5. Calculation of annual fuel consumption amount and fuel expenses ("Step--4")

With regard to the unit fuel price, use T$300/KL at Pago Pago based on the materials obtained from the SSFCL.

Item	M.V. LOFA (8.0 knots)	Designed Vessel (9.5 knots)		Requested Vessel (8.0 knots)	
	380 sea miles x 4 times	900 sea miles x 1 time + 450 sea miles x 3 times	450 sea miles x 4 times	900 sea miles x 1 time + 450 sea miles x 3 times	450 sea miles x 4 times
①Fuel consumption by sailing condition					
1) At the time of service sailing	45days x 2.292 = 103.140KL	44days x 2.626 = 115.544KL	40days x 2.626 = 105.040KL	54days x 2.266 = 122.364KL	49days x 2.266 = 111.034KL
2) At the time of research operations	192days x 1.568 = 301.056KL	193days x 1.788 = 345.084KL	198days x 1.788 = 354.024KL	170days x 1.630 = 277.100KL	180days x 1.630 = 293.400KL
3) At the time of drifting on the sea	28days x 0.252 = 7.056KL	28days x 0.288 = 8.064KL	28days x 0.288 = 8.064KL	28days x 0.288 = 8.064KL	28days x 0.288 = 8.064KL
4) At the time of anchorage in a port	75days x 0.216 = 16.200KL	76days x 0.247 = 18.772KL	75days x 0.247 = 18.525KL	89days x 0.247 = 21.983KL	84days x 0.247 = 20.748KL
5) At the time of docking	25days x 0 = 0	24days x 0 = 0	24days x 0 = 0	24days x 0 = 0	24days x 0 = 0
Total of annual fuel consumption	427.452KL	487.464KL	485.653KL	429.511KL	433.246KL
②Total of annual fuel cost	T$128,235.6 ↓ T$128,300	T$146,239.2 ↓ T$146,300	T$145,695.9 ↓ T$145,700	T$128,853.3 ↓ T$128,900	T$129,973.8 ↓ T$130,000

(Note) From this Step and thereafter, the comparison with the M.V. LOFA will involve the study concerning the expenses and income. Therefore, the relevant comparison with the M.V. LOFA will be discontinued at this Step.

6. Assumption of annual sailing operations expenses excluding bait cost ("Step--5")

1) Assumption of annual sailing operations expenses excluding the fuel expenses and bait cost

We will use rather higher side of figures with some reserves being taken after referring to the detailed results of expenses for the respective years between 1982 through 1990 of the M.V. LOFA which was obtained from the Ministry of Fisheries and after making trial calculations from the individual figures obtained from the SSFCL. However, we would exclude those data

which are considered inadequate to be used contained in the detailed figures of the S.S. LOFA from the figures to be referred to.

The following provides resultant figures of the M.V. LOFA by each item and details of materials obtained from the SSFCL as well as the figures adopted and their respective grounds. Meanwhile, as to the classification of items, we will follow that used in the results of the M.V. LOFA.

① Personnel expenses of crew

- Average for the period from 1983 to 1990 of the M.V. LOFA (exc. 1988) : T$161,582/year
- Data obtained from the SSFCL : Captain – Approx. T$20,000/year, crew in general – approx. T$5,000 – 6,000/year, other officer – between the above two
- Trial figure : 1 x T$20,000 + 4 x T$12,000 + 15 x T$6,000 = T$158,000
- No wages will be paid to the trainees and 1 crew is assumed to embark on behalf of an analyzer of data collected who is a ground staff.
- Adopted figure : We assume that the figure will be 105% of the results of the M.V. LOFA. Adopted figure : T$170,000

② Oil expenses other than fuel oil (lubricant, hydraulic oil, etc.)

- Average for the period from 1983 to 1990 of the M.V. LOFA (incl. fuel oil) : T$117,255/year
- Data obtained from the SSFCL : Unit fuel price at Pago Pago is T$300/KL
- Other oil expenses are estimated at 10% of that of fuel expenses.
- Adopted figure : As the expenses for lubricant, hydraulic oil, etc., we would estimate them as 15% of that of the fuel expenses since it is assumed that the data obtained from the SSFCL only include those oils which are consumed during the service operations and that those oils which are exchanged regularly at the time of docking, etc. are not included.

  a) Designed Vessel – In the case of 900 sea miles x 1+ 450 sea miles x 3 : T$146,300 x 0.15 = 21,945 → T$22,000

b) Designed Vessel – In the case of 450 sea miles x 4 :
T$145,700 x 0.15 = 21,855 → T$21,900

c) Requested Vessel – In the case of 900 sea miles x 1 + 450 sea miles x 3: T$128,900 x 0.15 = 19,335 → T$19,400

d) Requested Vessel – In the case of 450 sea miles x 4:
T$130,000 x 0.15 = 19,500 → T$19,500

③ Fishing gear expenses

– Average for the period from 1983 to 1990 of the M.V. LOFA : T$8,333/year

– Adopted figure : We would assume that the fishing gear expenses would be 120% of the resultant figure of the M.V. LOFA since our assumption is that the fishing gear will be required both for the conventional type longline and monofilament type longline for either of the Designed Vessel and Requested Vessel as well.
T$8,333 x 1.20 = T$10,000 → Adopted figure : T$10,000

④ Foods and fresh water expenses

– Average for the period from 1983 to 1990 of the M.V. LOFA : T$12,054/year

– Data obtained from the SSFCL : Foods expenses T$3.0/person/day
Water is to be replenished at Tonga and the price is approx.T$1.1/ton.

– Trial figures:
Foods expenses : (On the sea/overseas areas: 275 days x 26 persons + Wharfing in Tonga: 60 days x 5 persons + Docking period: 30 days x 20 persons) x T$3.0 = T$24,150
Water expenses : T$1.1 x 20 tons x 4 times = T$88
Total : T$24,150 + T$88 = T$24,238

– Adopted figure : T$24,300

⑤ Maintenance and repairing expenses

– Average for the period from 1983 to 1990 of the M.V. LOFA : T$28,021/year

– Adopted figure : We would assume that the expenses would be 110% of the resultant figure of the M.V. LOFA.

T$28,021 x 1.10 = T$30,823 → Adopted figure : T$31,000

⑥ Agent commissions

- Average for the period from 1983 to 1990 of the M.V. LOFA : T$6,931/year
- Adopted figure : We would assume that the commissions would be 110% of the resultant figure of the M.V. LOFA.
  T$6,931 x 1.10 = T$7,624 → Adopted figure : T$8,000

⑦ Ground administration expenses

- Average for the period from 1983 to 1990 of the M.V. LOFA : T$1,789/year
- Adopted figure : We would assume that the expenses would be 110% of the resultant figure of the M.V. LOFA.
  T$1,789 x 1.10 = T$1,968 → Adopted figure : T$2,000

⑧ Warehouse charges and customs expenses

- Average for the period from 1983 to 1990 of the M.V. LOFA : T$2,643/year
- Adopted figure : We would assume the expenses would be 110% of the resultant figure of the M.V.LOFA.
  T$2,643 x 1.10 = T$2,907 → Adopted figure : T$3,000

⑨ Insurance premium covering the hull and crew

- Average for the period from 1983 to 1990 (exc. 1990) of the M.V. LOFA : T$46,644/year
- Adopted figure : We would assume that the premium would be 110% of the resultant figure of the M.V. LOFA.
  T$46,644 x 1.10 = T$51,308 → Adopted figure : T$51,500

⑩ Miscellaneous expenses

- Average for the period from 1983 to 1990 of the M.V. LOFA : T$3,571/year
- Adopted figure : We would assume that the expenses would be 110% of the resultant figure of the M.V. LOFA.

T$3,571 x 1.10 = T$3,928 → Adopted figure : T$4,000

2) Summary of annual sailing operations expenses (exc. bait cost)

The following shows the grand total of the annual fuel expenses obtained in "Step–4" and other expenses in the preceding paragraph:

Unit: T$ (Tongan Dollar)

Item	Designed Vessel(9.5 knots)		Requested Vessel(8.0 knots)	
	900 sea miles x 1 time + 450 sea miles x 3 times	450 sea miles x 4 times	900 sea miles x 1 time + 450 sea miles x 3 times	450 sea miles x 4 times
① Expenses for fuel and other oils				
1) Fuel expenses	146,300	145,700	128,900	130,000
2) Expenses for lubricant and running oil	22,000	21,900	19,400	19,500
Total of expenses for fuel oil, etc.	168,300	167,600	148,300	149,500
② Other expenses (excluding bait cost)				
1) Crew expenses	170,000			
2) Fishing gear expenses	10,000			
3) Foods and water expenses	24,300			
4) Expenses for maintenance and repairing	31,000			
5) Agent commissions	8,000			
6) Ground administration expenses	2,000			
7) Warehouse charges and customs expenses	3,000			
8) Insurance premium covering the hull and crew	51,500			
9) Miscellaneous expenses	4,000			
Total of other expenses	304,300			
Annual total sailing expenses (excluding bait cost)	472,100	471,400	452,100	453,300

7. Assumption of the correlation formula between the size of fishing gear/bait cost and annual haul of fish/income ("Step-6")

1) Data pertaining to bait cost and adopted figure

a) Resultant figure of the M.V. LOFA : Average cost of bait for the period from 1983 to 1990 (exc. 1986) isT$50,157/year. The purchase unit price is unknown.

b) Materials obtained from the SSFCL : The frozen saury is obtained from Japan as the bait. The price is ¥1,700 per box (10 kg, 130 heads in average).

c) Adopted figure : Although it is expected that the bait cost would become cheaper than obtaining from Japan if we would buy the bait in Pago Pago, we would adopt the unit price based on the materials obtained from the SSFCL in this study.

On the assumption, US$ 1.00 = ¥110 and T$1.00 = US$ 0.86;

Unit price/head of bait = (¥1,700/130 heads)/(¥110 x 0.86) = T$0.13823

With regard to the number of heads of bait required, we would assume additional 10% as a reserve including waste bait under the condition that one head each attached to one hook.

2) Data pertaining to the haul of fish and the adopted figure

a) Size of fishing gear : According to the materials obtained from the SSFCL, the size of the fishing gear of the M.V. LOFA under the conventional type longline is 2,200 – 2,300 hooks in average/day with max. 2,500 hooks/day on a condition of one line casting each day.

b) CPUE : According to the materials obtained from the SSFCL, the resultant CPUE of the M.V. LOFA was 3.35/100 in average in 1994 and 2.53/100 in average in 1995.

c) Fish weight : According to the materials obtained from the SSFCL, the esultant fish weight of the M.V. LOFA was 19.92 kg/head in average in 1994 and 19.34 kg/head in average in 1995.

d) Adopted figure : We would study the size of the fishing gear later on in this Step and thereafter.

The CPUE is assumed as 3.00/100.

The fish weight in average is assumed as 19.50/head.

3) Data pertaining to the sales price and adopted figure

a) Purchaser : According to the materials obtained from the SSFCL, 70.3% in average in 1994 and 71.1% in average in 1995 respectively out of the total haul of fish of the M.V. LOFA were exported to Pago Pago and the rest was directed to the domestic sales.

b) Sales unit price : According to the materials obtained from the SSFCL, the sales unit price for export was T$2,670(US$ 2,300)/ton. Meanwhile, the market purchase price in the national fish market was T$2.50/kg in average. The domestic sales price of the SSFCL is slightly higher than that of the national fish market although it depends upon the kind of fish.

c) Adopted figure : On the assumption that 70% of the total amount of haul of fish is exported and 30% is sold domestically in a year, we would assume that the unit price for export is T$2,670/ton and for domestic sales is T$2,500/ton.

