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**Report on the**

**Freetown, Sierra Leone  
24 September – 14 December 1979**

**TRAINING COURSE IN SMALL  
FISHING BOAT CONSTRUCTION**

**FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS**





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REPORT  
on the  
TRAINING COURSE IN SMALL FISHING BOAT CONSTRUCTION  
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Rome, 1980



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#### ABSTRACT

This report summarizes the activities of the Training Course in Small Fishing Boat Construction, held at the Fisheries Department Boatyard, Freetown, Sierra Leone, from 24 September to 14 December 1979, with the joint support of the Fisheries Division of the Ministry of Natural Resources, Sierra Leone, and the FAO/Denmark Government Cooperative Programme.

The course was attended by 21 participants from eight African countries and was directed by the Master Boatbuilder from the Fisheries Division and an FAO Consultant as Co-Director, assisted by two full-time FAO consultants. Technical and administrative support was provided by the Fisheries Department, Rome, with cooperation from the FAO Representative Office, Freetown.

The objective was to upgrade the skills of the participants selected from private and government boatbuilding enterprises who already possessed a considerable degree of practical experience, in order to enable them to produce improved wooden boats of various types, and to disseminate their experience and skills amongst their immediate colleagues in their home countries. It was concluded from the participants' continued interest and positive feedback that the course not only met its immediate objectives, but also indicated the need for further distinct courses, for both the artisanal level and a somewhat higher level.

Emphasis during the course was placed on practical aspects of boatbuilding but during construction, related theory lessons were also organized each week.

Three vessels were constructed during the course: one 9.07 m flat-bottomed beach landing craft of planked lapstrake construction, one 8.7 m V-bottom boat of seam batten planked construction and one 10.26 m V-bottom trawler/seiner. The latter vessel, being larger than could be completely finished in the time span of the course, was intended to be outfitted by the Fisheries Division which would then employ it for their exploratory fishing programme and would use it as a model for further local constructions in the boatyard.

The Food and Agriculture Organization is greatly indebted to the following who assisted in the implementation of the project by providing information, advice and facilities:

The Hon. K.C. Gbamanja - Minister of Natural Resources  
Mr S.E. Johnny - Permanent Secretary, Ministry of Natural Resources  
Mr T.J. Shorunkeh-Sawyerr - Chief Fisheries Officer  
Mr E.T.A. Golley-Morgan - Deputy Chief Fisheries Officer  
Mr K. Fergusson - Assistant Chief Fisheries Officer  
Mr A.B. Kamara - Principal Fisheries Officer  
Mr R.E. Williams - Master Boatbuilder, Fisheries Division (National Course Director) and his supporting staff.

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## 1. INTRODUCTION

Present indications and future trends in Africa indicate that the traditional artisanal fishery will continue to coexist with the modern industrial fishery. The artisanal (mainly canoe) fishery employs at least half of the fishing population in many countries in Africa. In these countries the canoe fishery often produces a high percentage of total fish catch.

Several African countries have received bilateral and multilateral assistance in the development of their artisanal fisheries, particularly in the introduction of new fishing techniques.

The relatively small carrying capacity of the coastal dugout canoe, plus the increasing scarcity of suitable trees for building the canoes, limits expansion and improvement of the fishery. A new type of small artisanal fishing boat is required to promote development in this field. Transition from the use of the outboard motor powered canoe to a small inboard engine fishing boat has been a priority of a number of development programmes in African countries. To date, solutions proposed have not been successful, largely due to economic considerations. Vessels imported from industrialized countries, or locally built but based on design concepts relevant to such economies, have been found to have such a wide price discrepancy compared to the canoe that the relatively small increase in the earnings of the more sophisticated vessel, using similar fishing methods, has not been sufficient to cover the cost increase.

Developments which show considerable promise in solving the problem of bridging the cost gap between the improved craft and the canoe are some recent experiments in the application of small-scale versions of modern fishing methods, notably the use of purse seines from canoes in West Africa. With the possibility of considerably increased fish catching as a solution to the need for economical small fishing boats increases in building costs could be absorbed. In searching for a solution to the need for economical small fishing boats in this range, FAO has published volumes of designs for flat-bottomed and small V-bottomed wooden boats. These designs have been prepared with the requirements of developing countries in mind and with particular emphasis on the most economical methods of achieving the desired results.

To build vessels such as these developed by FAO will require boatbuilders with a knowledge of the reading of simple plans, the use of patterns to build a number of similar small boats quickly and economically and an introduction to simple hand tools and portable woodworking machines which can increase production.

In order to utilize the manpower, low overhead and on-the-spot advantages of local boatbuilders already skilled in the use of simple tools and the construction of canoes and other indigenous craft, a training course of three months duration was held for selected candidates from Africa, south of the Sahara, to upgrade their skills to enable them to produce an improved boat type. The course was also used as a means of disseminating through a number of countries the designs and construction methods of the small fishing boats chosen as a result of FAO fishing boat development activities.

The Training Course in Small Fishing Boat Construction was organized under the FAO/Denmark Government Cooperative Programme and held from 24 September to 14 December 1979 in Freetown, Sierra Leone. The course had a duration of three months and all travel to and from the course, plus a subsistence allowance, was paid to participants.

In order to derive the maximum advantage from a course of this duration, it was advantageous to site the instructions in an established boatyard. The Government of Sierra Leone owns and operates a small boatyard in Freetown which was used as the course venue.

The primary responsibility for course planning, syllabus preparation and overall direction rested with FAO staff members and a consultant Course Director, in collaboration with the Fisheries Division of the Ministry of Natural Resources of Sierra Leone. Consultant boatbuilder and mechanical engineer instructors were responsible for day to day practical lessons and demonstrations of boatbuilding and engine installation.

## 2. COURSE CONTENT

The training course was organized with emphasis on the practical aspects of boatbuilding, the objectives being to build three boats of different types of construction. To this end, the boats built utilized seam batten planking, lapstrake planking and carvel planking (further discussion of these methods, plus other details, is contained in Section 3 on the construction of vessel types).

During construction of the boats, suitably related theory lessons were given by the FAO instructors according to a programme previously worked out in FAO Headquarters and as expected, some changes were made during the course to enable better use of time as dictated by local conditions. These changes were not made in the actual course content but in the order in which lessons were given. For example, in the Course Timetable and Contents (Appendix 1), there are shown daily theory lessons. These, in fact, were found to be disrupting the daily construction timetable, the only classroom available being some distance from the building site, so theory lessons were concentrated into larger time blocks, usually Saturday mornings, wherein several subjects were covered during the same time period. This was also preferred by the participants.

Outlined below is a brief summary of the practical and theoretical aspects of the course and some of the changes made. For details of the construction programme as actually carried out, see Appendix 2.

### 2.1 PRACTICAL

This phase called for the construction of three vessels, as follows:

- (i) 9.07 m flat-bottom beach landing craft of planked lapstrake construction;
- (ii) 8.7 m V-bottom boat of seam batten planked construction;
- (iii) 10.26 m V-bottom trawler/seiner, this vessel to be built concurrently with the first two boats.

All the boats were built by the participants, using a full range of woodworking machinery, portable power tools and hand tools, instruction being given on a continuous basis throughout the duration of the course by practical demonstration on the shop floor.

### 2.2 THEORY

As mentioned previously, the changes made in this area were to the actual timing of the sessions, from daily to weekly, in order to minimize disruption of the practical work schedule.

Theory lessons started with basics, such as reading of simple plans and drawings, then progressed to mould loft work for lofting of the boats and thence on to related theory for boatbuilding, covering most aspects of boatbuilding. This included proper marking of timber, assembly of parts, setting up backbones, frames, planking, decking, bulkheads, etc., plus engine installation, steering systems, fuel tanks and related engineering for fishing boats. At the participants request, a series of lessons were given on basic design considerations, using simple non-mathematical methods, and this was well received by the majority of participants.

### 3. CONSTRUCTION PHASE

This section of the report discusses the actual building of the boats on an individual basis, with observations and recommendations as to possible structural changes and future use in other courses of this type.

