Sahara.

m/ Including the Byelorussian Soviet Socialist Republic and the Ukrainian Soviet Socialist Republic.

n/ Including Belize, Bermuda, British Virgin Islands, Brunei, Dominica, Falkland Islands (Malvinas), Saint Kitts and Saint Lucia.

o/ Including Alaska and Puerto Rico.

III. STATUS OF HYDROGRAPHIC SURVEYING AND CHARTING

20. The existing chart coverage of developing countries with a limited hydrographic capability, and in particular those countries that have no hydrographic capability whatsoever, is entirely dependent on surveys carried out earlier by the major charting nations. Many of these surveys were carried out more than a century ago by methods that are completely outdated and dangerously inadequate for ensuring the safety of navigation for present-day shipping. Nevertheless, since the charts based on such surveys are the only ones available, mariners have perforce to depend upon them for navigating to the harbours or along the coasts of these developing countries. A mariner must have confidence in the chart he is using and to be able to take it for granted. However, charts based on ancient surveys are likely to be misleading, since dangers that have escaped detection by antiquated surveys and interim changes in the sea-bed could endanger shipping. Accurate and up-to-date charts are needed to encourage international shippers to enter harbours or navigate along the coasts without fear or reservation.

21. In 1970 the Ad Hoc Group of Experts on Hydrographic Surveying and Bathymetric Charting investigated as thoroughly as current knowledge permitted the status of hydrographic surveying and charting throughout the world. Table 2 of the report p/ showed the status of charts of the waters of developing countries with limited or no hydrographic capability and illustrated the acute deficiencies in those charts at the time.

22. Table 2 below is an updated version of that table. It reflects the present membership of the United Nations and the specialized agencies, but more importantly it reflects a redistribution of responsibilities for hydrographic services throughout the world. Whereas quite often some developed nations with well established hydrographic services had formerly assumed that important function, with independence the burden was, in effect, transferred to the new countries.

23. The overall status of coastal charting remains virtually unchanged. Several of the established services have directed their efforts towards the deeper waters off their own coasts, as off-shore resources have assumed a greater economic importance. q/ In the developing countries, some work continues in the port areas and in support of new terminals as normal growth in transportation occurs, but in general very little change has taken place in the past seven years.

24. The International Chamber of Shipping (ICS) is currently collecting information on the areas of the world that are in urgent need of modern charts, so that international shipping can move safely through these areas. Degrees of priority have been identified by ICS and when the findings are published many of the countries listed in table 2 below will be included in the list of high-priority areas.

p/ Ibid., pp. 352 and 353.

q/ Japan, for example, has made great strides in conducting basic charting surveys, not only for bathymetric charts, but also for geophysical data.

Table 2. Dates of surveys used in current coastal charting of countries with limited or no capability for hydrographic survey r/

Country <u>s</u> /	Dates of coastal surveys <u>t</u> /	Remarks
Albania	1872-1930	Little recent survey
Algeria	1924-1933	Some scattered surveys, 1953-1961
Angola	1939-1974	
Bahamas	1970 and earlier	
Bahrain	1932-1960	
Bangladesh	1879-1928	Some more recent surveys, 1953-1958
Barbados	1869-1968	
Benin	1826-1846	Limited surveys, 1937-1942
Bulgaria	1835-1899	
Burma	1884-1939	Some more recent surveys
Cape Verde	1946-1972	
Colombia	1935-1938	Some recent surveys, 1968-1973
Comoros	1841-1892	Some surveys, 1953-1964
Congo	1952-1972	
Costa Rica	1830-1938	
Cyprus	1931-1963	
Democratic Kampuchea	1934-1952	
Democratic Yemen	1835-1929	Partly surveyed
Dominican Republic	1905-1911	Some recent surveys
Ecuador	1948	Some recent surveys
Egypt	1862-1928	Approaches to Suez Canal being surveyed
El Salvador	1880-1884	Some recent surveys, 1967
Equatorial Guinea	N <u>u</u> /	Some recent surveys, 1963-1968
Ethiopia	1924-1954	
Fiji	1854-1970s	Recent limited surveys
Gabon	1951-1972	
Gambia	1934	Some recent surveys, 1971
Ghana	1826-1930	Surveys planned for 1978

Table 2 (continued)

