International Hydrographic Review, Monaco, LX (1), January 1983

HYDROGRAPHIC SURVEYING REQUIREMENTS FOR THIRD WORLD PORTS

by Robin EKBLOM(*)

This paper was first published in *International Dredging and Port Construction*, Vol. 1, No.2, February 1982, and is reproduced here with the kind permission of the Editor of this journal.

In this period of world-wide recession, there is nothing more comforting to the hydrographer than the thought than there is more water than there is land. While sparsity of up-to-date hydrographic information in fully developed countries such as the U.K. is well enough stated, the demand for modern surveys in areas of more recent development grows even more pressing.

It is right and proper that a developing nation should want to stand on its own feet as much in hydrography as in any other field. Equally, it is understandable that a nation would want to employ the very latest survey techniques, tending to look upon analogue echo sounders and sextants with some disdain – and without giving due regard to their inherent simplicity and reliability.

However, it is not possible for a nation to develop properly in isolated areas of high technology. For example, one cannot usefully employ a high technology instrument which may have to wait several months before it can be repaired. It requires local support to be of real value. So, one should ask, are Third World nations aiming low enough ? For as long as they aim high, they will be reliant upon the industrially-developed world. While it is true to say that all nations are dependent upon others to some extent, not all possess the infrastructure either to support the intake or make the best possible use of it.

(*) 10 Tycehurst Hill, Loughton, Essex IG10 1BU, U.K.

There is no doubt that direct assistance must continue to flow to Third World countries. But what should the short, medium and long-term aims be ? And what form should any assistance take ? First, then, the short-term aims : these must be to provide a set of working charts, sufficient to meet requirements for immediate economic development. Whether they are achieved by direct aid from an international agency or whether commercial undertakings become involved is another question altogether. Medium-term aims, on the other hand, must be directed towards building local self-sufficiency. These in turn should lead to the final long-term objective of establishing a firm base of proven self-sufficiency, plus a will to improve.

With these considerations in mind, there are several options open to those willing to assist developing countries. They can be usefully summarised as follows :

1. To provide a complete hydrographic service.
2. To provide advisers.
3. To provide financial and/or material assistance by way of instruments, craft, training facilities and chart production.
4. To provide a basic and sound technical and administrative structure upon which surveyors of moderate ability can build in their own good time.

Ideally, of course, an amalgam of all four options provides a ready-made answer. But there are important qualifications to be made in respect of each, viz.

A complete hydrographic service

The discovery of a natural resource lying inshore or within a country's EEZ may require greatly enhanced port facilities and be the spur to a comprehensive hydrographic programme, giving no time for training local staff to any tolerable level of self-sufficiency. Most such surveys are carried out by commercial companies who cannot afford to spend time on any activity not expressly written into their contract. Such a service should therefore be considered as a short-term arrangement only.

Advisers

Advisers vary considerably in their ability to pass on the benefit of their knowledge and experience to local technical staff. Many would advise on what to do without necessarily saying why, or what the alternatives are. With the backing of their own knowledge and perhaps an agency funding, they may well employ the latest instruments to produce surveys in an elegant and efficient manner but, following their departure, may well leave behind nothing more than an inherited ability to press buttons.

The true role of advisers must, therefore, be one of preparing for the long-term, to establish foundations by which a nation's hydrographic surveying effort can stand on its own feet. While this can be done by local formal education classes, their greatest contribution must be by way of trying to maintain the closest possible dialogue with those aspiring to become surveyors in their own right.

Financial and/or material assistance

To provide something virtually free over a long period is to invite one or all of three results : the possible disrespect of the recipients, a continuing lack of original and well-thought-out effort on their own part and, finally, a failure to provide a base at the correct technical level upon which to build for the future.

Here, there is admittedly something of a chicken and egg situation. It is no use providing technical hardware without proper use being made of it; yet, at the same time, how is the Third World surveyor going to learn and to gain the necessary experience ? A student surveyor taken from the Third World and pitched into a developed country to learn something of his profession will be in the comparatively luxurious danger of seeing all that goes on, but almost wholly out of context. Is it possible for him to relate surveying in a very large port in the west, with its temperate weather, well-established chart control, stable power supplies, and so on, to his situation back home ?

