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DOCUMENTS OFFICE



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NEEDS OF THE AFRICAN COUNTRIES IN CARTOGRAPHIC DOCUMENTATION

Paper presented by the Government of Algeria

This note does not claim to be either detailed or exhaustive. It gives a survey of the cartographic documentation possessed by Algeria and presents our ideas on the project of establishing an African cartographic and photogrammetric institute as well as on the regional training centre.

CHAPTER ONE

NEEDS OF ALGERIA

In this first chapter we propose to state in a very general manner the gaps in cartography and aerial photography in Algeria. These gaps - some large, some small - have their counterpart in the other African countries. It has been our concern to use the advantages of aerial photography and photo-interpretation for the benefit of development.

During the colonial period, especially after the outbreak of guerilla warfare in the Algerian Territory, and later at the time of the discovery

* For participants only.

of signs of petrol and natural gas deposits, the IGN* was prompted to prepare a large number of small- or medium-scale "staff" type, maps, all topographical. It was only as from 1959, when the Constantine Plan was put into action, that the IGN began to prepare large-scale 1 : 20,000 maps. On 1 January 1964, the coverage of Algeria in maps and photographs was as follows:

1. Map coverage

(a) New 1 : 20,000 map (type 1960)

In 1959 the IGN set on foot, under the development fund, a large-scale cartographic programme for those regions of Algeria that were most important from the economic point of view.

At the request of the Algerian committee of geographical operations, the IGN will prepare maps of the scale 1 : 25,000, and not 1 : 20,000, on which work had already been begun; it will convert the 1 : 20,000 maps to 1 : 25,000.

(b) The 1 : 50,000 map

This map, as those for almost all the departments of northern Algeria, comprises sheets based on former direct surveys that have been revised and brought up to date, and sheets based on stereophotographic surveys not supplemented by observations on the ground.

(c) The 1 : 20,000 map (type 1960)

There is a series of 91 sheets of a former five-colour map on this scale covering the departments of the north, and the northern part of the Sahara departments.

(d) The 1 : 200,000 map of the Sahara

Since 1958 the IGN has been working on a new 1 : 200,000 regular map of the Sahara.

* IGN: Institut Géographique National Français.

(e) The 1 : 500,000 map of the Sahara

The IGN is also preparing a 1 : 500,000 map derived from the preceding map.

To this can be added many small-scale maps prepared several years ago (pedology, geology, pluviometry, population density).

2. Photographic coverage

(a) On the 1 : 50,000 scale

The entire territory is covered on this scale.

(b) On the 1 : 80,000 scale

Taken for the preparation of the 1 : 200,000 Sahara map, the 1,100,000 sq. kilometres will be covered by the end of 1964.

(c) On the 1 : 25,000 scale

Double photographic coverage on this scale, on panchromatic and infra-red film, was begun in 1959 for the preparation of the 1 : 20,000 map of the departments in Northern Algeria. An area of 250,000 sq. kilometres is covered with the 38°N parallel as its south-eastern limit.

Moreover precise levelling covers the entire territory, over a total length of 20,000 kilometres. It is to be noted that it is indispensable to verify its continuing accuracy whenever it is to be used and to supplement it, whenever it proves inadequate for stereotopographic preparation

3. Triangulation points and astronomical control network

In the northern part of Algeria, there is a triangulation network covering 350,000 sq. kilometres and comprising 800 first-order points and approximately 15,000 detailed triangulation points.

For the Sahara regions, there is an astronomical control network. It comprises 550 points and covers 1,100,000 sq. kilometres. These astronomical points are used for the 1 : 200,000 map surveys.

As can be seen, Algeria already has a fairly wide coverage of topographical maps, as well as an infrastructure (geographical and astronomical control networks, precise levelling) which facilitate other photogrammetric and cartographic work.

As already pointed out above, all this work is being carried out by the IGN, which keeps the aerial photographs, copies of which are fairly difficult to obtain.

It is not without value to recall here various applications of aerial photography for geographical and cartographical studies, the exploitation of less-developed regions, town-planning, hydraulic engineering projects, drainage, re-allocation of land, etc.

The data obtained from aerial photographs are numerous and a synthesis of the interpretative work of the various specialists (geologists, agronomists, etc...) makes it possible to prepare a rapid inventory of the potentialities and needs of an area for purposes of regional planning. This technique makes it possible to cut down on, or even dispense with, conventional surveys, which are too long and expensive and very difficult to carry out over great areas without penetration routes, as is often the case in developing countries.

For example, in Algeria, it is out of the question to launch a regional survey of the Sahara, and still less of the Hoggar, although these areas have an almost certain future in the long view.