#### 3.1 CONSTRUCTION OF THE 8.7 m V-BOTTOM BOAT

Introduction: This boat was chosen for the course as being representative of V-bottom types for outboard motor propulsion and also for the planking method, which is not particularly common in Africa. The long easy lines of the vessel made it relatively easy to build, thus building participant confidence and abilities before starting more difficult work on the other boats. Upon completion this boat was handed over to the Division of Fisheries for general use as an outboard powered fishing boat and such other uses as the Division may require.

Lofting: Since this boat was considered a prototype and also to maximize participant exposure to mould loft work, it was decided to loft the full lines of the vessel. As a result, a corrected table of offsets was produced and is shown along with the lines plan in Illustration 1.

Construction jig: This was built concurrently with the lofting work and is of the standard type as described and illustrated in FAO Fisheries Technical Paper T134, with two longitudinals and transverse spacers, levelled longitudinally and transversely and firmly fixed to the floor.

Hull construction: In keeping with the objective of exposing the participants to various types of construction, this boat was built utilizing the seam batten technique. Fastenings were galvanized nails, driven through the plank and the batten, then turned and clinched into the batten. Some difficulties were experienced with the battens and twisting them into a fair line at the stem but this could be alleviated on future boats by placing an extra frame in the bow. This particular boat was built using only four frames, stem and transom and no other fairing problems were encountered.

Hull planking was 3/4 in x 6 in planks of opepe (local name bundui or broomstone) a very strong borer resistant wood readily available from several suppliers, its only disadvantage being that it tends to split easily with the grain unless holes are bored for all fastenings, particularly nails.

Frames are of mahogany (local name yawi), these being 3 in x 1 in, with gussets of the same material, glued and screwed together.

The stem is of laminated opepe, the lamination being done by the same method as shown in FAO Fisheries Technical Paper T134, in three layers of 3/4 in each.

Transom construction is entirely of local mahogany, except for the waterline plank which is opepe.

All other parts of the boat except thwarts, which are opepe, are fabricated in mahogany; this includes the foredeck, sole, gunwale capping, cleats and fairleads.

The boat was completed in approximately six weeks. For the actual timetable of construction see Appendix 2 of this report.

General observations: Considering that the vessel was built entirely by trainees, many of whom had no previous experience whatsoever in this type of construction, the finished product turned out to be of good quality as judged by the course instructors. Here it should be emphasized that the only direct work on the boat by instructors was for demonstration purposes only. Emphasis was placed on having participants perform all work themselves, even though this meant taking somewhat longer than necessary on some jobs; the gain in experience outweighed any time lost as a result of inexperience or mistakes by the trainees.

For trials the boatyard was able to borrow a 40 HP outboard motor from the marine engineering section of the Department of Fisheries. Although this was larger than the recommended horsepower for this boat, it was the only one available.

Launching and running trials took place on 26 and 27 November. The boat handled well and predictably, with virtually no leakage of water. Carrying capacity was tested and the boat comfortably held 18 persons, showing no signs of overloading or instability during the trials.

Official handing over of this boat to the Government of Sierra Leone took place on 12 December as part of the closing ceremonies for the course.

### 3.2 CONSTRUCTION OF THE 9.07 m FLAT-BOTTOM BEACH LANDING CRAFT

Introduction: This boat, unlike the other two, was not intended for use in Sierra Leone waters. It was built as an experimental prototype for use on an FAO project in Nigeria as a beach landing fishing boat, hence the flat bottom and considerable rocker apparent in the drawings (Illustration 2).

An unusual feature of the boat is that the propulsion unit is a small lightweight diesel engine, manufactured as a unit complete with gearbox, shaft and propeller, mounted inboard but driving through a tunnel. This system is not uncommon, however, this unit is designed to be completely portable and can be removed from the boat, in much the same manner as an outboard motor, and it also has the capacity to tilt the shaft and propeller to prevent damage when landing on the beach. The hull of this boat was completed but, as the motor unit had not arrived by the end of the course, this will be fitted at a later date in Nigeria, where trials are to be carried out.

Lofting: Due to the simplicity of the lines on this boat, lofting the full lines was not considered necessary and consequently only the frames were drawn full size, along with the transom and stem, all lofting being done by course participants.

Construction jig: Due to shortage of space, it was not possible to build a separate jig for this boat. Therefore, the V-bottom boat jig was utilized with slight modifications for the differences in frame spacings; both boats being approximately the same length, very little adjustment was necessary.

Hull construction: As can be seen from the illustrations following, this boat was planned using the lapstrake system. Fastenings are galvanized nails through the plank edges and turned over on the inside. Both garboards were fitted first. It was then possible to have groups working on both sides plus planking the bottom. Work started relatively slowly but did speed up considerably as experience and confidence were gained, as can be seen from the actual timetable in Appendix 2. The boat was structurally ready in approximately seven weeks.

Lumber had to be purchased at the time to build this boat, wood for the other two being purchased six months previously and stored for seasoning at the boatyard. Unfortunately, the only timber available was quite high in moisture content. A test sample showed 68 percent moisture content and, as a consequence, the planking was not fastened to the frames. This was being delayed as long as possible to allow the initial shrinkage to take place without danger of splitting the planks. The boat held its shape well by virtue of its lapstrake construction.

Structural points worthy of consideration for the future are the bottom planking and gunwale.

For the bottom planking, instead of using seam battens and planks, a complete double bottom could be used with planks instead of seam battens. Two benefits are thus derived. First, this eliminates pockets of water lying between the battens; these are hard to remove and also would be a source of rot and unhealthy deposits of fish juices, scales, etc. Secondly it would make the watertight bulkheads somewhat easier to fit and make watertight.

Regarding the gunwale arrangement, it would be advantageous to use a heavy external rubbing strake at gunwale level to provide more stiffening than provided by the present method.

### 3.3 CONSTRUCTION OF THE 10.26 m TRAWLER/SEINER

Introduction: This boat is considerably different from the other vessels built during the course, which are of relatively light construction. By contrast and necessity, the trawler is a heavily built V-bottom, hard chine displacement hull with a large inboard diesel engine (64 HP Bukh) with power take-off and a trawl winch, plus other equipment for fishing (see Illustration 3).

On completion, the boat will be used by the Fisheries Division for their programme of exploratory fishing operations.

During the planning stage it was realized that this boat could not be completed during the duration of this course and arrangements were made for the boatyard staff to complete the vessel under the supervision of the yard manager Mr R. Williams (for timetable see Appendix 3), with possible short term assistance from an FAO consultant boatbuilder in February/March 1980 for the final fitting out stages and engine installation.

Lofting: The lofting of this boat was carried out in considerable detail, both for instructional purposes and to obtain a full set of templates for future use should more boats of this type be built.

As no loft floor existed at the boatyard, several sheets of 1/2 in plywood laid on 2 in x 2 in framework were utilized. A separate scribing board was also made up with all frames drawn and scribed in for future reference. A corrected table of offsets was also produced from the loft floor.

Hull construction: Keel and backbone assembly are made from opepe as are the frames, bottom planking, lower side planking and transom. All wood above the waterline is of African mahogany. Galvanized boat nails were used for fixing the planking in place, with galvanized bolts and screws being utilized for other joints.

When comparing the two building time schedules some differences will be seen in the time taken for various jobs. For example, the chines took considerably longer to install than anticipated. One of the major factors affecting this was the nonavailability of lumber in long lengths and consequently, the chines had to be put in in three pieces, which had to be scarfed and glued. Other jobs were similarly affected during the construction phase, especially the bottom planking where short plank lengths also made a good shift of butts difficult.

Timetable for this vessel in relation to the other two worked out well, in that as the smaller boats were completed, more personnel were required for jobs on the larger boat, until in the final two weeks all participants were occupied on planking the trawler, one group each for both sides and bottoms. Side planking was completed on 7 December, while bottom planking was delayed somewhat due to it being more difficult to fit garboards and work underneath the boat.

During construction some structural changes were made, the only major one being changing the frame spacing from 12 in to 18 in centres, this in view of the type of lumber being used, which is extremely strong and durable. Other changes were of a minor nature and are to be included in a revised drawing for this boat now being prepared in the FAO Fisheries Department

Rigging/Fuel tanks: Included as part of the programme was the construction of a mast, boom, trawl gallows and ancillary fittings, plus fuel tanks for the 10.26 m trawler/seiner. Initially it had been anticipated that these items would be manufactured by local constructors. This idea was finally discarded in favour of having the items fabricated by the national Fisheries Division engineering staff in the Division's workshops near the Boatyard, with the FAO/Denmark project providing the necessary materials. By involving the engineering staff at this time, an active interest in the boat was created, which probably will extend through to the later repair and maintenance stages after the boat is launched and in use.