Country s/	Dates of coastal surveys t/	Remarks
Grenada	1859-1958	
Guatemala	1835-1896	Some recent surveys, 1965
Guinea	1857-1897	Some recent surveys, 1960
Guinea-Bissau	1949-1972	
Guyana	1960-1972	
Haiti	1905-1924	Some recent surveys
Honduras	1830-1938	Complete coastal surveys in hand
Iran	1937	Surveys in progress
Iraq	1953	
Ireland	1860-1970s	
Ivory Coast	1826-1964	
Jamaica	1851-1975	
Jordan	N	
Kenya	1870-1880	Some more recent surveys, 1964
Kuwait	1948-1952	Later commercial surveys
Lebanon	1860-1921	
Liberia	1826-1913	
Libyan Arab Jamahiriya	1919-1930	Partial surveys since 1945
Madagascar	1893-1964	Some later surveys of small areas
Malaysia	1910-1975	
Maldives	1839-1934	
Malta	1800s-1957	
Mauritania	1934-1963	
Mauritius	1877-1897	
Mexico	1870-1970s	
Morocco	1912-1934	Atlantic coast, 1947-1959
Mozambique	1931-1974	
Namibia	1928-1972	
Nicaragua	1870-1884	Some later surveys
Nigeria	1911-1933	Some later surveys
Oman	1828-1934	

Table 2 (continued)

Country <u>s</u> /	Dates of coastal surveys <u>t</u> /	Remarks
Panama	1880-1938	Surveys currently in progress
Papua New Guinea	1850-1977	
Peru	1836-1969	
Qatar	1946-1961	
Romania	1856-1857	
Samoa	1910-1956	
Sao Tome and Principe	1951-1965	
Saudi Arabia	1853-1977	
Senegal	1934-1965	Recent off-shore and local surveys
Seychelles	1875-1972	
Sierra Leone	1870-1969	
Somalia	1938-1939	
Sri Lanka	1860-1945	More recent local surveys
Sudan	1830-1939	
Suriname	1967-1970	
Syrian Arab Republic	1859	Some local surveys, 1921-1923, 1961
Togo	1826-1846	
Trinidad and Tobago	1867-1965	
Tunisia	1924-1939	Some scattered surveys, 1950-1972
United Arab Emirates	1824-1960s	
United Republic of Cameroon	1848-1909	Some recent surveys, 1948-1968
United Republic of Tanzania	1873-1878	
Uruguay	1925-1969	Some more recent surveys, 1957
Venezuela	1938-1976	
Viet Nam	1873-1970	
Yemen	1890-1925	
Zaire	1825-1937	River surveys, 1975-1976

(Foot-notes to table 2)

r/ Information about port surveys has not been included. Although important in enabling vessels to use ports with safety, good quality port surveys are not in themselves sufficient, because they must normally be supported by good coastal surveys to ensure safe approach to ports. The table does not discriminate between lead-line surveys, echo-sounder surveys and those produced by the latest methods, because this would tend to lead the reader to make unwarranted assumptions about the reliability of surveys. The reliability of a survey depends upon other factors, as well as the method of determining depth. These other factors include the topography of the sea-bed, the density of depth measurements and the position-fixing system in use.

s/ The term "country" as used in this table refers also to territories or areas.

t/ The age of a survey may be a rough guide to its reliability, although the considerations mentioned in foot-note r/ must be borne in mind. In general, older surveys tended to measure depths at fewer points and with less positional accuracy than more recent surveys.

u/ The designation "N" means that the Group had insufficient information at its disposal on the status of surveying.

25. With the interest created by the United Nations Conferences on the Law of the Sea and the concept of the 200-mile economic zone, many countries will refocus their hydrographic activities on these broad new horizons. Hydrographic surveys of the coastal waters are receiving a smaller proportion of the attention of today's hydrographers. Yet in many developing countries, as table 2 above suggests, the existing data are so antiquated that the needs of national planners cannot be met. The impetus for a country to develop its off-shore resources will depend to a large degree on the picture drawn by hydrographic advisers. Not only must the less developed countries now plan to provide the charts and services for safe navigation but they must also decide how best to incorporate their skills to meet the need brought on by a world-wide thrust into an ocean economic environment.

