THE NAVY HYDROGRAPHIC OFFICE OF THE ARGENTINE REPUBLIC

I. — NATIONAL MARITIME OBJECTIVES

With the object of appraising adequately the activities which the Navy Hydrographic Office of the Argentine Republic carries out, and the part it plays within the institutional and national spheres, it is convenient to begin by emphasising the following two basic aspects which are interrelated with its activities :

1) the geographic features of the Argentine Republic, which imply the existence of vast maritime interests;
2) the attitude of the country as a whole with regard to the sea, and the importance of this sea to the welfare of the nation.

In the first place it must be pointed out that the Argentine Republic occupies a geographic position virtually peninsular in a hemisphere predominantly oceanic : the southern hemisphere (80 % sea, 20 % land). This simple geographic fact, considered in the light of the geopolitics of the country, stresses the outstanding importance that must be attached to the maritime routes of communication as regards the development and progress of Argentina, inasmuch as the greatest percentage of its foreign trade uses those routes of communication. It can be anticipated, furthermore, that this situation will not suffer substantial changes within the foreseeable future.

Another important geographic feature is that Argentina possesses a continental shelf that ranks among the widest in the whole world. This wide belt of shallow waters holds a great wealth — so far a potential wealth — in natural resources (biological, mineral, hydraulic power, etc.) for the development of which there are at present no technical limitations.

The mere listing of the geographic factors pointed out above suffices to make readily understood the prominent role that the sea has played, is playing and will continue to play, ever increasingly, in building up the greatness of the Argentine Republic. The recognition and adequate appraisal of the maritime interests must, in consequence, be a matter of permanent concern to the authorities responsible for the administration of the country, and, further still, it must constitute a question of vital interest to the Argentine people in general.

Unfortunately, the degree of maritime consciousness is still poor in Argentina, not only because it is a young and sparsely populated country, but also because its vast land area offers huge possibilities. This explains

— although it does not justify — the fact that the people are not concerned, and in many instances have no idea, of the immense interests that their country has in the sea.

In order to complete the picture within which the Navy Hydrographic Office conducts its activities, it must be emphasized that from the very inception of the nation, the Argentine Republic has endeavoured to build up a Naval Power commensurate with the requirements of its defence and those of the safety of its maritime interests. It is a well-known fact that for the proper use of Naval Power it is necessary to possess a thorough knowledge of geographic factors, and the Navy Hydrographic Office has a fundamental part in their determination.

Similar situations are presumably taking place in other young countries in the stage of development that have large maritime interests (both potential and in exploitation). Both their Navies and their Hydrographic Offices can surely have a conspicuous share in the promotion of these interests, as well as in creating a maritime consciousness among their populations.

II. — MISSION OF THE NAVY HYDROGRAPHIC OFFICE

The mission of the Navy Hydrographic Office encompasses several tasks, some of them closely connected with the different aspects previously outlined.

The first and classical task of Hydrographic Offices throughout the world is that of providing safety measures — the so-called navigational aids — along the maritime routes of interest to each particular country. This is a pre-eminently civil task which is carried out — in the case of Argentina — by the Department of the Navy (Secretaria de Marina) through its Navy Hydrographic Office (Servicio de Hidrografia Naval). This task has the character of a "public service". Although these safety measures or navigational aids are undertaken along all coastwise routes with the Office's own resources and means, economic limitations, coupled with the insufficient appraisal of the problems of the sea, have not permitted this service to expand to the maritime trade routes which link the Rio de la Plata with the north and northeast — particularly the United States and Europe. The maritime lines that ply these routes use the navigational aids furnished by countries which have more tradition, more experience and larger maritime interests, especially England and the United States.

It is convenient to define the scope of the term "provide safety to navigation" as regards the tasks which the Argentine Hydrographic Office carries out. With the limitations pointed out above, as regards the overseas routes, this Office provides the navigational aids necessary for ships to sail with an adequate margin of safety along the vast maritime seaboard of the country, as well as the Argentine Basin, and even over a wide expanse of the South Atlantic. Navigational aids are of very different types, and in fulfilling this task the Navy Hydrographic Office does not share its responsibilities with any other institution or agency, except in the case of

meteorological support to commercial shipping, the responsibility of which rests with the National Meteorological Bureau (Servicio Meteorológico Nacional).