4) Regarding the correlation figure between fishing gear/bait cost and annual haul of fish/income amount

When using the above mentioned adopted figure and giving Average number of hooks/day = Y, and Average number of annual research fishing operations days = N,

Annual bait cost

= T$0.13823/head x 1.10(reserves) x Y x N = 0.152053 x Y x N(T$)

Annual total amount of haul of fish

= Y x N x (19.50 kg/1,000 kg) x (3.00/100) = 0.000585 x Y x N(tons)

Annual amount of income

= 0.000585 x Y x N x (T$2,670 x 0.70 + T$2,500 x 0.30)

= 1.532115 x Y x N(T$)

Therefore, in order to make the annual income amount exceeds the annual ground total amount of sailing operations expenses which are the sum of the above bait cost and amount of expenses assumed in "Step–5," the following inequality must be satisfied:

① In case of the Designed Vessel(9.5 knots of speed) and Fishing

operations 900 sea miles away x 1 time + Fishing operations 450 sea miles away x 3 times a year:

1.532115 x Y x N > 472,100 + 0.152053 x Y x N

When 193 days are substituted for N, ... Y >1,772.5

② In case of the Designed Vessel(9.5 knots of speed) and Fishing operations 450 sea miles away x 4 times a year:

1.532115 x Y x N > 471,400 + 0.152053 x Y x N

When 198 days are substituted for N, ... Y >1,725.1

③ In case of the Requested Vessel(8.0 knots of speed) and Fishing operations 900 sea miles away x 1 time + Fishing operations 450 sea miles away x 3 times a year:

1.532115 x Y x N > 452,100 + 0.152053 x Y x N

When 170 days are substituted for N, ... Y > 1,927.0

④ In case of the Requested Vessel (8.0 knots of speed) and Fishing operations 450 sea miles away x 4 times a year:

1.532115 x Y x N > 453,300 + 0.152053 x Y x N

When 180 days are substituted for N, ... Y > 1,824.8

8. Establishment of the size of proper fishing gear and trial calculation of annual sailing operations expenses("Step-7")

1) Establishment of minimum number of hooks in average per day

We would establish the minimum number of hooks in average which would make the annual sailing operations profitable, in other words, the average number of hooks per day which would satisfy the inequality established in "Step-6" as follows:

① Designed Vessel(9.5 knots of speed), Fishing operations 900 sea miles away x 1 time + Fishing operations 450 sea miles away x 3 times a year: 1,780 hooks/day

② Designed Vessel(9.5 knots of speed), Fishing operations 450 sea miles away x 4 times a year : 1,730 hooks/day

③ Requested Vessel(8.0 knots of speed), Fishing operations 900 sea miles away x 1 time + Fishing operations 450 sea miles away x 3 times a year : 1,930 hooks/day

④ Requested Vessel(8.0 knots of speed), Fishing operations 450 sea miles

away x 4 times a year : 1,830 hooks/day

2) Establishment of size of the monofilament type longline

There are following six kinds of the monofilament type fishing machinery and the size of fishing gear:

Reel dimensions (Diameter) x (width)	Length of main line (sea miles)(m)	Number of branch lines (40 – 50m space between lines)
36 inches x 72 inches	50 (92,600)	approx. 1,800 – 2,300 hooks
36 inches x 60 inches	41 (75,930)	approx. 1,500 – 1,850 hooks
36 inches x 48 inches	33 (61,120)	approx. 1,200 – 1,500 hooks
33 inches x 40 inches	21 (38,890)	approx. 750 – 950 hooks
30 inches x 36 inches	14 (25,930)	approx. 500 – 630 hooks
27 inches x 30 inches	10 (18,520)	approx. 360 – 450 hooks

The Ministry of Fisheries requested us originally the establishment of the largest type, 36 inches x 72 inches. However, as a matter of fact, the Designed Vessel is scheduled to implement the research fishing operations by applying both of the conventional type longline and monofilament type longline. Therefore, it is necessary to install both of the fishing machinery on the deck and consequently, we would be obliged to select either of enlarging the hull size so that the large type fishing machinery can be installed or the size of type of machinery of minimum necessity which can be installed in the limited space and also which is sufficient to maintain the sailing operations profitability. However, it is not desirable to enlarge the hull size only because of the factor, the selection of the fishing machinery. In addition, for establishing the type of the machinery and size of the fishing gear, it is considered inadequate to select a larger type of machinery for nothing by only having the sailing operations profitability in mind, when we consider that a case where those trainees who completed the training conducted on the Designed Vessel embark a monofilament type longliner in which case the most of the vessels covered will be small–sized ones.

In view of the above, it is judged adequate to select the size of the fishing gear having the maximum number of branch lines with approximately

1,500 hooks whose main line is of approximately 60,000m long for the cases of the Designed Vessel and the Requested Vessel. Meanwhile, it must be noted that this maximum number of hooks, 1,500 hooks, are not used everyday and, therefore, it is assumed that the number of hooks used per day in average will be approximately 1,300 hooks(an equivalent of approximately 87% of the maximum number of hooks).

3) Establishment of the conventional type longline fishing gear

Out of the four research fishing operations a year, two of each are conducted in the monofilament type longline and conventional type longline respectively. Therefore, if we assume that the number of hooks in average per day of the fishing gear of monofilament type longline is 1,300, the respective numbers of hooks required for the fishing gear of the conventional type longline can be obtained as follows:

① In case of Designed Vessel(9.5 knots of speed), Fishing operations 900 sea miles away x 1 time + Fishing operations 450 sea miles away x 3 times a year:
Number of hooks required per day
= (1,780 hooks x 4 times − 1,300 hooks x 2 times)/2 times
= 2,260 hooks/day

② In case of Designed Vessel(9.5 knots of speed), Fishing operations 450 sea miles away x 4 times a year:
Number of hooks required per day
= (1,730 hooks x 4 times − 1,300 hooks x 2 times)/2 times
= 2,160 hooks/day

③ In case of Requested Vessel(8.0 knots of speed), Fishing operations 900 sea miles away x 1 time + Fishing operations 450 sea miles away x 3 times a year:
Number of hooks required per day
= (1,930 hooks x 4 times − 1,300 hooks x 2 times)/2 times
= 2,560 hooks/day

④ In case of Requested Vessel(8.0 knots of speed), Fishing operations 450 sea miles away x 4 times a year:
Number of hooks required per day

= (1,860 hooks x 4 times − 1,300 hooks x 2 times)/2 times
= 2,420 hooks/day

When considering that the results of the M.V. LOFA were of the maximum number of hooks of 2,500 hooks/day and average number of hooks of 2,200 − 2,300, out of the above cases, the Designed Vessel will have almost same size of the fishing gear as the M.V. LOFA, on the other hand, for the Requested Vessel it would be necessary to assume the size of fishing gear of approximately 15% increased from that of the M.V. LOFA, with 2,900 − 3,000 hooks /day at maximum. It is well expected that the line casting once a day would become difficult in accordance with the significantly increased number of hooks and that such fishing gear would be an excessive one for this size of a fishing vessel.

Such being the situation, it is judged that the appropriate size of the fishing gear for the Designed Vessel and the Requested Vessel would be such fishing gear having the maximum number of branch lines with approximately 2,500 hooks and the main line of approximately 150,000m long(standard makeup: 5 branches for one basket and the main line of 300m long per basket making a total of 500 baskets).

It is assumed that the number of hooks to be used per day in average will be approximately 2,200(approximately 87% of the maximum number of hooks), but, for the research fishing operations 900 sea miles away, we would use approximately 2,400 hooks in average (approximately 96% of the maximum number of hooks) in order to prevent any deterioration in the profitability to be caused by the increased number of service sailing days and decreased number of the research fishing operation days.

4) Trial calculation of annual total amount of sailing operations expenses

Based on the establishment and calculation formulas in the above, the trial calculations of total annual number of hooks and annual bait cost for the respective cases of 1) Research fishing operations 900 sea miles away using the conventional type longline fishing gear with 2,400 hooks per day and 2) Research fishing operations 450 sea miles away using conventional type longline fishing gear with 2,200 hooks per day and using monofilament type longline fishing gear with 1,300 hooks per day are given below:

① In case of Designed Vessel (9.5 knots), Fishing operations 900 sea miles away x 1 time + Fishing operations 450 sea miles away x 3 times a year:

Annual total number of hooks = 2,400 hooks x 45 days + 2,200 hooks x 50 days + 1,300 hooks x 49 days x 2 times = 345,400 hooks

Annual bait cost = T$0.13823 x 1.10 x 345,400 heads = T$52,519.1 → T$52,600

② In case of Designed Vessel(9.5 knots of speed), Fishing operations 450 sea miles away x 4 times a year:

Annual total number of hooks = 2,200 hooks x 50 days x 2 times + 1,300 hooks x 49 days x 2 times = 347,400 hooks

Annual bait cost = T$0.13823 x 1.10 x 347,400 heads = T$52,823.2 → T$52,900

③ In case of Requested Vessel(8.0 knots of speed), Fishing operations 900 sea miles away x 1 time + Fishing operations 450 sea miles away x 3 times a year:

Annual total number of hooks = 2,400 hooks x 38 days + 2,200 hooks x 44 days + 1,300 hooks x 44 days x 2 times = 302,400 hooks

Annual bait cost = T$0.13823 x 1.10 x 302,400 heads = T$45,980.8 → T$46,000

④ In case of Requested Vessel(8.0 knots of speed), Fishing operations 450 sea miles away x 4 times a year:

Annual total number of hooks = 2,200 hooks x 45 days x 2 times + 1,300 hooks x 45 days x 2 times = 315,000 hooks

Annual bait cost = T$0.13823 x 1.10 x 315,000 heads = T$47,896.7 → T$47,900

If we sum up the above bait cost and other expenses obtained in "Step -5," we can get the following total expenses of sailing operations:

Unit: T$ (Tongan Dollar)

Item	Designed Vessel(9.5 knots)		Requested Vessel(8.0 knots)	
	900 sea miles x 1 time + 450 sea miles x 3 times	450 sea miles x 4 times	900 sea miles x 1 time + 450 sea miles x 3 times	450 sea miles x 4 times
① Expenses for fuel and other oils 1) Fuel expenses	146,300	145,700	128,900	130,000
2) Expenses for lubrication and haydraulic oil	22,000	21,900	19,400	19,500
Total of expenses for fuel oil, etc.	168,300	167,600	148,300	149,500
② Bait cost	52,600	52,900	46,000	47,900
③ Other expenses 1) Crew expenses	170,000			
2) Fishing gear expenses	10,000			
3) Foods and water expenses	24,300			
4) Expenses for maintenance and repairing	31,000			
5) Agent commissions	8,000			
6) Ground administration expenses	2,000			
7) Warehouse charges and customs expenses	3,000			
8) Insurance premium covering the hull and crew	51,500			
9) Miscellaneous expenses	4,000			
Total of other expenses	303,800			
Annual total sailing expenses	524,700	524,300	498,100	501,200

9. Trial calculation of annual amount of haul of fish and amount of income based on the proper size of fishing gear ("Step-8")

If we make trial calculations of the annual amount of haul of fish and amount of income by using the figures and formulas obtained so far up to "Step-7," the following will be obtained:

Item	Designed Vessel(9.5 knots)		Requested Vessel(8.0 knots)	
	900 sea miles x 1 time + 450 sea miles x 3 times	450 sea miles x 4 times	900 sea miles x 1 time + 450 sea miles x 3 times	450 sea miles x 4 times
① Total of annual fish hooks to be used (Referred from "Step – 7," 4.) (hooks)	345,400	347,400	302,400	315,000
② Annual haul of fish (tons)	202.059	203.229	176.904	184.276
③ Total of annual income	T$529,192.5 ↓ T$529,200	T$532,256.8 ↓ T$532,300	T$463,311.6 ↓ T$463,400	T$482,616.2 ↓ T$482,700

10. Summary of annual sailing operations profitability("Step–9")

If we make trial calculations of the annual sailing operations profitability by using the figures obtained in "Step–7" and "Step–8," the following will be obtained:

Unit: T$ (Tongan Dollar)

Item	Designed Vessel(9.5 knots)		Requested Vessel(8.0 knots)	
	900 sea miles x 1 time + 450 sea miles x 3 times	450 sea miles x 4 times	900 sea miles x 1 time + 450 sea miles x 3 times	450 sea miles x 4 times
① Annual income	529,200	532,300	463,400	482,700
② Total of annual sailing expenses	524,700	524,300	498,100	501,200
③ Annual net income/loss (▲ indicates loss.)	+4,500	+8,000	▲34,700	▲18,500

As a result of the above study, it was found that the sales income would be difficult to cover enough the sailing operations expenses unless we make the size of the fishing gear much larger since the speed and fuel tank capacity of the Requested Vessel cannot sufficiently ensure the research fishing operations. On the other hand, in the case of the Designed Vessel, the sailing operations expenses will be fully covered by furnishing with the same size of the conventional type longline fishing gear as for the M.V. LOFA and middle–sized monofilament type longline fishing gear

11. Establishment of proper fuel tank capacity ("Step–10")

Establish the proper fuel tank capacity of the Designed Vessel from the

fuel consumption amount required for the longest one service sailing.

① In the case of Fishing operations 900 sea miles away x 1 time + Fishing operations 450 sea miles away x 3 times a year:
Fuel tank capacity required = 120.566 KL/(0.93 x 0.90)
= 144.05 → approx. $145m^3$

② In the case of Fishing operations 450 sea miles away x 4 times a year:
Fuel tank capacity required = 118.755 KL/(0.93 x 0.90)
= 141.88 → approx. $142m^3$

In view of the above, it is adequate to establish the proper fuel tank capacity of the Designed Vessel as approx. $145m^3$. Meanwhile, the cruising radius of the Designed Vessel for performing the service sailing only by using this size of fuel tank can be calculated as follows by using the fuel consumption amount per day for performing the service sailing as obtained in "Step–1."