26. In summary, while the status of hydrographic surveying and charting has changed very little in the past seven years, the scope of interests in the ocean has broadened much more widely and rapidly than previously anticipated. Significant increases in the draught of vessels have led to the requirement that the latest surveys search for dangers at much greater depths than was formerly customary; many recent surveys can therefore no longer be considered adequate.

Status of hydrographic services

27. A list follows of coastal States that have no hydrographic service. There is an urgent need for each of these countries to investigate the establishment of hydrographic service.

Countries with no hydrographic services

Albania	Guinea-Bissau	Qatar
Algeria	Haiti	Samoa
Angola	Honduras	Sao Tome and Principe
Bahamas	Iran	Saudi Arabia
Bahrain	Iraq	Senegal
Bangladesh	Ireland	Seychelles
Barbados	Ivory Coast	Sierra Leone
Benin	Jamaica	Somalia
Cape Verde	Jordan	Sri Lanka
Comoros	Kenya	Sudan
Congo	Kuwait	Suriname
Costa Rica	Lebanon	Syrian Arab Republic
Cyprus	Liberia	Togo
Democratic Kampuchea	Libyan Arab Jamahiriya	Trinidad and Tobago
Democratic Yemen	Maldives	Tunisia
Djibouti	Malta	United Arab Emirates
El Salvador	Mauritania	United Republic of Cameroon
Ethiopia	Mauritius	United Republic of Tanzania
Gabon	Morocco	Viet Nam
Ghana	Mozambique	Yemen
Grenada	Namibia	
Guatemala	Oman	
Guinea	Papua New Guinea	

IV. GUIDELINES FOR THE FORMATION OF HYDROGRAPHIC SERVICES

Hydrographic services

28. The preceding sections of this report have stressed the economic benefits that may be derived from the establishment of an efficient national hydrographic service capable of carrying out surveys throughout a country's exclusive economic zone. It is of crucial importance that a country's decision-makers should recognize the short-term and long-term benefits of investing resources in a hydrographic service and that commercial interests should give their support. Ultimately, the decision is a political one. Therefore, it is necessary for those at the appropriate levels of government and administration to recognize that important economic developments involving the expansion of trade and the utilization of off-shore resources would be dependent on an efficient hydrographic service. Any developing country that has no hydrographic service must examine critically and carefully its need for one. It should take expert advice, consulting the International Hydrographic Organization (IHO) or the United Nations, because the appropriate expertise seldom exists within countries in this situation.

The decision to establish a national hydrographic service

29. The economic arguments make it reasonable to assume that the need for a national hydrographic service will be recognized. Because national resources are involved, it follows that a country's Government will normally choose to establish a national service. From this point of fundamental decision, the various options must be examined.

30. In most cases, it is probable that there is no readily identifiable agency in the country that could adequately represent the needs of hydrography, and it is necessary to identify the national organization best fitted to control the project in its very early stages. This selection having been made, the country should invite one or more hydrographic experts to examine the local requirements in liaison with the body identified. Proposals appropriate to the country's needs, capability and funds should be formulated for government consideration. It is not possible to give definitive technical advice here, because the requirements may vary from country to country, as does the ability to meet the needs. Given this expert advice, the Government will determine whether a national hydrographic service should be established as soon as possible. There may be circumstances in which it is impossible for a nation to set up immediately even a minimum hydrographic service without considerable financial and technical assistance from international sources or a developed country. Indeed, a developing country should ascertain what it can expect by way of assistance from the United Nations, for example, under the United Nations Development Programme (UNDP).

Organization of a new hydrographic service

31. There are obvious reasons why the hydrographic service should be an official national agency and not a private body. Its charts and associated publications must have legal authority. This national agency will ensure that all data collected during the exploration of resources will be available to the country. It is essential that the new service should be associated with a government body concerned

with maritime affairs, and that its future head should be at a relatively high level in government service, because of the problems that will inevitably be associated with its establishment and growth. Furthermore, the new hydrographic service must have links with other national agencies in the relevant fields, such as transportation, maritime navigation, port authorities, land-mapping authorities, inland waterway authorities and the like.

32. The nucleus of a new hydrographic service should be recruited to form a judicious mix of personnel from existing maritime and cartographic agencies within the country.