Designs for the rigging were supplied by FAO. Some small modifications were made by the consultant engineer in order to utilize locally available materials and equipment but none of the alterations will affect the final performance of the parts.

Fuel tanks were designed by the consultant to fit the vessel, these being fabricated in 3 mm sheet steel of all-welded construction, and fittings were purchased locally. The bow tank and after tank were made to give a capacity of 120 gallons of diesel fuel, for a theoretical cruising range of 60 hours.

The rigging was being fabricated by the engineering department.

Engine: For this boat a Danish-made engine was supplied together with shaft, stern/gear, propellor and ancilliary equipment for proper installation. The engine is a model number 4.105 Bukh marine diesel, developing 64 HP at 1 800 rpm. Delivery took place at the boatyard on 8 November 1979.

#### 4. GENERAL OBSERVATIONS

##### 4.1 STAFF

The Course Director was Mr R.E. Williams of Sierra Leone who is Manager of the Government Boatyard where the course was held. He and his staff provided the considerable variety of assistance necessary during the training course, especially important during the early stages.

The FAO Course Co-Director, Mr M.A. Shawyer, arrived in Freetown on 18 September 1979 after a preparatory period of two weeks at FAO Headquarters. He was accompanied by two FAO Fisheries Department staff members: Mr J. Fyson, Fishery Industries Division, who was responsible for planning and technical preparation of the course, and Mr M. Doeff, Fishery Operations Service, who organized the administrative procedures and disbursement details for the initial period.

Working relationships were established with the Sierra Leone Ministry of Natural Resources (Fisheries Division), the office of the FAO Representative for Sierra Leone and the Office of the UNDP Resident Representative for Sierra Leone.

Mr K. Bailey, the consultant boatbuilding instructor, arrived in Freetown on 23 September and Mr K.K. Svensson, the consultant engineering instructor, arrived on 14 October as scheduled.

Mr Doeff returned to Rome on 26 September and Mr Fyson on 28 September.

##### 4.2 PARTICIPANTS

There was a total of 21 participants from eight English-speaking African countries, including Sierra Leone (see Appendix 4).

No problems were encountered with either punctuality or attendance during the programme, with the exception of one local participant who contracted a severe case of malaria; in all only 30 workdays were lost out of a possible total of 1 260.

In general the interactions between the participants was excellent in both the social and working environments, even though individual backgrounds and work experience varied considerably.

##### 4.3 BOATYARD FACILITIES

For this training course the Government of Sierra Leone, through the Ministry of Natural Resources, made available its boatyard, which is situated at Kissy on the outskirts of Freetown. The boatyard is operated by the Fisheries Division and has a permanent operational staff of 20 persons. Actual physical layout of the boatyard is shown in Illustration 4, with the places where each vessel was built during the course.

The location of the yard was quite adequate for purposes of the course.

Timber storage was in a separate building nearby and ample space for all lumber was available for the course programme. The timber store was covered, with some ventilation provided by windows and sliding doors. Other materials were kept in the boatyard general stores and issued as required.

For classroom facilities the Fisheries Division made available a lecture room at the headquarters buildings a short distance from the boatyard. A photocopier and duplicating machine were placed at the disposal of the course personnel and office space was allocated in the same building. Secretarial services were provided by the Division, with a secretary-typist assigned to the programme for its duration.

#### 4.4 TOOLS AND EQUIPMENT

Participants were each provided with a basic toolkit as listed in Appendix 5. Although the kit was fairly complete, some additions would be useful in future courses of this type. For example, a spokeshave and marking gauge are two useful tools that should be included.

Besides the tools issued to the individual participants, several portable electric hand tools and other items of equipment were provided for general use. These items, listed in Appendix 6, were left at the boatyard for use in completing the 10.26 m trawler/seiner.

#### 4.5 MATERIALS

Prior to the arrival of participants and staff, consultants had been to Freetown to arrange purchase of the wood to be used during the programme. This was successfully carried out and the lumber purchased was stored under cover at the boatyard for approximately six months for drying/seasoning. This worked well and the lumber was of suitable moisture content for the start of the programme. The types of wood used are described in Appendix 7.

Other materials, such as steel tube and steel plate of suitable sizes for the rigging and fuel tanks of the 10.26 m trawler, were also available and were purchased during the course for fabrication by the Marine Engineering Workshop at the Fisheries Division.

Some items, such as bolts, etc., were actually late in arriving but suitable substitutes were found locally, thus minimizing delay. However, in future courses of this type, purchasing of items which must be imported to the site should be carried out somewhat earlier to ensure timely delivery. In this case local substitutes were available, whereas in another country or situation serious delays could be incurred by nonavailability of substitutes.

### 5. RECOMMENDATIONS

#### 5.1 PROGRAMME CONTENT

Theory lessons should be given in once or twice weekly time blocks rather than daily. For this course, daily theory lessons were found to be impractical as they disrupted the construction phase through excessive loss of time. Saturday mornings were found to be best in this case for these sessions.

Future courses should be provided with basic sets of drawing instruments and drawing boards. These, used in conjunction with notes and lectures, would help immensely in teaching mould loft work in particular. Drawing and sketching practice is also extremely useful to all boatbuilders at whatever level of proficiency they may be.

## 5.2 TOOLS AND EQUIPMENT

As was done in this course, other programmes of this type should provide a basic tool kit for all participants. This should be the same as the kit listed in Appendix 5 but with the following possible additions:

- oilstone, 8 x 2 x 1 in medium fine combination
- spokeshave, flat bottom malleable iron
- spokeshave, round bottom malleable iron
- one set H.S.S. drills 1/16 to 1/4 in by 1/32 in increments
- marking gauge

Electrical equipment provided for general use by all participants should have the necessary spares shipped with them, i.e., belts, shear pins, fuses, brushes, switches, etc., in case of breakdown and nonavailability of such spare parts locally.

For boatbuilding programmes a large number of G-clamps and sash clamps should also be provided, since ordinary woodworking does not use or have need for the large numbers of clamps that are necessary for boatbuilding.

Another item that could be considered is a duplicator with a supply of various colored stencil masters. This is a very useful teaching aid which is very simple to use, especially for sketches and handout sheets which can be produced at very short notice if necessary.

## 5.3 THE 10.26 m TRAWLER/SEINER

Considering the large investment in both time and materials for this boat, it was considered essential to send a short term expert boatbuilder for a period of not less than one month in February/March of 1980 to supervise the finishing of the vessel and more particularly to supervise installation of the engine, tanks, rigging and trawl winch, this part of boatbuilding being a weak point at the boatyard.

## 5.4 BUDGET FOR FOLLOW-UP ACTIVITIES IN 1980

Normally in programmes of this type it is usual to close off the local accounts when the course is finished. However, due to the fact that the trawler had not been finished and also that fishing gear and other equipment had still to be delivered for this boat, it is proposed that a certain amount of money be retained in Freetown (Appendix 8) at UNDP or FAO offices so that clearances and transport can be arranged on arrival of the goods, plus providing a small fund for the suggested FAO consultant to work with when finishing the boat during 1980.

## 6. CONCLUSIONS

From participant reaction and feedback on this programme, which was very favourable, it seems that this type of course is meeting a real need for training at this technical level.

During the programme most participants requested information regarding other courses of a similar or more advanced nature. This seems to indicate that a keen interest for training programmes of this type exists among present technical and trade persons in Africa.

From this it would seem that further possibilities exist for similar training programmes of this nature, both of a more basic artisanal level and of a somewhat higher level. Participants for these should, of necessity, be carefully chosen so as to minimize differences in either working or technical abilities between candidates in the same course.

One very distinct advantage of this type of programme is that the persons exposed to this training, although relatively few in number, have contact with and access to large numbers of their own countrymen after the course and these persons will, in turn, also benefit from the knowledge gained by the participants during their training period. It seems also to be economically more viable than setting up several one-country training programmes, which obviously reach only a specific minority within a certain area.