Cruising radius = ($145m^3$ x 0.93 x 0.90/2.626 KL/day) x 9.5 knots x 24 hours
= 10,537.4 → approx. 10,500 sea miles

12. Consideration and conclusion ("Step–11")

With regard to the annual sailing operations expenses and income amount, the comparison of the resultant figures of the M.V. LOFA based on the materials provided by he Ministry of Fisheries and the assumed figures of the Designed Vessel is given below. Out of the resultant figures of the M.V. LOFA, the expenses indicated are those of the average figures for the period from 1983 to 1990, while the income amounts indicated are those for the period from 1982 to 1992.

(Item)	(Resultant figures of LOFA)	(Assumed figures of Designed Vessel)
Expenses of fuel and other oils	T$117,568	approx. T$168,000
Bait cost	T$ 50,157	approx. T$ 53,000
Other expenses	T$271,568	approx. T$303,800

Income amount	T$611,285	approx. T$530,000
Export rate (in terms of amount)	approx. 83%	approx. 71.4%

Since we have assumed the expenses of the Designed Vessel at a rather higher one, actual expenses will not exceed significantly the above figures unless there happens a sharp rise in the unit price of fuel. On the other hand, some increase in the amount of income might be expected due to such factors as the increase in export ratio, improved sales performance due to sales and catch of such fish whose unit price is higher, increase in the number of hooks in average and improved CPUE and increased weight of fish to be brought by the exploration of good fishing grounds. Therefore, the expected profitability of the annual sailing operations under this study has a good chance of realization or rather better performance might be expected.

The conclusion of this section is given below:

1) Proper size of fishing gear
   a) Size of conventional type longline fishing gear: Maximum number of branch lines(number of hooks) -- approx. 2,500 hooks with the main line of approx. 150,000m long
   b) Size of monofilament type longline fishing gear: Maximum number of branch lines(number of hooks) -- approx. 1,500 hooks with main line of approx. 60,000 m long
2) Proper capacity of fuel tank: approx. 145m^3

Procedure – III Establishment of proper fish hold capacity and quick freezing capacity

1. Fish hold capacity

1) Stowage factor of fish hold

According to the standards of the Japanese Fishery Agency, the stowage factor of the frozen tuna is 0.53 tons/m^3 and that of the frozen bonito is 0.63 tons/m^3 respectively. Although in the case of the Designed Vessel, the covered fishes are mostly tuna, we would assume the average stowage factor is 0.55 tons/m^3 since a variety of fishes in size are mixed in the haul.

2) Amount of haul of fish per voyage expected for the purpose of calculation of sailing operations profitability and the fish hold capacity required

a) In the case of research fishing operations 900 sea miles away:

Amount of haul of fish = 2,400 hooks x 45 days x CPUE, 3.0/100 x average fish weight, 0.0195 tons = 63.18 tons

Fish hold capacity required = 63.18 tons/0.55 = 114.9m^3

b) In the case of research fishing operations 450 sea miles away:

Amount of haul of fish = 2,200 hooks x 50 days x CPUE, 3.0/100 x average fish weight, 0.0195 tons = 64.35 tons

Fish hold capacity = 64.35 tons/0.55 = 117.0m^3

3) Maximum haul of fish assumed per voyage and the fish hold capacity required

The above amount of haul of fish is the average amount expected and we have to consider the maximum capacity to be required as much as expected for establishing the size of the facilities. Therefore, we would assume that the number research fishing operations days as 50 days and fish weight as 0.020 tons/head as well as the number of hooks and CPUE respectively modified as shown below:

a) In the case of 2,500 hooks and the CPUE, 3.0/100:

Amount of haul of fish = 2,500 hooks x 50 days x (3.0/100) x 0.020 tons
= 75 tons

Fish hold capacity required = 75.00 tons/0.55 = 136.4m^3

b) In the case of 2,200 hooks and the CPUE, 3.5/100:

Amount of haul fish = 2,200 hooks x 50 days x (3.5/100) x 0.020 tons
= 77 tons

Fish hold required = 77.00 tons/0.55 = 140.0m^3

4) Establishment of proper fish hold

In the case of the maximum haul of fish assumed, it is not necessary to be always prepared for holding all of the fish so caught in the fish hold and some of the fish can be held in the quick freezing room and preparation room as describe later. Therefore, it would be appropriate to establish the fish hold capacity as approximately 130m^3 same as of the M.V. LOFA. Meanwhile, the possible insufficient capacity in the above case and the corresponding weight amount of the haul of fish are given below:

- In the case of 75 tons of haul of fish:
  Insufficient capacity – approx. 6.4m^3
  Correspondent weight amount of haul of fish – approx. 3.5 tons
- In the case of 77 tons of haul of fish:
  Insufficient capacity – approx. 10.0m^3
  Corresponding weight amount of haul of fish – approx. 5.5 tons

5) Regarding the proper cooling temperature

The cooling temperature of the fish hold of the M.V. LOFA is –30°C. and the intention of the Ministry of Fisheries is that the same temperature as of the M.V. LOFA is acceptable, we will decide it at –30°C.

2. Quick freezing capacity and the capacity of the freezing preparation room

1) Stowage factor

According to the standards established by the Japanese Fishery Agency, the stowage factor of the fish caught is for the available space capacity for storing in the quick freezing room and 0.35 tons/m^3 for the freezing preparation room. Therefore, we will adopt this figure in this study.

2) Assumed amount of haul of fish per day

a) Results of the M.V.LOFA:

Average for the period from 1982 to 1992: 1.624 tons/day

Average in 1994: 1.456 tons/day

Average in 1995: 1.105 tons/day

b) Assumed amount of haul of fish for the purpose of calculating sailing operations profitability

Amount of haul of fish

= 2,500 hooks x CPUE, 3.0/100 x average fish weight, 0.0195 tons

= 1.4625 tons/day

c) Assumed maximum amount of haul of fish:

When we would consider the maximum number of hooks as 2,500 hooks, the CPUE as 3.50/100 and average fish weight as 20.0 kg,

Amount of haul of fish = 2,500 hooks x (3.50/100) x 0.020 tons

= 1.75 tons/day

When we would consider the CPUE is improved to 4.0/100,

Amount of haul of fish = 2,500 hooks x (4.00/100) x 0.020 tons

= 2.00 tons/day

3) Establishment of proper quick freezing capacity

The freezing capacity of the M.V. LOFA is 1.5 tons x 2 rooms(−40°C.) and in some cases, the amount of haul of fish per day exceeded the storage capacity in the past. In such a case, it was assumed that the haul of fish was divided to two freezing rooms. But, in preparation for the haul of fish expected in the following day, it might be considered that some of a part of the haul of fish was moved to the fish hold in an incomplete condition of freezing in some instances.

In connection with the Designed Vessel, it is desirable that the storage capacity of another room is reserved for the haul of fish of the following day on the assumption that the storage capacity of one room corresponds to that of the maximum amount of haul of fish assumed. And as to the freezing temperature, the freezing temperature of the M.V. LOFA is −40°C, and the intention of the Ministry of Fisheries is that the same temperature as of the M.V. LOFA is acceptable. Therefore, we would presume that it will be appropriate to establish as follows:

Storage capacity per room, 2.0 tons x 2 rooms

Freezing temperature: −40°C/36 hours (the capacity to reduce the fish

body temperature to −40°C. within 36 hours)

In connection in the above, approximately 35m^3 of cubic volume is required as a space to satisfy the above amount of storage and freezing capacity(including the space for the freezing shelf, cooling fan, etc.).

4) Establishment of cubic volume of proper freezing preparation room and cooling temperature

In relation to establishment of the above-mentioned quick freezing room, a preparation room will become necessary for carrying in and out the fish caught and it is assumed that the cubic volume required will be approximately 15m^3 in consideration of the arrangement of surrounding equipment/facilities. With regard to the cooling temperature, −25°C. (same temperature as of the M.V. LOFA) is appropriate for maintaining the degree of freshness of the fish caught during the time of work being conducted for the fish.

5) With regard to the stowage tonnage of fish caught in the quick freezing room and preparation room

The stowage tonnage can be obtained as follows by applying the stowage factor based on the standards described in the above:

Quick freezing room: 2.00 tons x 2 rooms = 4.00 tons
Preparation room: 15m^3 x 0.35 = 5.25 tons
Total: 9.25 tons

The above storage tonnage is sufficient to cover any insufficiency in the fish hold (the corresponding amount of fish caught is approx. 5.5 tons) in the case of the maximum amount of haul of fish per voyage described in the above.

3. Conclusion

The conclusion of this section is as follows:

1) Proper fish hold capacity and cooling temperature: approx. 130m^3, −30°C.

2) Proper quick freezing capacity and freezing temperature: approx. 2.0 tons x 2 rooms, $-40°C$/36 hour

3) Proper cubic volume of the freezing preparation room and cooling temperature: approx. $15m^3$, $-25°C$.

Procedure – Ⅳ Establishment of proper rooming accommodations and fresh water related facilities

1. Rooming accommodations

1) Fixed number for the accommodations

The number of the trainees will be six based on the training program. The total number of crew will be twenty based on the crew list prepared by the Ministry of Fisheries consisting of six officer–class crew (Captain/Chief Fisherman, Chief Engineer, Chief Mate, Second Engineer, Radio Officer and Analyzer of Data Collected) and fourteen general crew members. Therefore, the maximum capacity of the Designed Vessel is twenty–six, same capacity as that of the M.V. LOFA.

2) Arrangement of rooms

The arrangement of rooms of the M.V. LOFA consists of 2 rooms for 1 each and another 2 rooms for 2 each for officers on the poop deck and 1 room for 8 and another 1 room for 12 on the upper deck which are located beneath the poop deck for the use of the general crew members and trainees. However, for the Designed Vessel, it is appropriate to arrange 2 rooms for 6 each and 1 room for 8 for the general crew members and trainees due to the following reasons but as to the composition of the rooms for officers, leaving it intact taking consideration of the request made by the Ministry of Fisheries for the improvements in the rooming accommodations:

a) In view of the fact that the number of the trainees is six, it is desirable to establish a separate room for six so that those of the same level can live together rather than living in the same room on the Vessel with the senior crew members with reservations all the time for a long period of voyage.
b) In case of a room for ten or more, there are some apprehensions that someone on the bed at the other end of the room may have a difficulty in escaping from the room at the time of emergency such as an accident or power failure because of some distance from the exit door.
c) When we consider about the living conditions of the room, it is desirous to increase the number of rooms for fewer people to live in, but it will necessitate to increase the size of the hull significantly. Therefore, the

above composition will be the limit allowable in view of the size of the Designed Vessel.

3) Other living related facilities

In accordance with the expansion of sea areas for the research fishing operations to be conducted and partly paying attention to the desire expressed by the Ministry of Fisheries, the air conditioning equipment and heated water supplying facilities for showers are also required since the Vessel goes down as far as to the sea areas up to around 35°–36°S off Tonga's EEZ. In the meantime, no air conditioning equipment nor heated water shower facilities are furnished with in the M.V. LOFA.

2. Fresh–water related facilities

1) Design conditions and present situations of the M.V. LOFA and policy for the Designed Vessel

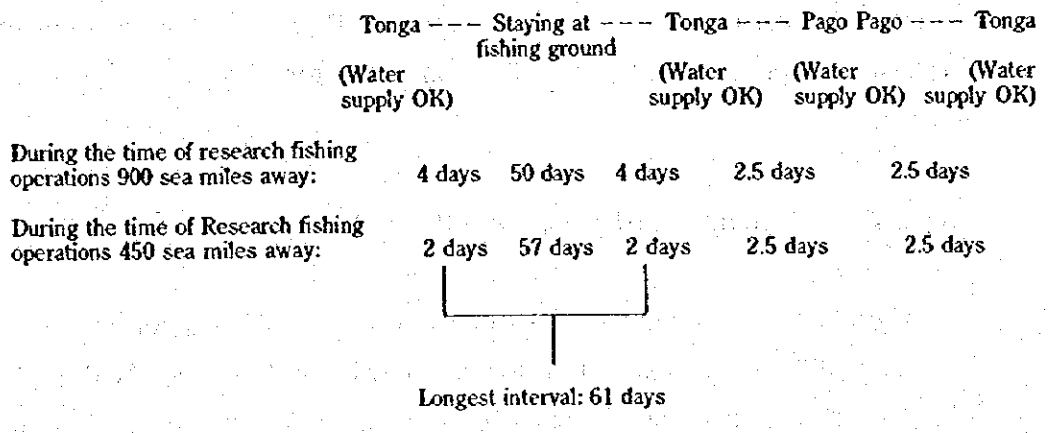
In the case of the M.V. LOFA, the fresh water generator was not equipped and the size of the fresh water tank was set for the volume of 30 days' use based on the intention expressed by the Tonga authorities at the time of planning. In accordance with the above, the capacity of the fresh water tank was obtained from the following formula by using the standards of the Japanese Fishery Agency ($0.020m^3$/person/day):

26 persons x $0.020m^3$ x 30 days x 1.1(reserves)
= $17.16m^3$ → Actual capacity $17.34m^3$

However, it was found out in the field study of the Designed Vessel that the fresh water was extremely insufficient in the M.V. LOFA and that the available fresh water was only for the use of cooking and drinking thus forcing the people on the vessel to use sea water for all of other uses such as for showers and washing. Such being the situation, it proved to be undesirable as the living environment for a long term of voyage. Therefore, partly paying attention to a desire expressed by the Ministry of Fisheries, it also became necessary to furnish the Designed Vessel with a fresh water generator since it was expected that should a larger fresh water tank be installed than that of the M.V. LOFA it would necessitate larger hull which

was unrealistic in the light of the size of the hull of the Designed Vessel.

