

WORKINGGROUP VI/1

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OPTIMUM PHOTOGRAMMETRIC EDUCATION IN DEVELOPING NATIONS

ABSTRACT: Lack of qualified manpower, funds and time are typical debit-  
-posts on the balance sheets of most developing nations com-  
monly facing widening in stead of narrowing gaps between the  
needs of the fastgrowing, undernourished, underemployed, un-  
det-etc.etc. politically and humanly unhappy poor classes.  
It should be selfevident that education and training in general,  
as well as in photogrammetry should aim at filling the immediate  
needs (a short perspective of e g one decade) of the integrated  
development efforts and NOT primarely to satisfy collective and  
individual professional pride and status according to imported  
concepts. This also refers to specifications, methods and means  
for surveying and mapping when a country is suffering from an  
acute lack-of-development-crisis.  
UNFORTUNATELY development aid in surveying has far too often fol-  
lowed the philosophy, specifications and education principles  
of the industrialized nations .  
This paper presents in general terms the basic requirements of  
and principles for stepwise education and training in surveying  
and mapping out of which photogrammetry is one partsubject.

(ABBREVIATIONS of repeatedly appearing terms  
in this paper:

DNat = Developing Nation  
INats = Industrialized Nations  
SurvM = Surveying and Mapping  
Phgrm = Photogrammetry  
EducTrai = Education and Training )

It is often difficult or even wrong to separate Photogrammetry (Phgrm) from  
the other techniques used in Surveying and Mapping (SurvM). The various tech-  
niques involved have now become highly integrated with each other theoreti-  
cally as well as in practical productive field and office work. Hence this  
paper primarely deals with Education and Training (EducTrai) in SurvM in  
general and thus automatically includes Phgrm as well as ordinary field sur-  
veying and cartography.

Development Nations (DNat) are normally short of:

1:o Qualified manpower at various levels in general, as well as in  
SurvM including Phgrm. The recruitment base for trainees for  
responsible qualified jobs is normally very narrow.

2:0 Funds and especially foreign exchange.

3:0 Time, as the needs of improvements are imminent and the political patience short.

The development resources of a DNat - human as well as material, including funds - will therefore only become available for projects with a high priority. When setting those there are relevant and irrelevant, objective and subjective, unselfish and selfish etc factors involved. But generally spoken, a high priority is more likely for projects giving early results beneficial to the big poor masses and for projects aiming at spectacular results. SurvM, as such, does not fit into any of these two categories!

SurvM in DNats must, in this context, be divided into two groups:

1:0 Nationwide regular mapping which is a prerequisite for a rational long-term planning and for an efficient administration.

2:0 Project mapping which is needed for designing specific technical projects like dams and irrigation schemes, roads, towns, boundary surveys of arable land etc.

Because of the time shortage common for most project mapping it is often carried out by foreign contractors. Nationwide regular mapping, on the other hand, is normally too costly and too time-expanded ( a 25 - 75 years perspective is common ) to be contracted out. And such national mapping seldomly receives any high priority and consequently no or insufficient funds.

Project mapping contracts often include paragraphs about transfer of know-how through the participation by nationals in the contractor's operations and paragraphs about fellowships (or similar) for training at a foreign university or at the home office of the contractor where e.g. the photogrammetric office work normally is carried out. Such arrangements have normally not been very successful for a number of reasons. Transfer of know-how and efficiency-attitudes is only functioning if the "receiver" is of the right pushing type of man with enough professional education and experience to assimilate what is useful and a position high enough in his own organisation to implement what he has experienced. People with those qualifications and such a position normally prefer to visit the field only for short periods and if sent abroad there are many distractions within or outside the profession. Theoretical studies of satellite-triangulation may e.g. have very little impact on the surveys for urgent development projects.

It was early realized in the multilateral and bilateral aid activities that the lack of adequate maps seriously hampered the national development efforts. It was also found essential that at least a part of the project mapping should be carried out with national survey resources. Hence considerable technical assistance - funds, instruments and other equipment and experts - were allotted to several DNats for building up national survey capacity and educate and train national survey personnel. For various reasons only few of those projects resulted in efficiently working organisations. Project duration was often too short, especially for the foreign advisory or managing staff of experts. The best nationals were commonly sent abroad on year-long fellowships during the most intense project period when they really should have been deeply involved in the project and learn a lot, not only technicalities, from the teamwork with experts/advisors. Frequent changes in the national staff according to obsolete promotion principles and a fast advancing bureaucracy may be some of the common causes.