Finally, considering the favourable reception of this programme by all concerned and its generally successful conclusion, it is obvious that further programmes of this nature should be seriously considered as an integral part of FAO assistance to developing nations in the future.

Appendix 1

## SCHEDULED COURSE TIMETABLE AND CONTENTS

## 1. OUTLINE OF COURSE CONTENT

WEEK 1 - 24 to 29 SEPTEMBER24 September (Monday)Introduction to CourseMorning:

Registration of participants  
 Opening address by senior government official  
 Welcome to the course - course co-director  
 Technical details of the course  
 Content and procedure

Afternoon:

Preliminary allocation of tools  
 Use of woodworking hand tools

25 September (Tuesday)

## Theory:

Marking out of timber

## Practical:

Use of woodworking machinery and portable power tools  
 Safety precautions, etc.

26 September (Wednesday)

## Theory:

Reading of simple drawings

## Practical:

Construction of a tool box by participants

27 September (Thursday)

## Theory:

Reading of drawings

## Practical:

Construction of tool box

28 September (Friday)

## Theory:

Reading of more advanced drawings/lofting

## Practical:

Completion of tool box

29 September (Saturday)

Lofting

WEEK 2 - 1 to 6 OCTOBER1 October (Monday)

## Theory:

Jigs for small boat building

## Practical:

Maintenance, sharpening and adjustment of woodworking machinery

2 October (Tuesday)

Theory: Lofting  
 Practical: Maintenance, sharpening and adjustment of portable power tools

3 October (Wednesday)

Theory: Lofting  
 Practical: Begin construction of jigs and moulds for beach landing boat

4 October (Thursday)

Theory: Lofting/transom expansion and taking off bevels on frames  
 Practical: Jig construction

5 October (Friday)

Theory: Lofting  
 Practical: Mould construction

6 October (Saturday)

Theory: Lofting

WEEK 3 - 8 to 13 OCTOBER8 October (Monday)

Theory: Picking up patterns  
 Practical: Setting up building jig/markings out deadwoods

9 October (Tuesday)

Theory: Handling and cutting of large timbers  
 Practical: Erect moulds on building jig  
 Mark out and cut keel timbers

10 October (Wednesday)

Theory: Scarfs in timber - keel scarfs, planking scarfs, etc.  
 Practical: Scarf keel of trawler  
 Complete building jig ready for planking

11 October (Thursday)

Theory: Bolts and other fastenings  
 Practical: Cut and fit aft deadwoods, horn timber, etc.

12 October (Friday)

Theory: Lifting off frames from loft floor  
 Practical: Cut and fit forward deadwood, stern, etc.

13 October (Saturday)

Theory: Frame assembly  
 Practical: Assemble backbone of trawler

WEEK 4 - 15 to 20 OCTOBER15 October (Monday)

Theory: Frame assembly (continued)  
 Practical: Begin cutting and assembly of frames for trawler

16 October (Tuesday)

Theory: Deck, beams/layout of camber, etc.  
 Practical: Frame construction

17 October (Wednesday)

Theory: Planking on a jig  
 Practical: Frame construction  
 Planking of beach landing boat

18 October (Thursday)

Practical: Frame construction  
 Planking of beach landing boat

19 October (Friday)

Theory: Transom construction  
 Practical: Frame construction  
 Planking of beach landing boat

20 October (Saturday) (morning)

Practical: Frame construction



31 October (Wednesday)

Theory: Planking layout, use of spiling battens  
 Practical: Install clamp and breasthook  
 Fit covering board and foredeck on beach landing boat

1 November (Thursday)

Theory: Butts in planking, use of stealers, butt planes/rules  
 Practical: Complete installation of clamps and transom knees  
 Final details of beach landing boat, thwarts, mast step, engine beds, etc.

2 November (Friday)

Theory: Installation of engines - shaft line and engine beds  
 Practical: Preliminary shaft line, prepare and fit engine beds in trawler

3 November (Saturday) (morning)

Practical: Complete engine beds

WEEK 7 - 5 to 10 NOVEMBER5 November (Monday)

Theory: Engine installation (continued)  
 Practical: Begin hull planking of trawler

6 November (Tuesday)

Theory: Engine installation (continued)  
 Construction of jig for V-bottom boat  
 Practical: Hull planking  
 Jig for V-bottom boat

7 November (Wednesday)

Theory: Engine installation (continued)  
 Practical: Hull planking (continued)  
 Jig for V-bottom boat

8 November (Thursday)

Theory: Engine installation (continued)  
 Practical: Hull planking (continued)  
 Frames for V-bottom boat

9 November (Friday)

Theory: Engine installation (continued)  
 Practical: Hull planking (continued)  
 Frames and transom for V-bottom boat

10 November (Saturday) (morning)

Practical: Hull planking (continued)

WEEK 8 - 12 to 17 NOVEMBER12 November (Monday)

Theory: How to laminate wooden members  
 Practical: Hull planking (continued)  
 Complete frames, make stem of V-bottom boat

13 November (Tuesday)

Theory: Setting up V-bottom boat on jig  
 Practical: Hull planking (continued)  
 Begin setting up V-bottom boat

14 November (Wednesday)

Theory: Other construction methods - plywood  
 Practical: Hull planking (continued)  
 Complete setting up frames, stem and transom of V-bottom boat

15 November (Thursday)

Theory: Other construction methods - seam batten construction  
 Practical: Hull planking (continued)  
 Fit hog and chines to V-bottom boat

16 November (Friday)

Practical: Hull planking (continued)  
 Finish chines and fit sheer planks for V-bottom boat

17 November (Saturday) (morning)

Practical: Hull planking (continued)

WEEK 9 - 19 to 24 NOVEMBER19 November (Monday)

Theory: Bulkhead construction  
 Practical: Hull planking continued by boatyard staff  
 Begin engine installation in trawler  
 Bevel stem, hog and chines of V-bottom boat

20 November (Tuesday)

Theory: Fitting of deck half beams and carlins  
 Practical: Engine installation/tanks  
 Make and fit keel and skeg for V-bottom boat

21 November (Wednesday)

Theory: Fitting of coamings  
 Practical: Engine installation/tanks  
 Install deck half beams and carlins for deck openings  
 Install and fasten keel and skeg on V-bottom boat

22 November (Thursday)

Theory: How to lay deck planking  
 Practical: Engine installation/skin fittings, etc.  
 Fit coamings in deck opening  
 Make intermediate frames for V-bottom boat

23 Novembre (Friday)

Theory: Preparation, scarfing and fitting of covering boards  
 Practical: Complete coamings, begin bulkheads  
 Fit intermediate frames in V-bottom boat

24 November (Saturday)(morning)

Practical: Continue bulkhead construction  
 Complete intermediate frames in V-bottom boat and level

WEEK 10 - 26 NOVEMBER to 1 DECEMBER26 November (Monday)

Theory: Wheelhouse construction  
 Practical: Complete bulkheads, begin deck planking of trawler  
 Begin hull planking of V-bottom boat

27 November (Tuesday)

Theory: Wheelhouse construction/installation of steering gear and instruments

Practical: Deck planking (continued)  
Begin wheelhouse construction  
Continue hull planking of V-bottom boat

28 November (Wednesday)

Theory: Fitting out (rigging details)

Practical: Deck planking (continued)  
Wheelhouse construction (continued)  
Hull planking of V-bottom boat (continued)

29 November (Thursday)

Theory: Fitting out - deck equipment

Practical: Deck planking and wheelhouse construction of trawler  
Hull planking of V-bottom boat (continued)

30 November (Friday)

Theory: Fitting out - installation of fishing gear, winch, etc.