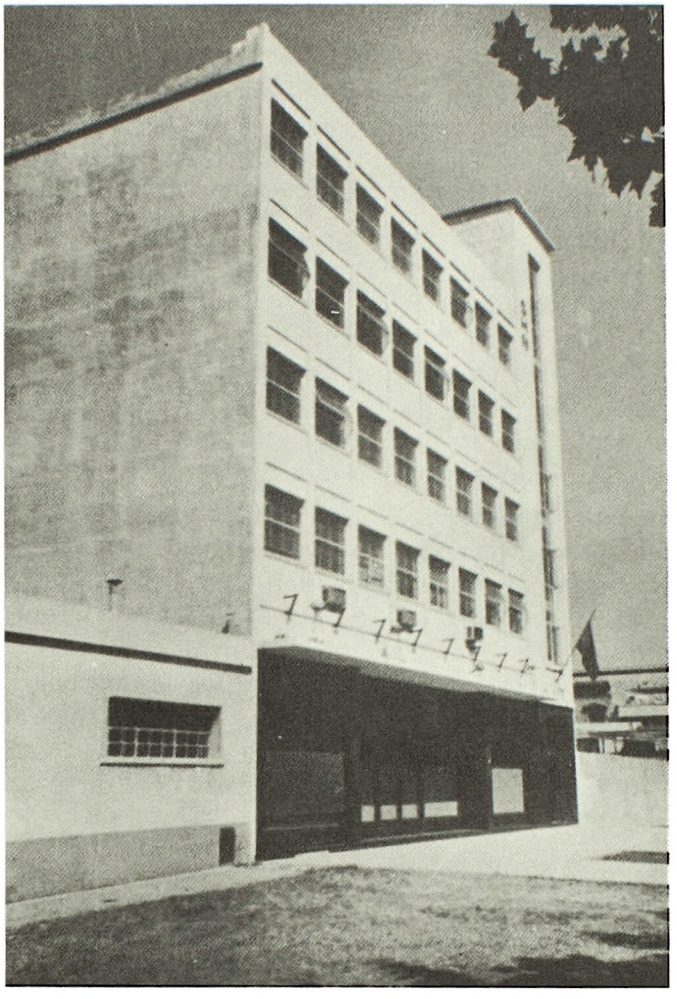


FIG. 1. — Headquarters of the Argentine Hydrographic Office in Buenos Aires.

The Argentine Hydrographic Office not only prepares and supplies the classical nautical chart — in addition to the Sailing Directions, the List of Lights and other publications — but it also has the responsibility of constructing and placing navigational aids (lighthouses, beacons, buoys, radiobeacons, etc.); the gauging, analysis and prediction of tides, which it subsequently publishes in its Annual Tide Tables; the computation and issuing of the Nautical Almanac; and the keeping of the official time. The study, acquisition and upkeep of the most modern systems of position fixing at sea, as well as the construction of the adequate cartography to be used in connection with those systems are also the exclusive responsibility of the Hydrographic Office.

Another task explicitly entrusted to the Argentine Hydrographic Office, and which is second in importance to that previously expounded, is that

of supplying the Navy with all necessary information regarding the geographic factors of strategic maritime areas. This task is directly concerned with the defence of the Nation, and in this respect the Navy Hydrographic Office plays the role of an agency of the Office of Naval Operations, thus justifying the word "Naval" which completes its name.

This geographic factor, which, as is well-known, some years ago only amounted to the hydrographic and climatological aspects, has since expanded enormously, until today it includes all the subjects studied and evaluated in oceanography (physical and chemical features of the oceans, geomagnetism, gravimetry, submarine geology, etc.), and meteorology (synoptic and synoptic-climatological aspects).

It is with this last objective that in its organizational layout there is a Meteorological Bureau of the Navy (Servicio Meteorológico de la Armada) which, even though its main task is that of providing the weather data, as part of the complex geographic factor required by the Navy, also collaborates with the National Weather Bureau by contributing observations made in its meteorological stations along the maritime seaboard, adjacent islands, and on ships and aircraft under way.

A third task entrusted to the Navy Hydrographic Office, and one which has a close connection with the former, is that of contributing to the advancement of the marine sciences which may be of interest not only to strategic requirements but also for the economic development of Argentina. This task would not have a real motivation in other countries, where scientific research is the concern of universities and other institutions of higher learning, but in countries having an undeveloped maritime consciousness, as in our case, it becomes necessary for agencies such as ours to undertake and promote scientific research in this field of human endeavour.

