

**THE FIJI HYDROGRAPHIC SERVICE 1970-1990**  
**A WORKING EXAMPLE OF THE CHALLENGES**  
**THAT FACE SMALL MARITIME STATES**  
**IN DEVELOPING A VIABLE**  
**NATIONAL HYDROGRAPHIC CAPABILITY**

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**Abstract**

The aim of this paper is to identify the major challenges that small maritime States can expect to face in developing a viable national hydrographic capability, with particular reference to the development of Fiji Hydrographic Service (FHS) in the period 1970-90.

**INTRODUCTION**

In the last 30 years, a tidal wave of decolonization has swept the globe. One result of Britain's diminishing colonial responsibilities has been a slow but steady decrease in the overseas survey activity of the Royal Naval Hydrographic Service, which in turn has meant that a number of ex-British colonies have been obliged to set out along the path to hydrographic independence, in order to sustain their national maritime development.

A Hydrographic Unit was established in the civil Fiji Marine Department in 1970. In 1976, the Unit was transferred to the Fiji Naval Division. Following two military coups in 1987, the Unit was returned to the Marine Department in late

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1988. In 1990, the first indigenous Chief Hydrographer was appointed in charge of what is now called the Fiji Hydrographic Service (FHS)<sup>1</sup>.

### **A BRIEF HISTORY OF HYDROGRAPHIC SURVEYING AND NAUTICAL CHARTING IN FIJI (1643-1970)**

Fiji is strategically positioned at the hub of the South West Pacific Ocean. Its European discovery is generally attributed to Abel TASMAN in 1643. However, the first surveyor to gain an adequate concept of the extent of the archipelago was Lieutenant BLIGH RN who, in 1789, recorded the existence of the two principal islands of Viti Levu and Vanua Levu, during his epic small boat voyage after the mutiny in HMS BOUNTY.

Whilst the earliest systematic surveys of Fiji were undertaken by Captain BETHUNE RN, in 1838, it was Commander WILKES USN, of the 1840 US Exploring Expedition, who produced the first chart that adequately depicted the whole of the Fiji Group. In 1854-57, Captain DENHAM RN completed many large scale surveys, but it was not until 1874, when Fiji became a British colony, that the Hydrographer of the Navy assumed responsibility for the provision of nautical charts — a responsibility that, notwithstanding Fiji's Declaration of Independence in 1970, continues to this day.

In 1952, a Fiji Government committee acknowledged that, due to increases in ship size and changes in traffic patterns, the existing charts of the group were becoming obsolete. However, little could be achieved until modern echo sounder surveys were to hand, and thus the United Kingdom Hydrographic Department (UKHD) had to wait for the numerous medium scale surveys undertaken by HMS COOK, between 1957-63, and HMS DAMPIER, in 1966, before making a start on the production of new charts.

In 1966, the Fiji Government invited the United Nations (UN) to conduct a study of its entire transport system, the result being the joint UN-Fiji 'Survey of the Transport System' (UK-42). The Assistant Project Manager of the Survey was an expatriate hydrographer who, during 1967-69, carried out a number of large scale port surveys.

### **ESTABLISHMENT OF A HYDROGRAPHIC UNIT WITHIN THE MARINE DEPARTMENT (1970-75)**

At the end of the Transport Survey in 1969, the Fiji Government, recognising the value of an inshore survey capability, requested the UN to continue its hydrographic assistance. Utilizing unexpended funds already allocated

<sup>1</sup> Although called the Fiji Hydrographic Unit between 1970-88, for convenience the Unit is referred to as FHS throughout the paper.

to the UK-42 project, the formation of a hydrographic unit took place within the Fiji Marine Department, in March 1970, under the direction of the ex-Transport Survey Assistant Project Manager. Later that year, with the assistance of a 90% grant from the British Government, Fiji purchased second hand the 96-foot survey vessel VOLASIGA, together with a Hifix electronic positioning system. The United Nations Development Programme (UNDP) recruited a further expatriate assistant surveyor in January 1971.

The UK-42 funding was exhausted during 1971, but a second UN project (FIJ/71/006) was approved for the period 1972-75. The project's laudable objectives were:

- (a) to operate and direct FHS, including the execution of those hydrographic surveys required for development projects and for the modernization of charts;
- (b) to train local personnel, with the ultimate aim of full localization.