2) With regard to the interval period between the times of water supply available from the land



When we suppose to keep all of the fresh water for 61 days' use in a fresh water tank without having a fresh water generator and applying the same standards for the M.V. LOFA, the capacity of the fresh water tank required can be calculated as follows:

26 persons x 0.020 m^3 x 61 days x 1.1 (reserves) = 34.89 m^3

Although the above cubic volume represents approximately two times of that of the M.V. LOFA, the insufficient volume of the fresh water tank capacity is the same amount as that of the M.V. LOFA. Therefore, it will be required to increase its capacity furthermore actually. But, the significant increase in the capacity of the fresh water tank would necessitate to squeeze the sizes of the fuel tank, fish hold, living area and engine room. Consequently, the installation of a fresh water generator is inevitable for the Designed Vessel.

3) Trial calculation of the fresh water tank capacity and ability of the fresh water generator

The capacity of the fresh water tank is to be assumed as 120% of that of the M.V. LOFA and the equivalent amount of 10% of the full load of the fresh water must be left as the residual water before receiving the water supply.

In other word, usable amount of the fresh water in the tank will be $20m^3$ x 0.90 = 18 tons. When we would assume the use amount of the fresh water as $0.060m^3$/person/day (three times of that of the standard of the Japanese Fishery Agency) in consideration of the use of water for cooking, drinking, shower, washing and some other miscellaneous purposes, the amount of the fresh water for one voyage of the longest interval can be calculated as follows:

26 persons x $0.060m^3$ x 61 days = 95.16 → 95.2 tons

Therefore, the amount of the fresh water generation required per day in average will be (96.2 tons – 18.0 tons)/61 days = 1.282 tons. With regard to the fresh water generation ability of the generator, when we assume its average efficiency as 65% in consideration of the deteriorated efficiency in generating fresh water in the high temperature water region and also making an assumption that there would be a case in which generating fresh water becomes difficult at the time of suspension of the main engine, too, the ability can be calculated as follows:

Rated capacity of fresh water generator
= 1.282 tons/0.65 = 1.972 → approx. 2.0 tons/day

4) Ballast tank

In case of a tuna longliner, there happens some troubles in sailing and fishing operations caused by an excessive stern trim depending upon the conditions of the loaded cargo. Therefore, we will furnish the Designed Vessel with a ballast tank at the bow in the same manner as the M.V. LOFA for correcting the trim as necessary.

With regard to the piping and painting of the ballast tank, they must be usable for loading fresh water at the time of departure for a voyage in preparation for an emergency of insufficient fresh water which might occur. The above is also requested by the Ministry of Fisheries. As to its capacity, we assume that approximately $8m^3$ would be appropriate for it although it is related to the location of its installation as well as the capacity of other tank.

3. Conclusions

The conclusions of this section are given below:

1) Rooming accommodations:

The room composition will be 2 rooms for 1 each, 2 rooms for 2 each, 2 rooms for 6 each and 1 room for 8 with air conditioners and heated water showers being furnished.

2) Proper fresh water tank capacity: approx. $20m^3$

3) Fresh water generator:

1 unit is to be furnished having rated capacity of approx. 2 tons/day

4) Ballast tank:

A ballast tank having a capacity of approx. $8m^3$ will be furnished at the bow and it must be the one which can be used for both sea water as well as fresh water.

Procedure – V Establishment of proper principal dimensions

1. Principal dimensions

1) Length (the M.V. LOFA: Length overall (Loa) = 37.00m, and Length between perpendiculars (Lpp) = 31.00m)

The results of comparison between the Designed Vessel and the M.V. LOFA are given bellow:

① With regard to the arrangement beneath the upper deck:

a) The increased fresh water tank capacity ($17.34m^3 \rightarrow$approx. $20m^3$) will substitute for the capacity of the stern ballast tank of the M.V. LOFA which will be abolished.

b) With regard to the engine room, although the horsepower of the engine will be increased, it is expected that the engine will be more compact one than that of the old one, and thus, no increase in its length is expected fundamentally. However, as described later, the space on the upper deck for the engine will become tight, we will make efforts to secure the space for the maintenance work by allocating the space available in the engine room beneath the upper deck as much as possible after securing the space for the fish hold and fuel tank capacity.

c) With regard to the length of the fish hold, since its capacity is almost same ($128.06m^3 \rightarrow$ approx. $130m^3$) , we assume same length for the Designed Vessel as that of the M.V. LOFA

d) In accordance with the increased capacity of the fuel tank($126.65m^3 \rightarrow 145m^3$), it is necessary to increase the length of the deep tank at the bow by approximately 1m. And, the increased portion of the capacity of the fish hold brought by the increase in the width and depth of the vessel as described later, we will secure the capacity of the fuel tank by distributing such increased portion to it through increasing the height of the double bottom.

② With regard to the arrangement above the upper deck:

a) Because of the improvements to be made in the composition and arrangement of the rooms for the general crew and trainees, an

increase by approximately 1m will become necessary. We would assume that the increase in length can be reduced to 0.5m by relocating the lavatory from its present location of the M.V. LOFA to some upper location and by changing the arrangements of some facilities and equipment around there.

b) With regard to the space for the engine, we would assume an increase of approximately 0.5m of length since some sewage treatment equipment conforming to the USCG regulations, fresh water generator, heated water supply facilities for showers, etc. will be newly furnished even though we will endeavor to relocate the expected equipment and apparatus to be installed to some place beneath the upper deck as much as possible.

c) Although the capacity of the quick freezing room and freezing preparation room will be slightly increased, we would assume the length will be almost same since some increase can be expected in the width of the Vessel which will absorb such increase as described later.

d) With regard to the working space, an increase by approximately 1m of length is desirable in accordance with the combined use of the conventional type longline and monofilament type longline, we would assume the increase in length can be squeezed to approximately 0.5m through some effective arrangement of these two fishing equipment. However, we will make every effort to expand the working space as much as possible by devising the length and location of the fore castle.

③ With regard to the arrangement on the poop deck

We will establish the rooming region, the length of the main line tank, etc. almost same as that of the M.V. LOFA basically.

As a result of the above, it is adequate to establish the proper lengths for the Designed Vessel as those shown below:

Length overall(Loa) = approx. 39.50m
Length between perpendiculars(Lpp) = approx. 33.50m

2) Breadth moulded (the M.V. LOFA: Breadth moulded B = 7.00m)

When we would assume, by giving considerations to the length mentioned in the above and the speed efficiency, cubic volume, stability, etc. and by referring to the data of the vessels actually obtained, Lpp/B = approx.4.45, we can obtain B = 33.5/4.45 = 7.53. However, in consideration of the convenience of the engineering work at the construction site, establish the proper breadth moulded as approx.7.50m in the unit of 0.10m.

3) Depth moulded and designed full loaded draft (the M.V. LOFA: Depth moulded D = 2.70m, Designed full loaded draft d = 2.30m)

When we would assume, by giving considerations to the breadth moulded mentioned in the above and the cubic volume, stability, etc. and by referring to the data of the vessels actually obtained, B/D = approx.2.45, we can obtain D = 7.50/2.45 = 3.06. However, in consideration of the convenience of the engineering work at the construction site, establish the proper depth moulded as approx. 3.10m in the unit of 0.10m. And, as to the designed full loaded draft, establish it as approx. 2.70m for securing the freeboard and stability.

2. Full loaded displacement and coefficient

Since it is anticipated that the largest displacement will be attained at the time of departure with full load, we would study on this situation.

1) Light weight: approx. 300 tons

Assumed figure from the light weight of similar vessel	approx. 290 tons
Increased thickness of the bottom shell plate and keel (for lowering the center of gravity and as anti-corrosion measures)	approx. 8 tons
Total	approx. 298 tons → approx. 300 tons

2) Dead weight: approx.195 tons

Crew and effect (26 persons x 150kg)	3.9 tons
Foods (26 persons x 61 days x 3kg)	4.8 tons
Fresh water ($20m^3$ x 1.0)	20.0 tons
Fuel oil ($145m^3$ x 0.93 x 0.85)	114.6 tons
Lubricant (Presumption)	5.0 tons

Water & oil in engine room (Presumption)	4.0 tons
Ballast water (in fore peak tank, 8.0m^3 x 1.0)	8.0 tons
Stores (Presumption)	3.0 tons
Fishing gear (conventional type) (Presumption from actual figures, 150,000m long main line with 2,500 hooks.)	13.0 tons
Fishing gear (monofilament type) (Referred from catalogue. If it is not loaded, it will be a reserve.)	2.0 tons
Bait (80g x 2,500 heads x 50 days x 1.1)	11.0 tons
Others and reserves	5.0 tons
Total	194.3 tons → approx. 195 tons

3) Displacement at the time of departure with full load:

Light weight + Dead weight = 300 tons + 195 tons = approx. 495 tons

4) Block coefficient(Cb):

The block coefficient which represents the degree of stoutishness of the vessel can be obtained by the following formula:

Cb = (Full loaded displacement − Shell plate displacement)/Sea water specific gravity/(Lpp x B x d)

Assuming the shell plate displacement as 3.0 tons and the sea water specific gravity as 1.025, and substituting the figures obtained in the above items for the above formula, we can obtain (495t − 3t)/1.025/(33.50m x 7.50m x 2.70m) = 0.7076. Therefore, it will be adequate to plan that the block coefficient(Cb) is approximately 0.70.

3. International gross tonnage

The international gross tonnage can be obtained by giving "V" as the total of the cubic volume beneath the upper deck and the cubic volume of the enclosed portion above the upper deck and using the following formula;

Iinternational gross tonnage(tons) = V x (0.2 + 0.02 x log V)

Now, the international gross tonnage of the Designed Vessel are as follows:

Cubic volume beneath the upper deck	
Portion under D=3.10m: 33.5 x 7.5 x 3.1 x 0.73 =	approx. 569m^3
Portion by shear: 39.5 x 7.5 x 0.9 x 0.5 x 1/4 =	approx. 33m^3
Portion by camber: 39.5 x 7.5 x 0.9 x 0.1 x 2/3 =	approx. 18m^3
Cubic volume of poop deck: 21.5 x 7.5 x 2.3 =	approx. 371m^3
Cubic volume of fore castle: 7.0 x 5.6 x 2.0 =	approx. 78m^3
Cubic volume of deck house: 18.0 x 5.0 x 2.2 =	approx. 198m^3
Others(funnel, hatch, etc.):	approx. 12m^3
Total cubic volume	approx. 1,279m^3 → approx. 1,280m^3

International gross tonnage = 1,280 x (0.2 + 0.02 x log 1,280)
= 335.5 → approx.335 tons

4. Conclusions

The summary of the conclusions of this section and those obtained so far up to the preceding section is given below:

Length overall(Loa):	approx. 39.50m
Length between perpendiculars(Lpp):	approx. 33.50m
Breadth moulded(B):	approx. 7.50m
Depth moulded(D):	approx. 3.10m
Designed full loaded draft(d):	approx. 2.70m
Full loaded displacement:	approx. 495 tons
Block coefficient(Cb):	approx. 0.70
International gross tonnage:	approx. 335 tons
Service speed:	approx. 9.5 knots
Main engine:	approx. 600 horsepower x 1 unit
Electric generator:	approx. 200 horsepower x 2 units
Conventional type longline fishing gear:	2,500 branch lines with a main line of approx. 150,000m long
Monofilament type longline fishing gear:	1,500 branch lines with a main line of approx. 60,000m long
Cubic volume of fish hold:	approx. 130m^3
Cubic volume of quick freezing room:	approx. 35m^3

