Part VIII Estimate on Cargo Movements

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To make an estimate on cargo movements, an attempt will be made, first, to analyze the actual movement of exports and imports, composition of items as well as supplying and buying countries in a time series, and after the grasping the actual situation, to forecast the future movement of cargoes.

1. Structure of Foreign Trade

1-1 General

A check of the changes in the quantities of exports and imports in Paraguay from 1968 to 1977 indicates that the exports and imports greatly fluctuated from year to year and did not remain stable. In general terms, it might be said that the exports and imports increase at an annual rate of about 5%. Particularly in two years from 1975 to 1977, the quantities of exports and imports grealy increased with 15.3% and 12.3%, totaling 1,186,000 KT. The great fluctuations in the quantities of exports and imports must be assessed from the standpoint of the structure of foreign trade in the Paraguayan economy. For this purpose, there is a need to analyze the composition of exports and imports as well as the consignors and consignees.

1-2 Export Items

The export items of Paraguay may be roughly classified into four categories -- (1) sawn wood and other lumber, (2) meat and other livestock products, (3) farm products and (4) industrial and other products. A check of the flow of commodities by categories indicates that there have been great fluctuations in a time series in the ratios of sawn wood and other lumber and agricultural products. This point will be elucidated in the following.

1-2-1 Sawn Wood and Other Lumber

In regard to sawn wood and other lumber, material wood had had a high share in the exports until 1968, the share standing at 78% in the exports of the lumber sector in 1968. In 1969, a policy was adopted to decrease the export of material wood and switch to sawn wood. This policy was adopted lest indiscriminate felling should result in the exhaustion of lumber resources. Under the Law No. 24,489 enacted in February 1972, a total ban was put on the

exports of material wood, and no material wood has been exported since 1973. The exports of sawn wood increased from 1972 to 1974 but were sufficient to compensate for the exports of material wood. For this reason, the share of this sector in all exports dropped to less than 50% in 1970 from 52.9% in 1968 and further down to 13.9% in 1976. Although the share recovered to 18.2% in 1977, it might be said that there are signs of a drop in the export of the category of sawn wood and other lumber.

1-2-2 Meat and Other Livestock Sector

With respect to meat and other livestock products, canned food accounted for 93.6% in 1968. From 1971 to 1973, this category centered around frozen meat, accounting for 63% of the livestock export in 1972. Up until 1973, there had been a steady rise in the total export of meat and livestock products, sharing 12.2% of all exports. Due to restrictions put on imports by European countries, which constituted the greatest buyer and Paraguay's competition with the neighboring country of Argentina, however, the export of meat and other livestock products registered a drop of 40% in 1974 from the previous year but its share in all exports recovered to 4.3% in 1977. Like the category of lumber, there are signs of a drop. However, the reason is because the foreign market and demand were restricted in contrast to the case of lumber in which the supplies were restricted. In a longrange perspective, however, there is the possibility of a recovery or growth in the export of livestock products.

1-2-3 Agricultural Products

Here, the category of agricultural products includes palm, tung and other vegetable oils. Agricultural products had a share of over 30% in all exports, but their exports began to increase at a rapid pace in 1972, having a share of 73% in 1977. Since 1971, the export of this category has centered around soybeans and other seeds, feed and cotton. These three commodities accounted for 83.3% of the export of agricultural products and 60.9% of all exports. The export of soybeans to Europe began to increase in large quantities in 1974. Stimulated by this factor, attempts were made to switch to the production of soybeans at a rapid pace, with the consequence that the exports totaled 241,000 KT in 1977, accounting for 38.7% of all exports.

The export of feed began to increase at a rapid pace in 1973. In 1977, 67,600 KT of feed were exported, accounting for 14.8% of the export of

agricultural products and 9.4% of all exports.

The export of cotton, like that of feed, has steadily increased since 1973, sharing 12.9% of the export of agricultural products and 9.4% of all exports.

Fluctuations were repeated in the export of palm and tung oils from 1968 and 1977. In a long-range perspective, it might be said that the export will level off.

The export of tobacco increased at an annual average rate of 8.5% from 1968 to 1977.