FHS's continued development dovetailed conveniently with UKHD's decision to rationalize and metricate its chart coverage of Fiji, primarily to meet the needs of international shipping. A new Fiji chart scheme, agreed with the Marine Department, was finalized in 1973. A major consequence of this decision for FHS was that, since the rationalization plans involved the withdrawal of a number of large scale 19th century charts, purely local charting needs would in future have to be satisfied either by adopting the withdrawn charts or by compiling new local charts.

Anticipating this cartographic requirement, FHS had in fact recruited an experienced Lands Department draughtswoman in 1971 but, by 1975, the complexity and volume of draughting and compilation work had already increased to the point where the need to acquire specialist expertise in nautical cartography was recognised<sup>2</sup>.

Notwithstanding this broadening of its original remit, it is clear that, with a total of 64 mainly development-related surveys to its credit in the period up to the end of 1975, FHS essentially achieved its first project objective<sup>3</sup>.

By comparison with survey output, progress on its second project objective was very disappointing, principally because of the erroneous assumption that a reservoir of suitable personnel — that is, men with previous land survey training who could be cross-trained in hydrographic methods and techniques — would be readily recruited as counterpart hydrographers. Thus, for instance, the single local hydrographic trainee recruited in the period 1968-71 resigned to seek commercial employment in 1972. Later attempts to recruit school leavers who, after a 2 year secondment to the Lands Department for basic survey training, were to undertake hydrographic training proved equally ineffective.

<sup>2</sup> Not only had incoming surveys to be screened for data affecting local navigational safety, but it was recognised that future new nautical charts produced in Fiji (5 monochrome local charts were available by 1976) should be compiled to full international standards.

<sup>3</sup> FHS was, however, unable to execute many of the coastal surveys required by UKHD for chart modernisation purposes, a need addressed in part by the despatch of HMS HYDRA (to date the last HM Surveying Ship to work in Fiji waters) in 1974-75.

Turning to equipment, VOLASIGA's availability was a continual problem due to both prolonged periods under repair or, more frustratingly, to all-too-frequent diversions for non-surveying tasks. Further, given FHS's dependence on a single Hifix maintainer<sup>4</sup> and the fact that the complexity of deploying the Hifix system made it impractical to operate with the logistic resources available to FHS, it is hardly surprising that the UN Hydrographer described its purchase as 'premature'<sup>5</sup>.

Although FHS's progress in the period to 1975 was superficially satisfactory, at least in terms of survey output, the most fundamental long term objective — the training of local personnel — remained largely unrealized.

### THE MILITARY ERA (1976-1988)

The transfer of FHS's personnel and assets from the Marine Department to the Royal Fiji Military Forces (RFMF) followed from Cabinet's decision to establish a Naval Division within RFMF in early 1976 — which conveniently coincided with the expiry of FIJ/71 at the end of 1975. In particular, it was hoped that FHS's militarization would allow the training of personnel and the acquisition of equipment to be pursued within the terms of Fiji's existing bilateral military aid programmes with Australia and New Zealand<sup>6</sup>. This in turn was expected to assist FHS to offer prospective employees a worthwhile career with good levels of job satisfaction and professional experience, and thus to improve recruitment and retention.

Not surprisingly perhaps, with uncertainty in the minds of the UN and its personnel as the FHS's future direction, the militarization process did not proceed as smoothly as had been hoped. Shortly after the transfer the UN Hydrographer left Fiji, with his less experienced assistant<sup>7</sup> assuming his position. Regrettably the firm leadership required, if FHS was to take full advantage of its changed circumstances, was not forthcoming and so an uneasy interregnum commenced whilst the loan of a naval hydrographer was sought. In the event neither Australia nor New Zealand were able to provide a suitable officer, and thus it was not until August 1979 that a Royal Navy (RN) Charge Hydrographic Surveyor was appointed to head FHS<sup>8</sup>.

<sup>4</sup> who resigned in 1973, just one year after being trained.

<sup>5</sup> (The Hifix system was subsequently 'exchanged' in 1980 for a modest outfit of second-hand Trisponder equipment, which proved to be much better suited to the task.)

<sup>6</sup> who, apart from France, were the only developed hydrographic 'powers' in the SW Pacific region.

<sup>7</sup> who continued to be funded by UNDP.

<sup>8</sup> Although this first loan ended in 1982, subsequent requests to British Development Division in the Pacific for continuing assistance prompted the consecutive appointment of three further RN Charge surveyors during the period to 1990 — when the full localization of FHS finally came about.