Finally, an ultimate basic task of the Argentine Navy Hydrographic Office should be pointed out. This task, although not specifically included in the pertinent regulations, is evident as well as important, inasmuch as it bears upon the field of the advancement of maritime consciousness undertaken by the Navy Department. It bears restressing that in young countries with important, but inadequately appraised, maritime interests the Navy has undertaken a leading role in the awakening of that consciousness — a role which has very diverse aspects. In Argentina, the Navy Hydrographic Office is perhaps the national agency carrying out the most important activities in this direction, because the nature of its mission connects it with many of the maritime interests and activities.

III. — GENERAL PLANS IN PROGRESS

The different responsibilities which must be faced by the Argentine Hydrographic Office have been enumerated in a very general way, but it is convenient to explain in more detail current plans aimed at attaining the objectives already stated.

These plans — which will be commented upon at some length — are

of far reaching scope, and it would appear that increasingly exacting requirements — especially in the naval field — and the advancement of geographical technology make it necessary to carry out periodic reviews to put them in line with changing conditions.

Navigational aids

Activities connected with the specific hydrographic task of the Office are centred on the provision of the most adequate aids to present conditions in surface navigation and in the special features of the Argentine maritime seaboard.

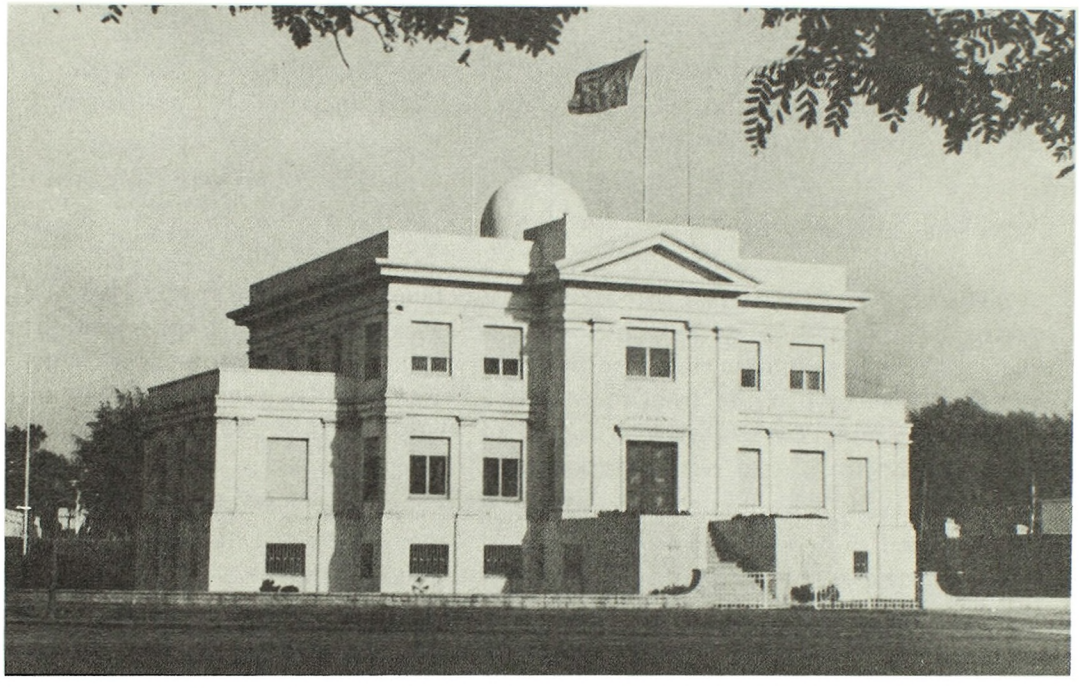


FIG. 2. — Naval Observatory.

Cartography

Although, generally speaking, the existing cartography satisfies present requirements of coastwise navigation, a thorough modernization has been undertaken on the basis of a cartographic plan which would establish a more logical distribution in comparison with the previous plan. The fulfillment of the new plan requires hydrographic surveys, some of which are already in the course of execution. At the same time a project for the quantitative evaluation of the quality of this type of aid is being considered. This task is not a simple one inasmuch as no definite agreements exist as to how to rate a nautical chart, but it is expected that, by the trial and error method, a satisfactory solution will be found.

Tides

The large diversity of tides is a very important feature of the southern Argentine maritime seaboard. Many of the natural ports in Patagonia are accessible only during certain periods because of tidal action, and this is the reason why tide prediction in that region is a highly valuable type of aid.

The existing tide gauging plan aims at the establishment of a greater number of tide gauging stations, and at the evaluation of the data provided in the Tide Tables which the Hydrographic Office prepares. The computation of tide currents with the predicting machine it possesses is also contemplated, with the object of including these data in the above-mentioned Tables.