Practical: Deck planking and wheelhouse construction of trawler (continued)  
Hull planking of V-bottom boat (continued)

1 December (Saturday) (morning)

Practical: Deck planking and wheelhouse construction of trawler (continued)  
Hull planking of V-bottom boat (continued)

WEEK 11 - 3 to 8 DECEMBER3 December (Monday)

Theory: Fitting out details  
Rudder and steering

Practical: Deck planking (continued)  
Wheelhouse completed  
Hull planking of V-bottom boat (continued)

4 December (Tuesday)

Theory: Fitting out details - navigation lights, ventilation

Practical: Deck planking (continued)  
Hull planking of V-bottom boat (continued)  
Begin engine installation of beach landing boat

5 December (Wednesday)

Practical: Deck planking  
Complete hull planking of V-bottom boat  
Engine installation of beach landing boat (continued)

6 December (Thursday)

Practical: Deck planking for trawler  
Turn over V-bottom hull and fit rubbing strakes and gunwhale clamp  
Complete engine installation of beach landing boat

7 December (Friday)

Practical: Complete deck planking of trawler  
Fit covering board to V-bottom boat  
Launch beach landing boat

8 December (Saturday) (morning)

Practical: Carry out trials with beach landing boat

WEEK 12 - 10 to 14 DECEMBER

10 December (Monday)

Practical: Fit wheelhouse  
Plank bulwarks of trawler  
Fit floor bearers in V-bottom boat  
Make outboard well

11 December (Tuesday)

Practical: Complete wheelhouse installation  
Continue planking of bulwarks  
Complete floor bearers and begin flooring in V-bottom boat  
Complete outboard well

12 December (Wednesday)

Practical: Complete bulwark planking and begin to fit rail cap  
Complete floor of V-bottom boat

13 December (Thursday)

Practical: Fit rail cap on trawler  
Final details and launch V-bottom boat

14 December (Friday)

Closing ceremony  
Inventory of tools  
Administrative details of closure of course

## 2. COURSE TIMETABLE

| Period                             | Activity  |  | Vessel construction stage  |
|------------------------------------|---|--|--|
|                                    | Classroom theory & demonstration  | Practical work   |  |
| Week 1<br>24-29 Sep.               | <u>Introduction</u><br>- Marking out and preparation of timber<br>- Reading of simple drawings<br>Commencement of lofting   | <u>Introduction</u><br>Use, care and maintenance of hand tools, woodworking machinery and portable power tools.<br>Construction of individual tool boxes   | Completed  |
| Weeks 2 & 3<br>1-13 Oct.           | - Lofting plans to full size, taking off bevels, transom expansion and picking up patterns from the loft floor.<br>- How to build jig and moulds for flat-bottomed boats<br>- Handling and cutting large timbers, scarfs and bolting of backbone assembly<br>- How to lift frame dimensions from the loft floor | <u>A) Small boat building</u><br>Construct a jig and moulds for the building (upside down) of a flat-bottomed beach landing boat<br><br><u>B) Larger boat building</u><br>Mark out, cut and assemble backbone structure comprising keel, stern and stern frame for a 10.26 m trawler | A) Completion of building jig for a beach landing boat<br><br>B) Lofting completed and backbone assembled                            |
| Weeks 4 & 5<br>15-27 Oct.          | - Cutting of deck beams, layout of camber, etc.<br>- Transom construction and layout of planking for flat-bottomed boats<br>- Setting up of larger vessels on foundation blocks<br>- Longitudinal strengthening for small boats<br>- How to fit chine battens   | Plank a flat-bottomed boat, remove from jig and fit internal framing<br><br>Set up and brace backbone assembly and frames of a 10.26 m trawler   | A) Planking completed for beach landing boat<br><br>B) Backbone and frames of trawler set up on building foundation                  |
| Weeks 6 & 7<br>29 Oct.-<br>10 Nov. | - Use of a steam box<br>- How to fit longitudinal members<br>- Layout of planking for upright construction<br>- Establishment of shaft line and   | - Fit chine & clamps, breasthook & knees<br>- Begin planking<br>- Line up & fit engine bearers   | A) Hull of beach landing boat completed. Jig prepared for 8.7 m V-bottom boat<br><br>B) Chine and beam clamps installed. Engine beds |

|                                     |   |  |  |  |
|-------------------------------------|---|--|--|--|
|                                     | fitting of engine beds<br>- Engine installation requirements<br>- Fitting of fuel tanks   | - Make up the jig for the construction of and 8.7 m outboard-powered V-bottom boat<br>- Set up jig and frames for V-bottom boat<br>- Fit hog, chines and sheer strakes<br>- Make and fasten keel and skeg<br>- Fit intermediate frames | - Hull planking, spiling & fit of shutter strakes<br>- Construct bulkheads including insulation<br>- Install engine, tanks & piping<br>- Fit deck half beams and carlins | fitted. Hull planking in progress.<br>A) Framing completed for V-bottom boat<br>B) Hull planking completed. Engine & tanks installed.<br>Deck framing & coamings in place                            |
| Weeks 8 & 9<br>12-24 Nov.           | - How to laminate wooden members<br>- Set up for V-bottom boat construction<br>- Other construction methods, plywood and seam batten construction<br>- Deck framing<br>- How to lay deck planking | - Plank hull of V/B boat<br>- Turn over and fit rubbing strakes, gun-whale clamp & covering board<br>- Install engine in beach landing boat & carry out trials   | - Plank deck<br>- Build wheelhouse framing & cover with ply<br>- Cut & fit wheelhouse beams & cover with ply<br>- Make rudder  | A) Engine fitted to beach landing boat<br>Hull of V/B boat complete<br>B) Deck planking completed (or to the stage where can be completed by boatyard staff)<br>Wheelhouse built separate from boat. |
| Weeks 10 & 11<br>26 Nov.-<br>8 Dec. | - Wheelhouse construction and installation of steering gear & instruments<br>- Mast & rigging construction<br>- Installation of deck equipment & fishing gear                                     | - Fit floor bearers & flooring in V/B boat<br>- Make outboard well & complete final fittings out details   | - Install wheelhouse & plank bulwarks<br>- Fit rail cap  | A) V/B boat completed<br>B) Hull, deck & bulwarks completed. Wheelhouse installed. Engine & shaft installed & awaiting launching for final line up   |
| Week 12<br>10-14 Dec.               | Inventory of tools<br>Administrative details of course closure, packing & despatch of participants' tools, notes & publications   |  |  |  |

Note: Remaining work to be carried out on the trawler by boatyard staff after completion of course:

- 1) Caulk hull & deck
- 2) Haul out boat and install mast and rigging
- 3) Install rudder and steering
- 4) Make foundations and install winch, galleys and purse davit.

Appendix 2  
ACTUAL TIMETABLE

| Dates  | 8.7 m V/Bottom   | 9.07 m F/Bottom   | 10.26 m Trawler/Seiner   |
|--|--|---|--|
| 24 September<br>28 September                 | <ul style="list-style-type: none"> <li>- Tool box construction</li> <li>- Preparing the mould loft floor</li> </ul>  |   |  |
| Theory                                       | Basic plan reading; marking timber; lofting; jig construction  |   |  |
| 1 October<br><br><br><br><br><br>5 October   | <ul style="list-style-type: none"> <li>- Lofting</li> <li>- Frame construction</li> <li>- Transom construction</li> <li>- Jig construction</li> <li>- Battens placed</li> <li>- Fairing</li> <li>- Sheerstrakes fixed</li> </ul> |   | <ul style="list-style-type: none"> <li>- Lofting</li> <li>- Frame construction</li> </ul>  |
| Theory                                       | Lofting; making out deadwoods  |   |  |
| 8 October<br><br><br><br><br><br>12 October  | <ul style="list-style-type: none"> <li>- Fairing bottom</li> <li>- Side planking complete</li> <li>- Planking bottom</li> <li>- Cut out keel</li> </ul>  |   | <ul style="list-style-type: none"> <li>- Frame construction</li> <li>- Transom construction</li> <li>- Horn timber</li> <li>- Deadwoods</li> <li>- Stem</li> <li>- Deck beams</li> </ul> |
| Theory                                       | Lofting; care and maintenance of hand tools  |   |  |
| 15 October<br><br><br><br><br><br>19 October | <ul style="list-style-type: none"> <li>- Planking bottom</li> <li>- Outer chines fixed</li> <li>- Caulking</li> <li>- Cleaning of hull</li> <li>- Primer paint</li> <li>- Remove from jig</li> </ul>                             | <ul style="list-style-type: none"> <li>- Lofting</li> <li>- Frame construction</li> <li>- Jig preparation</li> </ul>                        | <ul style="list-style-type: none"> <li>- Frame construction</li> <li>- Deck beams</li> <li>- Chines</li> <li>- B/bone construction</li> </ul>  |
| Theory                                       | Use of hand power tools; use of woodworking machinery  |   |  |
| 22 October<br><br><br><br><br><br>26 October | <ul style="list-style-type: none"> <li>- Butt/blocks</li> <li>- Laminating ext. stem</li> <li>- Turn over</li> <li>- Clean interior</li> <li>- Foredeck beams</li> <li>- Sole bearers</li> </ul>                                 | <ul style="list-style-type: none"> <li>- Erecting frames</li> <li>- Erecting transom</li> <li>- Erecting stem</li> <li>- Fairing</li> </ul> | <ul style="list-style-type: none"> <li>- Frames complete</li> <li>- B/bone construction</li> <li>- B/bone assembly</li> <li>- Make rudder</li> </ul>                                     |

