

**SPANISH SOCIETY FOR CARTOGRAPHY,
PHOTOGRAMMETRY AND REMOTE SENSING**

**CARTOGRAPHIC
ACTIVITIES IN SPAIN**

1999-2003

**National Report Submitted to the 12th General Assembly
of the International Cartographic Association**

Durban, August 2003

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CARTOGRAPHIC ACTIVITIES IN SPAIN 1999-2003

Cartographic activities in Spain between 1999 and 2003 have been characterized by the increased production of large-scale topographical and thematic maps, and the production of orthoimages at different scales. It must be underlined the development of geographical information systems (GIS), the commercial management of cartographic products (specially digital) made available to companies and the general public, and the participation in international projects. The Spanish Society for Cartography, Photogrammetry and Remote Sensing has been honoured by ICA with the commitment of the organization of 2005 International Cartographic Conference to be held in the city of A Coruña.

In short for Spain this has meant a great deal of cartographic activity, leading to the adoption of the latest technological advances and increased production of maps and the dissemination of cartography within Spanish society. To serve as an example it should be mentioned the Official Map of Roads of Spain produced by the Spanish Ministry of Public work, with a hundred and fifty thousand copy edition every year, both in printed version and CD-ROM.

The various cartographical institutions have continued to modernize their production means and methods in line with the advances in technology which have taken place at great speed in the last few years.

Since for the period in question it would be difficult to single out any one event as the most important, we shall mention some of those of most significance. Within the field that concern the Instituto Geográfico Nacional (IGN-National Geographic Institute) has concentrated its efforts on several main lines of action.

The incorporation of modern computer techniques has meant a substantial change in the collection and treatment of cartographic information in the National Geographic Institute (IGN). As a result during 1999-2003 the topographic map at scale 1:25,000 has been ended and it is now in a continuous process of updating.

The cartography currently produced by the IGN joins a series of characteristics, which enables a quick and intergrated consultation and treatment. It should be highlighted the National Atlas of Spain. Its first edition was completed in 1997 with more than 2,000 pages and 4,000 different maps. A revised and abridged version of two volumes, with a total of 600 pages, was published in 2002.

Furthermore, this digital cartography is able to incorporate sectorial and georeferenced thematic data through quick, easy loading and publication operations, without having to create complex maps by using classic procedures. These characteristics complement each other in that they allow quick and easy updating, interactive generalization and efficient and automatic publication and printing. In this sense the basic purpose of the National Center for Geographic Information (CNIG) is to produce, develop, and distribute jobs and publications and to meet the demand of the Spanish society. This includes the marketing of jobs and publications of the National Geographic Institute

The activity of the National Geographic Institute has been focused to the development and innovation of the data capture techniques, with digital photogrammetry, together with fast and effective GPS surveyings and the automated design and cartographic production techniques. In this sense the Numeric Cartographic Database at scale 1:25,000 has been completed. The database information comes from planimetry of national topographic map, continuous over the territory, and with topological structure.

As a consequence of the progressive implementation of the geographic policy of the NATO, the Army Geographic Center (CGE) has taken part in the international co-production of Vector Map-Level 1, vector map based on Vector Product Format (VPF) with the 1:250,000 scale information, compiling the Iberian Peninsula, the Balearic Islands, the Azores, Madeira, the Canary Islands, West Sahara and part of Morocco, Algeria and Mauritania. On the other hand it has produced orthophotomaps of humanitarian aid areas of Bosnia Herzegovina and Afghanistan.

In the year 2000 was published by the CGE the version 2.0 of the Digital Chart of Spain, that may be considered as a GIS, capable to use raster, vector and digital terrain elevation data from a map at 1:250,000 scale. In 2002 was published a new version with improvement tools, which contained, as a new feature, the capability to import data in several raster and vector formats. At the moment, it has been published the 2003 version which improves the capabilities of spatial analysis with vectors linked to relational databases.

The Spanish Cadastral Board is developing a new project to offer the possibility to consult the digital cadastral cartography and all related data on Internet.

In the field of regional cartography, we must point out the excellent achievements of the Catalanian Cartographic Institute, which since its foundation in 1982 has brought a high degree of innovation and modernity to the cartographic production undertaken in Catalonia. It ensures that high-quality cartography is available to support territorial planning initiatives. The great five areas of ICC's perform are: cartographic production, geology and geophysics, technological support and research, infrastructure and education and research.

It is bound to remark the following main activities undertaken by ICC during 1999-2003 in the field of cartography and images production. First of all the continuous production and updating of the topographical map of Catalonia 1:5,000 (4,274 sheets, more than 2700 available in 2nd and 3rd edition) and the orthophotomap of Catalonia 1:5,000 in colour (4,274 sheets). The ICC is maintaining and monitoring the Rasant system for broadcasting of GPS differential corrections.

In addition, an active presence in America deserves mentioning, as well as the organization of important national and international events. Production of the topographical map of Argentina at scale 1:100,000, the orthophoto map at scale 1:25,000 and radar images at scale 1:50,000 of Venezuela.

Among the achievements of the Cartographic Institute of Andalucia, within the framework of the Junta de Andalucia's planning and development policy for the territory, we can mention the completion of the orthophotography of Andalucia in colour with 0,5 meters of resolution. Also this Institute has recovered, microfilmed, catalogued and digitalized more than 130.000 old maps.

We must also mention the high standard of the work carried out by other cartographic departments belonging to regional governments, such as the Galician Center, the Regional Cartographic Service of Madrid, Canary Islands Cartography and the Public Works Office of Navarra, which are dealing with the basic digital cartography of rural and urban areas at large scales, and also general and thematic maps at medium scales.

In the field of thematic cartography, we must mention the work carried out by the Instituto Tecnológico y Geominero de España de España (Technological and Geomining Institute of Spain), Instituto Meteorológico Nacional (National Meteorological Institute), Instituto Español de Oceanografía (Spanish Oceanographical Institute) and Dirección General de Conservación de la Naturaleza (General Management of Nature Preservation) on the different aspects of activity.

A large number of private companies specializing in the fields of the cartography, photogrammetry and remote sensing have taken part in the production of these programs.

Cartography, Geodesy, Photogrammetry and Remote Sensing are taught at most Spanish universities. The largest number of specialist are educated at the University Schools of Engineering in Geodesy and Cartography – there are 6 centers in Spain (Alcalá de Henares, Extremadura, Jaén, Madrid, Valencia y Salamanca) - and of Technical Topographic Engineering -currently, there are 9 centers in Spain- (Extremadura, Jaén, Las Palmas de Gran Canaria, Oviedo, Salamanca, País Vasco, Cataluña, Madrid y Valencia).

In addition to the centres mentioned above, there are other Faculties and Higher Schools where subjects related with those covered by the Spanish Cartographic, Photogrammetry and Remote Sensing Society are taught . These centres include the Faculty of Geography at the University of Alcalá de Henares, and those of the Complutense and Autonomus Universities in Madrid . Futhermore, several Higher Technical Schools (ETS – Escuelas Técnicas Superiores) of Engineering at the Madrid Polytechnic University, such us the ETS of Mining Engineers, Agronomist and Forest Engineers cover these subjects with specific departments whose standards of teaching and research have earned them their well-deserved prestige.

Apart from the subjects included in the degree studies, a large number of Postgraduate and Masters Courses, Seminars and Technical Conferences are organized during the academic year by all the Universities and Organizations linked to these sciences. These courses have received a very warm reception from a lage number of students, which demonstrate the growing interest of professionals in the new tecniques and working methods that have appeared in the last few years.

In the field of European cartography, extensive participation has been carried out in projects developed within the Eurographics (European Committee of Representatives of Official Cartography (CERCO), and of the Economic Interest Group, MEGRIN), for the drawing up of the Inspire document, of establishing the basic criteria for the management of European infraestructure on geographic and spatial information in the near future.

Within the iniciatives carried out in this time period in the field of cartography, the following Conferences and Congresses should be highlighted:

- The VII National Topographic and Cartographic Conference, held in Madrid in 2000.
- European user conference of Intergraph cartography (EUROCARTOSIG). Organizad by the ICC. Barcelona 2000.
- On-demand Mapping Seminar. ICA and ICC. Barcelona. September 2000.
- The VI Conference of the Spanish Association of Geographic Information Systems. Barcelona, 2001.
- Congress of Cartography and New Technologies. Sevilla, 2001.
- Annual GEOMATIC Technical Exposition, Madrid, 2000, 2001, 2002 and 2003.
- In the year 2000, the well-known Map of Juan de Cosa, which was created in the Port of Santa Maria (Cadiz), has commemorated its 500th birthday.The City Council of the Port of Santa Maria, in collaboration with different Spanish cartographic organizations has prepared an extensive program of expositions, congresses, scientific meetings with participation of the entire international community.

2. NATIONAL MAPPING ORGANIZATIONS

2.1. NATIONAL GEOGRAPHIC INSTITUTE (IGN).

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Since its foundation in 1870, the National Geographic Institute has been engaged in scientific investigations and production activities in the field of mapping. IGN publishes also papers and information related to astronomy, geodesy, photogrammetry, cartography and administrative boundary lines.

