

CARTOGRAPHY AND TOPOGRAPHY IN AFRICA

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The purpose of this paper is to review briefly the needs of African countries for surveying and mapping and to examine some general problems connected with the meeting of these needs. Particular reference is made to photogrammetry, which is the theme of the symposium. Within this context, the role of photogrammetry and of photogrammetrists in studying and solving these problems will be discussed.

To appreciate generally the needs for topographic maps, it is only necessary to mention the fact that all African countries, most of which are young independent nations, are endeavouring to engage in intensive economic and social development. Their programmes invariably include the building up of communication and transport systems, the installation of manufacturing industries, the surveying and utilisation of natural resources — agricultural, mineral, energy and water, the improvement of urban and rural conditions etc. As other speakers in this symposium have already pointed out, all these important projects require adequate maps, and related cartographic data in their planning as well as in their execution.

Let us take, as an example, the mapping at the scale 1:50,000 which has been considered as a basic series in developing countries for economic purposes. A recent survey, based on information available in the United Nations Economic Commission for Africa indicated that less than 20% of Africa, which has a land area of 30 million square kilometers, is covered by such map sheets. On this scale alone, more than fifty thousand sheets have to be compiled and published to complete the coverage. Needless to add many of these sheets are urgently needed. The work to be carried out in connexion with the 1:50,000 scale mapping represents already a tremendous amount of ground surveying, photogrammetry and cartographic preparation. The total amount of work of all other cartographic projects is obviously much more impressive.

In view of the urgent need for topographical maps and other maps which have to be based on an accurate topographical map or which have to be compiled by the interpretation of aerial photographs the application of photogrammetric methods to the greatest extent of the work is certainly a must.

It may be of interest to point out at this juncture, that, Africa, which perhaps has the greatest need for original mapping, is the continent which has the least facilities, in term of skill personnel, technical equipment and financial means to carry out such work. It also has the least professional tradition in surveying and mapping.

Thus the fulfilment of African needs for surveying and mapping raises problems much more complex than those encountered in technically advanced countries.

For many years to come, the work involved is still too immense to be carried out by African countries themselves; in the meanwhile it is also too immense for countries outside the region to bear permanently the whole burden. Thus close co-operation between African countries and cartographically advanced countries, at governmental level as well as at scientific and technical level, is essential for mutual benefit. Such co-operation is required, not only for the carrying out of technical work, but also for the set up a firm basis to achieve normal development of cartographic activities in the continent.

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The gradual increase of African participation in technical work would provide basis for solving long term problems in fulfilling the continent's needs for surveying and mapping. This means increasing the technical capability of African national services — particularly with respect to the type of work which can be done on the spot more economically and more conveniently by local staff. This touches the question of training technical staff and the introduction of suitable instruments and equipment.

With regard to the meeting of the need for training African staff and in particular, those at operational level and middle level which involves a great number of trainees, many other aspects have to be taken into account, in addition to the pure technical education aspects; for instance, the Second United Nations Regional Cartographic Conference for Africa held in Tunis in September 1966 stressed the desirability of carrying out such training in an African environment particularly under local working and living conditions. The purpose is not only to reduce the cost of training but also to avoid certain economic and social problems in the employment of such skilled personnel after their training.

It may be useful to draw the attention of photogrammetrists in charge of such training to the necessity of working out suitable methods of training, appropriate programmes and other arrangements in line with the needs and the background of the trainees, to suit the African environment, and to increase the effectiveness of such training from all practical points of view.

With regard to the introduction of suitable techniques and equipment, photogrammetrist and instrument manufacturers could make an invaluable contribution to the development of surveying and mapping work in Africa. The physical and social environment, as well as human and economic factors are usually determinant in obtaining efficiency from the technical staff in the application of a technique or in the operation of an instrument. In my personal opinion it would be worth while to look into the requirements arising from the African environment and to carry out scientific research on the subject; one basic question would be whether new technical procedures work in the African environment and make it more efficient. This objective may be achieved by adapting of existing methods and equipment or by creation of new technical procedures and new types of equipment.