| Dates            | 8.7 m V/Bottom   | 9.07 m F/Bottom   | 10.26 m Trawler/Seiner   |
|------------------|--|---|--|
| Theory           | Lifting bevels; setting up b/bone  |   |  |
| 29 October<br>/  | - Foredeck construction<br>- Sole<br>- Gunwale capping<br>- Rubbing strips<br>- Painting<br>- Coaming foredeck   | - Planking bottom<br>- Planking sides<br>- Caulk bottom<br>- Chine rubbing strips   | - B/bone assembly<br>- Take up lift floor<br>- Prepare bldg. bay<br>- Set up keel blocks<br>- Set up b/bone<br>- Straighten b/bone   |
| 2 November       |  |   |  |
| Theory           | Shop floor instruction; backbone assembly; set up  |   |  |
| 5 November<br>/  | - Interior finishing<br>- Bollard<br>- Fairlead<br>- Cleats<br>- Thwarts<br>- Stopping/sanding   | - Planking complete<br>- Preps. for w/t bulk'ds<br>- Primer paint<br>- Stem capping   | - Prepare overheads<br>- Set up transom<br>- Set up frames<br>- (Engine delivered)   |
| 9 November       |  |   |  |
| Theory           | Scarfs; jig types; frames; bulkheads   |   |  |
| 12 November<br>/ | - Painting<br>- Boat complete  | - Remove from Jig<br>- Foredeck<br>- W/t bulkheads<br>- Laminate b/hook<br>- 1/4 knees, fitting                               | - Setting up frames<br>- Cut engine beds   |
| 16 November      |  |   |  |
| Theory           | Fastenings; scarfs in B/bones, setting up foundations; stopwaters; futtocks and floors; floor types  |   |  |
| 19 November<br>/ |  | - Foredeck finished<br>- Bollard fitted<br>- 1/4 knees fixed<br>- B/hook fixed<br>- Longitudinal stiffeners<br>- Primer paint | - Chines; fitted<br>- Cheekpieces aft. B/woods<br>- Fairing rabbet<br>- Full tank welded up (aft)<br>- Bow tanks cut out             |
| 23 November      |  |   |  |
| Theory           | Stern post/deadwoods arrangement; stern post fairing; propeller clearances; tenions/tabling pieces/dovetail plates; through-hull fittings; spiling; stealers |   |  |
| 26 November<br>/ | - Boat launched and trial run completed  | - Plank protectors (bow)<br>- Boat structurally complete, except for engine and final paint<br>- Launched<br>- Stored in shed | - Fairing frames<br>- Fixing shelves<br>- Planking topsides<br>- Spile and cut garboards<br>- Planking transom<br>- Bow tanks welded |
| 30 November      |  |   |  |

| Dates   | 8.7 m V/Bottom   | 9.07 m F/Bottom | 10.26 m Trawler/Seiner  |
|---|--|-----------------|---|
| Theory  | Basic boat design; general structural recommendations; shift of butts; petrol and butane gas installations; decks; decking; galvanic action/electrolysis |                 |   |
| 3 December<br><br>7 December                              | /  |                 | <ul style="list-style-type: none"> <li>- Planking topsides</li> <li>- Planking bottom</li> <li>- Cut engine beds</li> <li>- Cut steel, rigging</li> </ul> |
| Theory  | Engine installations; alignment; fuel tanks; paints/varnishes; marine borers; plywood  |                 |   |
| 10 December<br><br>14 December                            | /  |                 | <ul style="list-style-type: none"> <li>- Planking bottom</li> <li>- Bulwarks</li> <li>- Welding rigging parts</li> </ul>                                  |
| Formal closure of programme, presentation of certificates |  |                 |   |

Appendix 3

## PROPOSED TIMETABLE FOR COMPLETION OF 10.26 m TRAWLER/SEINER (HULL ONLY)

|             |  |
|-------------|--|
| 2 January   | - Fitting frame heads; plank bulwarks; fit deck beams;           |
| 15 January  | fit hatch carlings; caulk hull                                   |
| 16 January  | - Painting; filling seams and nail heads; place aft fuel tank;   |
| 31 January  | fit bulkheads; capping bulwarks; deck planking; samson post      |
| 1 February  | - Caulk and pay decks; fit stern tube; line up shaft for plumber |
| 15 February | block  |
| 16 February | - Build wheelhouse; place rudder fittings; fit rudder            |
| 28 February |  |
| 1 March     | - Cleaning off; priming; paint; anti-fouling; prepare for        |
| 15 March    | launching  |

This timetable had been agreed to by Mr R. Williams, Manager of the Boatyard.

Note: The above proposes completion of the hull only. Installation of engine and accessories, such as rigging, winch, etc. would be carried out in the latter stage of hull construction and supervised by an FAO consultant, possibly during late February-March 1980.

Appendix 4

## LIST OF PARTICIPANTS

GHANA

BONNEY Edward  
AMOAH Robert Kofi  
ACQUAH Harold Boateng

KENYA

MWAKAMUSHA Isaac  
OMWENGA Zacharia  
MUHURI Amos

LIBERIA

BOYE Frederick

MALAWI

BANGALIERA Coston Henderson  
CHILIMBA Amos Lewis

NIGERIA

AKINBISOSE Francis

TANZANIA

MJAWIR Usi Uyengo  
NDUMA Samuel

ZAMBIA

CHILONGE Oswald

SIERRA LEONE

TURAY Alusaine  
KAMARA Mohamed  
KAMARA Kunda  
SUMA Ibrahim  
COLLINS Sylvanus  
KAMARA Momoh  
ATKINS Christopher  
NGEGBA Michael

Appendix 5

## TOOL LIST

- 1 15 in steel jackplane
- 1 9 in steel smoothing plane
- 1 9 in wooden smoothing plane
- 1 22 in hand saw
- 1 10 mm hand drill
- 1 10 in hand brace
- 1 8 in carpenter's pincers
- 1 Set augers 3/8, 1/2, 5/8, 3/4 and 1 in
- 1 3 ft folding rule
- 1 Set chisels 1/4, 1/2, 5/8, 3/4 and 1 in
- 1 20 oz claw hammer
- 1 6 in screwdriver
- 2 Screwdriver bits 3/8 in-1/2 in
- 1 9 in square
- 1 9 in bevel
- 1 Countersink
- 1 Oilstone

Appendix 6

## LIST OF EQUIPMENT FOR TRANSFER TO FISHERIES DIVISION BOATYARD, FREETOWN

| <u>Item</u>                                   | <u>Quantity</u> |
|---|-----------------|
| 10 mm hand drill, model SPK 2513              | 12              |
| 13 mm drill, model 10 HM/2V/220V              | 4               |
| 13 mm drill, model 13 HG/2V/220V              | 1               |
| 8 1/4 in portable electric saw, model SEC 9S  | 2               |
| 9 1/4 in portable electric saw, model SEC 818 | 2               |
| Hand planer, electric, model 80 PLA           | 2               |
| Circular saw blades 220 mm                    | 8               |
| Circular saw blades 235 mm                    | 4               |
| Planer cutters (for 80 PLA) sets              | 5               |
| 6 in record G clamps                          | 9               |

## Appendix 7

## SPECIES OF WOOD USED

| Scientific designation                                  | Common name           | Local name(s)        | Characteristics   |
|---|-----------------------|----------------------|---|
| Lophira alata<br>(Banks ex Gaertn)                      | Ekki                  | Hendui               | Very hard<br>Extremely durable<br>Difficult to work<br>Prone to splitting<br>Heavy 960-1 120<br>kg/m <sup>3</sup> dry   |
| Nauclea diderrichii<br>or<br>(Dewild & Th. Dur)<br>Merr | Opepe                 | Bundui<br>Broomstone | Very hard<br>High resistance to<br>marine borers<br>Very durable<br>Moderately easy<br>workability<br>Prone to splitting<br>Weight approx,<br>750 kg/m <sup>3</sup> |
| Albizia spp.  | Albizia               | Pepper teak          | Moderately hard<br>Medium heavy<br>Very durable<br>Strong<br>Moderate workability   |
| Khaya spp.<br>(K. senegalensis)                         | Mahogany<br>(African) | Yawi                 | Moderately strong<br>Moderately durable<br>Moderate workability   |

Note: Of the African mahogany used, two types were apparent but positive identification was difficult. However, it seems likely that the planking used for the 9.07 m F/B beach landing boat is of the species Khaya senegalensis.