SUMMARY OF IGN CARTOGRAPHIC PRODUCTS AND NUMERIC CARTOGRAPHIC DATABASE:

- **National Basic Cartography: National Topographic Map at 1:25,000 and 1:50,000.**

- National Topographic Map at 1:25,000 (MTN25). New version in paper and digital format that is being constantly updated.
- Numeric Cartographic Database at 1:25,000 (BCN25). Datasets from planimetry of national topographic map at 1:25,000, continuous in the national territory and with topological structure.
- Digital Terrain Model at 1:25,000 with a square of 25 x 25 m. offers national coverage; it is fully finished, in continuous updating.
- National Topographic Map at 1:50,000 (MTN50) started the updating of the series through generalization of 1:25,000 scale.
- Database of boundary lines, towns and villages. The Documentary Information System of Administrative Division of Spain (SID-DAE) has been finished.

- **Derived and Thematic Maps.**

- *Provincial Maps at 1:200,000.*
 - Series of Provincial Maps at 1:200,000 (MTN200). Since 1999 the serie is updated and digitalized form the numeric cartographic database at 1:200,000 (BCN200).
 - Numeric Cartographic Database (BCN200). National coverage and updated yearly.
 - Digital Terrain Model (MDT200) with square of 200 x 200 m. National coverage and in continuous updating.
- *Maps of the Spanish Autonomous Regions.*
 - Production of a new version of the several ‘multi-provincial’ autonomous maps in digital and in a new style format.
- *Guide Maps and Tourist Maps.*
 - Publication of four new exemplaries of the cartographic serie of Spanish National Parks: Map and Guide of National Park of “Caldera de Taburiente” (Palma). Map and Guide of National Park of “Garajonay” (Gomera). Map and Guide of National Park of “Cañadas del Teide” (Tenenrife). Map and Guide of National Park of “Timanfaya”(Lanzarote)
- *Orthoimages and other maps.*
 - National orthophotomap at 1.25,000. Cartographic serie made from digital color orthophotomap.

- Space orthoimages at different scales (1: 100,000, 1:250,000 and 1:500,000).
- Land use Map at 1:100,000
- New digital version of WORLD series of Spain at 1:500,000.
- Map of the Iberian Peninsula, Balearics and Canary Islands at 1:1,000,000
- Digital Map at different scales.
- Thematic maps.
- Historical maps.
- Aerial photography at different scales and images from space satellites.
- Other cartographic products and educational materials.

CARTOGRAPHIC PRODUCTION PLAN.

The activity of the National Geographic Institute has been focused on the development and modernization of the physical resources and geomatic tools, which as a producer, is using these resources and tools to make numerous cartographic products in the era of geoinformation in which we are immersed. This leads to the development and innovation of the following techniques in the different production phases:

- Data capture techniques with digital photogrammetry, being the most important as the head of them, together with fast and effective GPS-surveyings (by the displaying of artificial satellites) constitute the best Data Capture Techniques.
- Information processing techniques by means of graphic design and digital edition tools, that in edition are in continuous evolution.
- Automated design and cartographic production techniques such as the design and digital imposition of texts and graphics, the laser plotter of film for offset printing, and the folding and finish process.
- Check of process and implementation of quality system in the different units and production phases that form part of the carrying out of cartographic projects, and in general of the geographic information projects.

On the other hand, the National Geographic Institute, with new and innovative products and the commitment of adapting the services to evolution of market demand, has given place to the incorporation of new lines of cartographic projects, for example multimedia products, 3D viewer or the called image cartography obtained from scenes taken by transported sensors on spacecraft or airborne.

Formation and publication

Currently, automated cartographic production techniques are fully developed. The experience acquired since 1988, when the National Atlas of Spain was started through the exploitation of an integrated cartographic production system, has enabled the development of a new methodology. Due to its sufficient contrast, it could be defined as an ambitious production project, which has allowed to finish fully MTN25 digital and to begin the new updating of MTN50.

The result during the last years has been excellent for the successful production level and for the exploitation of new cartographic products (ending of digital MTN25, new MTN50, series of autonomous maps, relief cartography and updating of numeric cartographic database, digital terrain model...) which has appeared as a result of the introduction of new automated digital process in the different phases of cartographic production.

NATIONAL BASIC CARTOGRAPHY

- **Cartography at 1:25,000 scale (MTN25)**

When in 1968 the publication of the 1:50,000 National Topographical Map (MTN50) was finally concluded, work started on the project to prepare a new series of maps. In accordance with a National Cartographic Plan, preparation began for the publication of the sheets at the scale of 1:25,000, under the denomination MTN25.

Nowadays the MTN25 serie is in updating process, following the quinquennial plan of the National Photogrametric Flight, and doing complementary surveyings that are more accurate with GPS techniques.

- **Cartography at 1:50,000 scale (MTN50)**

At the same time, geoinformation technologies allow the obtention of a new digital MTN50, through computer-aided cartographic generalization techniques, with an unthinkable achievement in these years when the serie was finishing its adventure.

DERIVED AND THEMATIC MAPS

The National Geographic Institute produces and updates the following derived cartography based on edition processes or topographical generalization contained in existing basic cartography. Likewise, it produces thematic cartography, using as base basic or derived cartography, developing some specific aspect of the geographic information of these, and incorporating specific additional information.

- **Map series of the Spanish Provinces at 1:200,000 scale.**

- All the Spanish provinces are published (peninsula and islands), as well as the territories of Ceuta and Melilla, on 48 independent maps (the three Basque provinces are featured on one single map) and in spite of their different surface areas, follow fixed formats which allow all them to have a folded size of 12,5 x 25 cm. These map series are being updated.
- Currently, a new digital serie of provincial map is being worked on, with a scale of 1:200,000, completed with data from the national topographical map with a scale of 1:25,000 (MTN25)
- Base 1:200,000 also obtained from BCN200 through generalization and updated with information from different sources. New updates of digital base 1:200,000.

- **Autonomous Map Series.**

- A serie of map of the ten Multiprovincial Autonomous regions are being carried out (the seven once provincial maps match the provincial serie at 1:200,000 scale. All of them, are made in digital format through provincial maps, changing their scales between 1:200,000 and 1:400,000 according to surface area of each autonomous region.
- Map of Spain at 1:500,000 scale, obtained through scanning and vectorization of positive of the sheets of Atlas. A new version of the Map of Spain at 1:500,000 scale in digital format has been finished.

-
- 1:1,000,000 base obtained from BCN200 through generalization and updated from different sources; like the official road map and the nomenclador of National Institute of Statistics (INE).

The base has been updated in year 2000 with the edition of the “New General Map of Spain” at 1:1,000,000 scale according with the not of law proposal approved by the Commission on Infrastructure and Environment of Council of Ministers, on 27th December 1994, which established that the Canary Islands were placed on the southwest of the map.

- **National Parks Maps and Tourist Maps.**

- These reflect the most important characteristic of certain national geography areas of particular tourist and cultural interest. They are made of different scales and formats, chosen according to necessity and the extension of the area. The scales range between 1:10,000 and 1:500,000, the most common are the scales of 1:50,000 and 1:100,000.

- **Relief Maps.**

- Digital Terrain Model (MDT) and the map, produce some relief maps. For example, it should be mentioned that a new edition of the Physical Map of Iberian Peninsula, Balearics and Canary Islands has been recently produced at 1:1,250,000 scale.

THE NATIONAL ATLAS OF SPAIN

Once the National Atlas of Spain was consolidated, its first edition was finished in 1997. The National Atlas of Spain is presented in two versions, in booklet (also called fascicles) (47) and in volumes (6), and has more than 2,000 pages with more than 4,000 maps.

The National Atlas of Spain is devised as a publication in continuous evolution, its aim is to contribute to understand the changing and complex reality that the Atlas intend to represent, working on the major advances in information technology, a system has been designed that makes easier and quicker, so that the information is more

According to new information technologies the production of the Atlas has changed its range of products:

- Atlas published in paper, in big formats as well as in reduced formats.
- Atlas on digital format (CD-ROM and DVD)
- Atlas on Internet and Intranet.
- Revised and abridged version of National Atlas: The Physical Environment

In book format, it consists of two volumes with a total of 600 pages. The first book includes a map of Spain at 1:500,000 scale along with an toponymical index with some 28,000 entries, as well as tables of geographic data.

The second volume covers information about landscape, geophysics, relief, climatology, hydrology, pedology, biogeography, flora and fauna, protected natural areas and the marine environment.

- **CD ROM version of National Atlas.**

It consists of a cartographic reference module and a thematic reference module. In the cartographic reference module maps at 1:2,000,000; 1:1,000,000 and 1:500,000 scales can be viewed.

The information of each map has been structured in raster layers that allow their individual manipulation. The user has also the possibility of exporting information in order to edit images.

The digital terrain model module includes the possibility to generate profiles, maps of visible and invisible areas, slope maps, hypsometric coloring, and a 3D view of the maps at a scale of 1:1,000,000.