It would therefore be desirable for the African countries to be able to prepare their own economic or other maps themselves by the photogrammetric technique; it was with this thought in mind that we considered a project of an African institute of cartography and photogrammetry working on such lines.

CHAPTER II

PROJECT OF AN AFRICAN GEOGRAPHICAL INSTITUTE

The indisputable advantage of establishing such an institute having been pointed out in the preceding chapter, a statement will now be given of the form that it might take. This is merely our contribution to the joint deliberation that can alone lead to a final project.

Considering the extent of the facilities to be provided for the operation of such a technical service, its establishment (see sketch of the organization chart) has been divided into two successive stages.

In the first stage, the Institute would comprise all the phases of the process of cartographic preparation with the exception of the various aerial operations (which call for considerable technical equipment).

At first sight, it may seem scarcely logical to include the aerial operations, which constitute the initial phase of the whole process, in the first stage.

The reasons for this choice will now be stated:

- The remainder (or almost the remainder) of the work is carried out in the laboratory and is a homogeneous whole.

- The aerial documents can (provisionally) be obtained through the same channels as previously (from private or foreign organizations).

- If, on the contrary, the African States established the service that carried out the aerial operations as a first stage, these raw documents would have only very limited interest and it would be necessary to appeal to outside bodies for their processing (which would be much more difficult to achieve).

The first stage envisaged corresponds to divisions 2, 3, 4 and 5 of the organization chart. To be precise, it includes the following:

Stereopreparation work (No. 2 of the organization chart). The execution or improvement of triangulation and levelling networks require a great deal of time (decades for the great areas of Africa, where no previous work has ever been done), but are absolutely necessary for the preparation of the maps. They do not require very large-scale equipment nor "high-level technicians", though they do require qualified personnel. Finally, it should be noted that these operations take place in the field.

The documentation section (No.3) is the repository of the photographic and cartographic documents necessary for the work (to the extent that certain existing maps may be useful in preparing later documents). It should be recalled that, in the first stage, these documents must be obtained from a source outside the institute. This service raises no particular problems of equipment (except for the documents themselves) or personnel.

Cartographic preparation proper (No. 4) is a complex process that will only be outlined here. Identification corresponds to the first draft of the map, carried out by stereoscopic observation of aerial photographs, and on the basis of geodetic data and levelling; it requires special instruments and personnel capable of keen observation. The document thus obtained, the stereoscopic manuscript, is supplemented according to information that must be obtained on the ground (in addition to stereoscopic ground control). This is the phase of interpretation; technicians - specialists or with knowledge in several fields, according to the maps to be prepared - "extract" from the prints the data to be reproduced in the maps. (The specialities that we have noted in the organization chart are neither mandatory nor exhaustive). Finally compilation: cartographic draughtsmen prepare the final map, using techniques that may vary according to the nature of the map. We have indicated in schematic fashion the many types of maps, which may be classified in two main categories: those that express facts in one and the same sector (physical or human) and those that express the principal facts (physical and human) in a given area.

We see that this fundamental stage of map-preparation requires considerable equipment and very competent technicians, all highly qualified, either specialists or with knowledge in several fields; the latter are, properly speaking, the interpreters of aerial photographs - it is very desirable for them to have a geographical background. The final draughting, to be of practical use, must be capable of reproduction. The printing house in charge of this reproduction must be equipped with machines for colour reproduction.

In this first phase of its development, the Institute will already be a body of some size, able to do work of remarkable quantity and quality. But for it to be complete and thus independent - the advantages of which cannot escape us Africans - it must also carry out aerial operations. Therefore it seems to us necessary for the African geographical institute to include as a second stage this additional branch, which will now be described. (No. 1 of the organization chart).

The most important work is, certainly, the taking of aerial photographs (of different orders). However, it should be noted that other operations (aerotriangulation and APR work in particular) give much more rapid solutions to the problems of stereoscopic ground control (see No.2 above) and are therefore of great significance to the African countries.

It should be noted that, in addition to the normal crew of every aircraft (pilot, engineer, radio operator), who must be trained for these special flights, the navigator and the photographer play an essential role.

The qualities required of the aircraft (ability to fly low and slowly, high stability and precise manoeuvrability) call for heavy and therefore costly aircraft that cannot always be adequately served by makeshift airfields.

The negatives obtained must be developed and printed in a photographic laboratory equipped for processing the special plates and films used in aerial photography. The documentation service will therefore be supplied directly from this laboratory.

After this presentation of the outline project for an African geographical institute (or one "covering" only a single region of Africa) we shall now make a few remarks.