In the meantime survey operations were somewhat hampered when it was found necessary to declare VOLASIGA unseaworthy shortly after the transfer<sup>9</sup>. Indeed it was not until September 1979, with the commissioning of HMFS RUVE, that FHS fully regained its ability to conduct detached survey operations.

At the time of the transfer only three of FHS's 14 authorized posts had incumbents. Even though half of these posts had been filled by 1979, it was still difficult to progress field work, collate survey data and conduct on-job training in an orderly fashion. Consequently the major task confronting the new RN Hydrographer was to develop a balanced team of well trained and motivated staff who, in the fullness of time, would be capable of sustaining FHS without expatriate assistance.

After lengthy negotiations, the much-needed rationalization of FHS's complement was accomplished — at least on paper — when the Fiji Government not only authorized an establishment of six survey officers but also negotiated a further 3 year UNDP project (FIJ/80/016). Besides extending the contract of the UN assistant surveyor and providing an additional UN electronic technician, the project funded the local recruitment of an additional 4 survey recorders<sup>10</sup>, 3 electronic technicians and 1 cartographer.

The selection of suitable officers and ratings, which was spread over a period of some years in order to develop a balanced hierarchy, was conducted with considerable care; in contrast to the recruiting problems experienced in the early 1970s, the RN Hydrographer found that there was no shortage of suitable local applicants.

Specialist and military training of recruits was accomplished both in Fiji and overseas, with military assistance from Australia and New Zealand. Successful officer candidates completed a two year Basic Naval Training course with Royal New Zealand Navy (RNZN), after which they attended the Royal Australian Navy (RAN) Officers Basic Hydrographic course. Rating candidates first attended the RAN Able Seaman Survey Recorder course; thereafter RAN and RNZN Leading Seaman and Petty Officer career courses were available. As a result all hydrographic staff not only received a firm grounding in seamanship and hydrography, but did so on courses alongside their RAN and RNZN peers.

In 1982, Fiji became a member of the International Hydrographic Organization (IHO), thus formally cementing FHS's growing ties with the international hydrographic community in general, and with the hydrographic services of the RN, RAN and RNZN in particular. Indeed 1982 not only witnessed the first RAN/FHS exchange<sup>11</sup>, but also the very successful joint RNZN/FHS survey<sup>12</sup> of a gap between HMS HYDRA's 1974-75 surveys — which had the further

<sup>9</sup> UNDP responded to this difficulty by funding a locally built 9 metre survey motor boat; unfortunately conceptual and design shortcomings greatly reduced BELO's utility for survey operations, and she was disposed of as unsuitable in 1983.

<sup>10</sup> bringing the authorized establishment to 14.

<sup>11</sup> a Fiji surveyor served as a watchkeeper in HMAS FLINDERS whilst his Australian counterpart took command of HMFS RUVE.

<sup>12</sup> involving HMFS RUVE and HMNZS MONOWAI; joint surveys with MONOWAI thereafter became an annual event until the 1987 coups intervened.

benefit of enabling UKHD to commence compiling a new metric chart of the area. A further 'exchange' occurred in 1984-85, when a RN surveyor took command of RUVE, thereby releasing FHS's senior local surveyor to pass the very demanding UK Long Hydrographic Course.

Electronics training advanced when, under the terms of the FIJ/80 project, FHS recruited 3 trainee technicians who commenced a 4 year sandwich course at the Fiji Institute of Technology in 1982. Besides maintaining FHS's electronic surveying equipment, the qualified UN technician supervised the trainees' on-job training<sup>13</sup>.

FHS's need to develop a small team of qualified nautical cartographers led to the recruitment of 3 trainee draughtsmen in 1978-81. With funding provided by the NZ Mutual Assistance Programme (MAP), all 3 were seconded to the RNZN Hydrographic Office in Auckland where, alongside the RNZN's own cartographic trainees, they undertook on-job training at the Office and day release/night school study at a nearby Technical College. After further study by correspondence from Fiji the first two completed all 5 stages required for the award of the New Zealand Certificate of Draughting (NZCD). In 1990, the third, his study interrupted by the 1987 coups, had yet to complete the syllabus.