Appendix 8

## PRELIMINARY BUDGET PROJECTION FOR COMPLETION OF THE 10.26 m TRAWLER/SEINER

It will be necessary to retain an amount of money in the UNDP account for this project. This is to enable completion of the boat by providing funds for necessary purchases, also freight clearance, etc.

|   | <u>Leone</u>           |
|---|------------------------|
| - Freight clearance/transport             | 500                    |
| - Miscellaneous fastenings                | 400                    |
| - Paints                                  | 250                    |
| - Deck fittings                           | 400                    |
| - Electrical installations                | 150                    |
| - Miscellaneous engine installation items | 250                    |
| - Crane rental (engine installation)      | 75                     |
| - Cables/telephone                        | 200                    |
| - Contingencies                           | <u>600</u>             |
|   | <u>2 825</u> <u>1/</u> |
|   | =====                  |

1/ US\$ 1.00 = Leones 1.05.

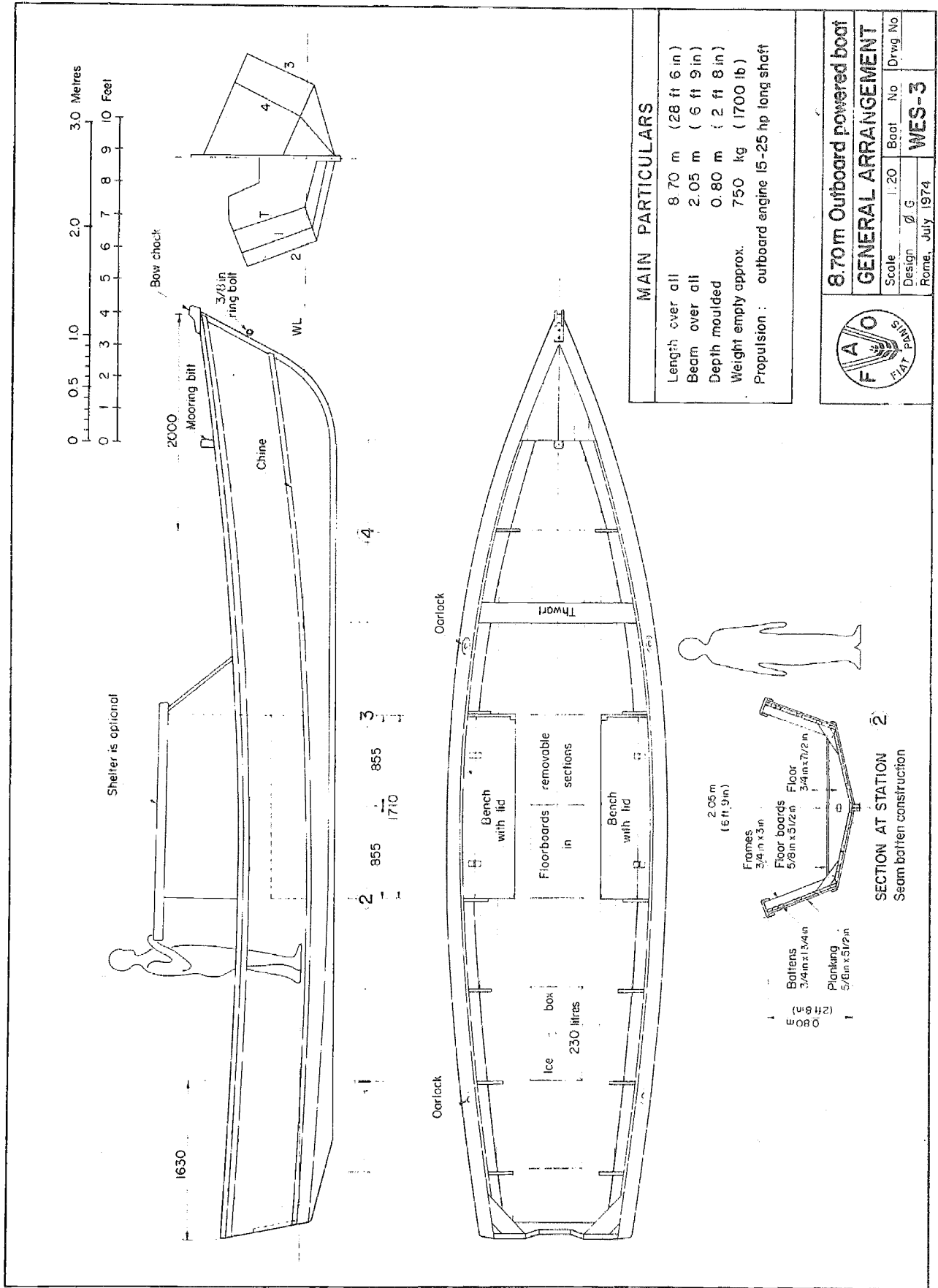


Illustration 1: General arrangement of 8.7 m V-bottom boat and offsets

8.7 m V-BOTTOM BOAT-TABLE OF OFFSETS  
(See Illustration 1)

| STATIONS:                     |                    | TRANSOM | 1      | 2     | 3     | 4     | STEM  |
|-------------------------------|--------------------|---------|--------|-------|-------|-------|-------|
| HALF-BREADTHS FROM CENTERLINE | DECK               | 2-3-2   | 2-11-3 | 3-4-6 | 3-3-2 | 2-3-4 |       |
|                               | CHINE              | 1-7-1   | 2-3-4  | 2-7-4 | 2-3-4 | 1-3-6 |       |
| HEIGHTS FROM BASELINE         | DECK               | 3-1-2   | 2-9-3  | 2-6-3 | 2-7-4 | 3-2-3 | 4-0-0 |
|                               | CHINE              | 0-10-3  | 0-8-7  | 0-6-4 | 0-7-7 | 1-1-2 | 1-9-2 |
|                               | CENTERLINE OF KEEL | 0-6-7   | 0-3-1  | -     | 0-0-6 | -     |       |