National Atlas of Spain

1 Presentation,

Introduction and Index

SECTION I:

GENERAL BASIC INFORMATION

2. General references (2nd edition)
- 3 a. Cartographic references
- 3 b. Geographic data tables
- 3 c. Images and landscapes
4. Historical references

SECTION II:

THE TERRESTRIAL MEDIUM

5. Geology (2nd edition)
6. Relief (2nd edition)
7. Edaphology
8. Geophysics
9. Climatology
10. Hydrology
11. Biogeography, flora and fauna
12. Natural protected spaces

SECTION III:

THE MARINE MEDIUM

13. The marine medium

SECTION IV:

DEMOGRAPHIC INFORMATION

- 14 a. Demographic information
- 14 b. Demographic potentials

SECTION V:

TERRITORIAL OCCUPATION

Basic economic activities

15. Territorial occupation and urbanism
16. Mining
17. Agriculture, livestock and fishing (2nd edition)

SECTION VI:

INDUSTRIAL ACTIVITIES

18. Energy (2nd edition)
19. Industrial sector
General data (2nd edition)
20. Industrial sector
Sectorial data (2nd edition)
21. Construction, public works, and building

SECTION VII:

TRANSPORTATION AND COMMUNICATION

22. Transportation by road
23. Transportation by rail
24. Air transportation
25. Maritime transportation (2nd edition)
- 26 I. Urban transportation
- 26 II. Other means of transportation
27. Communications

SECTION VIII:

COMMERCE AND FINANCE

28. Business activities
29. Domestic trade
30. Foreign trade
31. Finance and Treasury (3rd edition)

SECTION IX:

OTHER ACTIVITIES AND SERVICES

32. State organization (2nd edition)
33. Tourism
34. Health
35. Education and Science
- 36 a. Art and Culture
- 36 b. Sports
37. Work, Social Security and Social Services
38. Defense, Security and Justice

SECTION X:

ENVIRONMENTAL PROBLEMS

39. Environmental problems (2nd edition)

SECTION XI:

TERRITORIAL KNOWLEDGE

40. Territorial knowledge
National Geographic Institute (2nd edition)
41. Territorial knowledge
Other official organizations

SECTION XII:

SOCIOLOGICAL INFORMATION

42. Family Sociology
43. Labor Sociology
44. Cultural Sociology
45. Electoral Sociology

SECTION XIII:

GENERAL SYNTHESIS

46. Toponymic indexes
47. General indexes

2.2. THE NATIONAL CENTER OF GEOGRAPHIC INFORMATION (CNIG)

General Ibañez de Ibero 3 • 28003 Madrid

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The National Center of Geographic Information (CNIG), created by article 122 of Law 37/1988 of December 28, of General State Budgets for 1989, with the aim of producing, developing and distributing works and publications of geographic character requested by society. This includes the marketing of works by the General Management of the National Geographic Institute, the elaboration of derived and thematic products and international and national distribution, with special dedication to the creation of projects based on advanced technology, research and development programs and the lending of technical assistance in the fields of sciences and geographic techniques.

The supplying of these data, products and publications, as well as the lending of services by the National Center of Geographic Information is done in exchange for economic compensation that has the character of public prices in accordance with those established by article 24 of Law 8/1989, of April 3, of Taxes and Public Prices.

The National Center of Geographic Information has published the following between 1999-2003:

- “Guía de carreteras”, year 2000, 2001, 2002, y 2003 (four Repsol-YPF, CAMPSA)
- “Guía turística de carreteras de Castilla y León”, 1ª ed. Year 2003.
- Serie Parques Nacionales:
 - “Mapa y guía del Parque Nacional de Ordesa y Monte Perdido”
- Serie Imágenes de satélite y efecto relieve de las Comunidades Autónomas” (en coedición con la Universidad Autónoma de Madrid) :
 - Asturias
 - Madrid
 - Cantabria
 - La Rioja
 - Navarra
 - Murcia
 - País Vasco
 - Islas Baleares.
- “Mapa turístico de Ordesa y Monte Perdido” (pequeña edición de bolsillo).

Books:

- “Francisco Coello, su vida y su obra”
- “Cartógrafos españoles”
- “Historia de la Cartografía y Topografía”
- “De la Aguja náutica al GPS”

2.3 GEOGRAPHIC CENTER OF THE ARMY

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Spanish Army Geographic Centre goes on with the computer-assisted production of the country's Series L (at 1:50,000 scale), based on aerial photograph at 1:40,000 scale, with field revision, topological validation and database downloading, in order to hardcopy production, digital terrain elevation data creation and vector geographic information compilation. At the moment, three quarters of the territory have been covered and the change of Dynamo to Geomedia environment, customized with Visual C language, has already finished. Therefore, many format changes have been reduced and, what is the most important thing, a digital geographic database with spatial Oracle has been created.

It has finished the compilation and publication of the Series 1501 (at 1:250,000 scale), based on generalization of the Series L, and Series 1404 (at 1:500,000 scale) based on Series 1501. Also, it has produced many others cartographic products of interest for Spanish Armed Forces at many diverse scales covering national (for example, maps of training areas at 1:25,000 scale or bigger) and international (for example, ortophotomaps of humanitarian aid areas: Bosnia Herzegovina, Afghanistan, Iraq).

It has taken part in the international co-production of Vector Map-Level 1 (VMap-L1), vector map based on Vector Product Format (VPF) with the 1:250,000 scale information, compiling the Iberian Peninsula, the Balearic Islands, the Azores, Madeira (Library 083), the Canary Islands, West Sahara (Library 119) and part of Morocco, Algeria and Mauritania (Library 120).

In the year 2000 was published the version 2.0 of the Digital Chart of Spain, that may be considered as a geographic information system, capable to use raster, vector and digital terrain elevation data from a map at 1:250,000 scale. In some areas of military interest, sets of data with geographic information of a map at 1:50,000 or 1:25,000 scale have been produced. In 2002 was published the version 2.5 with improvement tools, which contained, as a new feature, the capability to import data in several raster and vector formats. At the moment, it has been published the version 3.0 which improves the capabilities of spatial analysis with vectors linked to relational databases.

Spanish Army Geographic Centre takes part in the Spanish Supreme Geographic Council and its committee meetings, in the technical and policy meetings of VMap Coproduction Working Group (VaCWG-TG and VaCWG-PG), in the technical and steering meetings of Digital Geographic Information Working Group (DGIWG-TC and DGIWG-SC), in the meetings of Interservice Geographic Working Group (IGEWG) of NATO, in the NATO Geographic Conference and its Southern Regional meetings, in the Latin American geographic institute's directors meetings, in the committee for the maintenance of the border meetings, etc.

Geographic Support Unit has just been created. It is able to give the required geographic support to national or international forces deployed. This includes terrain analysis, geographic information production and presentation and dissemination of this information.

MILITARY MAPS

- Military Map of Spain, L series, 1:50,000. Has been finished.
- Military Map of Spain, C series, 1:100,000. Has been finished.
- Military Map of Spain, 2C series, 1:200,000. Has been finished. (It is being substituted by the 5L series).

- Military Map of Spain, 5L series, 1:250,000. Has been finished. Totally digitized with a DTM of 100 by 100 m grid.
- Military Map of Spain, 4C series, 1:400,000 in 30 sheets.
- Military Map of Spain, 8C series, 1:800,000 in 2 sheets.
- Military Map of Spain series M7814, representative scale 1:50,000. This series began to be compiled in 1993. Up to now 405 out of 447 sheets have been printed.
- Military Map series 1501, representative scale 1:250,000. This series was begun in 1996. Its 44 sheets have been printed all.
- Military Map series 1404, representative scale 1:500,000. This series was begun in 1998. Its 15 sheets have been printed all.
- Series 5V at 1:25,000 and 2V series at 1:10,000, have been published corresponding to military interest zones such as national shooting and manwer grounds (Renedo Cabezón, San Gregorio, El Teleno, Alvarez de Sotomayor, Chinchilla, ...).

SPECIAL MAPS AND WORKS

- Morphological geology Map of Isla Decepción (Antartic Continent)
- Map of Camino de Santiago
- Spanish Digital Map
- Cooperation with the National Geographic Institute in several plans (Regente, Iberia, 95, Balear 98,) to stablish the Geodesic Network WGS84 in Spain.

NATO STANDARDIZED CARTOGRAPHY

As a consequence of the progressive implementation of the the Geographic Policy of NATO, the following cartographic series, which adopt the scales and symbology established, are being published:

- 1:50,000 Series M7814, P735 and P713 (Peninsula and Balearic Islands, Ceuta and Melilla, and the Canary Islands)
- 1:250,000 Series 1501
- 1:500,000 Series 1404

Next, the principal characteristics of each one of these are described.

CHARACTERISTICS OF THE SERIES M7814, P735 and P713

- Scale: 1:50,000
- Projection: UTM
- Datum: ED50
- Square: UTM
- Geographic square numbered every 5' and started every 1'
- Level curves every 20 meters
- Represented area: 10' in latitude by 20' in longitude
- Numeration according to series L of SGE
- NATO symbology (visible with red light)

The marginal information in English and Spanish is reflected on the recto of the sheet, mainly of the southern and western edges.

- It contains:
- Projection data
 - Data and graphics from the different Norths
 - Designation of a CUTM point
 - Information on formation, publication, etc...
 - Index of adjoining pages
 - Chart of administration divisions
 - Glossary
 - Parameters of WGS84 datum transformation

CHARACTERISTICS OF THE 1501 SERIES

- Scale: 1:250,000
- Projection: UTM
- Datum: WGS84
- Geographic square numbered every 15' and started every 1'
- Level curves every 100 meters
- Aeronautical information (airports, obstacles, radio assistance, etc...)
- Numeration according to world distribution of the Series
- Represented area: 1° in latitude by 2° in longitude, overlapped on the Eastern and Northern sides, 2' with adjoining sheets.
- Northern and Eastern borders
- NATO symbology (visible with red light)

The marginal information in English and Spanish is reflected on the recto of the sheet, mainly on the southern and western edges.