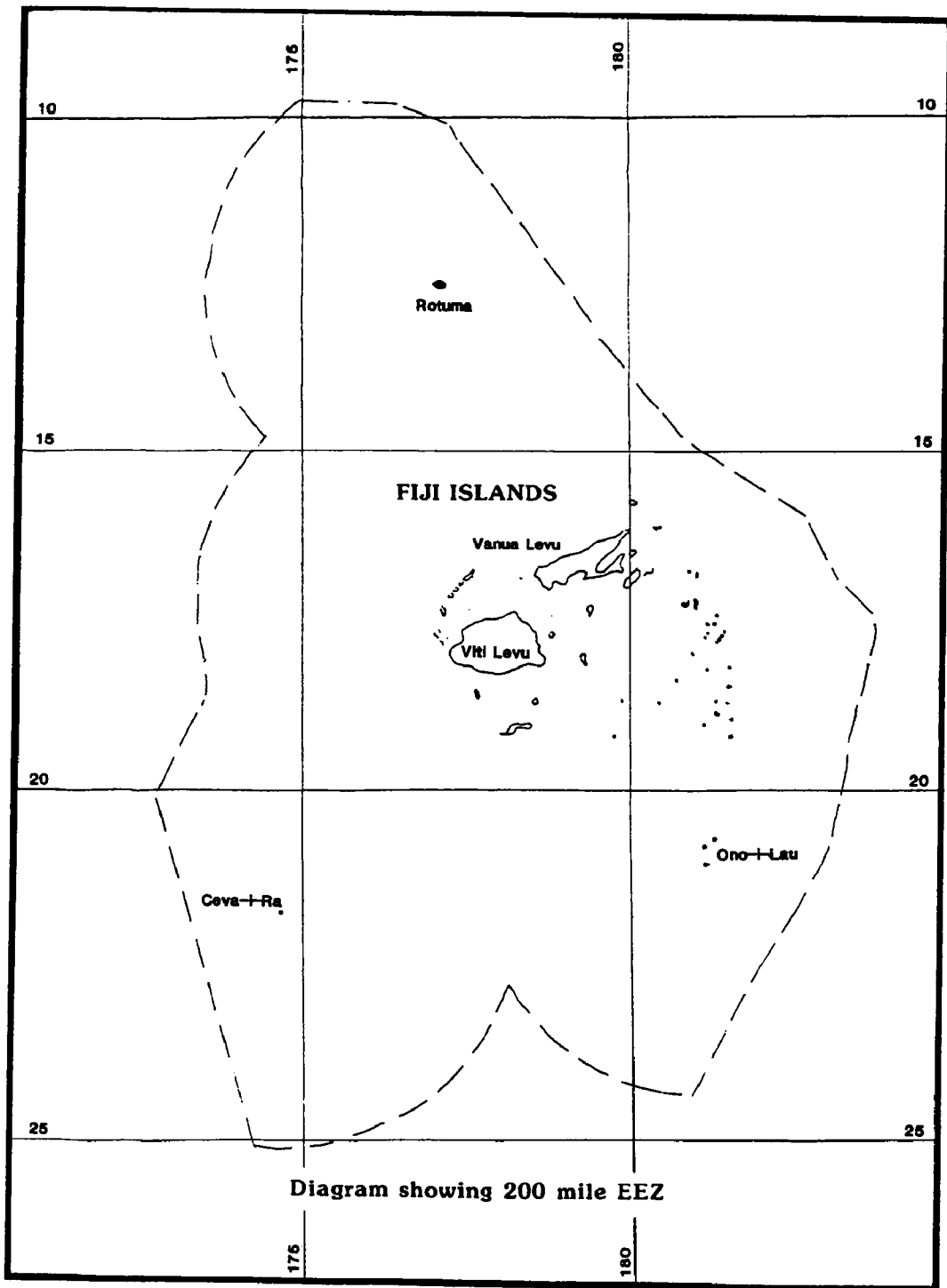
Appreciation within the Fiji Government of the practical uses of hydrographic and cartographic expertise received a considerable boost when, following the observation of doppler satellite stations on a number of off-lying islands and reefs by the Royal Australian Army Corps in 1979 and 1981, the RN hydrographer oversaw the computation of the median line that forms the limit of Fiji's Exclusive Economic Zone (EEZ). Fiji's 1981 Marine Spaces legislation declaring this boundary was also supported by a set of three charts, prepared by FHS's cartographers, illustrating these limits. In the same year, a cartographic milestone was passed when FHS published its first four colour metric chart, an achievement followed in the period to 1988<sup>14</sup> by the production of two further new charts and one new edition, all to full international standards; three INT charts<sup>15</sup> were also adopted and printed locally in 1987-88. A related development was the establishment in 1987 of a semi-commercial fund to facilitate the production and sale of charts to the public; in 1988-90, this chart fund realised a modest profit, thus providing welcome evidence that at least some of the costs associated with the operation of a national hydrographic service can be recovered<sup>16</sup>.