Quick freezing capacity:	2 tons/36 hours x 2 rooms
Cubic volume of preparation room:	approx. 15m^3
Cubic volume of fuel tank:	approx. 145m^3
Cubic volume of fresh water tank:	approx. 20m^3
Cubic volume of ballast tank:	approx. 8m^3
Fresh water generator:	approx. 2 tons/day x 1 unit
Complement:	26 persons (20 crew and 6 trainees)

2-3-2 Basic Design (continued)

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(2) Basic design of the machinery/equipment furnished

In accordance with the design concept of the machinery/equipment furnished, the following shows the basic design of the major machinery/equipment:

Item	Specifications	Quantity	Use purpose
(1) Deck machinery			
1) Windlass	Electro-hydraulic type 3t x 15m/min.	1 unit	Dropping/weighing anchor at the time of anchorage
2) Capstan	Electric type, 3t x 15m/min., 3.7kw	1 unit	Rolling up of mooring rope
3) Steering gear	Electro-hydraulic type 2 ton-m, 1.5kw	1 unit	Steering of the vessel
4) Tender boat	FRP made, 5m long, 15 h.p.	1 vessel	Transportation of crew/personnel in a port
5) Cargo hoist	Electric type, 0.9t x 20m, 5kw	2 units	Unloading of fish caught
(2) Conventional type longline			
1) Line hauler	Electro-hydraulic type 11 - 261m/min.	1 unit	Hauling up of main line
2) Line caster	Electro-hydraulic type max. 600m/min.	1 unit	Casting of main line
3) Line arranger	Electro-hydraulic type max. 185,000m	1 unit	Arranging of main line in the main line box
4) Branch line reel	Electric type, 157m/min., 0.75kw	2 units	Reeling up of branch lines
5) Line conveyor	Electric type, 25m/min., 2.2kw	1 unit	Transporting of branch lines from the bow to stern
6) Bow slow conveyor	Electric type, 2 - 7m/min.,0.4kw	1 unit	Transporting of main line
7) Stern slow conveyor,	Electric type, 2 - 7m/min., 0.4kw	1 unit	Transporting of branch lines
8) Dyeing machine	Electrically powered type, 2kw	1 unit	Tar dyeing of main line and branch lines to increase their durability
9) Fishing gear	Polyester made	1 set	
branch lines	3.9mm, 5 - branch x 500 baskets = 2,500 branch lines		Fixing fish hooks at the tips
main line	6.0mm, 150,000m long		Fixing branch lines

Item	Specifications	Quantity	Use purpose
(3) Monofilament type long line			
1) Main line reel	Electro-hydraulic type 36 inches x 48 inches	1 unit	Reeling up of main line
2) Line caster	Electro-hydraulic type LS-4 type	1 unit	Casting of main line
3) Fishing gear	Nylon monofilament made	1 set	
branch liness	2.0mm, 20-branch x 75 baskets = 1,500 branch lines		Fixing fish hooks at the tips
main line	3.6mm, 60,000m long		Fixing branch lines
(4) Research equipment			
1) Current meter	3-stratum-ultrasonic wave type, CRT display, for 200m depth-sounding with sailing speed indicator furnished	1 unit	Measures the speed and direction of the current and maintains appropriate shape of the longline.
2) Fish finder	Color, two-wave cycle for 2,000m depth sounder	2 units	Finding of schools of fish. 2 units being installed in view of its essential nature for the research operations.
3) Mid-depths sea water thermometer	Recording type, with cable of 300m long with an electric winch installed	1 unit	Researches the relationship between the mid-depths sea water temperature and the inhabitant tuna species.
4) Surface sea water thermometer	Electronic type automatic counter balance thermometer	1 unit	Researches the relationship between the surface sea water temperature and inhabitant tuna species.
(5) Refrigeration facilities			
1) Quick freezing facilities	Semi-air blast and freezing shelf system Capacity:2tons/36hrs.	2 rooms	2 rooms are used alternately so that the fish caught can be frozen completely and efficiently.
2) Refrigeration compressor	Reciprocal two-step type compressor 37kw x 1 unit and 30kw x 1 unit Refrigerant: Freon 22 Temperature condition: In fish hold -30°C. In freezing room -40°C. In preparation room -25°C.	2 units	Compressing the medium for refrigerating and keeping the fish caught. All two of them are used at the time of freezing while one at the time of cooling.
3) Fish hold thermometer	Recording type with 12 measuring points furnished	1 unit	Temperature control of the temperature in the fish hold and freezing room

Item	Specifications	Quantity	Use purpose
(6) Life saving & accommodation equipment			
1) Life rafts	Inflatable type for 15 persons each	2 rafts	For survival use at the time of emergency. Furnished one each at the both sides of the vessel in accordance with the regulations.
2) Life jackets	Solid type	26 pieces	For survival use at the time emergency. Furnished for the complement of the vessel.
3) Cooking range	Oil burning type	1 unit	For cooking use
4) Refrigeration compressor for provision	Reciprocal type, R-22, 1.5kw	1 unit	For cooling foods
5) Air conditioner	Compressor 5.5kw, ventilator 1.5kw, heater 8 kw	1 unit	For air conditioning and heating
(7) Engine room machinery			
1) Main engine	4-cycle low speed diesel engine. Max. output: approx. 600 PS	1 unit	For propelling the vessel
2) Propeller	4-bladed propeller with fixed pitch Diameter: approx. 1.85m	1 unit	For propelling the vessel
3) Electric generating engine	4-cycle high speed diesel engine approx. 200 PS x 1,500rpm	2 units	For operating the electric generator
4) Electric generator	approx. 170KVA (136kw)	2 units	For supplying power in the vessel
5) Electric generator in a port	approx. 10PS x 6.5KVA	1 unit	For supplying power at the time of anchorage, mostly for lighting. This generator is used for fuel saving.
6) Fresh water generator	Distillation type, 2 tons/day	1 unit	For supplying fresh water for living use in the vessel.
7) Water heating equipment	Electric type, 5kw	1 unit	For shower use.
	Waste heat utilization type $0.48m^2$	1 unit	For shower use. During the service sailing, the heated water using the waste heat of the main engine is supplied.
8) Bilge separator	International standard compliance type $0.25 - 0.30m^3/h$, 15ppm	1 unit	Prevents sea water pollution due to discharging waste oil/water.

Item	Specifications	Quantity	Use purpose
(8) Electric installation			
1) Main switchboard	Drip proof, self standing type AC420V, 50Hz	1 unit	Distribution of electricity in the vessel.
2) Search light	AC240V, 3kw	2 units	2 units are required for securing the safety at the time of going into and out from a port at night as well as for lightening the both sides of the vessel.
3) Public addressor	Total-back system, 50w	1 unit	For broadcasting in the vessel.
4) Internal telephone	Wall-hang type, 3 circuits	1 set	For communications between the wheel house, mess room, engine room and steering gear room.
(9) Navigation/ radio equipment			
1) Gyro compass	With automatic steering equipment installed	1 unit	An ectropometer. At the time of service sailing, an automatic steering system is used.
2) Magnetic compass	Desktop type with card diameter of 180mm used	1 unit	An ectropometer. Furnished in accordance with regulations.
3) Air horn	Air using type	1 unit	For giving a warning to any approaching vessel. Furnished in accordance with the regulations.
4) Clear view screen	Diameter of 300mm	1 unit	For securing the visual range at the time of sailing during rainy weather.
5) Anemometer	Propeller-used electric generator type	1 unit	For measuring the wind direction and wind speed.
6) Day light signal light	Portable type	1 unit	Flash signal at the time of emergency. Furnished in accordance with the regulations.
7) Rudder angle indicator		1 unit	The actual rudder angle is displayed in the wheel house.
8) Engine telegraph		1 unit	Directs the engine room from the wheel house the operation mode of the main engine.
9) GPS	With a plotter installed	1 unit	Measuring its own position.
10) Direction finder	200KHz - 13.5MHz	1 unit	Measures the direction of the radio buoy for fishing work.

Item	Specifications	Quantity	Use purpose
11) Weather facsimile	Synthesizer type, 8 inches	1 unit	Receiving weather chart
12) Radar	X band, 25kw, 12 inches	2 units	Measures the relations with land and approaching other vessel(s) as to the distance and direction as well. 2 units are furnished in view of its essential nature of the equipment for securing safety.
13) MF/HF radio communication equipment	Complying with GMDSS, 250W	1 unit	For long-distance telecommunications
14) VHF radio telephone	Complying with GMDSS, 25W	2 units	For short-distance telecommunications
15) NAVTEX receiver	Complying with GMDSS	1 unit	Automatically receives sailing information
16) INMARSAT C	Complying with GMDSS, enhanced group call function built-in type	1 unit	For telecommunications utilizing a maritime satellite to be used exclusively by telex.
17) Satellite EPIRB	Complying with GMDSS, homing frequency incorporated type	1 unit	Automatically transmit its location being wrecked.
18) Radar transponder	Complying with GMDSS	1 unit	When wrecked, it helps to be caught easier by radar of the rescue boat.
19) VHF two-way radio telephone	Complying with GMDSS, with a battery charger installed	2 units	When being wrecked and when rescuing other vessel, it is used for making communications with the counter-party vessel.
20) Radio buoy	1.9MHz	5 units	Being fixed with the longline, it indicates its position.

(Note) "GMDSS" is the abbreviation for "Global Maritime Distress and Safety System," an international regulation.

(3) Basic design drawings

Figure-2 on the next page shows the general arrangement of the Designed Vessel, Figure-3 shows the composition of the conventional type longline and Figure-4 of the monofilament type longline respectively.