33. The choice of civilian or military control is also a government decision. It is a historical fact that many existing hydrographic services are associated with their countries' military organizations, there being an advantage in using naval vessels and supporting services. Alternatives should be carefully considered, and the decision made for fundamental reasons rather than historical or imitative ones.

Objectives

34. The decision to set up a national hydrographic service having been made, the ultimate aim should be the achievement of self-sufficiency. It will be realistic to treat this as a long-term goal and to consider intermediate targets that will make for planned growth through the various stages.

35. The terms of reference of the hydrographic service will depend upon national political and economic objectives, the available potential and the geographical nature of the area. The hydrographic service must aim at achieving most or all of the following:

(a) The provision and promulgation of nautical information and charts to ensure safe navigation for national and international shipping;

(b) The survey of new and developing ports;

(c) Co-operation with buoyage and lighthouse authorities in fixing the precise position of navigational aids, promulgating changes, etc.;

(d) The collection of data in the marine environment, especially to acquire knowledge of resource potential;

(e) The provision of geodetic and other hydrographic data for the determination of maritime limits;

(f) The provision of information for the protection of the maritime environment.

36. Studies must be undertaken to provide information that will assist in the establishment of targets and stages of development and the determination of priorities of hydrographic tasks, including relative priorities compared with projects in other fields. These studies should include:

(a) A review of existing data;

(b) The consideration of environmental factors, such as the nature of the coastline and sea-bed, tidal conditions, sediment transportation, river régimes, meteorological conditions and the like;

(c) The identification of national elements likely to be users of hydrographic products, including petroleum and mining industries, shipping, fisheries, tourism, environmental agencies, ocean engineers and the like;

(d) The general assessment of the availability of funding over a long period.

37. Once a general idea has been formed of the desired programme and relevant factors, it is necessary to decide on a suitable time-frame for growth through planned stages of organizational development. Although the ultimate aim should be self-sufficiency, the final stages in reaching this goal require sophisticated surveying facilities that are capital-intensive and involve the use of highly trained personnel. Because of the considerable expense involved, it is unlikely that many developing countries will attempt to start a complete service at the outset.

38. The decision concerning the pace of development will also depend upon expert assessment of potentially exploitable mineral resources on or below the sea-bed of the country's exclusive economic zone. The investigations necessary to assess this potential require at least one ocean-surveying vessel, sophisticated data-collecting equipment and specialized personnel. Outside assistance for an exploratory survey may be necessary if the information is required urgently.

Planned stage development

39. The normal progression will involve planned growth from modest beginnings, developing by stages as the needs emerge and the financial situation permits. The stages of development could be:

(a) The identification of the appropriate agency to act as the focal point for hydrographic matters;

(b) The training of the essential personnel, which would initially be very few in number;

(c) The establishment of a minimum service, using small craft with basic equipment, to survey and chart:

(i) Ports and harbours;

(ii) Approaches to ports and harbours;

(iii) Inner coastal waters;

(d) The expansion of the service to enable it to survey and chart:

(i) Outer coastal waters;

(ii) Off-shore areas;

(e) The expansion of the service to embrace full bathymetric and geophysical surveys of oceanic waters.

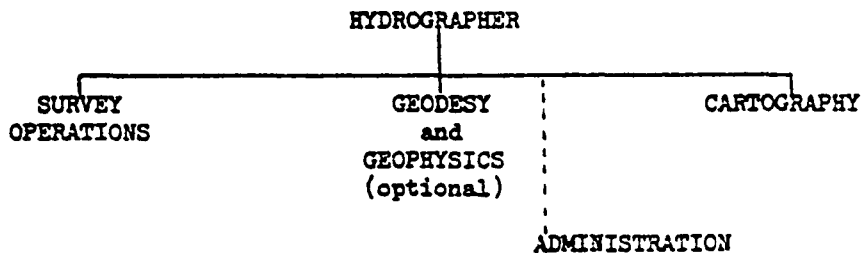
40. Growth along the lines suggested could be a slow process. No spectacular results would be achieved before stage (d), and it might take at least five years before a new service became competent to undertake complex surveys. Each succeeding stage of such a programme represents a major development compared with the previous one, in terms of capital requirements (ships and equipment) and personnel (number, training, and experience). The transition from in-shore to off-shore surveys is perhaps the greatest step in these terms.