<sup>13</sup> Although the FIJ/80 project expired in 1983, UNDP continued to fund this technician until he resigned in 1985; thereafter until the 1987 coup FHS was loaned the services of a RNZN technician. Predictably perhaps, only one of the 1982 trainees was still serving with FHS in 1990, the remainder having resigned to seek more lucrative employment outside Government Service.

<sup>14</sup> when FHS lost the services of its two fully qualified cartographers; one resigned in April 1987, whilst the other elected not to transfer to the Marine Department in December 1988.

<sup>15</sup> These three charts, produced by the RAN and RNZN Hydrographic Offices, are part of a scheme of small scale INTernational charts, the long term aim of which is to provide global coverage to a uniform standard; the scheme is sponsored by the IHO.

<sup>16</sup> Other options open to developing countries in order to offset such costs are the 'sale of hydrographic surveying services and/or survey vessel charter. For instance, given a ship with a true regional capability (such as that possessed by RN TOVUTO), it should be possible to recover the entire annual cost of operating a national hydrographic service by chartering the vessel for, say, 4 months each year.



The Fiji Islands.

If the above account appears to give undue emphasis to the training provided over the period to FHS's local personnel, this is for two reasons. Firstly the development of specialist skills, which had been the principal failing of the FIJ/71 project, was vital if the long term aim of full localization was to be realized. Secondly, FHS was obliged to operate within such severe financial constraints that, as far as progress in acquiring a balanced outfit of surveying equipment was concerned, there was relatively little to report. The fact that so much useful survey work was achieved during the period is as much a tribute to the resourcefulness of FHS's expatriate and local personnel, as to the adequacy of its ships and equipment.

The history of HMFS RUVE is a case in point. RUVE commenced life as a Marine Department inter-island medical boat during which time she suffered, for reasons unknown to the author, a brief period of almost total submersion. When refitted and commissioned as a naval survey vessel in 1979, the state of her hull was such that her remaining useful life was not expected to exceed 5 years. In fact judicious hull patching extended RUVE's life into 1986 when, following a rapid and irreversible decline, she was finally decommissioned in November; she sank at her moorings the following year.

The sequel to this tale aptly illustrates the political uncertainties to which all programmes of technical assistance are inevitably subject. In January 1987, with full funding provided through Australia's Defence Cooperation Programme (DCP), Cabinet authorized the purchase of HMFS BABALE<sup>17</sup>, a very sound 900 ton ex-seismic research vessel that was ideal for FHS's purposes; the intention was then that the DCP would fund the ship's outfitting for hydrographic survey work after her arrival in Fiji. Unfortunately, FHS's euphoria over this major acquisition was short-lived as, just 3 days after the ship's first arrival in Suva in May 1987, a military coup led to the immediate termination by both Australia and New Zealand of all forms of military assistance. As a result, FHS was for the first time in possession of a vessel with a truly national (and regional) survey capability which, because it had not been fitted out for surveying, could only be utilised as a 'mother ship' for survey operations using a small open boat.

Following the first coup it soon became evident that the restoration of Fiji's bilateral military relationships with Australia and New Zealand was unlikely to occur in the short term; indeed the only positive news was the fact that UK had not withdrawn its naval hydrographer. Nonetheless, with access prohibited to the many forms of RAN and RNZN sponsored assistance, on which FHS had become almost totally dependent for its continued development and well-being, urgent action was required if the very considerable investment made by Fiji and its various aid partners to develop an indigenous hydrographic capability was not to spiral into oblivion. Thus in November 1988, after 18 months in limbo, Cabinet approved the transfer of FHS back to the Marine Department — the prime aim of the move being to 'sanitize' its military pedigree, so making it eligible to receive civil aid.