Figure – 2 General Arrangement

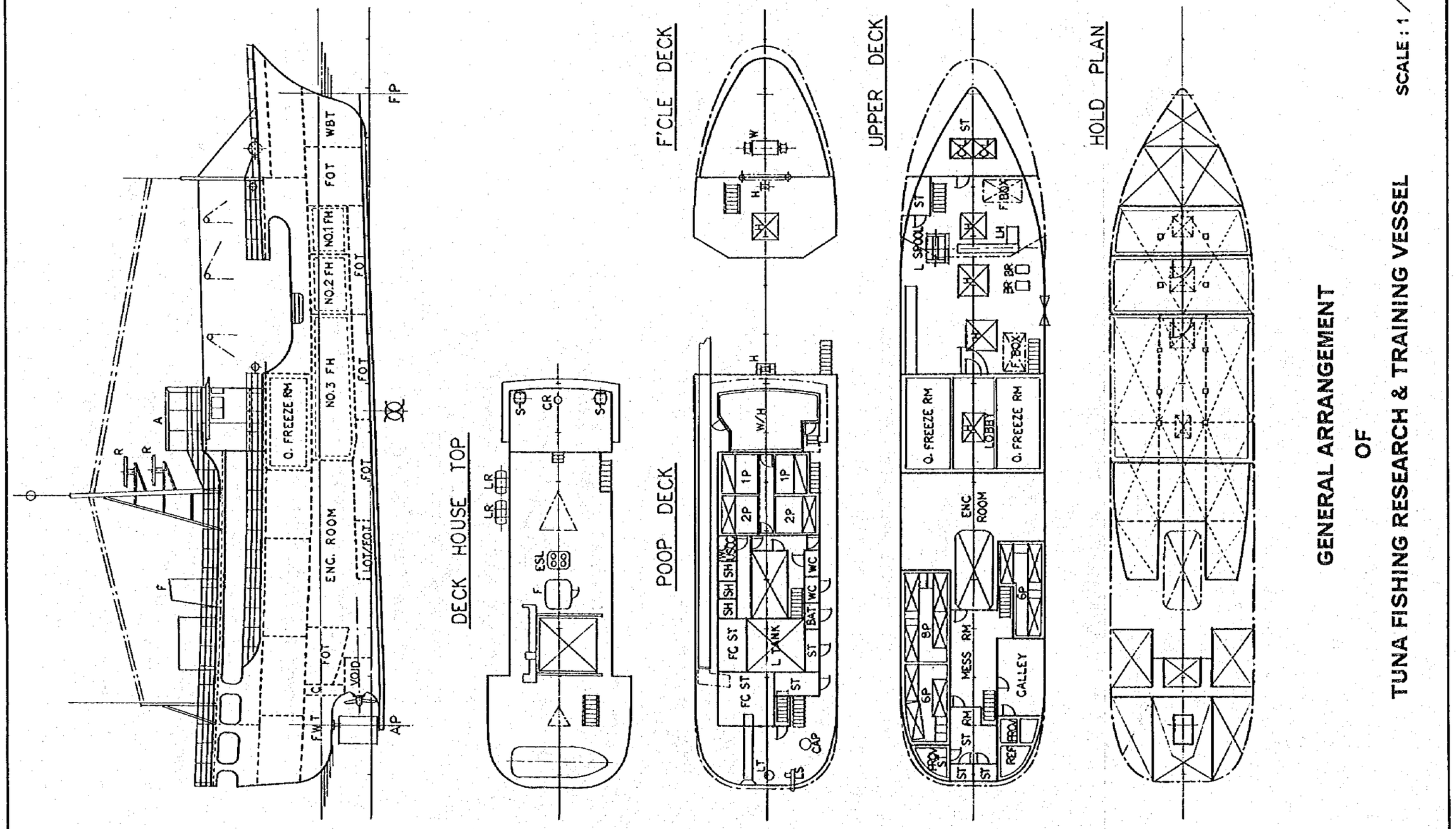


Figure – 3 Conventional Type Longline

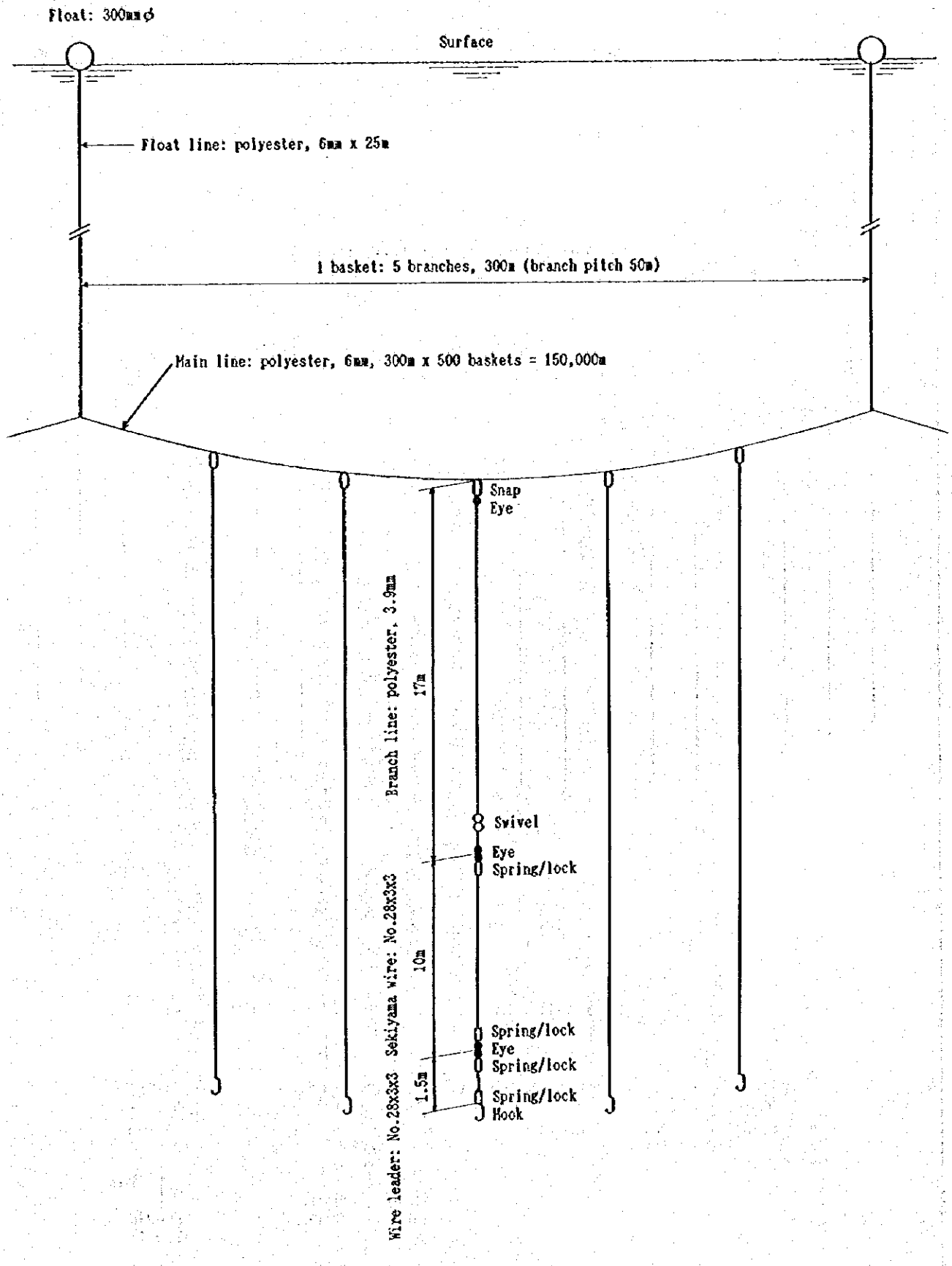
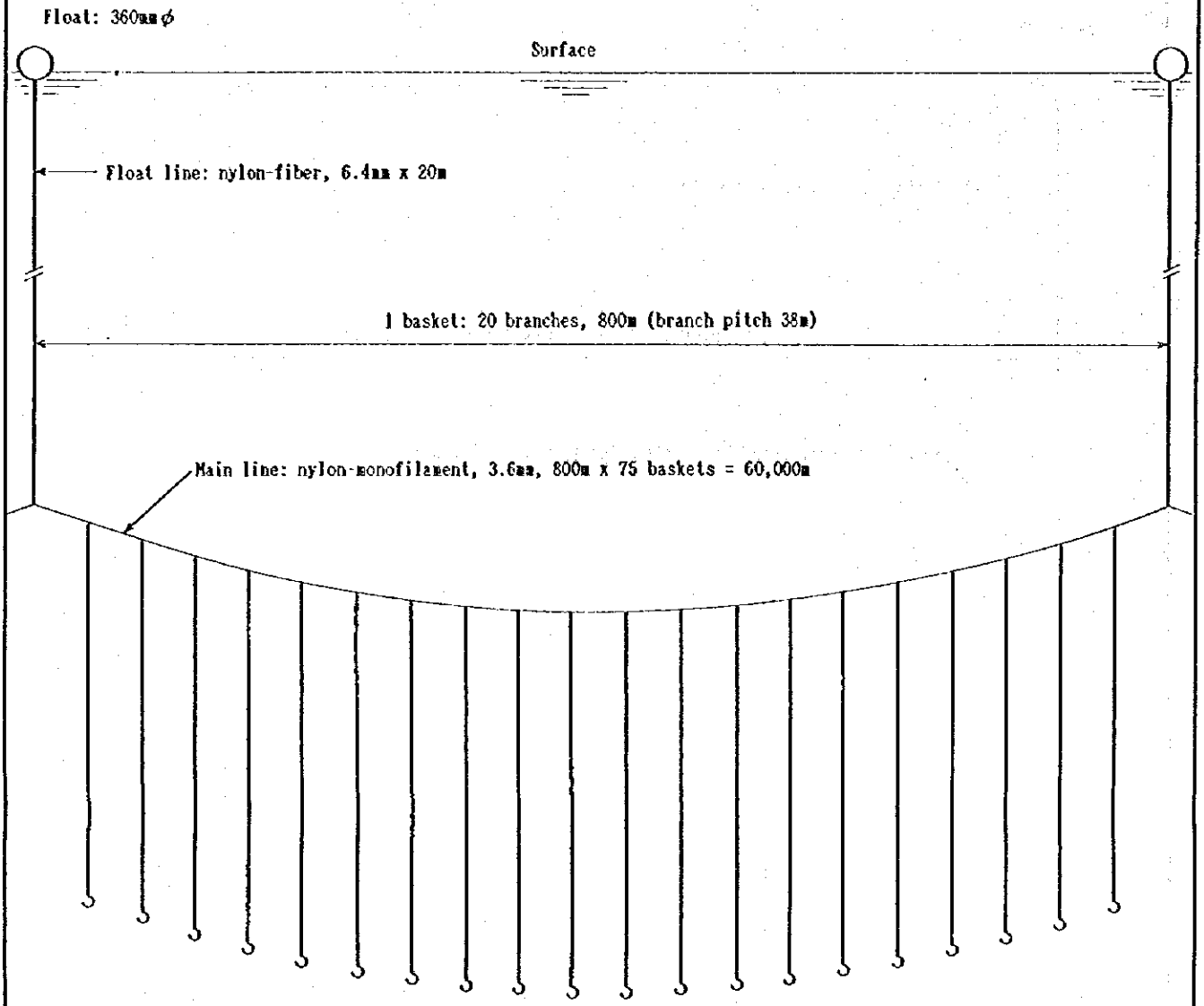
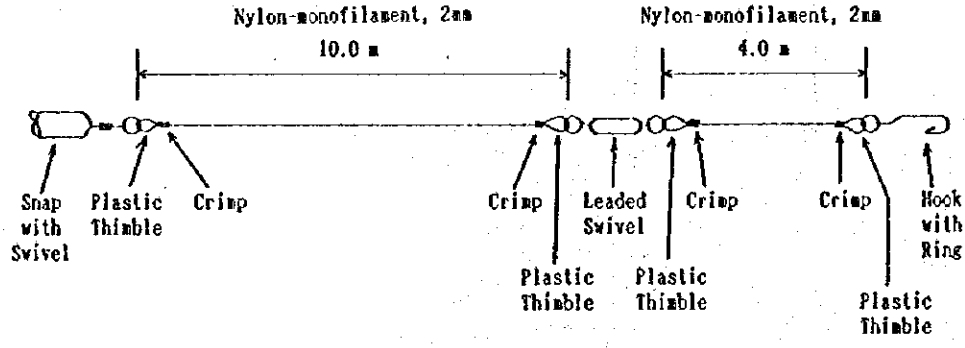


Figure – 4 Monofilament Type Longline



(Branch line detail)



Chapter 3 Implementation Plan

Chapter 3 Implementation Plan

3-1 Implementation Plan

3-1-1 Implementation Cpncept

Although there are some shipyards for constructing small-sized wooden fishing vessels locally in Tonga, they do not have any ability to construct steel fishing vessels. Therefore, it is impossible to construct such tuna fishing research and training vessel there. In addition, the tuna longline fishing method is a unique fishing technology which was developed in Japan. Since the shipyards in Japan have the advanced technology and broad experience in constructing tuna longliners, it is unrealistic to consider to construct the Designed Vessel in any third country. Furthermore, the Designed Vessel constructed in Japan has an ability to cruise unaidedly by itself to Tonga all the way from Japan thus posing no problems in terms of its transportation. In view of the above, it is proper to construct the Designed Vessel in a shipyard in Japan.

For implementing the Project, we will send the drawings of the Designed Vessel to the Ministry of Fisheries, which is the competent and responsible authorities of Tonga, for their implementation approval. And then, we will pay due attention to and incorporate the opinions of Tonga authorities, too, in the drawing so that the research and training program will be implemented without any difficulties after the delivery of the Vessel is made.

3-1-2 Implementation Conditions

Since a vessel is always in contact with the sea water and salinity, the anti-corrosion measures by painting is essential for increasing its durability. In view of the fact that the effectiveness of painting depends upon the surface-treatment of the steel plate, sufficient implementation supervision on this point is required.

It is also necessary to arrange the machinery/equipment, piping, valves, etc. efficiently in the limited space in a manner so that their operation and maintenance can be performed easily. As such, the implementation supervisor is always requested to try to supervise the

outfit work from the standpoint of the persons in charge of sailing operations and maintenance.

3-1-3 Scope of Works

All of the construction works of the Designed Vessel shall be implemented by Japanese side including the transportation of the Vessel to Tonga and no works are required to be implemented on the part of Tonga.

3-1-4 Consultant Supervision

The construction work of the Designed Vessel can be divided into the hull construction before launching and the outfitting work after the launching. During the period of the hull construction work, the spot supervision will be provided in which the hull blocks are inspected, while during the period of the outfitting work, the permanently stationing supervision will be provided, basically, since the progress of the work will be accelerated.

The implementation supervisor team consists of 1 supervisor who is in charge of hull and deck outfitting, 1 in charge of engine outfitting and electric outfitting and the other 1 in charge of navigation and radio equipment.