1. Since our scheme proposes one institute for Africa (or at least for an area covering several countries) various technical difficulties may appear when it is necessary to prepare maps relative to a region thousands of kilometres from the institute. One fact is certain: centralization of effort and facilities in one, two or three centres at most is technically necessary. This is doubtless not so inconvenient for aerial operations - the continent has a network of aerodromes adequate for the long-range aircraft used - as for field work - or the transmission of its results to the headquarters of the institute. Decentralization of certain sections of the institute would perhaps be necessary to overcome these difficulties.

2. There seems to be no room for variations in quality in the documents produced by an institute of this nature - in other words, either the maps produced are of good quality and therefore useable, or they are not, and they, and thereby the institute, are practically useless. This somewhat brutal statement (which, however, expresses the facts as we see them) leads to an absolute requirement: a centre with high-quality equipment and highly-qualified personnel.

3. In the organizational sketch we have reserved a place for what we call "pure research and training".

Why "pure research"? The interpretation of aerial photographs is a young science and its full potentialities have not yet been exploited. It is therefore necessary, if we are not to stagnate - or even be left behind in relation to general progress - to carry on research parallel to practical operations.

Why "training"? Because the Institute - and later other institutes, perhaps - needs competent technicians to operate properly. This "internal" training is all the more necessary as specialists in this field are very rare throughout the world and as even external aid - which, moreover,

can and must be only temporary - will be problematic, to say the least. By the way, it seems to us that a training programme operated parallel to the normal running of the institute would not necessarily raise difficulties.

This brings us to an important point, on which we shall conclude this chapter: if, the cadres can be trained internally, once this institute is in operation, it is a fundamental condition for its establishment to obtain the first "wave" of technicians needed.

4. For the same reason as those mentioned in the following chapter - relative to the project of an African training centre - it appears that Algeria has facilities for the establishment of such an African geographical institute on its territory, particularly in view of the support that the existing infrastructure might offer.

CHAPTER III THE TRAINING CENTRE

Work programme

In our opinion, the ideal situation would be for the Centre to be able to train African technicians in the various stages of map preparation (photography, stereoscopic ground control, interpretation, plotting, supplementation, compilation, and issue). It is possible that, through lack of means, the Centre will initially train only certain grades of technicians. In this case, priority may be given to training interpreters of aerial photographs, the results of whose work will provide valuable information both for geology - the prospecting of oil deposits, for example - and forestry, agriculture, and numerous other fields already mentioned.

Operation of the Centre

As it is difficult to foresee how the Centre will operate, we shall confine ourselves here to indicating the advantages and facilities to be found in Algeria if such a centre were established there.

First of all the documentation possessed by Algeria, which can be supplied by the IGN. This documentation can be placed at the disposal of the Centre for teaching purposes and for its work.

Attached to the university in Algiers there is a geographical Institute that prepares students for higher diplomas in geography. On the one hand, the African and Algerian students enrolled in this Institute might simultaneously follow courses at the Training Centre, and might constitute the future cadres of the African geographical institute (see project); on the other hand, the teachers of the Algerian Geographical Institute will be able to teach at the Training Centre.

For aerial photography, Algeria possesses a large network of aerodromes; those in the south can serve as bases for aircraft operating in the countries south of the Sahara.

Still in the field of the work of the Training Centre, Algiers has a printing house for producing maps in colour.

In conclusion, it will be noted that there will be no problem of premises with regard to the establishment of the Training Centre.

The needs of the Centre will be functions of its level and influence; they are to be determined by the competent departments of the United Nations.

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ORGANIZATION CHART OF AN AFRICAN GEOGRAPHICAL INSTITUTE

1. AERIAL OPERATIONS						
Photography		<ul style="list-style-type: none"> - On normal panchromatic plates - On colour-plates - On infra-red plates 				
Photographic work processing and photomosaics						
Other Operations		<ul style="list-style-type: none"> - Aerotriangulation - APR 				
2. STEREOSCOPIIC GROUND CONTROL		4. INTERPRETATION - PREPARATION			5. PRINTING	
<ul style="list-style-type: none"> - Ground control networks - Precise levelling 		PLOTTING IDENTIFICATION	SUPPLEMENTATION	INTERPRETATION	COMPILATION	
		Plotting with the stereograph	By data collected on the ground	Photo-interpreters with knowledge in several fields	Final draughting	
3. DOCUMENTATION		(stereographic manuscripts)	Various types of maps	Various specialists	General and topographical	
Photographic and cartographic coverage				Geology	Pedology	Topical
				Climatology	Hydraulic engineering	
				Agriculture	Industry	
				Demography	Town-planning	
				Transport	Physical planning	
				Polychrome		