Once the difficulties resulting from FHS's militarization had been overcome, the period in the RFMF was one in which the Unit made enormous

<sup>17</sup> renamed RV TOVUTO in August 1989.



progress towards the goal of full localization. Although there are a number of threads to this story, not least the on-going support of UNDP until 1985 and the vital contribution of both the RAN and RNZN Hydrographic Services from 1979 onwards, the key unifying element was the continuity of professional direction afforded by the consecutive appointment of three RN hydrographic surveying officers to head the unit between 1979-88. In this regard, it is worth emphasising that the commonality of RN, RAN and RNZN survey standards and 'philosophy' meant that on-job and overseas training were fully complementary.

### THE RETURN TO THE MARINE DEPARTMENT (1989-90)

If the process of militarization had proved to be less than straight-forward in 1976, FHS's return to the civil Marine Department in December 1988 was certainly no less traumatic. On transfer, FHS's principal assets were: 23 disciplined ex-servicemen<sup>18</sup>, who had been denied overseas training for the preceding 18 months, and whose previous naval seamanship experience was not acceptable to the Fiji Marine Board; a very sound survey ship which, because of surveying equipment deficiencies, was limited to supporting small boat operations; a 16 foot wooden 'survey motor boat' (SMB) that required regular bailing to remain afloat; portable positioning and echo sounding systems that were unreliable, inaccurate and rapidly becoming unmaintainable; and a spacious, airy and adequately equipped hydrographic office.

Taking advantage of FHS's new civil status, the following aims were adopted for 1989-90:

- (a) to initiate bilateral training and equipment programmes in order to develop FHS into an organization with a balanced hierarchy of professional skills and the minimum outfit of modern equipment required to adequately fulfil its national responsibility for hydrographic surveying and nautical charting;
- (b) to develop an efficient civil management structure;
- (c) to progress surveying and charting projects within the constraints of (a) and (b).

Just prior to the transfer, a new Minimum Qualification Requirement (MQR) schedule for hydrographic surveyors within the Fiji Public Service was developed which, quite properly, related their appointment and promotion to recognized standards of competence in both marine<sup>19</sup> and hydrographic<sup>20</sup> training. Unfortunately the endorsement of a MQR for FHS's nautical cartographers was delayed until early 1991, when the NZCD qualification was at last formally re-accepted as their baseline training qualification.

<sup>18</sup> comprising 18 surveyors, 3 cartographers and 2 electronic technicians.

<sup>19</sup> the South Pacific Maritime Code.

<sup>20</sup> principally IHO category A and B survey standards, but with junior grades first required to qualify at Able and Leading Hydrographic Assistant (AHA and LHA) level to RAN/RNZN standards — or equivalent.

Overseas training, probably because aid agencies see it as simple to implement and hard to misappropriate when compared with material assistance, proved much easier to initiate than the equipment programmes that, in the author's view, had to be put in place. However, in 1989, British aid funded an exemplary integrated training and equipment programme<sup>21</sup>.

Other major training breakthroughs in 1989-90 were:

- (a) the training of 8 personnel on two separate dedicated Officers Basic Hydrographic courses at the Pakistan Navy Hydrographic School in Karachi;
- (b) the resumption of training by New Zealand, using civil aid funding, with 3 young trainees attending RNZN AHA courses;
- (c) the secondment of a senior surveyor and 2 untrained cartographers to attend Japanese Group Training Courses in, respectively, Hydrographic Surveying and Nautical Charting.

In 1990 marine training courses, run at the Fiji School of Maritime Studies, were well patronized by FHS personnel with the local Chief Hydrographer (designate) completing a Grade 3 Mate's certificate<sup>22</sup>, and a total of 12 of the more junior surveyors completing the Able Seaman Deck Rating certificate.

Two other major developments are worthy of mention. The first is the establishment in October 1990 of a National Hydrographic Committee (NHC), whose prime aim is to optimize FHS's contribution to the achievement of marine sector development objectives by means of a coordinated national hydrographic plan, to which all interested government departments will be asked to contribute. The second is that the required local funding to enable both the upgrading of the existing Trisponder precise positioning system to modern standards and the purchase of new dual frequency echo sounders has been included in Fiji's 1991 Budget Estimates<sup>23</sup>. The fact that the Fiji Government has recently endorsed its requirement for an effective national hydrographic service, and allocated the resources needed to make this possible, is a very positive step indeed.