41. An idea of the type of vessel and equipment required at each stage may be obtained by studying table 3 below.

Table 3. Requirements for the development of a hydrographic service

Purpose	Type of vessel	Echo sounder	Position fixing	Special requirements	
Safety of navigation	Harbour charts	Small boat(s)	Shallow use	Visual or short-range electronic system	-
	Approach charts, route charts for deep-draught vessels	Medium to large vessel	Shallow use and side-scan sonar	Visual or electronic system	-
Off-shore resources	Coastal charts	Small and large vessel(s)	Shallow use and deep use	Depending on conditions: short-range and long-range electronic system; satellite receivers	Dredge and corer, geo-magnetometer, sea-gravimeter, seismic profiler
	Basic and thematic charts	Large vessels			
Base-line surveys		Small boats	Shallow use	Visual or short-range electronic system	Aerial photography, satellite geodesy

42. The following figure shows a proposed organizational chart for a modest hydrographic service.



Organizational structure

43. The organizational structure of the new hydrographic service should be planned to match the stages of development. The general structure and its hierarchical responsibilities must be connected at each stage with estimates of the staff required, technical and administrative support services needed, ships and crews, equipment, office accommodation, workshops and laboratories and the like. The cost of these must be carefully estimated and subjected at each stage to strict financial and budgetary procedures. It is advisable to institute annual reviews of the project's development.

44. In the early stages, the training need is paramount, and those responsible must make themselves aware of the facilities available. The Group considered the subject of training to be so important that it is discussed in a separate section of this report (see paras. 53-59 below).

45. A most important consideration is the choice of the person to direct the project from its beginning. This person must be chosen with the utmost care, the ideal qualities being:

- (a) Demonstrated drive, tact and management ability;
- (b) A genuine interest in the sea and maritime affairs, preferably with experience as a mariner;
- (c) A highly developed sense of responsibility to the country;
- (d) Advanced education in surveying, engineering or scientific subjects.

46. Given the right choice of individual, the problems connected with recruitment, training, equipment, infrastructure and finances can largely be left to that individual, subject to the normal process of consultation and justification appropriate to any national enterprise.

47. No development will be possible without recognition of the need for hydrographic services by those responsible for the country's economic affairs, followed by positive support and encouragement throughout the formative years. Paucity of results in the early stages must be expected, and this must not be used as a pretext for withdrawal of support.

48. The preceding paragraphs of this section have been based upon the assumption that each developing country which recognizes the need for hydrographic services will consider it essential to aim at establishing a national agency. Lack of funds or limited potential for marine development may lead a few countries to consider, for the time being at least, alternative solutions. These alternatives include:

- (a) Entering into an agreement with another country to carry out hydrographic surveys and charting;
- (b) Obtaining hydrographic surveys by contract with commercial surveying firms;
- (c) Entering into joint hydrographic ventures with other countries;

(d) Establishing a partial national hydrographic agency, engaging only in surveying operations. This would necessitate the employment of another national charting agency or other competent agency to produce the charts. There are precedents for this solution, and developing countries should consider with great care the desirability of completing the process of charting within their own hydrographic service, because the cost might not be as readily justifiable as that for the surveying need.

V. GUIDELINES FOR STRENGTHENING EXISTING HYDROGRAPHIC SERVICES

49. A number of developing countries have a limited capability for hydrographic surveying and charting. Some of these may be inhibited from further growth through lack of awareness of the need to expand to meet an increasing need for hydrographic services. As a result, hydrographic activities often have been given unduly low priority. In many cases, these services are inadequate to meet increasing needs, and government bodies in these countries should examine critically their hydrographic services, calling in one or more expert advisers from outside, if necessary, to assist in this examination. They will readily determine the stage of development reached by their own hydrographic services, and can identify their position in the development scheme outlined in the guidelines for countries without any hydrographic service (see section IV above).

50. The Group's recommendations to the authorities in such countries are essentially the same as those in the guidelines already offered. The development must be projected forward from the stage already reached, and those responsible for the project should, whenever possible, take advantage of programmes for the provision of expert advice and training facilities.

51. It is most important that those responsible for financing the projects should develop an appreciation of the changed hydrographic needs of their country, what is involved in practical terms, and the possible economic advantages of supporting a vigorous growth in the hydrographic sector. They should look upon growth in this field as a good long-term investment for the future of the economy.