The recording and prediction of tides on the antarctic seaboard is also envisaged, on the basis of gaugings already successfully carried out, and this work will be continued.

Lights and beacons

The existing network of lights and beacons along the Argentine maritime seaboard is in the course of being renewed and being brought up to date in accordance with technical advances. In this connection work is in progress to provide lighthouses and beacons with new light systems so that they may have a greater range of visibility, and may serve at the same time as an aid to air navigation in the area.

Likewise, the acquisition of modern radiobeacons is contemplated, and it is expected that, within a short period of time, a network of these beacons will cover the whole maritime seaboard of Argentina.

Another subject under consideration is the suitability of installing a radio-aid system, Decca type or similar, in the approaches to the Rio de la Plata, scene of the largest volume of Argentina's maritime trade.

Meteorology

Even though it is true that the meteorological support to civil navigation is not the direct responsibility of the Argentine Hydrographic Office, the task of advising the authorities on aspects connected with navigational safety in general does fall within the confines of its implicit duties. In this direction, the meteorological support to navigation is another aid in which improvements are contemplated. The narrow width of the continent in the region of Argentina, and the lack of meteorological stations in both the Pacific and South Atlantic often make weather prediction uncertain, and frequently impossible to extend accurately over a period of more than 24 hours. In consequence, such predictions are not of great use as an aid to maritime navigation. With regard to coastwise navigation, although this does not encounter any major difficulties in the support it already gets, its improvement is however necessary. Furthermore, the possession

of a first-class weather chart is a basic element for the prediction of conditions at sea and this is another aspect of great interest in connection with navigational safety which the Hydrographic Office wishes to add to the list of existing navigational aids.

Geographic factor

Turning now to the plans of activities which are the responsibility of the Argentine Hydrographic Office in the discharge of its "naval" duties, the main activity is centred on the problem of forecasting "oceanographic conditions" in the areas of strategic interest, that is the prediction of environmental conditions for the execution of submarine and anti-submarine operations.

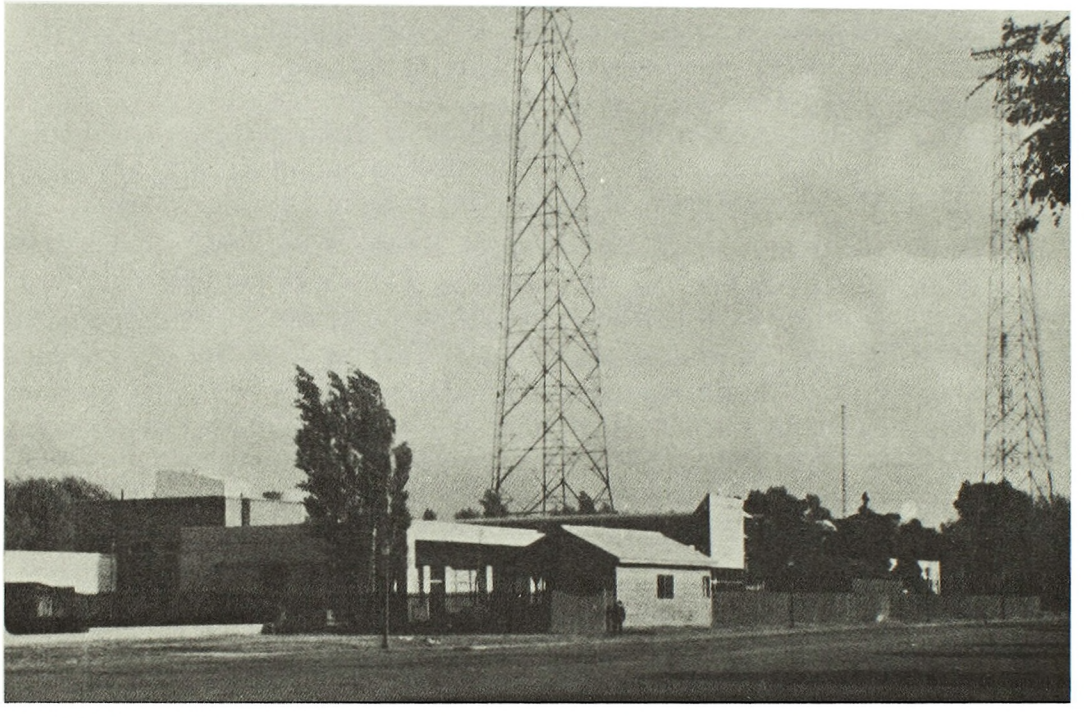


Fig. 3. — Instrumentation Workshop.