After a very slow and frustrating start in 1989, what was considered to be the basic minimum training and equipment 'package' needed to prepare FHS for localization had either been actioned, or was 'in course of supply', by the time that Fiji's first local Chief Hydrographer was appointed in December 1990 — an encouraging state of affairs that could not have come about without the very considerable personal interest shown in FHS's activities and well-being throughout 1990 by Fiji's Minister for Infrastructure and Public Utilities. Despite this progress

<sup>21</sup> which included the construction of a 5.3 metre aluminium 'survey catamaran' (SC), powered by twin outboards and with a spacious, protected work area; the supply of MRA7 Tellurometer distance measuring equipment, and of a hydraulic crane with which to hoist the SC onboard TOVUTO; and sponsorship to enable the attendance of both the senior cartographer on a specially tailored 5 month training and management attachment at UKHD in 1989, and of two surveyors at the RN Hydrographic School in 1990.

<sup>22</sup> which nearly qualifies him to take command of RV TOVUTO — a job he was obliged to relinquish when FHS transferred to Marine Department!

<sup>23</sup> This equipment is due to arrive in Fiji in March 1991, one month before the loan commences of a RN hydrographer of Lieutenant's rank; this officer, who will serve as an adviser for just one year, is expected to be the last expatriate input to FHS.

there was, alas, also evidence that some of the 'old' problems first identified in the 1970s — such as the too frequent diversion of the ship for non-surveying tasks — remained prevalent. Thus, whilst there is much reason for optimism, only time will tell if the very significant investment in manpower, training and equipment made over the last two decades has in fact been sufficient to develop and sustain a fully viable indigenous Hydrographic Service.

## THE CHALLENGES TO DEVELOPING COASTAL STATES

### IDENTIFYING THE REQUIREMENT

If the withdrawal of many of the ex-colonial Hydrographic Powers has prompted newly-independent littoral States to consider their on-going need for hydrographic information, then the widening acceptance of the 200 mile EEZ over the last decade has surely accelerated this process. For example, Fiji's sea/land ratio within its declared EEZ boundary is more than 70:1 but, in common with many States similarly endowed, the economic potential of this vast resource cannot be assessed until adequate hydrographic information becomes available. In general, however, small States first recognise their need for hydrographic products when faced with the requirement to develop modern port facilities, and to provide adequate charts to ensure the safety of international and local shipping using these ports.

The local requirement will depend largely on the extent of the residual commitment of the ex-colonial Hydrographic Power. For instance, since 1973 UKHD's policy in Fiji has been to rationalise chart coverage to meet predominantly the needs of international shipping. Interestingly, however, UKHD's almost total reliance on FHS for the survey data needed to update its rationalised chart coverage of Fiji has increasingly obliged Fiji to develop a coastal/offshore hydrographic capability — a significant expansion to FHS's original remit of satisfying specific local requirements for inshore hydrographic surveys. Additionally, UKHD's staged withdrawal of a number of large scale plans that were used by local mariners has further obliged FHS to develop a modest indigenous capability in nautical cartography.

Self-evidently, each State must determine both the nature and priority of its national hydrographic requirement and the extent and availability of the means needed to satisfy it. If the requirement is modest, the commercial option — with work undertaken either by other national Hydrographic Services or by private contractors — merits examination. In most cases, however, the development of a fully localised Hydrographic Service should, at least in the medium to long term, prove to be both more economic and flexible. In either case, the determination of the national requirement must be viewed in the long term with, as far as possible, full allowance made for anticipated growth.

## GATHERING THE RESOURCES

Although the process of hydrographic surveying is, in itself, not overly complex, it does require the simultaneous availability of specialist expertise and equipment — which, in the case of most developing countries, must be sought from overseas. The development of a national hydrographic capability thus immediately involves the State in a substantial outlay of resources for, initially, very little tangible return. Because short term ‘progress’ is more attractive (particularly to politicians.) than medium to long term investment, the importance of keeping the long term aim firmly in view cannot be over-emphasised.

Where the option exists, an early decision must be made as to whether to ‘plant’ the fledgling hydrographic unit within the military or civil sectors. Factors affecting this will include the ability of the chosen sector to operate and maintain a survey ship and, crucially, the availability of multilateral and/or bilateral assistance. Additionally, the sector must be capable of sustaining simultaneous programmes of personnel training and equipment procurement, as a piece-meal approach to resource allocation, will almost certainly end in disaster.