- It contains:
- Projection data
 - Magnetic declination data
 - CUTM point designation
 - Basic GEOREF square
 - Information on formation, publication, etc...
 - Chart of adjoining sheets
 - Chart of administration division
 - Glossary

CHARACTERISTICS OF THE 1404 SERIES

- Scale: 1:500,000
- Projection: Conica Conforme Lambert
- Datum: WGS84
- Square: UTM
- Geographic square numbered each degree and started every minute
- Represented area: 2° in latitude and between 3° 30' and 4° in longitude
- Hyposymetric inks

-
- Numeration according to world distribution of the Series
 - NATO symbology (visible with red light)

The marginal information in English and Spanish is reflected in the recto of the sheet, mainly on the lower edge, containing:

- Projection data
- Data and graphs of magnetic decline
- Data and graph of the GEOREF reference system
- Examples of point designation in GEOREF and CUTM
- Information and graphs on formation, publication, etc...
- Graph of adjoining sheets and administration divisions
- Glossary.

DIGITAL MILITARY MAP OF SPAIN IN CD-ROM

GEOGRAPHIC INFORMATION

- Altimetry (MDT with 100 meter mesh pass)
- Planimetry (on 1/250,000 and 1/800,000 scales)

APPLICATIONS

- Land Visualization in 2 or 3 dimensions
- Visible and hidden area studies
- Map of slopes
- Profile layout
- Visualization of level curves
- Calculation of distances between points
- Search by place name
- Zoom

NECESSARY HARDWARE

- Compatible PC (486 or greater)
- Color monitor (VGA or greater)
- VGA graphic card or greater
- 8 Mb of RAM memory
- Hard disk with 10Mb available
- Windows 95
- CD-ROM reader
- Mouse

2.4. HYDROGRAPHIC INSTITUTE OF THE MARINE

Tolosa Latur 1 • 11007 Cadiz

Phone: +34 95 6599000 • Fax: +34 95 6599396

E-mail: ihmesp@retemail.es

The Instituto Hidrográfico de la Marina, located at Cádiz, was established by law dated 30th December 1943.

Its aim is to look after the safety of navigation, in the sense of collecting and diffusing information on the sea and the coast, and to foster the development of Nautical Sciences.

It is tasked with the formation and maintenance of basic Nautical Cartography.

Competencies:

- Hydrographic surveys and studies on submarine relief in Spanish coasts and maritime areas. As well as, systematic observation and study of tides and currents, temperatures and acoustic and electromagnetic propagation in seawater.
- Development of Nautical Charts, books and documents as aids to navigation, and their printing and distribution.
- Collection of data and news on alterations in the environment, aids to navigation or dangers to the same, which will be disseminated as Notices to Mariners, for the updating of nautical charts and publications.

Hydrographic activities in the period

The following activities were conducted by hydrographic ships:

- The completion of the hydrographic surveys between Cape Villano and Cape Finisterre.
- The completion of hydrographic surveys of the Rías of Arosa and Muros and Noya.
- The completion of hydrographic surveys in the northern part of the Alboran Sea.
- The completion of hydrographic surveys from cape Gata to Cartagena.
- The realization of hydrographic surveys offshore the coasts of Almería and Murcia
- The continuation of the updating hydrographic surveys in the Canary Islands

The following works were also done:

- Bathymetric surveys with multi-beam sonar in the Spanish Exclusive Economic Zone in the Canary Islands and Galicia bank.
- Physiographic surveys in the harbours of Cádiz and Algeciras.
- Hydrographic surveys with multi-beam in the harbours of Cádiz, Huelva, Almería and Málaga.

Cartographic activity during the period

A total of 323 nautical paper charts, have been published, with the following distribution:

- | | |
|-------------------------------|-----|
| - New Charts and new editions | 186 |
| - Re-prints | 137 |

During this period it was established a new production line to elaborate the Electronic Nautical Chart (ENC). Nowadays has been produced a total of 78 ENC divided as follows:

- Generals 3
- Coastal 16
- Approaches 26
- Harbours 33

Nautical Publications

The edited nautical publications during the period are the following:

- Weekly frequency:
 - Notice to Mariners Bulletin
- Annual Frequency
 - Tidal prediction.
- Along the period
 - Sailing Directions nº 1 and nº3 Volume II
 - List of Lights and Fog signals, Volumes I and II
 - Special Publication nº14 (INT-1), Symbols and abbreviations used in Spanish nautical charts.
 - Maritime buoyage systems
 - International regulation for preventing collisions at sea
 - Catalogue of nautical charts and publications

2.5. THE SPANISH INSTITUTE OF OCEANOGRAPHY

Corazon de Maria, 8 • 28002-Madrid (Spain)
Phone: +34 91 3473619 • Fax: +34 91 4135594

The IEO, founded in 1914, is the entity responsible of Oceanographic Research in Spain. It develops cartographic activities basically through the marine geology department, where it is developing systematic cartographic projects of the Exclusive Economic Area and adjacent coastal areas.

Currently, the work done since 1995 in the Balearic and Canary Archipelagos is being edited.

PROGRAMA ZEE

*Hydrographic and Oceanographic Scientific program of Spanish Exclusive Economic Zone

In 1995 the Instituto Español de Oceanografía (IEO) and the Instituto Hidrográfico de la Marina (IHM) initiated a geologic and oceanographic investigation of the Spanish Exclusive Economic Zone (SEEZ). This investigation is being carried out aboard the R/V Hespérides. This vessel is equipped with the necessary equipment which allows both institutions to carry out the main objectives of the investigations.

Included in this equipment are a SIMRAD multibeam and a 3.5KHz. echosounding systems, a parametric sounding equipment, a gravimeter and a proton magnetometer devices.

The general objectives of this investigations are:

- A systematic mapping program of the SEEZ which will allow the compilation of a series of detailed bathymetric charts of the zone.
- A geophysical survey (gravity and magnetics, and seismic reflection profiles) which will make possible to determine the origin of structure and the geomorphology imaged by the bathymetric maps.

After processing and editing the different data sets: gravity, magnetics, high resolution seismic reflection, bathymetric (single and multibeam) are used to create a data base of the SEEZ zone and the compilation of the following charts:

- Bathymetry
- Backscatter reflectivity
- Sediment Isopach maps of the various sequences
- Structure maps (depth below sea level) of the various surfaces separating the sequences
- Total magnetic field
- Magnetic anomalies
- Free Air anomalies

SPACE Program

Study of the Spanish Continental Platform

GENERAL PROJECT OBJECTIVE

Acquisition of **multihaz data** of the coastal areas (0 to 150 meters)

Beginning with the Western Mediterranean and progressing towards the North, the products being obtained are:

-
- Cartography of the coastal area and the interior platform
 - Digital land modelling
 - Generation of bathymetric maps
 - Generation of maps of automatic classification of ground swells
 - Generation of reflected reflectivity mosaics (lateral sonar)

2.6 CARTOGRAPHIC AND PHOTOGRAPHIC CENTER OF THE AIR FORCE

Aeródromo militar de Cuatro Vientos • Avenida de la Aviación s/n • 28024 Madrid
Phone: +34 91 5180440 • Fax: +34 91 5180400

Its main mission is to produce aeronautical charts for the Spanish Air Force. It must compile and publish different types of charts, following NATO standards (Series at 1:250,000 and 1:500,000) or national standards (Series at scale 1:1,000,000 and 1:2,000,000). It also produces large scale topographic line maps for other uses (at scales 1:1,000, 1:5,000 and 1:10,000).

In this period it have been carried out the digital cartography of: «Pilot Handbook», «Instrumental Chart for Upper Airspace», «Instrumental Chart for Lower Airspace» and «Instrumental Chart for Terminal Areas», scale 1:2,000,000, «Visual Navigation Chart», scale 1:1,000,000, «Low Flying Chart, LFC-Spain», scale 1:500,000.

2.7 GENERAL SECRETARY OF AGRICULTURE AND FOOD

Paseo Infanta Isabel 1 • 28014 Madrid

Phone: +34 91 3475000

It mainly produces two types of maps: Crops and land use at 1:50,000 scales, of which all the territory has been published, and Agrological Classes 1:50,000, of which 60% has been published (total 1,130 sheets).

- Agroclimated Maps of Spain 1:500,000 and 1:200,000.
- Crops and Land Use Map of Spain 1:1,000,000.

2.8. GENERAL MANAGEMENT OF NATURE PRESERVATION

Gran Vía de San Francisco, 4 • 28071 MADRID

Phone: +34 91 596 46 19 • Fax: +34 91 5964894

The Directorate-General of Nature Conservation (DGCN), assumes the responsibilities of Conservation of the Nature in those matters not transferred to the Autonomous Regions, being a coordinator between these and the European Union. With regard to the cartographic topics, DGCN realizes the thematic basic cartography of the natural way, specially in forest matter and of conservation of the nature, being its responsible organ in these topics the Bank of Information of the Nature (BDN). The above mentioned unit develops bases of digital information georreferenciadas by means of the system utilization of Geographical Information System (GIS). In the period understood between 1999 and 2003 there have been realized the following publications or incorporations of digital bases to the BDN.:

- There has concluded the publication of the series of the Forest Map of Spain (scale 1:200,000), completing the series with a publication of national area to scale 1:1,000,000 in that there is included a visor of the digital cartography.
- Finished the Second Forest National Inventory already are published six provinces of the Third Forest National Inventory and other six are in press. In these publications besides the information in paper there are included the digital cartography and the bases of information with a specific software of consultation.
- The year 2000 supposes a point of inflexion in the methods of diffusion of the thematic cartography generated in the DG of Nature Conservation. In this year there put to the sale the information of the Second Forest National Inventory, Forest Map of Spain and Net Nature 2000; in 2001 there puts in functioning the servant of digital cartography inside the portal of the Department of Environment; in 2003 it is possible to come out, of free form, the digital cartography and the databases, of those projects that have a great demand and doesn't exists specific publication.
- Fruit of the collaboration with the Autonomous Regions is available harmonised the information of Sensitive Zones. The cartographic base has been supported updated corresponding to the Natural Protected Spaces, the Zones of Special Protection of the Birds (ZEPAS) and the Places of Community Importance (LIC'S), the assigned ones to agreement international (RAMSAR, ZEPIM), the Biosphere Reserves of the UNESCO. Being in all of them the scale of work 1:50.000 for the whole national area.