This implies a continued effort in a very specialized function, such as systematic observations, by means of ships and aircraft, of the environmental elements that will later serve as statistical data for evaluating "oceanographic conditions".

These observations are closely related to the subject dealt with in the following sub-section, entitled *Scientific Studies,* and it is here that are oulined the main research tasks they encompass.

Scientific studies

For that part of its mission dealing with the furthering of scientific studies of the sea, the Argentine Hydrographic Office has concentrated its main efforts in international cooperative cruises. These cooperative pro-

grammes are born of the fact that Argentina's scientific and technical possibilities in matters dealing with geophysical sciences are not sufficiently developed to obtain satisfactory results from these costly cruises, especially regarding the analysis of the data obtained. Two institutions, both in the United States, are the main participants in this international cooperative programme — Lamont Geological Observatory of Columbia University, for geophysical tasks, and the Agricultural and Mechanical College of Texas, for tasks concerning oceanic circulation and the fertility of the waters.

The following scientific surveys are being carried out systematically in the Argentine continental shelf area and the adjacent oceanic basin :

a) precision bathymetry, with deep sounders and precision depth recorders (PDR);

b) measurement of the total intensity of the geomagnetic force, with flux gate and proton precession magnetometers, towed by ships;

c) determination of the topography of the rock sub-bottom and of the stratification of the ocean bed by seismic techniques of continuous reflection and refraction;

d) determination of the fertility of the waters by the technique of pigment concentration measurements, and the determination of primary productivity by the absorption of radioactive carbon (C_{14}).

The distribution in space and time of all these data will enable the potentialities of the Argentine sea regarding biological natural resources and mineral resources, both solid and liquid, to be better known.

In this aspect, the role of the Office is that of assisting responsible national institutions to determine the natural resources contained in the Argentine shelf and the waters that wash it. With this object, the vessels of the Hydrographic Office have been provided with adequate facilities and the necessary instrumentation to carry out geophysical and biological observations during all their cruises.

Promotional work

The main effort, nevertheless, has been directed to encouraging educational institutions to take an active part in problems connected with the marine sciences. To this end, a limited number of scholarships are offered to students who wish to participate in specialized cruises, and accommodation is offered on board all vessels of the Hydrographic Office carrying out research work at sea. Furthermore, it is the intention to urge universities to include courses in hydrography and oceanography in their study programmes. Agreements have been established with other national institutions dealing with the evaluation of natural resources — both biological and mineral — that the sea treasures. Finally, the pertinent authorities are being encouraged to welcome foreign investments and the immigration of trained personnel coming from maritime-conscious countries, with the object of speeding up the development of marine resources. Such foreign contributions should serve as a spur to the Argentine people to seek their own expansion into the sea environment.

PERSONNEL REQUIREMENTS

Finally, it must be pointed out that in order to accomplish all these plans, the availability of adequately prepared personnel is imperative. This is, perhaps, one of the most difficult problems to solve in countries with heretofore little interest in the sea.

For the accomplishment of hydrographic and oceanographic cruises, two kinds of individual are necessary : marine technicians, capable of carrying out all types of field tasks on board, and the subsequent processing of data on land; and, on the other hand, scientific personnel who, in addition to their basic training, require a certain amount of specific knowledge of the sea environment.

In countries with a well developed maritime consciousness the recruitment of these two types of personnel is not difficult, because the very widespread interest in the sea means that there are many persons dedicated to these problems. The same is not the case in countries with a poorly developed maritime consciousness; as a general rule in such countries educational institutions, both intermediate and higher, do not have courses on the marine sciences in their curricula, and so to the larger part of the population the sea is a totally unknown environment. In such cases it is not an easy task to obtain persons conversant with, and interested in, the problems of the sea.

For the solution of this problem, the Argentine Hydrographic Office has adopted the following courses of action :

a) higher training, at university level, of its commissioned officers and civilian technicians in both national and foreign institutions;

b) training of personnel through joint work with foreign scientists and technicians;

c) training a staff of hydrographers, oceanographers and meteorologists using men of the Navy's enlisted personnel. The training will be at the level of marine technician;

d) intensive action to encourage universities to undertake the addition to their curricula of courses in marine sciences. To this end, one of its goals is the financing of study and research programmes that include problems of interest to the Argentine Hydrographic Office. The acceptance of these long-term programmes by the universities implicitly entails the creation of courses in marine sciences, and consequently, the encouragement of students and civilian graduates in these fields.