3-1-5 Procurement Plan

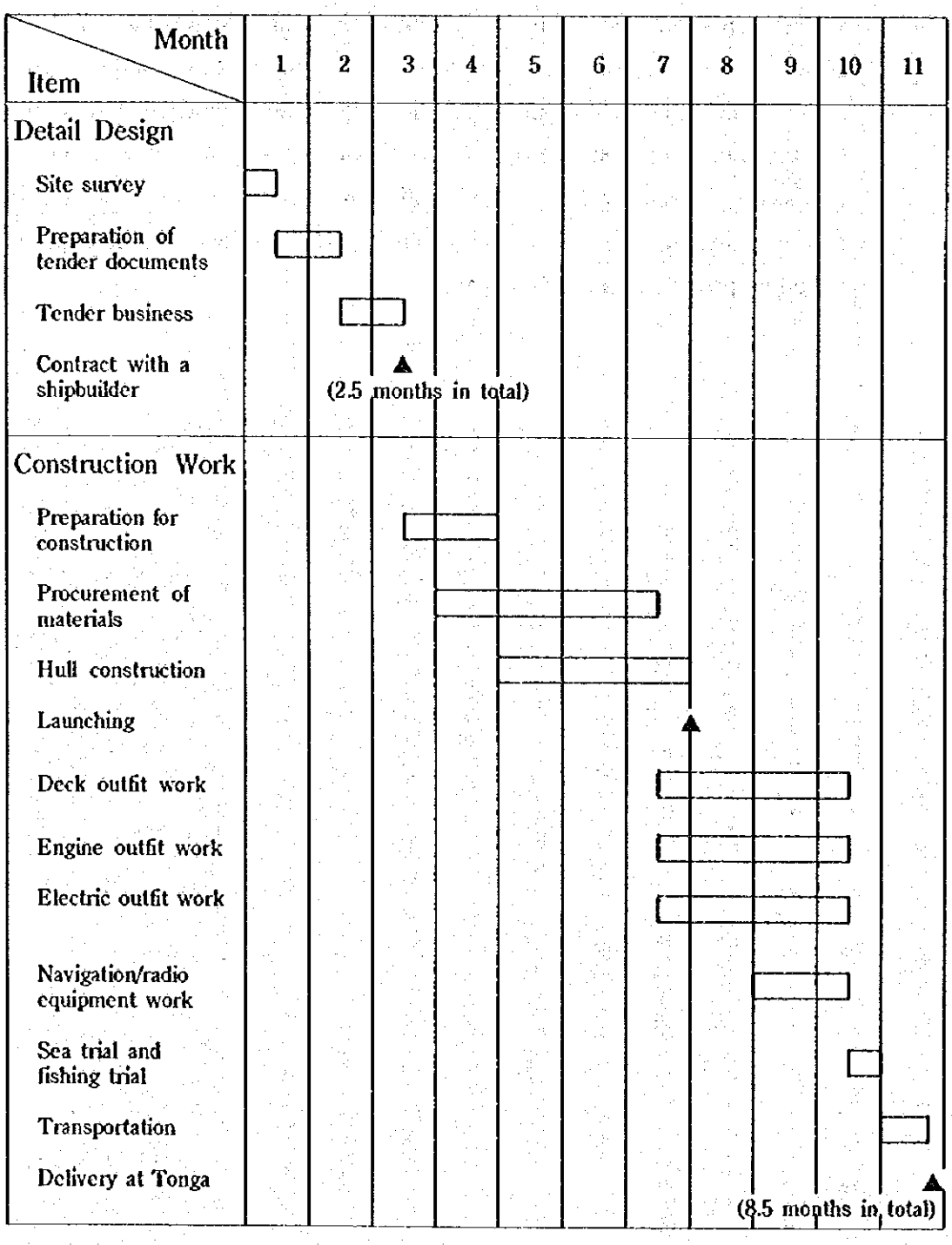
Out of the machinery/equipment required for the construction of the Designed Vessel, the monofilament type longline equipment which is made in U.S.A. will be procured through its sales agent in Japan. All of other machinery/equipment which are made in Japan will be procured in Japan. In selecting the manufacturers of such machinery/equipment, we will try, as much as possible, to select those manufacturers who have their sales agents in Tonga or some other neighbouring countries in consideration of convenience of obtaining spare parts and receiving maintenance services in the future.

3-1-6 Implementation Schedule

All of the Project shall be implemented at the expenses of the

Japanese side. The implementation schedule will be divided into the detail design including tender and the construction work of the Designed Vessel. In accordance with the system of the grant aid scheme, all of the schedule must be completed within twelve months. 2.5 months for the detail design and 8.5 months for the construction work including the transportation of the Vessel from Japan to Tonga are considered necessary respectively. The optimum schedule established in consideration of the above is shown on the Project Implementation Schedule provided on the next page.

Project Implementation Schedule



3－1－7 Obligations of the Recipient Country

The following is the undertakings by Tonga Government prescribed in the Minutes:

(1) to exempt Japanese nationals from customs duties, internal taxes and fiscal levies which may be imposed in the Kingdom of Tonga with respect to the supply of the products and services under the verified contracts;
(2) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such as facilities and may be necessary for their entry into the Kingdom of Tonga and stay therein for the performance of their work;
(3) to bear commissions, namely advising commissions of an Authorization to Pay (A/P) and payment commissions, to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement (B/A);
(4) to provide necessary permissions, licences, and other authorization for implementing the Project, if necessary;
(5) to ensure prompt unloading and customs clearance at ports of disembarkation in the Kingdom of Tonga and internal transportation therein of the products purchased under the Grant Aid;
(6) to ensure that the facilities and equipment under the Grant be maintained and used properly and effectively in line with the set objective of the Project;
(7) to bear all the expenses other than those covered by the Grant, necessary for the Project; and
(8) to coordinate and solve any matters which may arise with third parties during the implementation of the Project.

3－2 Project Cost Estimation

(1) Expenses to be borne by Japan

The Project will be wholly implemented under the grant aid scheme to be provided by the Japanese Government.

(2) Expenses to be borne by the Kingdom of Tonga: None

(3) Estimation conditions

1) Estimation time March 1997

2) Foreign exchange rate US$1.00 = ¥112.00
T$1.00 = ¥93.70

3) Implementation period

The periods required for the detail design and construction work are shown on the Implementation Schedule.

4) Others

The Project is to be implemented in accordance with the system of the grant aid scheme by the Government of Japan.

3-3 Operations and Maintenance Costs

The maintenance and management business pertaining to the Designed Vessel includes 1) placing orders and control of spare parts, 2) preparation of specifications for repair to be carried out at the time of docking work once a year and supervision of the relevant work, 3) implementation of minor repair work at the time of returning to Tonga four times a year, and 4) others. Currently, ten engineers are enrolled in the Engineering Section, Fisheries Management Department, Ministry of Fisheries which is responsible for the maintenance of the Vessel. Out of these engineers, the Section Chief and Assistant Section Chief have the licence of the Chief Engineer for the large-sized vessel and have the experience of being the engineering supervisors of the M.V. LOFA in the past. So, there will be no apprehensions at all about the maintenance and management system of the Designed Vessel as well as their abilities required for the relevant assignment.

According to the results of our study carried on in detail in 2-3-2 "Basic Design", the sailing operations expenses of the Designed Vessel including the maintenance and administration expenses are given below. It is expected that the annual sailing operations expenses, approx. T$524,700, can almost be covered by the sales income , approx. T$529,000, of annual

haul of fish, approx. 202 tons.

(Unit: T$)

Expenditure		Income	
Item	Amount	Item	Amount
Variable expenses	(220,900)	Export of fish caught	
Fuel cost	146,300	202 tons x 70% x @ 2,670 =	377,500
Lubricant cost	22,000		
Bait cost	52,600	Domestic sales of fish caught	
Fixed expenses	(303,800)	202 tons x 30% x @ 2,500 =	151,500
Crew expenses	170,000		
Fishing gear expenses	10,000		
Foods and fresh water expenses	24,300		
Repairing and spares expenses	31,000		
Agent commissions	8,000		
Ground administration expenses	2,000		
Warehouse charges and customs expenses	3,000		
Insurance premium covering the hull and crew	51,500		
Miscellaneous expenses	4,000		
Total	524,700	Total	529,000

Chapter 4 Project Evaluation and Recommendation

Chapter 4 Project Evaluation and Recommendation

4-1 Project Effect

The effects expected by the implementation of the Project can be divided into the direct, indirect and qualitative effects as given below:

(1) Direct effects

The direct effects expected by the implementation of the Project are the contribution to be made to the development of the tuna fishing industry of Tonga as a whole including the SSFCL and the private fishermen through the research and training, more specifically;

1) Through the implementation of training to the new crew members, approximately 120 tuna fishing crew members will be fostered. Thus, approximately 240 tuna fishing crew members will become available who would be required ten years from now, including approximately 120 crew members to be fostered by the M.V. LOFA.
2) Through the implementation of the research activities of fishing ground in the northern sea area, approx. 213,000km^2 and southern sea area, approx. 152,000km^2, making a total of approx. 365,000km^2, in the EEZ of Tonga, Tonga will be able to develop the whole sea area of fishing ground of approx. 700,000km^2 in its EEZ including the existing middle sea area of approx. 335,000km^2. In such a way, Tonga will be able to develop the fishing ground required for the 30 tuna longliner-structure as scheduled and, at the same time, provide fishery information useful for effecting efficient fishing operations to the SSFCL as well as the private fishermen.

(2) Indirect effects

As the overall effects of the research and training, the tuna longliner increasing plan is expected to be materialized ten years from now and consequently the annual amount of tuna caught in the EEZ will reach the maximum sustainable yield(MSY) of approximately 3,000 tons. Thus, the following indirect effects can be expected:

1) The annual amount of haul of fish will be increased by approx. 2,350 tons from the present level of annual haul of tuna, approx. 650 tons. Meanwhile, albacore tuna of approx. 1,650 tons, an equivalent of approx. 70% of the above increase, will be exported to American Samoa as the materials for canned provisions. This would contribute to the improvement in the trade balance for about T$5 million, approx. 6% of Tonga's trade deficit, T$80 million in 1995.
2) Out of the annual amount of haul of fish to be increased for approx. 2,350 tons, approx. 700 tons of big eye tuna and yellow fin tuna which occupy approx. 30% of the above will be supplied to the domestic market. This will contribute to the improvement in the eating habits of the people in Tonga which are excessively relying upon meats hence suitably matching to the national policy of the Tonga Government.
3) An employment opportunity for approx. 240 persons will be created to the jobless persons, 1,343, out of the working population of 32,013 as of 1990. Consequently, this will reduce the unemployment ratio from 4.2% to 3.4%.

(3) Qualitative effects

Although the quantitative evaluation is not easy, the following qualitative effects can be expected:

1) It is scheduled that the Designed Vessel will engage in the fishing ground research activities in the sea areas out of the EEZ in 2 voyages out of 4 a year, therefore, such activities will help to improve the fishing-oriented infrastructure in preparation for the time when they go into distant tuna fishing out of the EEZ in the future after their amount of haul of fish in the EEZ reaches the MSY.
2) Since the results of the research conducted by the Designed Vessel will be sent to the SPC and used as the basic materials for evaluating the tuna resource in the southern Pacific Ocean, the Project will contribute to the international activities, too.
3) Since some part of meats are replaced by fish supplied, the adult

diseases which have been increasing due to eating meats might be checked and eating of fish would help reduce the amount of imports of Tonga as well.

It is difficult to prove the adequacy of the Project from the viewpoint of the direct effects described in the above, but the indirect effects coupled with the qualitative effects which could be brought about through the impact of the direct effects will have a favorable influence upon the economy as well as the society of Tonga.

4-2 Recommendations

The Project will not only contribute to the development of the commercial tuna fishing industry but also have significant multiplied effects upon the economy and society as well of Tonga. And, since we see no apprehensions about the operation system and the maintenance/administration system of the Ministry of fisheries which is responsible for the implementation of the Project, we would conclude that the Project is really adequate as a project for the grant aid scheme. Meanwhile, should the following recommendation is incorporated in the operation of the Project, we are confident that its effects will further be enhanced:

1) The Ministry of Fisheries will take a positive initiative in the employment placement activities for those who have completed the training course through having a close contact with the SSFCL and the private fishermen.
2) The Ministry of Fisheries will openly publish the fishery information obtained through these researches to the public in general so that the tuna longliners of the SSFCL and the private fishermen will be able to carry out the fishing operations more effectively and efficiently.
3) In the future, when a fishery course is established in Tonga Maritime Polytechnic Institute (TMPI), the Ministry of Fisheries will, in collaboration with the TMPI, utilize the training function of the Designed Vessel.