Note: Dimensions are given as feet, inches and eighths of an inch

Frames 1, 2, 3 and 4 spaced at 67 1/4 in

Aft of station 1 to transom at sheer 64 1/8 in

Forward of station 4 to stem at sheer 78 3/4 in

Slope at stem at sheer 31 1/2 in

Slope at transom at sheer 8 1/2 in

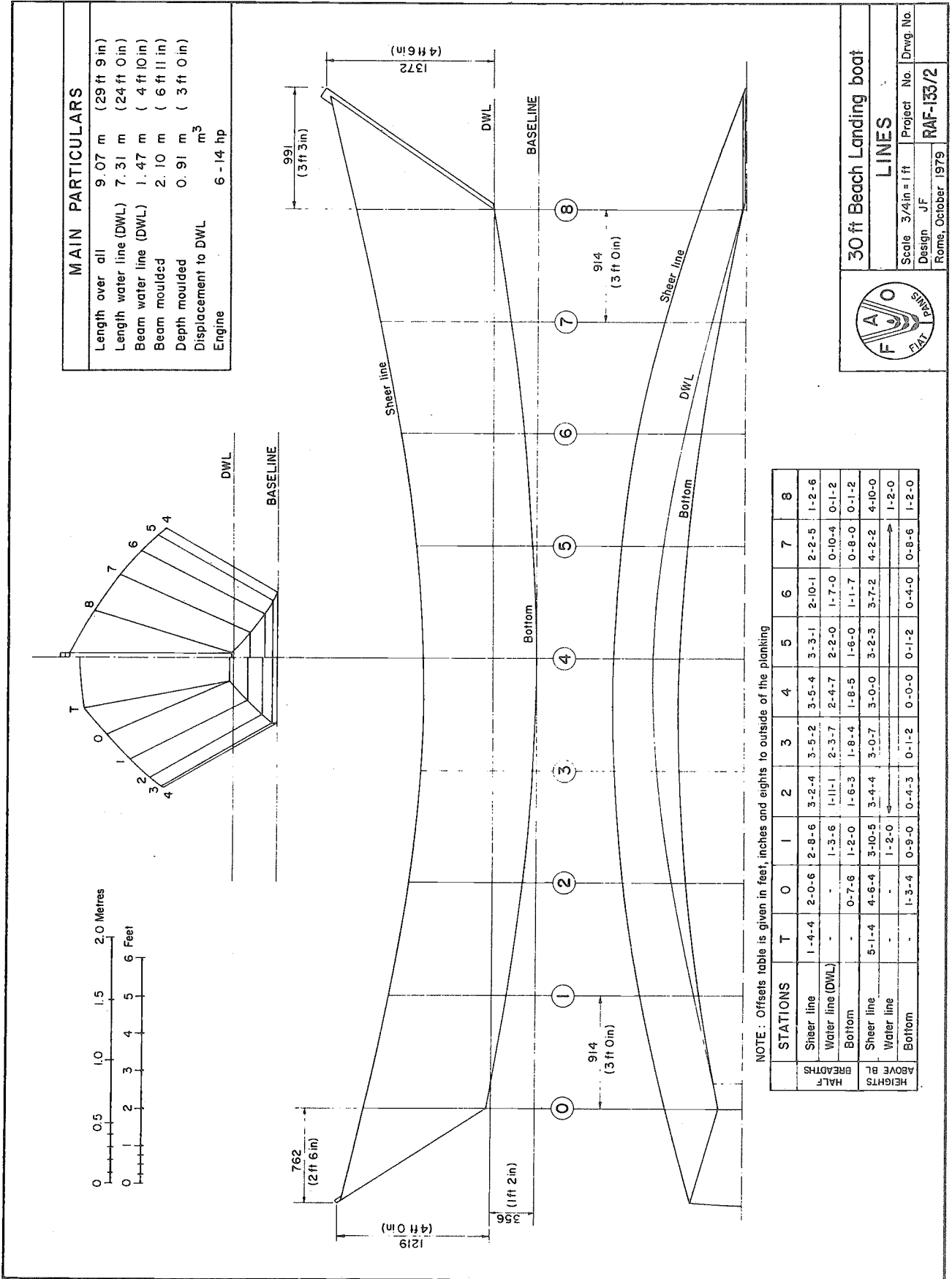
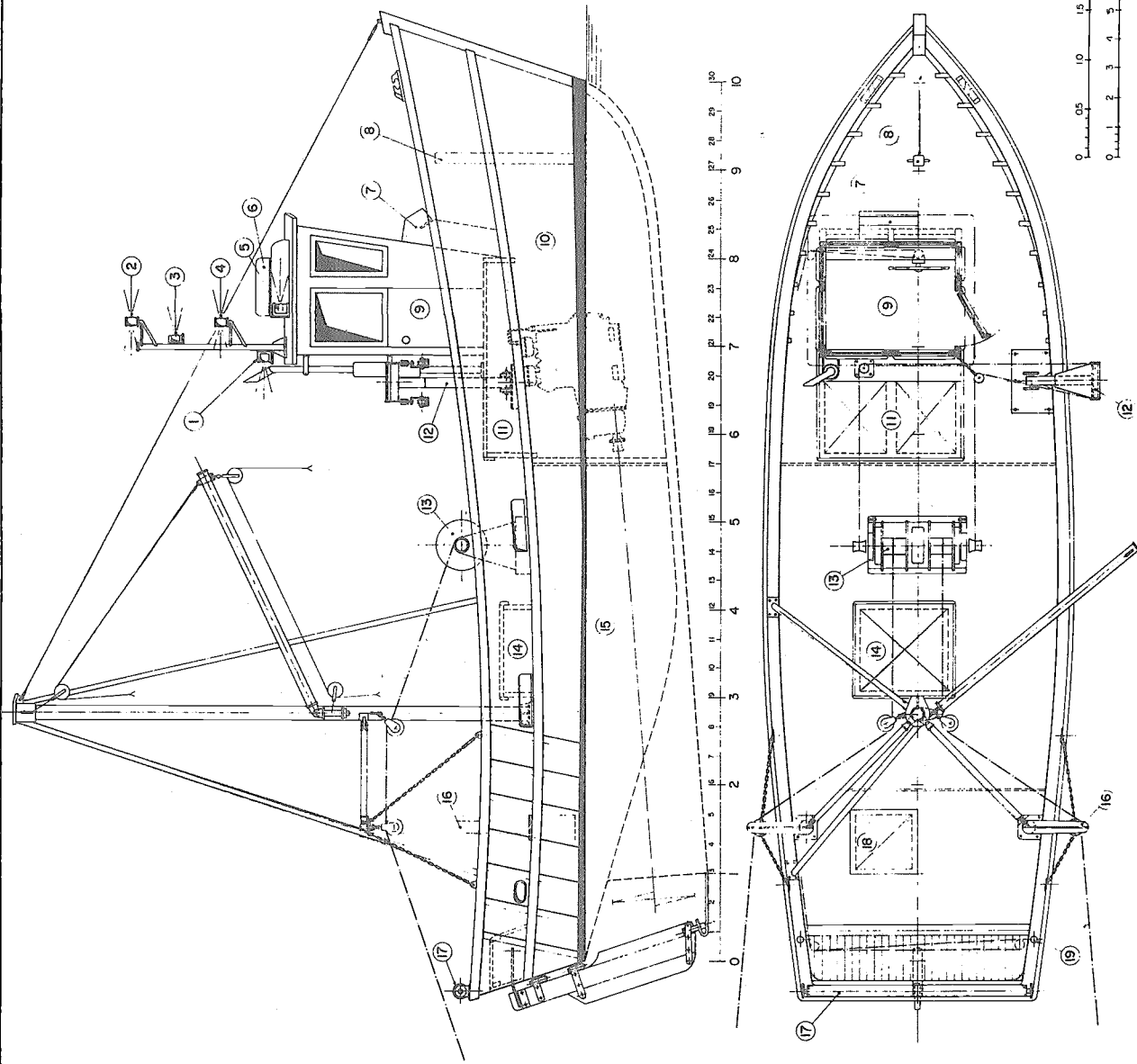


Illustration 2: General drawings of 9.07 m flat bottom beach landing craft

1. Stern light white 135°
2. Fishing light green 360°
3. Masthead light white 225°
4. Fishing light white 360°
5. Side light red/green 112.5°
6. Liferaft
7. Air intake to engine room
8. Mooring bitt
9. Wheel house
10. Engine room
11. Hatch to engine room
12. Purse davit
13. Trawl winch
14. Hatch to fish hold
15. Fish hold, capacity 6 m<sup>3</sup> (210 ft<sup>3</sup>)
16. Trawl davit
17. Stern roller
18. Hatch to deck store / fuel tankes
19. Socket for removable mooring fittings



**MAIN PARTICULARS**

|                         |  |
|-------------------------|--|
| Length over all         | 10.26 m (33 ft 8 in)                       |
| Length water line (DWL) | 9.14 m (30 ft 0 in)                        |
| Beam water line (DWL)   | 2.92 m (9 ft 7 in)                         |
| Beam moulded            | 3.15 m (10 ft 4 in)                        |
| Depth moulded           | 1.49 m (4 ft 11 in)                        |
| Displacement to DWL     | 8.55 m <sup>3</sup> (302 ft <sup>3</sup> ) |
| Engine                  | 64 hp                                      |

**10.26 m Trawler/Purse seiner**

**GENERAL ARRANGEMENT**

Scale: 1:100  
 Project No: 15/33F  
 Date: 17.79  
 Project: RAF-133

Illustration 3: General drawings of 10.26 m trawler/seiner and offsets

Illustration 4: "Boatyard Layout"  
(Not to scale)