IV. — ORGANIZATION AND MEANS FOR THE DEVELOPMENT OF THE PLANS

Having already explained the objectives which govern the activities of the Argentine Hydrographic Office, it is now pertinent to discuss, as a last subject, the general layout and the means available to accomplish such objectives.

Let us begin by the operational means — the " vehicles " — with which the programmes of operation at sea are carried out, that is, vessels and aircraft.

The concept of separate hydrographic vessels and oceanographic vessels has been replaced by a new definition that embraces both, namely that of a research vessel. In fact, an analysis of the tasks that are carried out at present by vessels devoted to research work and to observations of different natures clearly shows the superfluity of the classical subdivision into hydrographic vessels, oceanographic vessels, etc. The distribution of the different operations involved in a hydrographic survey, which formerly were concentrated on shipboard, has made it possible to discard the concept of hydrographic-logistic vessel, and consequently to use the vessel's tonnage for the accomplishment of a greater variety of " geographic " tasks.

The great advance attained in the aerophotogrammetric field, as well as in that of electronic position fixing, and anchored buoys with different types of sensing devices, now make it possible to increase the observational capacity of vessels.

These are the reasons why the vessels of the Argentine Hydrographic Office are currently considered as research vessels. In essence, this is equivalent to saying that they are floating, movable platforms, prepared for long-range cruising, having ample space for laboratory work and for the accommodation of scientific and technical personnel, and the capacity to house all kinds of instrumentation, plus suitable winches for all types of sampling.

On the basis of these specifications, the four vessels of the Argentine Hydrographic Office, with an aggregate of 6 870 tons, are being gradually refitted so that they may fulfill present-day requirements. These four vessels are :

A.R.A.	*Capitan Canepa*	1 250 tons
A.R.A.	*Comandante General Zapiola*	1 640 tons
A.R.A.	*Comodoro Augusto Laserre*	2 450 tons
A.R.A.	*Ushuaia*	1 530 tons

It is expected that any of these vessels will be able to undertake, in the not too distant future, either classical hydrographic surveys or oceanographic cruises of the types now required, or both tasks at the same time.

On the other hand, the huge advances made in the use of aircraft, not only for aerophotogrammetric purposes, but also for other needs of specialized observations (geophysical, oceanographic, meteorological, etc.), make the possession of aircraft units a vital need for the Hydrographic Office in the efficient carrying out of its activities.

Some research planes — basically the aerial counterparts of research surface vessels — are expected to be available shortly. Furthermore, it is pertinent to remark that on the widespread Argentine continental shelf, where no accurate fix systems for ships exist, aircraft offer great advantages for surveys and observations which must be carried out in that area, on account of the high precision it is possible to obtain with aircraft along the length and width of these expanses.

Organizational layout

The general layout of the Argentine Hydrographic Office is shown in the annexed block diagram. Inasmuch as the Office is in a determinate stage of development, this technical-administrative organizational layout is subject to changes as and when the new requirements of the tasks to be accomplished make this necessary.

In the meantime, and on the basis of the present layout, the functions of the different Departments and Divisions of the Office are outlined below :

Navigation Department (Departamento Náutica)

This Department keeps up to date, and issues through Notices to Mariners, all the information necessary to provide safety to navigators. This information is also included in nautical charts, sailing directions, lists of lights, etc., as the case may require.

It supervises the operation of the Lithographic and Printing Office, and that of the Naval Observatory which is responsible for the determination and the keeping of the official time throughout the Republic.

It also maintains an exchange of publications with other national and foreign institutions, and supervises the functioning of the Office's technical library.

Hydrographic Surveys Department (Departamento Levantamientos Hidrográficos)

This Department plans and executes the hydrographic and photogrammetric surveys along the whole length of the Argentine maritime seaboard that are required for the construction of nautical charts. Three Divisions : Aerophotogrammetry, Computations, and Cartography — each one fitted out with modern equipment — handle the results of the field work.

In addition, it supervises the activities of the School of Cartography.

Oceanographic Department (Departamento Oceanografía)

This Department plans and carries out all oceanographic cruises (investigations : geophysical and submarine geology, sea water chemistry, and marine biology), aimed at furthering the knowledge of the sea environment in all its aspects, including the features and composition of the ocean floor, as well as the biological and mineral resources contained in the waters. The research work of this Department has not only strategic and scientific purposes, but also studies economical means.

It operates a laboratory for the analysis of water samples, sediments and marine microorganisms.