From a general review of all export agricultural products, it is discernible that the exports have been shifted from the exports of many commodities in small quantities to the exports of limited commodities in large quantities.

1-2-4 Industrial and Other Products

In regard to the export of industrial and other products, the absolute quantities had greatly decreased from 1974, and the export in 1974 was up only 50% from 1968.

1-3 Import Items

The import items are wide in category, including food which centers around wheat and salt, crude and refined oil products, chemical products, automobiles, textiles, steel and machinery. At the beginning of 1968, the oil imports accounted for 48.2% and the food imports 29.4%, whereas the oil imports increased to 55.9% but the food imports dropped to 14.1%.

There are signs of a decrease in the quantity of fo d imports. The quantity in 1977 dropped to 32.2% of the level registered in 1968. This phenomenon was produced due to a drastic drop in the import of wheat, which used to share over 50% of the quantity of food imports each year. The quantity of wheat imported in 1977 was down 50% from the level registered in 1968. There have been signs of a slight increase in the import of salt, which has increased at an annual average rate of 4% in the last three years.

The import of crude oil and refined oil products increased by about 60% from 194,000 KT in 1968 to 314,800 KT in 1977, but its share in the quantity of imports merely increased from 48.2% to 55.9%. This is because the rise in the import of crude oil, which had a share of a little over 80% of the import

of oils in 1968 was practically the same as the rise in all imports. There are signs of a sharp rise in the import of lubricating oil and refined oil products (an increase of three times from 1968 to 1977).

In the import of machinery and automobiles, a sharp rise was marked in 1977, but the share in all imports stood at only 3.4% and 3.2%, respectively. There were signs of a slight increase in the import of textiles, chemical products and steel in parallel to moves for industrialization centered around the light industry.

1-4 Analysis by Buying Country

In this analysis of buying countries by bloc, the buying countries are classified into blocs with attention paid to the importance and future of the given bloc and the existing fairways -- that is, the blocs of buying countries are divided into (1) the North American Bloc, (2) Latin American Bloc, (3) European Bloc and (4) others (including Africa and Asia) for this study. The North American Bloc includes Canada, the United States and Puerto Rico, and Mexico and the countries situated south to Mexico are included in the Latin American Bloc. As for the Latin American Bloc, the neighboring countries of Brazil, Urguay, Argentina and Bolivia are separately taken up. The European Bloc is subdivided into North Europe and South Europe. The countries situated north to Switzerland, Austria and France are included in North Europe and those situated south to Italy and Spain are encompassed in South Europe.

The share of the European Bloc, which stood at only about 20% in 1968, rose to 59.4% in 1977. For the Latin American Bloc, the share dropped from 63.1% in 1968 to 27.6% in 1977. (Subdivided, North Europe accounted for 95% of the European Bloc and the neighboring countries of Argentina, Brazil and Urguay 90% of the Latin American Bloc). This is because the exports to the Latin American Bloc center around those of sawn wood and material lumber, whereas the exports to the European Bloc center around those of soybeans and other seeds, cotton and feed. The European bloc accounts for about 90% of the export of meat and other livestock products. Here, the drop in the export meat is offset by the rapid rise in that of agricultural products.

Table VIII-1-4-1 Ratio of Buying Countries by Bloc

(Unit: 1,000 KT with percentage in brackets)

Bloc \ Year	1968	1971	1973	1975	1977
North America	35.5 (10.2)	27.9 (6.9)	48.5 (11.3)	30.1 (5.9)	64.7 (10.4)
Latin America (three neighboring countries)	219.0 (63.1) (61.7)	241.4 (59.8) (56.3)	148.0 (34.5) (32.2)	184.6 (36.3) (31.9)	171.9 (27.6) (24.9)
Europe (North Europe)	72.4 (20.8) (19.1)	87.0 (21.6) (19.3)	154.7 (36.1) (34.0)	285.7 (56.2) (53.0)	370.4 (59.4) (56.7)
Others	20.4 (5.9)	47.2 (11.7)	77.0 (18.1)	8.4 (1.6)	16.3 (2.6)
Total	347.3 (100)	403.6 (100)	428.2 (100)	508.8 (100)	623.2 (100)

1-5 Analysis by Supplying Country

In regard to the supplying countries, the neighboring countries of Brazil, Argentina and Urguay share most of Paraguay's import of general merchandise in addition to the import of crude oil from Algeria since 1966. This may be considered natural in view of the composition of import items and their geographical position as a market.