While a short period spent in such a port no doubt has considerable value, the best place for a surveyor to learn and practice his art is surely within his own environment. The same could be said to apply equally to those who maintain vessels and instruments as well as those who publish charts. For training is a long-term activity and, properly carried out, is of the utmost value. In the final analysis, it neither begins nor ends at school, technical college or university, but is a continuous process. It is very easy to be fully qualified, but poorly educated.

A sound technical and administrative structure

This must be the final aim, built up slowly and solidly with the development of a human data bank of local knowledge and experience. There should be a high quality network of levelling and triangulation stations, without which nothing of lasting value and reliability can be produced. Once more, it is worth stressing the point that instrumentation and methods should be aimed at a level compatible with the local technological and meteorological environment.

Training must be continuous, with inputs from recognised publications and journals from bodies such as The Hydrographic Society providing a vital and necessary extension to this aim. Many individuals and organizations can make a decisive contribution towards these ends : United Nations agencies to identify the need, provide the initial impetus and probably, some funding; instrument manufacturers to produce wares which are reasonably priced, uncomplicated and reliable; educationalists to plan hydrographic courses which are relevant to local needs; organizations such as The Hydrographic Society to bring all the interested surveyors and technicians into a group and thus provide a world forum for the exchange of information and an active focal point for the profession at large. And last but not least, expert hydrographic surveyors who see their task to be the translation of their knowledge, experience and sense of professional integrity for the benefit of the local survey community.

SURVEY TECHNIQUE

What, then, might be a reasonable level of survey technique which a typical port in a developing country might wish to adopt ? It all depends, of course, upon the availability of funds for the purchase and maintenance of equipment, the configuration of the survey area both vertically and horizontally, the climate, power supplies, access, accuracy requirements and number and types of users.

But, in its simplest terms, a port would require the setting up of a number of well co-ordinated fixing beacons in addition to sextants and analogue echo sounders. Many ports continue to rely upon such systems – even those as large as the Port of London, where this is still the norm away from the inner estuary. Such a system admittedly has its drawbacks, mainly on account of variable weather conditions. But it has four distinct advantages. It is inexpensive, very reliable, extremely flexible, and actually involves the surveyor on a level at which he can totally comprehend what is going on at all times; this is something which at least ensures that the student surveyor learns about the rudiments of surveying rather than just those of its instruments.

The next stage should be the consideration of a straightforward electronic position fixing system with no frills, one which permits manual plotting and manual writing-in of soundings. This still has the advantage of direct surveyor input although it can reduce the flexibility of the system. Added to which can be one major operational problem usually associated with port surveying : a surveyor is seldom able to stick with one job from beginning to end, for other tasks often intrude : a ship may run aground, a buoy needs replacing, an interim dredging survey is required, etc. Similarly, on a river several miles long, with some bending, the shore stations of an electronic positioning system may have to be re-sited just for that small task if total reliance is to be placed upon them. For high frequency systems masking and reflections will be the problem, and for those of lower frequency there will be errors due to land path. There are problems which are in marked contrast to the flexibility of a sextant.

The ideal general solution, therefore, is probably an electronic position fixing system for the port approaches in order to surmount difficulties of poor visibility over longer distances, and then sextants for the inner areas. For electronic position fixing systems, in particular, it should be said that the levels of automation now possible with the latest instruments are worthwhile for those who can afford to buy and maintain them. This assumes, of course, that capital outlay can be first justified by a consequent saving in expensive surveying time, and that surveyors put in charge of such systems must be properly aware of the principles of hydrography and not subordinate their activities to become instrument operators.

So much, then, for present-day techniques. But what of those of the future ? A possible scenario for port authorities 10 years hence might look something like this : imagine a satellite-based system of greater accuracy than at present, giving fixes on demand to a small, reliable black box which is so simple to operate that almost anyone will be able to use it. Its use by surveyors, engineers, ships' masters and others will be so universal that the cost will be minimal, thereby allowing an

organization to retain spare units as an alternative to expensive maintenance programmes.

Admittedly, a fair amount of the surveyor's traditional expertise may no longer be required. But there are other important areas which will continue to be vital. There will still be depths to measure, and these will always be awkward comers. While there may be a danger that the science or art of position fixing as we know it could be forfeited in the same way that basic traditional skills like carpentry have been superseded by the march of technological progress, the role of the hydrographic surveyor will still be an important one. And nowhere is this likely to be more so than in developing countries, where the need for authoritative local training, and the experience and resources which go with it, will be just as paramount then as they are now.