2.9. DIRECTORATE GENERAL FOR CADASTRE. MINISTRY OF FINANCES.

Pº Castellana, 272 • 28016 MADRID

Phone: +34 91 5836860

The Directorate General for the Cadastre has the responsibility for the elaboration and administration of the cadastral cartography of their territorial scope, during the period between 1999 and 2003; it has centred their cartographic activities in two basic lines of performance:

Firstly, it has promoted the plan of digital cadastral cartography, so, at the beginning of 2003, it has digital rural cartography, over orthophotography, to scales 1/5.000, 1/2000 and 1/1.000 in function of the medium size of parcel, of more than 5.600 municipalities, 32 million hectares, and 30 million parcels, what represents in all the cases more than 75% of the total; and digital urban cartography, obtained by photogrammetric flight and numerical rectification to scales 1/1.000 and 1/500, of more than 2.800 municipalities (35%), with 800.000 hectares (66%), 7 million parcels or urban properties (60%) and 23 million Urban Units (80%).

Secondly it has implanted a new Cadastral Geographical Information System, SIGCA2 that allows managing and updating the digital cadastral cartography. This System, in combination with the System of Cadastral Administration, SIGECA, or alphanumeric database, gives place to the computerized integral administration of the cadastral databases. Also, presently, in 2003, The Directorate General for the Cadastre is developing the project Ensenada that will be operational from the first of January of 2004, and that will offer the possibility to consult the digital cadastral cartography, and many other cadastral data by Internet in the denominated Virtual Office of the Cadastre.

2.10. SPANISH POST ADMINISTRATION

Aduana, 27 y 29 • 28070 MADRID

Phone: +34 91 5963664 • Fax: +34 91 5963744

In a project sponsored by the Spanish Post Administration, Angel Bahamonde, Gaspar Martinez and Luis Enrique Otero have published the *Historical Atlas of Communications in Spain, 1700-1998*, which gathers more than 250 maps from 1721 to the present, collected in the following epigraphs: Illustrated Mail, Mail in the first half of the XIX century, The mail of a liberal state, The optical telegraph, The electric telegraph in the XIX century, Airmail, Mail in the XX century, Telecommunications.

2.11 TECHNOLOGICAL INSTITUTE AND GEOMINING IN SPAIN

Rios Rosas 4 • 28003 Madrid

Phone: +34 91 3495700 • Fax: +34 91 4426216

Since its foundation in 1849 it has continued the task of making geological, hydrological and mining cartography as well as publishing bulletins, geological guides, etc.

The most important publications during this period:

Cartographies on a scale of: 1:50,000:

- 63 geological sheets (1995 to 1999)
- 47 geomorphological sheets (1995 to 1999)
- 3 hydrogeological sheets (1998)

Cartographies on a scale of: 1:200,000

- 5 sheets of the Rock and Industrial Mineral Map (1998-1999)

Other cartographic products:

- Atlas stocktaking of Natural Risks of the Autonomous Region of Murcia (1995), including diverse maps on scales of 1:200,000 and 1:400,000.
- Atlas of the Natural Medium of the Province of Leon (1995), including maps on scales of 1:200,000 and 1:400,000.
- Atlas of the Hydric Medium of the Province of Burgos (1998), including maps on scales of 1:200,000 and 1:600,000.
- Hydrogeological Atlas of Andalusia (1999), including diverse maps on scales of 1:200,000 and 1:600,000.

2.12 NATIONAL METEOROLOGICAL INSTITUTE

Camino de las Moreras s/n • Ciudad Universitaria s/n • 28071 Madrid

Phone: +34 91 5819630 • Fax: +34 91 5819767

During the past four years, climatic cartography has been published in the monthly climatological bulletins (created and distributed by the National Institute of Meteorology). These maps present the monthly anomalies in temperature, precipitation and hours of daylight. Also, a set of seasonal and yearly maps is being created.

Maps of average temperatures, average precipitations and other climatic elements for the international referential period of 1961-1990 are being updated. Also, a daily weather analysis by means of cartography, which includes descriptions of field of pressure, temperature and geopotentials at different altitude levels is carried out in order to make meteorological predictions. The Institute receives satellite information in real time from the Meteosat and other meteorological satellites.

3. REGIONAL MAPPING ORGANIZATIONS

3.1. CARTOGRAPHIC INSTITUTE OF ANDALUSIA

Consejería de Obras Públicas y Transportes • Junta de Andalucía
Patio de Banderas, 14 • 41004 SEVILLA
Phone: +34 955057600 • Fax: +34 954219024
www.juntadeandalucia.es/obraspublicasytransportes/cartografia

Created by Decree 116/1993 of 7th September 1993 and assigned to the Territorial Development and Town Planning Headquarters, the Cartographic Institute of Andalusia is in charge of the programming and the elaboration of the basic and derived cartography of the Autonomous Community of Andalusia as well as the coordination and the standardization of the thematic cartography and the cartographic databases.

Since 2003 the Institute is the coordinating center of the all developed cartography in the Autonomous Community to stimulate the creation of the Infrastructure of Spatial Information of Andalusia (IDE Andalusia) and the future integration in INSPIRE (Infrastructure for Spatial Information in Europe) project.

Photogrametic Flights

Andalusia

- 1:60,000 in color (1995-1996 and 1998-1999)
- 1:40,000 (1984)
- 1:30,000 Western Andalusia (2000)
- 1:25,000 (1985-1990)
- 1:20,000 (1991-1996 and 2001-2002)

Coastal and urban agglomerations

- 1:20,000 in color of the western zone (2000-2001)
- 1:18,000 (1987-1991)
- 1:15,000 (1994-1996)
- 1:10,000 in color (1988-1989 and 2000)

Urban Nuclei

- 1:8,000, 1:5,000 and 1:3,000 (1980-2003)

Orthophotography

- Orthophotography of Andalusia in color with 1 meter resolution. Belong to the flight 1:60,000 (1998-1999)
- Orthophotography of Andalusia with resolution of 0,5 m. Belong to the flight 1:20,000 (2001-2002)

Basic Cartography

More than 16,600 maps of basic cartography have been produced. This cartography is available in paper, vegetable or polyester support (DIN A-1) and in digital support (DXF, ARCINFO Export, ARCVIEW SHAPE, DWG and TIFF).

Basic Territorial Cartography

- Topographic Map of Andalusia 1:10,000 (MTA10)
- Digital Topographic Map of Andalusia 1:10,000 (MAV10)
- Topographic Map of Coastal and Urban Agglomerations 1:5,000 (MTA5)

Basic Urban Cartography

- More than 2,000 urban nuclei on 1:2,000, 1:1,000 and 1:500 scale (CUV)
- Raster mosaic of urban cartography on 1:2,000, 1:1,000 and 1:500 scale (CUR)

Derived cartography

- Digital Map of Andalusia 1:100,000
- Map of Andalusia 1:300,000
- Map of Andalusia 1:400,000
- Digital Map of Andalusia 1:400,000
- Map in relief of Andalusia 1:500,000
- Map of Andalusia 1:800,000

Thematic cartography

- Towns maps
- Guide maps of Parks and Natural Places in Andalusia
- Roads maps

Historical Cartography

The Cartographic Institute of Andalusia has been able to recover more than 130.000 old maps, dispersed in different archives. These maps have been microfilmed, catalogued and digitalized for posterior use.

Atlas of Andalusia

Composed by four volumes and two CD

Toponymy

Inventories and Databases of Toponyms.