Table VIII-1-5-1 Ratio of Supplying Countries by Bloc

(Unit: 1,000 KT with percentage in brackets)

Bloc \ Year	1968	1970	1972	1974	1976
North America	61.8 (15.3)	56.6 (13.6)	57.6 (17.0)	20.2 (3.9)	18.2 (3.5)
Latin America (three neighboring countries)	140.0 (34.7) (34.4)	130.0 (31.3) (30.7)	110.8 (32.7) (31.9)	321.3 (62.2) (61.6)	227.3 (44.3) (41.8)
Europe (North Europe)	36.8 (9.1) (6.8)	29.7 (7.2) (6.6)	25.8 (7.6) (6.8)	28.6 (5.5) (5.1)	32.6 (6.4) (5.1)
Others (Algeria)	164.8 (40.9) (39.4)	198.7 (47.9) (44.4)	144.7 (42.7) (41.3)	146.6 (28.4) (16.6)	235.1 (45.8) (44.2)
Total	403.4 (100)	415.0 (100)	338.2 (100)	516.7 (100)	513.2 (100)

2. Estimate on Export Quantity

Here, the quantity of exports in the future is estimated while the rate of increases in the quantity of exports and imports in the past on the basis of the correlationship between GDP and the quantity of exports and imports as well as the target value by sector for the GDP growth rate under the new five-year program are taken into account. Reference has been made to the survey report on the corrected GDP and the values estimated by the Paraguayan Economic Planning Agency.

2-1 Sawn Wood

Quantitatively, there are signs of a drop in the export of sawn wood in the midst of a fear for a drainage of resources. At present, upwards of 50% of sawn wood is diverted to Argentina (except 1976). There has been a drop in the absolute quantity since 1974, whereas Brazil's share has increased. It is expected that the share will exceed 50% in several years.

In the future, attention will be focused on the development of areas along the Parana River for export to Brazil (via land transport). Insofar as the quantity of sawn wood exports is concerned, however, only the drop in the export to Argentina is offset by the rise in the export to Brazil. On the basis of the past fluctuations, it is estimated that sawn wood will be exported at an annual average rate of 110,000 KT a year.

2-2 Meat

Unless the something is done about the restrictions imposed by European countries on the import of meat, it will be impossible to bring the export quantity to the level of 30,000 KT in 1972 and 1973. The restrictions must be taken into account on the basis of changes in the global tone of business. Even if the import restrictions are lifted, it will have to compete with other meat exporting countries -- particularly, the neighboring country of Argentina. Given these factors, it is appropriate to estimate the exports at 20,000 KT in 1980, 25,000 KT in 1985 and 30,000 KT in 1990. As for the export of livestock products, it is estimated that the export will remain at more than 10,000 KT a year on the average.

2-3 Tobacco

On the basis of the past fluctuations, the export of tobbaco is

estimated at 38,800 KT in 1980, 35,000 KT in 1985 and 40,000 KT in 1990.

2-4 Soybeans and Other Seeds

The export of soybeans and other seeds is expected to increase in the future. However, attention must be focused on the fact that the production of these crops was increased by a raise in the acreage of fields under cultivation but not by a raise in productivity, or, to be more accurate, that the increase has been realized by a switch in plantation from other crops but not by the clearance of new land for cultivation. This clearly suggests that a rise in the export remains dependent on a raise in the acreage of fields under cultivation. Therefore, judging from the fact that the acreage of fields for soybeans and other seeds has come close to a peak and also from the actual clearance of new land for cultivation, it is difficult to hope for a big rise in the export of soybeans and other seeds.

With the trial computation of the Economic Planning Agency taken into account, therefore, the export is estimated at 275,000 KT in 1980, 300,000 KT i in 1985 and 325,000 KT in 1990.