52. Many hydrographic services may find themselves unable to progress beyond a certain stage, and they must then seek ways to establish further impetus by stimulating national interest.

VI. TRAINING

53. Recognizing the fact that trained personnel are the foundation upon which national hydrographic capabilities can be built, it is logical that training programmes should constitute an important activity within any specialized technical organization. So-called "on-the-job" training provides personnel with a basic familiarization in hydrography, but this type of exposure does not provide the in-depth knowledge which is essential for the development of the competent hydrographer.

54. Several national charting agencies conduct comprehensive training programmes, and some of these courses are available to personnel from developing countries. Each programme has been tailored to suit the needs of the agency conducting the course, and hence conforms to the particular national hydrographic standard. Efforts are being made to standardize training on an international level, primarily through the

efforts of the Fédération internationale des géomètres (FIG) and the International Hydrographic Organization (IHO). A joint report, which outlines minimum standards of competence for the hydrographic surveyor and presents detailed syllabi, has been adopted by both FIG and IHO. v/ It is anticipated that within the next few years many national training programmes will be modified to meet these international standards.

55. As it is unrealistic for developing countries to establish their own internal training facilities immediately, it is suggested that interested countries should avail themselves of programmes being offered by established hydrographic organizations. Arrangements of this type can often be made through bilateral or multilateral arrangements, with some funding support from international sources. w/ One point must be emphasized. Personnel selected for training programmes must have academic backgrounds that will enable them to absorb the training being offered. These potential candidates must be competent in the language of the training programme.

56. Table 4 below lists some of the major national hydrographic training programmes that could be made available by mutual arrangement to qualified candidates from developing countries. Those interested in obtaining further details should contact IHO x/, who will advise them of the name and address of the appropriate national contact. The importance of sea experience for all those contemplating a career in hydrography is stressed.

57. The majority of these courses emphasize the surveying aspects of hydrography. The cartographic or chart-making aspects must also be considered in training plans. Many cartographic courses are available from academic institutions for those interested, but these are not marine-oriented; additionally, help may be obtainable from the national mapping agency of the country.

58. In order to strengthen their capability, countries with an existing hydrographic service should not neglect training opportunities. The advanced courses offered will provide considerable insight into the latest survey instrumentation and modern technological developments. Course attendance allows for the interchange of ideas among hydrographers from various countries.

59. The task of producing trained personnel in adequate numbers to meet future demands is of a magnitude that requires extensive international co-operation. The international hydrographic community appears ready to meet this challenge.

v/ This report, entitled "FIG/IHO Working Group on Education and Standards of Competence for Hydrographic Surveyors", is available from the International Hydrographic Organization, 7 Avenue Président J. F. Kennedy, Monte Carlo, Monaco.

w/ Interested countries should contact offices of the United Nations, the Colombo Plan, the Organization of African Unity the Organization of Petroleum Exporting Countries or the Organization of American States. Various foundations can also be consulted.

x/ For the address of IHO, see foot-note v.

Table 4. Major training programmes in hydrography

Country	Category	Level	Approximate duration	Language	Remarks
Argentina	Surveyors	Advanced	4 years	Spanish	Educational institution
Australia	Surveyors	Basic	1 year	English	Naval hydrographic school
Australia	Assistants	Basic and advanced	12 weeks	"	" "
Australia	Surveyors	Advanced	-	"	Educational institutions
Brazil	Assistants	Specialist	40 weeks	Portuguese	Educational institution
Brazil	Assistants	Intermediate	19 weeks	"	" "
Brazil	Surveyors	Advanced	52 weeks	"	" "
Canada	Surveyors	Basic	24 weeks	English	Hydrographic service school
Canada	Surveyors	Advanced	12 weeks	"	" "
France	Assistants	Basic	2 years	French	Naval hydrographic service school
France	Assistants	Advanced	13 months	"	" "
France	Surveyors	Advanced	2 years	"	" "
India	Surveyors	Basic	16 weeks	English	" "
India	Surveyors	Advanced	37 weeks	"	" "
Italy	Surveyors	Advanced	15 months	Italian	" "
Japan	Surveyors	Intermediate	6 months	English	Hydrographic service
Philippines	Surveyors	Advanced	5 years	"	Educational institution