Editions and Publications

Printed support

- Map of Andalusia 1:300,000
- Map of Andalusia 1:400,000
- Map in relief of Andalusia 1:500,000
- Map of Andalusia 1:800,000
- Aerial photographs of cities
- Satellite orthoimages of Andalusian cities on 1:25,000 and 1:50,000 scale
- Urban cartography of the Metropolitan Area of Seville
- Street guide maps of Andalusian cities on 1:5,000 scale
- Physiographic map of the Andalusian coast 1:50,000
- Guide maps of Parks and Natural Places in Andalusia to scales included between 1:25,000 y 1:100,000.
- Roads maps of Andalusian provinces on 1:200,000 scale
- Atlas of Andalusia:
 - Volume 1. General cartography
 - Volume 3. Thematic cartography

-
- Volume 4. Town mapping
 - Provincial catalogues of historical cartography
 - Inventoires of toponymy

Digital support

- Digital Map of Andalusia 1:100,000 (2 CD-ROM)
- Digital Map of Andalusia 1:400,000. (CD-ROM)
- Municipal limits (CD-ROM)
- Digital model of 100 meter elevations (CD-ROM)
- Topographic Map of Andalusia 1:10,000. Raster mosaic (8 CD-ROM provinciales)
- Topographic Map and orthoimage of the Metropolitan Area of Seville (CD-ROM)
- Coast of Andalusia (CD-ROM)
- Atlas of Andalusia Multimedia (CD-ROM)
- Atlas of Andalusia Interactive (CD-ROM)
- Aerial photography of the province of Seville (DVD)
- Orthophotography of Andalusia in color with 1 meter resolution (DVD)

Internet Services

- Request of maps and aerial photographies
- View and download of the MTA10 and the aerial photos 1:60,000 in color (1998-1999) of the all Andalusia
- Consult of the Atlas of Andalusia
- Free services:
 - Andalusia in a sheet of paper. (Map of Andalusia 1:1,000,000)
 - Andalusia from the sky. (Aerial photographies of the most important cities of Andalusia)
 - Andalusia in 3D
- Download programs:
 - Transformations between geodetic systems
 - Transformations between projections
 - Cartographic viewer

3.2. CARTOGRAPHIC INSTITUTE OF CATALONIA

Parc de Montjuïc • 08038 Barcelona

Phone: +34 93 4252900 • Fax: +34 93 4267442

The Institut Cartogràfic de Catalunya (ICC - Cartographic Institute of Catalonia) was created by Law 11/1982, 8th October, of the Parlament de Catalunya (Catalan parliament), as an autonomous commercial, industrial and financial institution of the Generalitat de Catalunya (autonomous government). Since 11th June 1997, in accordance with Law 6/1997 of that parliament, is turned into a public corporation owned by the Generalitat de Catalunya.

In 1995, the ICC assumed management of the Servei Geològic de Catalunya (Geological Survey), which was formerly assigned to the General Secretary of the Departament de Política Territorial i Obres Públiques (Regional Planning and Public Works).

Since it was founded, the ICC has brought a high degree of innovation and modernity to the cartographic studies and production undertaken in Catalonia; furthermore, it ensures that high-quality cartography is available to offer planning and support to a wide range of territorial initiatives. Its purpose, then, is to carry out the technical tasks involved in the development of cartographic and geological information.

Within this framework, the ICC undertakes cartographic projects of an official nature and of general interest to Catalonia, in addition to studies and projects commissioned or requested by both public and private organizations.

ACTIVITIES

The activities of the ICC are planned and coordinated from a series of short and medium term productivity programmes, providing the possibility of a systematic following of those actions that are taking place as well as to incorporate new projects in the plan.

The great five areas of ICC's perform are: cartographic production, geology and geophysics, technological support and research, infrastructure, and education and research.

Concerning the main activities undertaken by the ICC during 1999-2002, it is bound to remark the followings:

1. Cartographic production

Topographic cartography

- Continuous production of the second and first editions (second version) of the Mapa topogràfic de Catalunya 1:5,000 - topographic map - (4 274 sheets). In December 2002, 2 499 available sheets of the 2nd edition and 201 of the 3rd edition
- Publication of the technical specification of the Base topogràfica de Catalunya 1:5,000 - topographic database - version 2.0.
- Continuous production of the Mapa topogràfic de Catalunya 1:10,000 (1 121 sheets). In December 2002, 587 available sheets.
- Continuation of the special project Mapa topogràfic de Catalunya 1:25,000 (84 sheets). In December 2002, 6 available sheets.
- Beginning of the Base topogràfica de Catalunya 1:25,000 (304 sheets).

- Continuous production of the Mapa comarcal de Catalunya 1:50,000 - regional map - (41 sheets). In December 2002, 20 available sheets of the 3rd edition, 14 of the 4th edition and 1 of the 5th edition.
- Publication of 1 sheet of the Mapa topogràfic de Catalunya 1:100,000 (9 sheets), corresponding to the Girona regions. In December 2002, 2 available sheets.
- Production of the Mapa topográfico de la República Argentina 1:100,000 (715 sheets). In December 2002, 261 available sheets.
- Publication of the 4th and 5th editions of the Mapa topogràfic de Catalunya 1:250,000 and the 3a edition in relief.
- Publication of several topographic maps in small scale.

Cartography to great scale

- Continuous production of the great scale series for specific projects at 1:1,000 and 1:2,000 scales.
- Publication of the technical specification of the topographic cartography 1:1,000 and 1:2,000.

Orthophotographic and orthoimage cartography

- Completion of the 2nd edition of the Ortofotomapa de Catalunya 1:5,000 - orthophotomap - and continuous production of the 3rd edition. The 3rd edition is in color (4 274 sheets). In December 2002, 1 025 available sheets in digital and 975 sheets in paper.
- Publication of the technical specification of the Ortofotomapa de Catalunya 1:5,000 version 2.0.
- Completion of the 2nd edition of the Ortofotomapa de Catalunya 1:25,000 and continuous production of the 3rd edition (304 sheets). In December 2002, 227 available sheets.
- Publication of the technical specification of the Ortofotomapa de Catalunya 1:25,000 in color version 2.0 and in infrared color version 1.0.
- Completion of the Ortofotomapa de la República de Venezuela 1:25,000 (PITSA-I and PITSA-II). 1 673 orthophotomaps and 1 779 line maps.
- Completion of the Ortofotomapa de la República de Venezuela 1:50,000 (Radar images - CARTOSUR). 536 sheets.
- Steady production of orthophotographic and orthoimage cartography series for national and international specific projects.

Geodetic networks

- At the end of 2002, the Catalonia utilitarian geodetic network contained of 2 306 points.
- At the end of 2002 the leveling network comprised of 484 km.
- Set up of the reference stations of Llívia, les Planes, les Avellanes and Montcada, which, along with the previous 4 stations already installed, has given a mean efficiency of year 2002 of 89,11%.
- Comparative tests between the new absolute GPS positioning (precision 3 m) and the RASANT GPS positioning (precision 0,5 m).
- Maintenance of the RASANT system for broadcasting of GPS differential corrections.
- Development of the CatPos service (Centimeter positioning service on all Catalonia) that intends to offer a positioning service based on GPS static observations and Internet technology.

Thematic cartography

- Continuous production of the Mapa de planejament urbanístic i usos del sòl de Catalunya 1:50,000 - town planning and land use map - (10 sheets). In December 2002, 7 available sheets of the 2nd edition.
- Continuous production of the Mapa de Punts d'Interès Turístic 1:50,000 - tourist information points - (37 sheets) and 1:30,000 (56 sheets). In December 2002, 9 sheets at 1:50,000 scale available of the 2nd edition and 12 sheets 1:30,000.
- Publication of diverse thematic maps to small and large scale: hiking maps, administratives, tourists, geologicals, vegetation, land uses, roads, fires, etc.

Atlases

- Publication of the Atles Universal - world atlas.
- Publication of the Atles ambiental de la Mediterrània – environmental atlas of the Mediterranean.
- Publication of the Atles climàtic de Catalunya - climatic atlas (solar radiation).
- Publication of the Atles sísmic de Catalunya. Catàleg de sismicitat – seismic atlas of Catalonia. Seismicity catalogue.
- Publication of 3 volumes of the Atles comarcal de Catalunya collection - regional atlas (Alt Empordà, Garrotxa, Pla de l'Estany).

Geographic and thematic databases

- Maintenance of the databases: land uses, toponymy, elevations, ground control, administrative boundaries, road information and transports, streets.
- Beginning of the database of side roads network, hydrographic river basins, and disseminated buildings.
- Continuation of the special project “Catalan rural land registry”.
- Cartographic tasks and creation of a SIG base for the boundary of the marine-terrestrial public dominion (special project).
- Beginning of the special project “Way network of Catalonia”.

Laser altimetry applications

- Support to the special project “Planning of fluvial spaces of Catalonia (PEFCAT)”. Heights measured for 18 224 ha corresponding to 220,9 km of the low basin on Ter river. Taquimetric rise undertaken for 404 factory works of the Tordera, Llobregat, Anoia and Ter rivers basins.

Photogrammetric flights

- Flight of Catalonia 1:60,000. In 2000, the fourth cycle began.
- Flight of Catalonia 1:32,000. Continuation of the flight to this scale.
- Flight of Catalonia 1:22,000. In 2000, this flight was begun.
- Carry out of the flight 1:60,000 for Ortofotomapa de la República de Venezuela 1:25,000 (PITSA).
- Continuous carry out of different flights in order to cover specific objectives: planning, road, urban nucleus and also for municipal and urban cartography out of Catalonia.
- Carry out of the multiespectral flights and with the laser altimeter.
- The total number of flights in period 1999-2002 is 802.
- The total number of hours flown in the period 1999-2002 is 2 373.
- The revealed of film meters for the period 1999-2002 is 38 914.
- The total number of photograms produced for the period 1999-2002 is 139 233.

Territorial boundary marking

- Technical advice to the Direcció General d'Administració Local (Local Administration Head Office) and preparation of the delimitation proceedings and certifications from private parties and municipal councils.
- Beginning of the special project “Municipal boundary of Catalonia”.

2. Geology and geophysics

Acquisition, analysis and diffusion of geologic data

- Continuation of the special project “Mapa geològic de Catalunya 1:25,000” - geological map – with the continuous production of the map (301 sheets). In December 2002, 26 available sheets.
- Publication of the technical specification of the Mapa geològic de Catalunya 1:25 000 version 1.0.
- Publication of the first Mapa geològic comarcal de Catalunya 1:50,000 in CD-Rom corresponding at Barcelonès.