One of the main causes for the less successful EducTrai results has commonly been the mistake of more or less copying survey methods, syllabus etc from the INats SurvM educational institutions. Those train surveyors for much more varied tasks and in the DNats we can afford a less job-oriented EducTrai and involve theory for its own and for prestige sake. The student-material in the DNats is far less homogeneous and they have often considerable white spots in their basic and fundamental education. INat-type of survey courses are often very difficult for the students to understand and if they learn it by heart (memorize it) in order to pass the examinations many of them never digest it.

The EducTrai must aim at producing surveyors etc able to carry out productive work soonest after completed school-period. Then he will never - in any case before he has forgotten the more sophisticated theories he may have learnt - find time or reasons to use them. Therefore the first of the school-periods should be concentrated on the methods and means really used in the country. Later on more theoretical training should be given a minor group of such surveyors which show intellectual aptitude for it. Those will later be responsible for future developments etc. but first and foremost the mapping activities must run smoothly and have enough staff competent to use efficiently and correctly the standard methods and means.

When composing the syllabus for job-oriented EducTrai in SurvM the modern techniques with "black boxes", ready made computer software or even programs for pocket size calculators allows for the exclusion of a lot of complicated theory when educating productive surveyors, stereographers etc.

On the other hand there are some fairly simple traditional survey methods which sometimes are useful for minor and odd surveys. Both in the simple theory and in practice they give the student a good and easily understood introduction in SurvM. This refers to the basic field survey methods and e.g. to the orientation of and plotting from an independent stereomodel. It must also be remembered that modern survey means are very expensive and certainly will be in short supply in the DNats. But they should definitely be used in the qualified parts of a survey and it is there where you earlier had the needs for theoretically educated surveyors, theories which now are automatically handled by computers etc. An "average" surveyor using e.g. a Distomat need not know anything about what goes on inside the "box". A supervisor in the photogrammetry room need no knowledge of least square adjustment when carrying out a block-triangulation. We must make a clear distinction between what is a prerequisite for the job and what is interesting for the individual to know. In the long run it is important to help staff to develop their minds and deepen their knowledge. That raises the standards and strengthens their self-esteem. But in an intense development period with shortage of resources it would be a luxury to use part of the resources for wider and higher education than needed for the urgent production. Certainly the opposite opinion will be aired but then they will have to tell us where to cut in the production of the needed surveys and maps.

With some hesitation it is also pointed out that the higher theoretical education a group of persons is given, the higher are their salary demands and their expectations on service etc. In DNats the field surveyor encounters a lot of hardship and if he feels that he is overqualified for the very important but technically rather simple fieldwork he will not be so positive to fieldwork and try various tricks to become an office surveyor. You will often find huge office staffs - an excellent growth ground for bureaucracy.

It is not possible, however, just to train people for specific positions on various levels and then leave them there "for ever". Of course there must be promotion possibilities and the promotions must be guided by the skill and aptitude for higher responsibilities. It is also to be noted that the cadre of any technical organisation is shaped like a pyramid and you must have the positions filled on all levels. For the main streams of a survey organisation (surveying, photogrammetry, cartography) there should be "Education and Promotion Ladders" in order to inspire the staff to improve and as a basis for selection of those suitable for higher posts. The principle should be that everyone should start from the bottom. There should exist procedures for switching from one "ladder" to the other in the lower grades, as well as for alternating service. In the top of the ladders they should be united into one.

In between the promotions there should be a considerable number of shorter and longer course-periods. The prime intention of such courses should be to make the person more competent for his job on a higher level, not to raise his general prestige-status. This seems self-evident but the contrary is very common in INats as well as in DNats, where e.g. an academic title is highly appreciated.