[Appendices]

[Appendices]

1. Members List of the Survey Team
2. Survey Schedule
3. List of Party Concerned in the Kingdom of Tonga
4. Minutes of Discussion
5. References

1. Members List of the Survey Team

Name	Charge	Belonging
Atuyoshi Toda	Team Leader	Development Planning Specialist, Japan International Cooperation Agency (JICA)
Takashi Tohyama	Coordinator	Second Project Study Division, Grant Aid Project Study Department, JICA
Kyoji Yano	Technical Advisor	Deputy Director, Fishing Boat Section, Oceanic Fisheries Department, Fisheries Agency
Toshio Hosonuma	Chief Consultant/ Management Planner	Maruha Corporation
Eiji Higuchi	Fisheries Development/ Research & Training Planner	Maruha Corporation
Shunichi Morita	Shipbuilding Planner/ Cost Estimation	Maruha Corporation
Koichiro Ishii	Equipment & Machinery Planner	Maruha Corporation

2. Survey Schedule

No	Date (1996)	Activities	
		Consultant	Government Officials
1	Nov.14 (Thu)	Lv. Tokyo 19:00	
2	15 (Fri)	Ar. Suva 10:50, Courtesy call at Japanese Embassy and JICA office	
3	16 (Sat)	Lv. Nadi 16:50, Ar. Tonga 19:15	
4	17 (Sun)	(Analysis of data)	
5	18 (Mon)	Courtesy call at MOF Explanation of Inception Report	
6	19 (Tue)	Discussion with MOF	
7	20 (Wed)	Ditto	
8	21 (Thu)	Ditto	
9	22 (Fri)	Ditto	
10	23 (Sat)	(Analysis of data)	
11	24 (Sun)	(Ditto)	
12	25 (Mon)	Data collection from Central Planning Dept./Statistical Dept.	
13	26 (Tue)	Data collection from SSFCL	
14	27 (Wed)	Site survey of fishing port	
15	28 (Thu)	Data collection from MOF	Lv. Tokyo 19:00
16	29 (Fri)	Discussion with SSFCL	Ar. Nadi 06:25, Call at Embassy and JICA office
17	30 (Sat)	(Analysis of data)	Lv. Nadi 16:50 Ar. Tonga 19:15
18	Dec. 1 (Sun)	(Inner meeting)	
19	2 (Mon)	Courtesy call at MOF and MOFAD, Site survey of "LOFA"	
20	3 (Tue)	Discussion with SSFCL and Ministry of Finance	
21	4 (Wed)	Discussion with MOF	
22	5 (Thu)	Ditto	
23	6 (Fri)	Courtesy call on Prime Minister, Signing of Minutes	
24	7 (Sat)	Lv. Tonga 20:10, Ar. Nadi 20:40	
25	8 (Sun)	Lv. Nadi 11:30, Ar. Suva 11:55 Reporat to Japanese Embassy and JICA office	
26	9 (Mon)	Site survey of shipyard in Suva	Lv. Nadi 13:30 Ar. Tokyo 19:25
27	10 (Tue)	Site survey of fishing boats in Suva	
28	11 (Wed)	Lv. Suva 15:00, Ar. Nadi 15:35	
29	12 (Thu)	Lv. Nadi 02:00, Ar. Tokyo 08:00	

MOF : Ministry of Fisheries
MOFAD: Ministry of Foreign Affairs and Defence
SSFCL: Sea Star Fishing Co., Ltd.

3. List of Party Concerned in the Kingdom of Tonga

Name	Title
Mr. Baron Vaea	Prime Minister and Minister for Fisheries
Mr. 'Akau'ola	Secretary, Ministry of Fisheries (MOF)
Mr. Mafi 'Akau'ola	Deputy Secretary, MOF
Mr. Taniela Koloa	Principal Fisheries Officer, MOF
Mr. Vilimo Fakalolo	Senior Fisheries Officer, MOF
Mr. Siotame Vaipuna	Technical Officer, MOF
Mr. Siliveinusi Ha'unga	Technical Officer, MOF
Mr. Pouha Hasiata	Fish Market Manager, MOF
Mr. 'Ulunga Fa'anunu	Senior Fisheries Officer, MOF
Mr. 'Anitimoni Petelo	Fisheries Extension Officer, MOF
Mr. Vailala Matoto	Fisheries Officer, MOF
Mr. Tu'a T. Tupou	Secretary, Ministry of Foreign Affairs & Defence (MOFAD)
Ms. Lupe 'Ilaiu	Permanent Assistant Secretary, MOFAD
Dr. Sione Leimoni Taufu'i	Acting Accountant General, Ministry of Finance
Mr. Douglas J. Christmas	Deputy Accountant General, Ministry of Finance
Mr. Malakai Tapealava	Deputy Principal, Tonga Maritime Polytechnic Institute (TMPI)
Mr. George Y. L. Nakao	Managing Director, Sea Star Fishing Co., Ltd. (SSFCL)
Mr. Masanori Kawaguchi	Marketing Manager, SSFCL

4. Minutes of Discussion

MINUTES OF DISCUSSIONS

THE BASIC DESIGN STUDY

ON

THE PROJECT FOR CONSTRUCTION OF TUNA FISHING RESEARCH AND TRAINING VESSEL IN THE KINGDOM OF TONGA

In response to a request from the Government of the Kingdom of Tonga, the Government of Japan has decided to conduct a Basic Design Study on the Project for Construction of Tuna Fishing Research and Training Vessel (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA has sent to the Kingdom of Tonga a Basic Design Study Team (hereinafter referred to as "the Team") headed by Mr. Atsuyoshi TODA, Development Specialist, JICA. From November 16 through December 6, 1996, the Team held a series of discussions with the officials concerned of the Government of the Kingdom of Tonga and conducted a field survey at the study area.

In the course of the discussions and field survey, both parties have confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Nuku'alofa, December 6, 1996

Atsuyoshi TODA
Leader
Basic Design Study Team
JICA

'AKAU'OLA, cvo
Secretary of Fisheries
Ministry of Fisheries

ATTACHMENT

1. Objective

The objective of the Project is to train crew for tuna long liners and research new fishing grounds and species for the purpose of developing tuna fishing industry.

2. Executing Agency

The Ministry of Fisheries (MOF) is responsible for managing the vessel and conducting research and training.

3. Result of Discussions

Both the Government of the Kingdom of Tonga and the Team agreed on the following:

a. One tuna fishing research and training vessel with such basic specifications as stated below is requested by the Government of the Kingdom of Tonga.
- The basic feature of the vessel is of tuna long liner type.
- The service speed is about 9.5 knots.
- The complement of the vessel contains maximum 20 crew and 6 trainee.
- The cruising range is approximately 10,500 miles, and actual research and training days are approximately 200 days per year.
- Types of fishing gears are one unit of conventional tuna long line system and one unit of monofilament tuna long line system.

b. Principal particulars and other aspects of specifications of the vessel will be determined after further studies.

The Government of the Kingdom of Tonga confirmed the following:

a. Policies for National Fisheries Development
There are two major policies for national fisheries development: one is the promotion of private sector participation and the other the sustainable exploitation of tuna and other off-shore resources (as reflected in the Strategy Plan 1996-2000, MOF). This is the guiding principle for the conception of Project.

b. Roles of MOF
The roles of MOF are, among other things, to identify new fishing grounds for tuna and other fish species and establish and implement a comprehensive training programme for skippers, engineers, fishermen and business managers (as stated in the Strategy Plan 1996-2000, MOF). The vessel is expected to play a major role in the performance of these functions.

c. Admission Policy for Training Programme
Admission for trainee is based upon "open-door" policy. In addition, the graduate is free to choose his or her work place , whether it may be a private set-up, a governmental organization or a public corporation.

d. Geographical Area to be Covered by the Vessel
There is a need for the vessel to cover the area beyond EEZ for research purpose. The vessel should be equipped with such capability.

The Team acknowledged the Items requested by the Government of the Kingdom of Tonga as follows:

a. Istallation and supply of test fishing equipments and gears for squid and deep sea bottom fish.
b. Installation of each one (1) set of SSB and VHF radio telephone in the radio operator room in addition to GMDSS requirements.
c. Supply of each one (1) set of SSB radio telephone, VHF radio telephone and weather facsimile receiver for shore use.
d. Acceptance of four (4) or five (5) officers and engineers to Japan, of which period is about two (2) months during the building of the vessel, for their training on hull, major equipment, fittings and fishing gears.
e. Supply of one (1) refrigerated vehicle (ca 2 tons capacity) and one (1) truck (open type, ca 3 tons capacity).

4. Japan's Grant Aid System

1) The Government of the Kingdom of Tonga has understood the system of the Japan's Grant Aid explained by the Team; the main feature is described in ANNEX I.
2) The Government of the Kingdom of Tonga will take the necessary measures, described in ANNEX II for the smooth implementation of the Project on condition that the Grant Aid by the Government of Japan is extended to the Project.

5. Further Schedule of the Study

Based on the Minutes of Discussions and technical examination of the study results, JICA will complete the Basic Design Study Report and send it to the Government of the Kingdom of Tonga by March, 1997.

(3)

A

ANNEX I: JAPAN'S GRANT AID SCHEME

1. Grant Aid Procedure

1) Japan's Grant Aid Program is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan & Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using Japanese consulting firms.

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Government of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

1) Contents of the Study

The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on the requested project (hereinafter referred to as "the Project"), is to provide a basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Study are as follows:

a) confirmation of the background, objectives and benefits of the requested project and also institutional capacity of agencies concerned of the recipient country necessary for the project's implementation;
b) evaluation of the appropriateness of the project to be implemented under the Grant Aid Scheme from the technical, social and economic points of view;
c) confirmation of items agreed on by both parties concerning the basic concept of the Project;

d) preparation of a basic design of the Project; and
e) estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even through they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For the smooth implementation of the Study, JICA uses a consulting firm selected through its own procedure (competitive proposal). The selected firm participates in the Study and prepares a report based upon the terms of reference set by JICA.

At the beginning of implementation after the Exchange of Notes, for the services of the Detailed Design and Construction Supervision of the Project, JICA recommends the same consulting firm which participated in the Study to the recipient country, in order to maintain the technical consistency between the Basic Design and Detailed Design as well as to avoid any undue delay caused by the selection of a new consulting firm.

3. Japan's Grant Aid Scheme

1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

3) "The period of the Grant" means the one fiscal year which the Cabinet approves the project for. Within the fiscal year, all procedure such as exchanging of the Notes, concluding contracts with consulting firms and contractors and final payment to them must be completed.

However, in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However, the prime contractors, namely consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

5) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability of Japanese taxpayers.

6) Undertakings required to the Government of the recipient country

a) to secure a lot of land necessary for the construction of the Project and to clear the site;
b) to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities outside the site;
c) to ensure prompt unloading and customs clearance at ports of disembarkation in the recipient country and internal transportation therein of the products purchased under the Grant Aid.
d) to exempt Japanese nationals from customs duties, internal taxes and fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts.
e) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such as facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.
f) to ensure that the facilities constructed and products purchased under the Grant be maintained and used properly and effectively for the Project, and
g) to bear all the expenses other than those covered by the Grant, necessary for the Project.

7) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign the necessary staff for operation and maintenance of them as well as to bear all the expenses other than those covered by the Grant Aid.

8) "Re-export"

The products purchased under the Grant Aid shall not be re-exported from the recipient country.

9) Banking Arrangement (B/A)

a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank". The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the verified contracts.

b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of recipient country or its designated authority.

ANNEX II: UNDERTAKINGS BY THE GOVERNMENT OF THE KINGDOM OF TONGA

1. to exempt Japanese nationals from customs duties, internal taxes and fiscal levies which may be imposed in the Kingdon of Tonga with respect to the supply of the products and services under the verified contracts;

2. to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such as facilities as may be necessary for their entry into the Kingdom of Tonga and stay therein for the performance of their work;

3. to bear commissions, namely advising commissions of an Authorization to Pay (A/P) and payment commissions, to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement (B/A);

4. to provide necessary permissions, licences, and other authorization for implementing the Project, if necessary;

5. to ensure prompt unloading and customs clearance at ports of disembarkation in the Kingdom of Tonga and internal transportation therein of the products purchased under the Grant Aid;

6. to ensure that the facilities and equipment under the Grant be maintained and used properly and effectively in line with the set objective of the Project;

7. to bear all the expenses other than those covered by the Grant, necessary for the Project; and

8. to coordinate and solve any matters which may arise with third parties during the implementation of the Project.

5. References

(1) Sixth Development Plan, 1991-1995

(2) Budget Statement, 1996-1997

(3) Statistical Abstract, 1993

(4) Annual Foreign Trade Report, 1993/1994/1995

(5) Report of the Ministry of Fisheries, 1994/1995

(6) Strategic Plan of the Ministry of Fisheries, 1996-2000

(7) Statement of Revenues and Expenses of M.F.V. LOFA, 1982-1990

(8) Report on Project Identification (Nov. 1991, by AIDAB)

(9) Assessment of Small-Scale Tuna Longline Potential (Aug. 1994, by USAID)

(10) Review of Tonga's Tuna Industry Development Policy (Nov. 1995, by FFA)

(11) Constraints to the Development and Expansion of Domestic Tuna Longline Fishery in Tonga (Oct. 1996, by SPC)

(12) Memorandum and Articles of Association of Sea Star Fishing Co., Ltd.