2-5 Cotton

The export of cotton in 1977 was up 80% from the previous year. Judging from the past fluctuations and the trial computation of the Economic Planning Agency, it is appropriate to estimate the cotton export at 40,000 KT in 1980, 42,500 KT in 1985 and 45,000 KT in 1990.

2-6 Vegetable Oil

There has been a repetition of increases and decreases in the export of vegetable oil from year to year in the past. In broad terms, there are signs of an increase. On the basis of these factors, the vegetable export may be estimated at 32,400 KT in 1980, 36,300 KT in 1985 and 40,200 KT in 1990.

2-7 Feed Cakes

There have been signs of a slight rise in the export of feed cakes since 1974. When the past fluctuations are taken into account, the export of feed cakes may be estimated at 78,400 KT in 1980, 96,900 KT in 1985 and 108,200 KT in 1990.

2-8 Industrial and Other Products

In view of the fact that the export of industrial and other products has been on the downturn since 1974, it is difficult to hope for a sharp rise in the future. On the basis of the industrial promotion policy incorporated in the new five-year program (attempts will be begun for industrialization in 1980 against the background of ample electricity), the export of industrial and other products may be estimated at about 120,000 KT in 1985, and 200,000 KT in 1990.

2-9 Conclusion

On the basis of the foregoing, the total volume of exports may be estimated at 700,000 KT in 1980, 875,000 KT in 1985 and 1,050,000 KT in 1990.

3. Estimate on Import Quantity

3-1 Wheat

Of all food, the self-sustaining rate of wheat (about 30%) is low, so that wheat turns out to be the only agricultural product for which Paraguay must depend on imports (for the remaining 70%). The self-sustaining ratio in the past several years has slightly improved. When increases in the future demand are taken into account, however, the imports will have to be increased. With the estimate of the Economic Planning Agency taken into account, therefore, it is estimated that 57,000 KT will have to be imported in 1980, 69,000 KT in 1985 and 80,000 KT in 1990.

3-2 Salt

Judging from the steady rise marked in the import of salt as a necessity, the import is estimated at 27,700 KT in 1980, 31,900 KT in 1985 and 36,000 KT in 1990.

3-3 Other Food

The import of other food centers around that of liquors. On the basis of the past fluctuations, a stable import of 8,000 KT a year on the average may be estimated.

3-4 Crude Oil

Judging from the domestic consumption and refining capacity, such a

big rise in the crude oil import as in the past may not be hoped for. Therefore, judging from the past fluctuations and the trial computation of the Economic Planning Agency which is of the same view, the crude oil import may be estimated at 232,900 KT 1980, 266,900 KT in 1985 and 301,900 KT in 1990.

3-5 Lubricating Oil and Other Refined Oil Products

There have been a big rise in the import of lubricating oil and other refined oil products since 1975 due primarily to the fact that the oil refineries which were put into operation in 1965 have no longer been capable of satisfying the demand. Judging from the future line of industrialization, therefore, the import may be estimated at 111,000 KT in 1980, 138,000 KT in 1985 and 160,000 KT in 1990.

3-6 Steel and Machinery

Judging from the past fluctuations and a rise in the demand along the line of industrialization, the import of steel and machinery may be estimated at 31,500 KT and 22,500 KT in 1980, 34,500 KT and 27,500 KT in 1985 and 37,500 and 32,500 KT in 1990.

3-7 Conclusion

On the basis of the foregoing, the total quantity of imports may be estimated at 590,000 KT in 1980, 670,000 KT in 1985 and 755,000 KT in 1990. (See Table VIII-3-7-1)

Table III-3-7-1 Actual Record and Estimate on Maritime Cargo Movements, by Export and Import

(Unit: KT)