- Continuous incorporation of geologic information database derived from MAGNA 1:50,000 series. In December 2002, 75% of the territory had been obtained.
- Publication of the Mapa geològic de les comarques de l'Ebre 1:100,000.
- Publication of the 2nd edition of the Mapa geològic de Catalunya 1:250,000.

Acquisition, analysis and diffusion of geophysics data

- Inauguration and maintenance of the new seismic network of Catalonia.
- At the end of 2002, 7 operational seismic stations.
- Maintenance of the accelerometer network. At the end of 2002, 9 operational accelerometers.
- Maintenance of the seismic database.
- Development of studies concerning seismic hazard.
- Elaboration of the seismological bulletin, published monthly and annually.

Snow studies and avalanches

- Continuous production of the Mapa de zones d'allaus de Catalunya 1:25,000 - avalanches maps - (14 sheets). In December 2002, 8 available sheets.
- Development of studies concerning avalanche prediction.

Geology and geophysical techniques

- Carry out of survey campaigns and geotechnical studies for the geology applied to construction and public works, and elaboration of geological reports of terrain.
- Completion of the Catalonia geotechnical database design.
- Publication of the Mapa geotècnic de Barcelona 1:25,000 - Geotechnical map.
- Carry out of geological risk studies: mass movement and collapses.
- Carry out of environmental geology studies: cemeteries and water.
- Development of geophysical prospecting.

3. Technological support and research

Photogrammetry and geodesy

- Update of geoid models' transformation to generate the geoid EGG'97 for the same area that covers the geoid model UB91.
- Correction of the geoid UB91 from points with ellipsoidal heights (GPS), orthometric heights.
- Introduction in the productive chain of the use of the information gathered by the system Applanix POS/DG 510 for the direct orientation of sensors from GPS and inertial observations.
- Improvement of the CASI sensor orientation process with SISA (Integrated Airborne Sensor System).
- Generation of the first True Ortho.

Cartographic edition

- Development of tools for capture, process and edition.
- Improvement of the applications for obtaining the Mapa topogràfic de Catalunya 1:10,000 out of the Base topogràfica de Catalunya 1:5 000.
- Conclusion of the Base topogràfica de Catalunya 1:25 000 data dictionary, that includes the capture specifications and the necessary indications to generalization data from Base topogràfica de Catalunya 1:5,000.
- Implementation of the first version of the applications to generate Base topogràfica de Catalunya 1:25,000.
- Improvement on the processes for the quality control of the digital data.
- Continuous research on newer version of available computer products in the market.

- Improvement of the processes for creation of automatic design files and steady production.
- New plotters in production.

Information systems

- of the GeoShow program for the development of virtual flights over the territory.
- Maintenance of the ICC website and incorporation of new contents and new applications. During the period 1999-2002, the web has received around 1,105,270 visits.
- Implementation in Internet the MapServer application that allows to visualize ICC cartography catalogues: flights, cartography to great scales, state maps of main series of the ICC, among others.
- Implementation and maintenance of a web application for calculating and visualizing the optimum routes on the roads of Catalonia for the mobility gateway of the Generalitat de Catalunya (autonomous government of Catalonia).
- Publication of cartographic products in CD-Rom under the Vis* application.
- Creation and support of special project "Infraestructura de Dades Espacials de Catalunya (IDEC)" - Spatial Data Infrastructure of Catalonia.
- Development of GIS applications for external projects.

Remote sensing and image processing

- Development of a digitalization kit for analogical photogrammetric cameras.
- Began production the laser sweeping airborne system ALTM-3025.
- Conclusion of the development of a visualization and measurement system of images captured with the GeoVan.
- Conclusion of the study to evaluate the automatization methodologic possibilities of land uses maps generation process from multispectral satellite images.
- Completion of the software that allows the operation of the interferometric images of the ERS-1/2 satellite.
- Implementation of new models for the orientation of the MOMS satellite.
- Definition of a job stream to visualize stereoscopic models of photograms pairs that don't come from airborne sensors.
- Development of the tools for generation of vertical automatic mosaic between images.
- Conclusion of the tests for EVInSAR software to obtain a terrain elevations model from two satellite radar images.
- Integration of the tasks for the semiautomatic capture of parcels in digital aerial images and conclusion of the development of a semiautomatic capture tool of linear elements of homogenous radiometry.

Geology and geophysics

- Accomplishment of specific projects, national and international.
- Advising several clients on geological activities.

4. Infrastructure

Distribution of cartographic products

- Presence of ICC distribution and sale centers in Barcelona, Girona and Lleida (EADOP).
- Conclusion of the commercial planning for the virtual store over the Internet, and preparing its opening.
- Conclusion of the reforms and opening of Barcelona store.
- In period 1999-2002, the total of digital cartography deliveries was 19,736.

Map Library

- Continuous increase of the resources of the Catalanian Map Library (254,899 maps; 32,497 books, 2,912 journals; 40,075 photographs and 17,600 microforms).

- Beginning of the special project “Digitalization of the Map Library historical cartography bottom”. As of December 2002, 204 scanned maps.

Documentation center

- Maintenance of the graphic catalogue (SIFOTO) and alphanumeric catalogue (FOTOPACK) of the Aerial Photo Library.
- Total of photograms of vertical aerial photography: 419,869 (both digital support and polyester).

Calculation infrastructure

- Implantation of the Storage Area Network structure.
- Improvement of the computer networks, the computer security of Internet and the electronic mail service.

5. Education and research

- Carry out of experimental projects related to topics and programmes of internal development.
- In the period 1999-2002, 143 communications have been presented in national and international congresses and 51 articles have been published in national and international publications.
- Continuous publication of books and institutional periodic publications designed to spread the ICC activities or to complement the information concerning specific cartographic products.

ORGANIZATION OF INTERNATIONAL EVENTS

- International workshop on broadband seismology. Organized by the ICC. Barcelona, September 1999.
- ISPRS Commission III. Direct Versus Indirect Methods of Sensor Orientation”. Organized by the Institut de Geomàtica and the ICC. Barcelona, November 1999.
- European user conference of Intergraph cartography (EURO CARTOSIG). Organized by the ICC. Barcelona, September 2000.
- On-demand Mapping Seminar. Organized by two commissions: Map Generalization and Map Production of the International Cartographic Association (ICA/ACI) and the ICC. Barcelona, September 2000.
- Meeting of the MAGIC Water Vapor Meteorology User Workshop project. Organized by the ICC. Barcelona, March 2001.
- Closing ceremony of orthophotographic and topographic cartography at 1:25,000 scale project of the Republic of Venezuela (PITSA). Organized by the Dirección General de Desarrollo Rural of the Ministerio de la Producción y el Comercio. Caracas, March 2001.
- Presentation of the agro-ecological zoning project in Namibia. Organized by the Asociación Española de Cooperación Internacional and the ICC. Namibia, May 2001.
- 9th International Map Trade Association (IMTA) Annual Conference. Organized by ESRI Europe, Altair, Lovell Johns, Nilsson & Lamm and the ICC. Barcelona, February 2002.
- 1st Theoretic-practical training course on advanced cartographic techniques: Digital photogrammetry. Organized by the ICC with the collaboration of the Instituto Geográfico Nacional and the Centro Geográfico del Ejército (within DIGSA scope). Barcelona, June 2002.

AWARDS AND HONORARY MENTIONS

- The members of the International Cartography Association (ICA/ACI), in the course of the 19th International Cartographic Conference held in Ottawa (Canada, August 1999), gave an award to the ICC for the Atlas Universal, in the atlases category. 1999.

- The Executive Committee of the International Cartographic Association, in the 11th General Assembly of ICA and 19th International Cartographic Conference (Ottawa, Canada, August 1999), presented the Director of the ICC, J. Miranda, with the certificate declaring him to be an Honorary Fellow of this Association. The ICA/ACI conferred this honor in recognition of contribution to Cartography and his outstanding conference and institutional leadership. 1999.
- J. Talaya et al., head of the Geodesy Unit, received the award for the best paper presented at the Carrier-Phase Positioning & Ambiguity Resolution at the 12th International Technical Meeting of the Satellite Division of the Nashville Institute of Navigation (Tennessee). 1999.
- E. Bosch, Geodesy Unit, received the “Jordi Viñas i Folch” award for the research: “New technologies for the establishment of GPS differential correction services”. 2000.
- Special Achievement in GIS award granted to the ICC by Environmental Systems Research Institute (ESRI) during the 20th ESRI International User Conference. 2000.
- The members of the International Cartography Association (ICA/ACI), in the course of the 20th International Cartographic Conference held in Beijing (China, August 2001), gave an award to the ICC for the Gavarnie-Ordesa sheet in the Mapa excursionista dels Pirineus 1:50 000 (hiking map) series, in the Recreation and orienteering map category. 2001.

3.3. THE TERRITORIAL INFORMATION SYSTEM OF GALICIA

The activities undertaken by the Territorial Information System of Galicia (SITGA) are very diverse in the field of cartography and in the development of GIS, intervening in different collaboration projects with the University as well as with the Councils of the Autonomous Community of Galicia. Some of these activities are the participation in European projects, which define the behaviour of a geographic area considered to be fundamental for improving cartographic knowledge, management and planification of territory resources.

3.4. REGIONAL CARTOGRAPHIC SERVICE OF MADRID

Maudes, 17 • 28046 MADRID
Phone: +34 91 5803100

This agency is a branch of Regional Government of Madrid and the Cartographic Service originated in COPLACO, an agency formerly under the Ministry of Public Works and Transport.