It registers, computes and predicts tides and tidal currents along the Argentine seaboard. This information is subsequently included in the yearly publication " Tablas de Marea " (Tide Tables). With the same purpose of registering and predicting tides, it supervises the operation of tide gauging stations, which at present number twelve.

Meteorology Department (Departamento Meteorologia)

This Department obtains and evaluates the meteorological information in areas of strategic interest. It supplies meteorological support to the vessels of the Argentine Navy both along the whole length of the national maritime seaboard, and also similar support over extensive oceanic areas beyond the territorial waters of Argentina.

It supervises the operation of nine meteorological stations (mainly lighthouses) located in Navy bases and establishments, and other meteorological stations which operate on board ships.

Lights Department (Departamento Balizamiento)

This Department is responsible for the upkeep of the system of lights, daymarks, and sound and semaphore signals along the whole maritime coastline of Argentina. It is also responsible for the upkeep of the system of maritime radiobeacons.

It carries out the construction of new aids to navigation in accordance with the Lights and Beacons Plan.

The units in operation it supervises are the following :

11 beaconage stations
14 manned lights
68 automatic lights
2 light-vessels
156 light beacons
190 beacons
3 fog signals
6 circular maritime radiobeacons
3 semaphores
65 light buoys
17 buoys
2 light buoys (special approach type)

Navigation Supplies Department (Departamento Alistamiento Náutico)

This Department keeps stock of navigation supplies, and handles their distribution as required to Navy vessels.

It manages and supervises the upkeep of all the instrumentation required for surveys and observations of all kinds by vessels and aircraft of the Hydrographic Office. A calibration tank for reversing thermometers is being built, and the installation of an electronics workshop for handling the assembling, repairing and upkeep of electronic apparatus is contemplated.

For this purpose the Department maintains a high precision Instrumentation Workshop, which is continually being improved, to keep abreast of technical developments in methods of repairing and fitting out instruments.

Accounting and Finance Department (Departamento de Contabilidad y Finanzas)

This Department keeps all the accounting records concerning expenditure.

It requisitions and allocates the funds required to pay regular operational expenses and for special projects of the Office.

It supervises the purchase of equipment and instruments, and also all questions of employment, piecework and large-scale building contracts. In short, it supervises all monetary commitments of the institution.

Technical Division (Secretaria Técnica)

This Division advises the Head of the Hydrographic Office — the Hydrographer — on the general coordination of operations and research plans, as well as on all the cruises of vessels and aircraft belonging to the Office.

Acting as the representative of the Hydrographer it supervises the development and execution of these plans.

This Division was recently created, and is still in the organization stage.

Correspondence and Files Division (Secretaria)

This Division handles all matters concerned with the correspondence and the general files of the Hydrographic Office.

Personnel Division (División Personal)

This Division handles all matters relative to personnel, both civilian and service. This is not an office content to solve problems in a merely routine way, on the contrary its main function is that of fostering pleasant working conditions, individual and collective welfare and advancement by means of adequate encouragement. From this point of view, the Personnel Division is actually a Human Relations Bureau.

Excluding the complements of its research vessels, the staff of the Hydrographic Office is made up as follows :

Commissioned officers	26
Technical and administrative strategic personnel	228
Higher-grade civilian personnel	12
College graduate civilians	5
Civilian technicians	187
Civilian administrative personnel	43

Antarctic Division (División Antártida)