Table 4 (continued)

Country	Category	Level	Approximate duration	Language	Remarks
Turkey	Surveyors	Basic	1 year	Turkish	Naval hydrographic school
Turkey	Assistants	Basic	1 year	"	" "
United Kingdom	Surveyors	Basic and advanced	10-24 weeks	English	" "
United Kingdom	Assistants	"	8-14 weeks	"	" "
United Kingdom	Surveyors	Basic	5 weeks	English	Educational Institution
United Kingdom	Surveyors	Advanced	6 months plus 2 years	"	Officer-level training at sea
United States of America	Surveyors	Advanced	2 years	"	Naval postgraduate school
United States of America	Surveyors	Advanced	1 year	"	Naval hydrographic school
United States of America	Surveyors	Advanced	48 weeks	"	National Oceanic and Atmospheric Administration school
United States of America	Surveyors	Basic	13 weeks	Spanish	Defense Mapping Agency (Inter-American Geodetic Survey) /Panama

VII. INTERNATIONAL CO-OPERATION AND RESPONSIBILITIES

60. It is particularly appropriate to draw attention to the need for countries with a limited hydrographic capability to consider the various avenues open through international co-operation, with a view to improving their services to the maritime community, especially their own. At the very least, such developing countries should take all measures necessary to ensure that charts of their waters are kept up to date.

61. All countries with existing hydrographic services, however limited, and all countries establishing new hydrographic services, should, without exception, seek membership in the International Hydrographic Organization. This is the best way to remain abreast of current hydrographic technology, to become aware of international hydrographic standards, and to become a participatory member of the international hydrographic community. The development of a strong and active international hydrographic community y/ is the best way of participating in the tremendous task of enhancing the knowledge of the oceans for the general benefit of mankind and the particular benefit of each maritime country.

VIII. RECOMMENDATIONS

62. Recognizing the urgent need for hydrography in the world today and the incapacity of most coastal States to meet this need, the Group makes the following recommendations:

I

National authorities should seriously and immediately consider the benefits of establishing hydrographic services to obtain adequate surveys of their maritime economic zones to permit potential resource exploration and exploitation.

II

National authorities should ensure that up-to-date nautical charts of coastal and port areas are published to encourage and enhance commercial marine transportation to and from their country.

III

Hydrographic services should re-examine their own capabilities and, if necessary, make the strongest appeal to their national authorities for the funding and support needed to meet their increasing responsibilities, particularly those in off-shore waters.

IV

Countries with insufficient hydrographic capabilities should take immediate advantage of training and other assistance now available.

y/ See D. C. Kapoor, "International co-operation in hydrography", International Hydrographic Review, vol. LIII, No. 2 (July 1976).

V

Developing countries should join the International Hydrographic Organization in order to derive the maximum benefit from association with the international hydrographic community.

VI

National authorities should examine the merits of regional bilateral or multilateral arrangements to meet their basic hydrographic needs.

VII

In following up the present report, the Cartography Section of the United Nations Secretariat should undertake a detailed study on the status of hydrographic surveying and bathymetric charting of the States Members of the United Nations and seek opportunities for organizing workshops in these fields in co-operation with the International Hydrographic Organization.

VIII

The United Nations Secretariat should send the present report to the ministries or departments responsible for maritime affairs and to the planning commissions, at the ministerial level.

Appendix

RESOLUTIONS OF RELEVANT UNITED NATIONS CONFERENCES

The Group considered 29 resolutions pertaining to hydrography and bathymetric charting adopted by various United Nations regional cartographic conferences and United Nations conferences on the standardization of geographical names held since 1970. z/

The Group took special note of the following resolutions:

(a) Resolution 25 of the Sixth United Nations Regional Cartographic Conference for Asia and the Far East, aa/ dealing with the report of the Ad Hoc Group of Experts on Hydrographic Surveying and Bathymetric Charting, in which the Conference recommended that the developing countries of Asia and the Far East should exert every effort to implement the recommendations contained in the report of the Group of Experts and urged that the developing nations should be supported in their efforts towards implementing those recommendations;

(b) Resolution 26 of the same Conference, in which the Conference recommended that all countries of the region should develop a capability for joint marine geophysical and hydrographic surveys;