3.5. PUBLIC WORKS SERVICE OF THE GOVERNMENT OF NAVARRA

San Ignacio, 3 • 31002 PAMPLONA- IRUÑA

Phone: +34 948 427435 • Fax: +34 948 427422

The cartography that the Public Works Service of the Government of Navarra produces is created in UTM projection and is digital in magnetic support and DGN format.

The orthophotomaps are also digital in TIF format and UTM projection.

Annual Cartographic Actitivity

Formation of digital Cartography on a scale of 1:5,000

Updating of digital cartography on a scale of 1:5,000

Formation and Updating of digital cartography of Pamplona and its Region.
at scale of 1:500

Digital orthophotomaps at scale of 1:5,000

Digital orthophotomaps at scale of 1:10,000

Digital orthophotomaps at scale of 1:25,000

Publications:

- Navarre Topographic map at scale of 1:10,000
 - Navarre Topographic map at scale of 1:100,000
 - Navarre Topographic map at scale of 1:200,000
 - Navarre Topographic map with hypsometry at scale 1:400,000
 - Navarre Topographic map at scale of 1:400,000
- Urban Topographic Cartography at scale of 1:500
- Orthophotomap of Navarre at scale of 1:10,000
- Orthophotomap of Navarre at scale of 1:25,000
- Geologic and Geomorphologic maps of Navarre at scale of 1:25,000
- Geotectonic map of Pamplona at scale of 1:25,000

4. CARTOGRAPHIC EDUCATIONAL CENTRES

4.1. SCHOOLS OF TECHNICAL TOPOGRAPHIC ENGINEERING (FIRST CYCLE)

At this moment the following universities exist in Spain:

- Universidad de Extremadura: <http://cum.unex.es/>
- Universidad de Jaén: <http://www.ujaen.es/centros/eps/>
- Universidad de las Palmas de Gran Canaria: <http://www.ulpgc.es/>
- Universidad de Oviedo: <http://www.etsimo.uniovi.es/mieres>
- Universidad de Salamanca: <http://web.usal.es/~epavila/>
- Universidad del País Vasco: <http://www.vc.ehu.es/campus/centros/peritos.html>
- Universidad Politécnica de Cataluña: <http://www.eupb.upc.es/>
- Universidad Politécnica de Madrid: <http://nivel.euitto.upm.es/>
- Universidad Politécnica de Valencia: http://www.upv.es/informa/info/EUITTOP/index_3f200c.html

4.2. SUPERIOR TECHNICAL SCHOOLS OF ENGINEERING IN GEODESY AND CARTOGRAPHY (SECOND CYCLE)

At this moment the following universities exist in Spain:

- Universidad de Alcalá de Henares: <http://www.uah.es>
- Universidad de Extremadura: <http://www.unex.es>
- Universidad de Jaén: <http://www.ujaen.es/centros/eps/>
- Universidad Politécnica de Madrid: <http://www.upm.es>
- Universidad Politécnica de Valencia: http://www.upv.es/informa/info/EUITTOP/index_3f200c.html
- Universidad de Salamanca: <http://web.usal.es/~epavila/>

For the 'first cycle' three years and the 'second cycle' two additional years.

5. OTHER CARTOGRAPHICAL CENTRES

5.1. INSTITUTO NACIONAL DE INVESTIGACIONES AGRARIAS (INIA).

José Abascal 56 • 28003 Madrid
Phone: +34 91 4413193

This institute does research in thematic cartography by remote sensing.

5.2 INVESTIGACIONES CIBERNÉTICAS, S.A. (ICI).

Parque Real, bloque 1 • 28280 El Escorial. Madrid
Phone: +34 91 8902061

It has developed systems in the field of GIS and digital cartography with the collaboration of General Dynamic Electronic División.

5.3 CÁLCULO Y TRATAMIENTO DE LA INFORMÁTICA, S.A. (CTI).

Provenza 216 • 08036 Barcelona
Phone: +34 93 2536807

This company has developed different systems for automated mapping from raster information.

5.4 CENTRO UAM-IBM.

Universidad Autónoma de Madrid

Facultad de Ciencias • 28034 Cantoblanco. Madrid
Phone: +34 91 7342166

This centre has developed diverse software for automated cartography and digital process for remote sensing information.

5.5 GALILEO INGENIERÍA Y SERVICIOS, S.A.

Orense 32 • 28020 Madrid
Phone: +34 91 5556706

Digital Photogrammetry and Correlation Systems.

5.6 INISEL ESPACIO

Polígono Industrial nº 1 • c/ Mar Egeo, s/n • 28830 San Fernando de Henares. Madrid
Phone: +34 91 3963911 • Fax: +34 91 3963912

INISEL ESPACIO covers some areas in remote sensing activities: system requirements definition, system design, development and implementation and applications based on optical and SAR data: Environmental studies, Land uses, Images geocoded, Digital cartographic and Forest resources exploitation.

5.7 Universidad Politécnica de Madrid.

ESCUELA TÉCNICA SUPERIOR DE INGENIEROS AGRÓNOMOS.

Ciudad Universitaria • 28003 Madrid

Phone: +34 91 3365732

Teaching and research in:

Surveying, Photogrammetry, Photointerpretation, Remote Sensing and Agricultural Cadastral Applications.

5.8 Universidad Politécnica de Madrid

ESCUELA TECNICA SUPERIOR DE INGENIEROS DE MINAS

Departamento de Topografía y Teledetección

Rios Rosas, 21 • 28003 Madrid

Phone: +34 91 3367007

Teaching and research in:

Mine surveying, Cadastre and Remote Sensing.

5.9 GRAFCAM - CARTOGRAFIA DE CANARIAS S.A.

C/ Panamá, 34. Naves 8 y 9 • Polígono Costa Sur. Santa Cruz de Tenerife.

Phone: +34 922 23 78 61 - Fax: +34 922 20 49 99

In 1994, the autonomous government of Canary Islands started an ambitious information planning over the Canary's Community, because of the recommendations of cartographical regional planning drawn up in the aforementioned year. The Regional planning provided what methodological, technological, commercial strategies were, together with the company plan for Grafcam.

The first phase of plan was carried out in the 1995-1998 period. During these four years was made the basic geographic information system of Canary Islands, which take account of photogrammetric flights, regional topographical map at 1:5,000 scale, urban cartography at 1:1,000 scale, land use map at 1:25,000 scale. Besides the production of basic geographic information system was implemented a reference geographic information system of Canary's government.

The forecast aims in this first stage have been fulfilled.

By 2000-2003 period has been set up some aims, which can be summed up in:

- Updating and production of a basic geographic information system: photogrammetric flights, topographical maps and land use maps.
- Division of natural spaces.
- Places of community interest.
- Geological map at 1:25,000 scale.
- Map of real state.
- Integration of cadastral urban maps
- Nomenclador: rustic and urban.

The investment plan for this period is about 2,300 millions of pesetas.

5.10 GEODÓS CARTOGRAFÍA

C/ Velázquez, 46 • 28001 MADRID

Phone: +34 91-431.33.76 • Fax 91-577.40.38

E-mail: geodos@teleline.es • geodoscar@jazzfree.com

GEODÓS Cartography is specialized in thematic cartography and deserve mentioning ,between the last jobs, the updating of some booklets of the National Atlas of Spain such as Transportation by road; Maritime Transportation; Finance and Treasury; Agriculture livestock and fishing; performing of a meta-data base on National Atlas of Spain and drawing up technical specifications for a CD-ROM on ' The Physical Environment'; drawing up the project of National Atlas of Spain on CD-ROM; collaboration in the production of a CD-ROM on the province of Madrid at 1:200,000 and 1:25,000 scales; taking part in the adviser committee and the team of authors of encyclopaedia called 'Large Reference: Anaya' edited by VOX group, consisting of 28 volumes; collaboration in the map called Central America and Carib.

5.11 GEOESTEL S.A.

C/ Diputació, 250 • 08007 Barcelona

Phone: +34 93 412 00 30 • Fax: 93 412 75 50

E-mail: geoestel@grec.com

Geoestel is a Spanish cartographic publishing company with a wide range of products: road and atleses maps, tourist maps and mountain maps. Our focus is to provide modern, comprehensive, user-friendly and attractive products. That is, clear and easily legible maps with a great deal of key travel information for the tourist, the car driver and the tripper. Our road maps include all Spanish regions with a uniform scale of 1/250,000 and show the main road networks and motorways, local services and tourist attractions. We also have a road map of Spain and Portugal (scale 1/000.000) which is also available in pocket format. Tourist maps cover the main tourist areas of Spain (Mediterranean Coast, Balearic Islands, North and South Coast and the Pyrenees). They contain key information for tourism: places of interest, sport and leisure activities museums, services and road networks. Road and tourist maps are available in six languages. Finally, our mountain maps are designed for trippers and people who love nature. They include a guide with routes, lodgings, services and sport and leisure activities as well. Some of them also have CDroms compatible with GPS systems.

5.12 THE KNOWLEDGE AND RESEARCH ON CARTOGRAPHY, GEODESY, PHOTOGRAMMETRY AND REMOTE SENSING ARE PROMOTED BY THE FOLLOWING TECHNICAL AND SCIENTIFIC REVIEWS:

- Review of the Professional Association of Engineer in Topography
- Review of the Association of Engineer in Geodesy and Cartography: Datum XXI
- Mapping

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