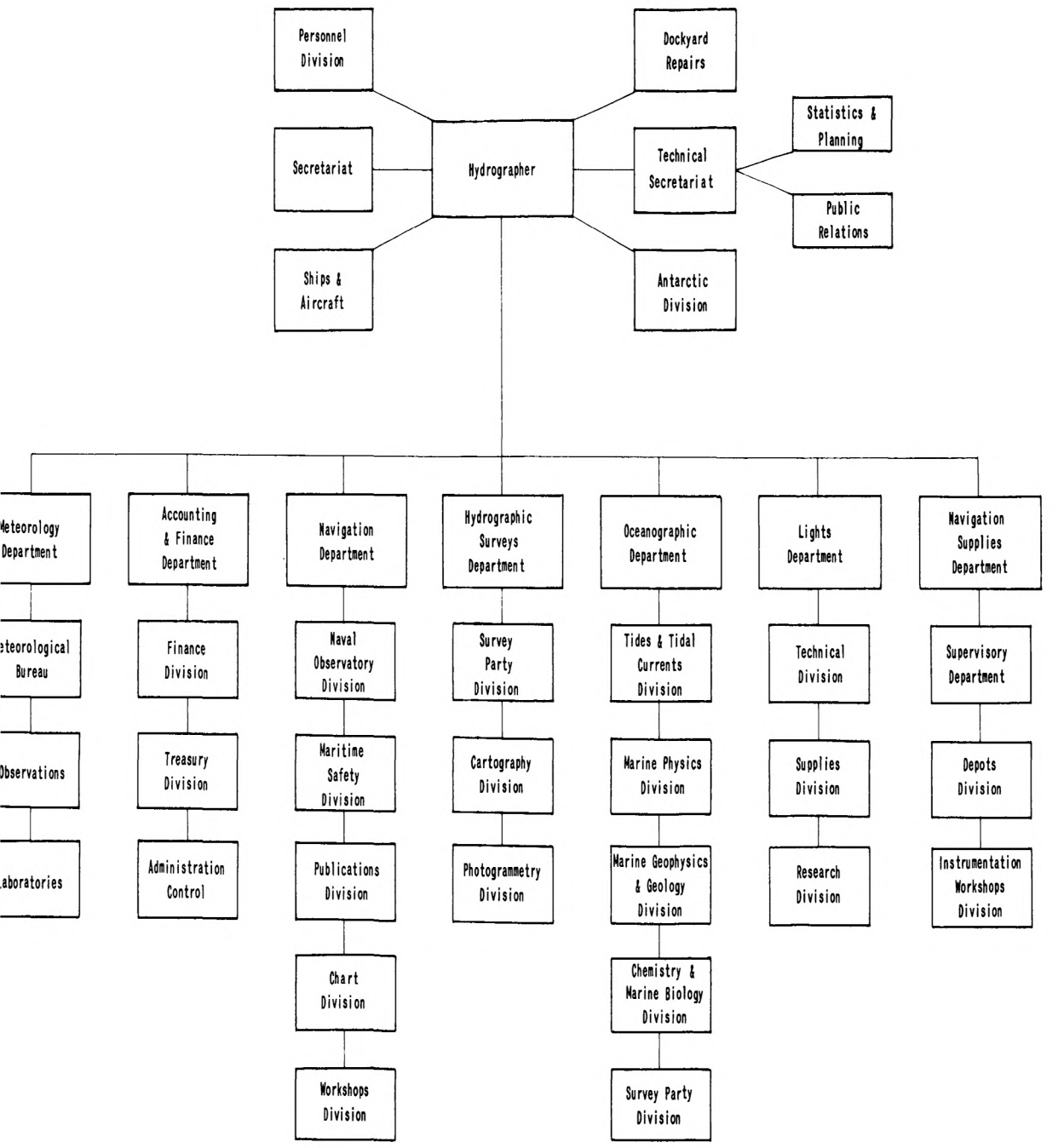
This Division supervises supplies to the Antarctic stations, and their day to day operation. There are five such stations, but only two are at present occupied. There are also eighteen shelters, which are occupied occasionally during summer campaigns.

Buildings of the Hydrographic Office

The Argentine Navy Hydrographic Office has its headquarters at Avenida Montes de Oca 2124, Buenos Aires. It is a 5-storey building (office space 4 700 sq. metres), alongside which a separate building is being constructed. When finished, this will be the premises of the printing shop of the institution, which currently functions in the old headquarters of the Hydrographic Office. Another enlargement which is contemplated for the

near future is the construction of a conference hall, which will have a film projection camera, a slide projector, plus facilities for delivering lectures and short study courses, space for exhibitions, and a public technical library.

The following branches of the Hydrographic Office at present operate outside its main headquarters : the Printing Shop mentioned in the previous paragraph, the Naval Observatory, the Instrumentation Workshop, and the Lights and Beacons Department.


Personnel Division
Dockyard Repairs
Statistics & Planning
Secretariat
Hydrographer
Technical Secretariat
Public Relations
Ships & Aircraft
Antarctic Division
Meteorology Department
Accounting & Finance Department
Navigation Department
Hydrographic Surveys Department
Oceanographic Department
Lights Department
Navigation Supplies Department
eteorological Bureau
Finance Division
Naval Observatory Division
Survey Party Division
Tides & Tidal Currents Division
Technical Division
Supervisory Department
Observations
Treasury Division
Maritime Safety Division
Cartography Division
Marine Physics Division
Supplies Division
Depots Division
Laboratories
Administration Control
Publications Division
Photogrammetry Division
Marine Geophysics & Geology Division
Research Division
Instrumentation Workshops Division
Chart Division
Chemistry & Marine Biology Division
Workshops Division
Survey Party Division