As an example of a ladder the following may be practical for field surveyors:

- Trainees ( e.g. having a GCE-Ordinary Level or equal )
- Survey Assistants
- Survey Technicians
- Survey Engineers
- Senior Survey Engineers
- Survey Managers

But it is also important for the functioning and for the future development of a major survey organisation to have, within its staff, scientifically trained persons responsible for handling appearing technical problems and for the further development of own and adoption of "imported" methods and means. As PRODUCTION and not "advanced research" is the overall task for any DNat survey organisation, it is preferable to select intellectually suitable candidates for advanced studies (abroad) amongst staff members. With their extensive practical experience they are likely to avoid "blind alleys" in their future development work.

Quite obviously there are other categories of personnel in a SurvM-organization. Also it is advisable not to make any rules absolutely rigid but to leave doors ajar for special cases of recruitment and promotion. But it is then utmost important to create such proceedings that the rules cannot too easily be overruled for nepotism or to give high politicians a chance to influence for one reason or the other. Hence there should be an anonymous body of staff members to approve exemptions and lift the heavy task of opposing e.g. a minister off the shoulders of the chief of the organization.

In order to illustrate the ideas above the following summarized "programs" for the EducTrai in the low and middle positions of two "ladders" are presented. Hopefully everyone is understanding that it is just general plans and that local conditions and sound traditions may justify considerable modifications.

## 1. GENERAL SURVEYOR'S STREAM

( month is abbreviated M )

### 1.1 SURVEY ASSISTANTS

It might be needed to arrange a brief pre-training to prepare those interested in sitting for the admission tests as otherwise good candidates may fail for irrelevant reasons.

Admission tests - 6M classroom (+lab+campus) - Intermediate test - 3M field team period 1 - 3M field team period 2 - final exam (practice and theory - Evaluation of overall suitability.

Total duration 12M , with 6 of them in the field with hardship.

### 1.2 SURVEY TECHNICIANS

The student must have passed the survey assistant final exam and also been deemed suitable for a surveyor's job and life. Furtheron he should have completed certain basic correspondence courses in maths and physics.

6M classroom (+lab+campus) - intermediate test to sort out unsuitable students, if any - 3M field team period 3 - 3M field team period 4 - 3M classroom - 1M examination task - final exam - evaluation.

Total duration 16 months, with 6 of them as productive field team members.

Note that there might be a period of waiting for a place in a technician course. Whilst waiting he will be serving as Survey Assistant and also improving his admission prospects through good work and correspondence studies.

### 1.3 SURVEY ENGINEERS

The student must have passed the survey technician final exam and have a minimum service of 12M as survey technician with good records - longer service to give additional marks according to a decreasing scale.

Admission exam (theory and practical) - 6M classroom (+lab+campus) - 6M fieldservice programmed with different methods - 6M classroom - 3M fieldservice as acting survey engineer - 1M examination task - final exam - evaluation.

Total duration 22 months ( 9 in the field )

## 2. PHOTOGRAMMETRIC STREAM

### 2.1 STEREO ASSISTANTS

First a rather simple pre-test (vision + drafting + visual memory + simple computation and reading. The best quartil may apply and be further tested. Survey assistant students unsuitable for fieldwork may also be accepted.

Application screening - thorough tests including examination by eye-doctor and a floating mark test - 3M classroom & stereolab - 1M alidade survey - 1M field studies (4 different topotypes) - final exam - evaluation.

Total duration 5 months.

### 2.2 STEREO TECHNICIANS

Either the student must have passed the stereo assistant final exam and

have completed 3 years service as such + corr.courses in maths, physics and photogrammetry or having branched off from the survey technician level + good vision + the abovementioned corr.courses.

6M classroom and lab - 1M in the field with a photo control survey party - 1M with the block triangulation unit - 4 M practice in productive photogrammetry units - 1M examination task - final exam.

Total duration 13 months

### 2.3 PHOTOGRAMMETRIC ENGINEER

Either the student must have served 3 years as stereotechnician with good records, show aptitude for maths and have taken certain corr.courses or being a survey technician or engineer branching off from the survey stream for special (e g medical ) reasons and having perfect vision, special aptitude for maths and taken corr.courses in maths, physics and photogrammetry. Students from the survey stream must pass a special stereocourse before the course starts.

6M classroom and lab - 2M survey training - 3M practice in photogrammetry dept - 3M for an extensive applicatory task - 3M classroom and practice in data processing - final exam - evaluation.

Total duration 17 months.