(c) Resolution 18 of the Seventh United Nations Regional Cartographic Conference for Asia and the Far East, bb/ in which the Conference urged that developing countries should give urgent consideration to expanding their hydrographic capabilities, if necessary by applying for assistance which was available through the United Nations;

z/ Sixth United Nations Regional Cartographic Conference for Asia and the Far East, held at Tehran from 24 October to 7 November 1970; Seventh United Nations Regional Cartographic Conference for Asia and the Far East, held at Tokyo from 15 to 27 October 1973; Eighth United Nations Regional Cartographic Conference for Asia and the Far East, held at Bangkok from 17 to 28 January 1977; First United Nations Regional Cartographic Conference for the Americas, held at Panama from 8 to 19 March 1976; Third Regional Cartographic Conference for Africa, held at Addis Ababa from 30 October to 10 November 1972; Second United Nations Conference on the Standardization of Geographical Names, held in London from 10 to 31 May 1972; and Third United Nations Conference on the Standardization of Geographical Names, held at Athens from 17 August to 7 September 1977.

aa/ Sixth United Nations Regional Cartographic Conference for Asia and the Far East, 14 October to 7 November, Tehran, Iran, vol.I, Report of the Conference (United Nations publication, Sales No. E.71.I.15), chap. VII.

bb/ Seventh United Nations Regional Cartographic Conference for Asia and the Far East, Tokyo, 15-27 October 1973, vol. I, Report of the Conference (United Nations publication, Sales No. E.74.I.7), chap. VII.

(d) Resolution 19 of the same Conference, bb/ in which the Conference recommended that maritime nations of the region should seek membership in the International Hydrographic Organization;

(e) Resolution 8 of the Eighth United Nations Regional Cartographic Conference for Asia and the Far East, cc/ in which the Conference, appreciating the offer made by the Government of India to extend its training facilities to meet the requirements of the region, recommended that the United Nations should give favourable consideration to any request for financial assistance that might be received from India in that regard and further recommended that the United Nations should give favourable consideration to requests for financial assistance in the award of scholarships to personnel from developing countries of the region for training in hydrography;

(f) Resolution 9 of the same Conference, cc/ in which the Conference, having noted that co-operative projects such as those concluded between Indonesia and Japan in the survey of the Lombok and Makassar straits had met with considerable success, recommended that developed nations should give favourable consideration to requests for assistance of a similar nature received from developing countries in the region;

(g) Resolution 4 of the Third Regional Cartographic Conference for Africa, dd/ in which the Conference recommended that African maritime nations should make every effort to establish their own hydrographic services and further recommended that those countries should seek the help that the International Hydrographic Organization could give in the form of technical advice and in the meantime, if possible, should enter into multilateral and/or bilateral arrangements with one another and with those countries in a position to render assistance in hydrographic surveys;

(h) Resolution 7, of the First United Nations Regional Cartographic Conference for the Americas, ee/ in which the Conference made recommendations similar to those referred to in subparagraph (g) above - that is, that maritime States should establish their own hydrographic organizations of appropriate size in order to undertake hydrographic surveying and, in due course, chart-making and to maintain close liaison with other charting authorities, and that nations with full hydrographic capability should look favourably upon requests for assistance from countries desiring to establish hydrographic organizations;

cc/ Eighth United Nations Regional Cartographic Conference for Asia and the Far East, Bangkok, 17-28 January 1977, vol. I, Report of the Conference (United Nations publication, Sales No. E.77.I.12), chap. VII.

dd/ "Report of the Third Regional Cartographic Conference for Africa", (E/CN.14/CART/349), p. 13.

ee/ First United Nations Regional Cartographic Conference for the Americas, Panama, 8-19 March 1976, vol. I, Report of the Conference (United Nations publication, Sales No. E.77.I.13), chap. VII, pp. 24-25.

(i) Resolution 20 of the Third United Nations Conference on the Standardization of Geographical Names, ff/ in which the Conference recommended that countries sharing a given geographical feature under different names should endeavour, as far as feasible, to reach agreement on fixing a single name for the feature concerned;

(j) Resolution 21, of the same Conference, ff/ in which it was recommended that the United Nations Group of Experts on Geographical Names should co-ordinate its programmes with those of the International Hydrographic Organization.

ff/ E/CONF.69/4.

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