Given that the goal of full localisation will take a minimum of 10 years to achieve, due to the lead time needed to train a local surveyor to the necessary degree of expertise, expatriate leadership will be required in the early years. In appointing an expatriate hydrographer, the following points should be considered:

- (a) commonality of standards between in-country on-job hydrographic training supervised by the expatriate and that provided overseas is highly desirable<sup>24</sup>;
- (b) linkage of training in nautical cartography with that of an established hydrographic office, preferably the office that retains charting responsibility, is more important;
- (c) the expatriate should have strong functional, and thus accountable, links with the primary funding agency;
- (d) military/civil cross-sector appointing (as occurred in FHS in 1976-79 and 1989-90) is best avoided.

The training of locally recruited personnel is the key to the success of any localisation programme. Unfortunately it is also the case that, particularly in developing countries where specialist expertise is at a premium, too little emphasis is given to retaining expensively-trained local personnel. Remedies are various but must centre around the creation of job satisfaction, which necessitates:

- (a) adequate levels of pay<sup>25</sup>;

<sup>24</sup> In this respect the IHO Standards of Competence for hydrographic surveyors are most helpful; the definition of similar standards for nautical cartographers will be very welcome.

<sup>25</sup> most particularly for electronics technicians whose skills are very easily ‘poached’.

- (b) the creation of a recognisable and worthwhile career structure, which in turn demands a base manpower establishment sufficiently large to admit reasonable promotion prospects;
- (c) good standards of training<sup>26</sup>;
- (d) availability of adequate specialist equipment <sup>27</sup>.

Although specific national requirements will differ, the provision of a suitable survey platform is fundamental. Whilst a SMB is sufficient for the conduct of survey work in a protected harbour close to suitable support facilities, such constraints are unacceptable if the hydrographic unit is to undertake any form of detached survey work. The acquisition of a sound and suitable ship, capable of surveying in its own right and of supporting detached boat parties for a minimum of 2 weeks, is an early priority.

It is recommended that a minimum outfit of precise positioning and echo sounding systems sufficient for a ship and 2 boats be obtained, thus providing some strength in depth in the event of equipment failure. The ship and boat systems should be readily exchangeable, with equipment voltages and cable lengths standardised as far as practicable. Systems should be neither too complex to deploy<sup>28</sup> nor to maintain, and in-country support must be carefully thought out, as the procurement of spares from abroad often takes months — even when funding is readily available. A further factor to consider in the selection of specialist equipment is its adaptability for future operational requirements.

Alongside the training of local personnel and the acquisition of survey equipment, which in Fiji's case have been almost exclusively funded through overseas aid programmes, there is a corresponding obligation for government to provide for the day-to-day running costs of the hydrographic unit — such as local salaries, ship operation and maintenance, equipment repair, and the provision of office facilities and minor sundries. Both government and aid agencies must recognise that the establishment and nurture of a national hydrographic capability demands long term financial commitment.

## SUSTAINING DEVELOPMENT

In many ways the greatest challenge to be overcome on the road to national hydrographic independence lies not in sowing the capability but in sustaining its development over a period of years. Coordination and continuity of effort, nationally and internationally, is the key.

With this aim in mind the IHO, together with the International Federation of Surveyors (FIG), recently established the joint FIG/IHO Technical Assistance Coordination Committee (TACC), in order to better coordinate the use of the slender aid resources allocated to hydrographic projects in developing coastal

<sup>26</sup> training to so-called 'third world standards' not only undermines the attempt to survey and chart to internationally recognised standards, but also reduces individual and corporate self-esteem.

<sup>27</sup> frustration quickly mounts when the opportunity to exercise newly-gained skills is denied.

<sup>28</sup> The purchase of Hifix in 1971 was a classic case of failing to match equipment to the requirement.

States. At national level, the IHO actively encourages Member States to establish a NHC, chaired if possible by a government minister, in order to provide both top level support and broad-based appreciation of the contribution that the national hydrographic Unit can and should make to national maritime development.

## CONCLUSION

The development of the Fiji Hydrographic Service is an interesting example of technical assistance in action, primarily because, over the period 1970-90, almost every combination of military and civil sponsorship, and of multi- and bi-lateral assistance, was tried. In the author's opinion, the major lessons that can be drawn from 'the Fiji experience' are:

- (a) the importance of continuity in expatriate professional direction which should, if possible, be combined with strong professional linkage to the ex-colonial and/or a regional established hydrographic power;
- (b) the need for a ready appreciation by politicians and aid agencies alike that hydrographic technical assistance demands long term commitment;
- (c) the need for a steady, integrated approach to the implementation of training and equipment programmes.

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