Another domain in which photogrammetric organisation and photogrammetrists can assist the young African nations in their cartographic work is the study of technical problems encountered in practical work. For instance, at the Second United Nations Regional Cartographic Conference for Africa mentioned above, the representative dense tropical forest. Firstly, the meteorological conditions are often unfavourable for aerial photography and secondly, the photographs are not easy to exploit for topographical mapping. The Conference invited the United Nations Economic Commission for Africa (E.C.A.) to encourage institutes and other bodies engaged in scientific research to study suitable methods and instruments which could help in the solution of the problems. As Africa has at present no research institutes in the field, photogrammetric organisations elsewhere can contribute much to the African cartography in this particular aspect. ECA would be available to assist in establishing contact between interested organisations and the countries that are experiencing difficulties and in disseminating the results of the research work.

ECA activities in assisting African governments in dealing with surveying and mapping question and especially those of particular interest to photogrammetrists and photogrammetric organisations, include (a) promotion and strengthening of international co-operation in the technical field between African countries and countries outside the continent, (b) promotion and strengthening of regional co-operation in the

same field among African governments, and (c) assistance to African governments in developing their national surveying and mapping services as well as in studying questions of regional or sub-regional interest.

With regard to strengthening international or regional co-operation, United Nations regional cartographic conferences for Africa are being convened at intervals of 3 years: the first conference in Nairobi 1963, the second conference in Tunis in 1966 and a third conference is recommended for 1969. The work of the conferences is not limited to the adoption of recommendations for implementation by ECA or by African Governments, they also review the progress achieved by the organisations as well as by governments concerned in the implementation of such recommendations. These conferences have provided an opportunity to African officials responsible for national mapping to exchange information among themselves and with experts of cartographically advanced countries, and to discuss problems and projects of mutual interest. Such conferences have proved to be very useful in reaching agreement on regional or sub-regional projects.

Some projects initiated by the conferences are of particular interest to organisation, scientists and educators dealing with photogrammetry.

a) *Establishment of training centres in photogrammetry and photo-interpretation.*

The main purposes of such centres to be set up in Africa on a regional or sub-regional basis are to provide to African national cartographic services with facilities similar to in-service training to train their staff for middlelevel staff and operators in an African environment, so that the limited technical staff and equipment available in these services can be put to work for production purpose. Six Governments — Cameroon, Ethiopia, Mali, Nigeria, Sudan and the UAR — have offered to act as host for such a centre in their respective capitals. Studies are being carried out to determine the suitability of the proposed sites.

b) *Establishment of a Common centres for specialized services in surveying and mapping.*

Such centres which would be established for a group of countries on a co-operative basis would supplement the technical facilities of the national cartographic services in certain specialized fields, in which the execution of technical work requires expensive equipment and highly specialized personnel. In most cases, one country alone can neither afford to have such facilities of its own nor supply sufficient work for full time operation of the facilities. Selected photogrammetric operations are included in the activities of such centres. Eight Governments — Kenya, Niger, Nigeria, Senegal, Somalia, Sudan, Tunisia and the United Arab Republic — have offered to act as host for a centre in their countries. A survey mission has been scheduled for November-December of this year to study on the spot the proposed sites and other factors which have to be taken into consideration in deciding which site to select.

c) *Research Centre in aerial Survey.*

This is a new project recommended by the Tunis Conference mentioned above to meet the necessity for further researches into problems of aerial survey in Africa. It is still premature to evaluate the implication of the project pending further consultations with African governments and interested international and national organisations.

The above indicates that there is a good deal to be done in the field of surveying and mapping so that the photogrammetrists are called upon not only to execute tech-

nical work but also to help in solving new problems. The role that photogrammetry can play in the development of Africa cannot be over emphasized.

In study African problems, one must bear in mind that the state of development in Africa varies greatly from country to country, as do the state of development of cartographic services and the state of mapping. For instance, the coverage of the 1:50.000 map series vary from 0% to more than 50%. The national cartographic service varies from small offices with several draughtsmen to well-equipped modern photogrammetric mapping facilities. The availability of technical personnel and funds also varies considerably. Thus it is often necessary to consider each case individually. Methods and techniques suitable for one country or one group of countries are not necessarily successful for another country - This fact must be taken into account when dealing with a country programme.

The above indicates the rather complex nature of African problems in surveying and mapping. Since this paper is addressed to scientists, educators and engineers in the field of photogrammetry, one can count on them to find correct solutions when problems are put in the right perspective. In the shrinking world of today, people everywhere have been brought much closer together than may be realized; therefore, the study of problems in any particular region will often bring results, whether intrinsic or incidental, that can be of benefit to other regions.