	Type of cargo	Breakdown	1977	1978	1980	1985	1990
Exports	General merchandise	Sawn wood	75,452	113,327	110,000	110,000	110,000
		Livestock products (minus meat)	7,639	11,527	10,000	10,000	10,000
		Tobacco	27,456	22,348	28,800	34,400	40,000
		Cotton	32,638	58,813	40,000	42,500	45,000
		Feed cakes	64,115	67,610	78,100	96,900	108,200
		Other farm products					
		Industrial and other products	29,697	26,980	35,000	120,000	200,000
		(Sub total)	294,293	328,964	372,600	513,700	654,800
	Cereals	Soybeans and other seeds	216,691	253,669	275,000	300,000	325,000
	Meat	Meat	12,647	15,276	20,000	25,000	30,000
	Crude oil, etc.	Vegetable oil	19,721	25,319	32,400	36,300	40,200
	Total		543,352	623,228	700,000	875,000	1,050,000
Imports	General merchandise	Salt	23,687	24,895	27,700	31,900	36,000
		Food	8,821	10,108	8,000	8,000	8,000
		Steel	21,086	29,292	31,500	34,500	37,500
		Machinery	10,601	19,016	22,500	27,500	32,500
		Others					
		(Sub total)	141,808	203,720	189,100	196,100	213,100
	Cereals	Wheat	56,756	44,335	57,000	69,000	80,000
	Crude oil, etc.	Crude oil	229,816	213,373	232,900	266,900	301,900
		Refined oil products	84,847	101,469	111,000	138,000	160,000
		(Sub total)	(314,663)	(314,842)	(343,900)	(404,900)	(461,700)
	Total		513,227	562,897	590,000	670,000	755,000

4. Estimate on Cargo Movements

The estimated exports and imports as indicated in the preceding chapter may be expressed in terms of quantity of maritime cargo movement as follows:

(Unit: 1,000 KT)

	1977	1978	1980	1985	1990
Quantity of exports	543.4	623.2	700	875	1,050
Quantity of imports	513.2	562.9	590	670	755
Quantity of maritime cargo movements	1,056.6	1,186.1	1,290	1,545	1,805

5. Estimate on Cargo Movements, by Type of Cargoes

For this estimate on cargo movements by type of cargoes, the types of loaded cargoes are classified into:

(1) Cereals loaded in bulk (wheat, soybeans and other seeds);

(2) Meat;

(3) Crude oil, lubricating oil and other refined oil products and edible oil; and

(4) Other general cargoes (dry cargoes).

According to this classification, the quantity of cargo movements may be tabulated as follows:

(Unit: 1,000 KT)

	1977	1978	1980	1985	1990
General cargoes	436.1	532.1	561.7	709.8	867.9
Cereals	273.5	298.0	332.0	369.0	405.0
Meat	12.6	15.3	20.0	25.0	30.0
Crude oil, etc.	334.4	340.2	376.3	441.2	502.1
Total	1,056.6	1,186.1	1,290.0	1,545.0	1,805.0

6. Estimate on Cargo Movements, by Means of Transport

6-1 General

The means of cargo transport may be classified into four types -- (1) Ship and fluvial transport, (2) railway transport, (3) air transport, and (4) truck transport.

Ships and rivers are the most frequently used means of transport in view of the geographical location of Paraguay. At present, this means of transport is used for about 80% of all cargoes.

The line between Asuncion and Encarcion is the only railway line available in Paraguay at present but this line is timeworn. Only about 7% of all cargoes is transported by rail at present.

Depending on the cargo movement and volume, truck transport is more economical than ship transport. From this point of view, there has been a sharp rise in the ship transport in recent years. It had a share of 12% in 1975.

The share of air transport has been mere 0.2-0.3% and a sharp rise in the share is inconceivable, so that air transport is excluded from this estimate. (See Table VIII-6-1-1)

6-2 Estimate on Cargo Movements by Means of Transport

For an estimate on the future, the share of railways must be taken into account. Now that no plans are afoot for the construction of a railway line running toward the border with Brazil and for the repair of the existing line, it is conceivable that the share of the railway will growingly decrease as it gets timeworn. Judging from the past developments, it is reasonable to make up for any decrease in railway transport with ship and truck transport. For this reason, as classified by means of transport, 80% of all cargo movements are estimated to be taken care of by ship and fluvial transport, 5% by railway transport and 15% by truck transport.

Table VIII-6-1-1 Actual Maritime Cargo Movements by Means of Transport

(Unit: KT)

		1968		1969		1970		1971		1972		1973		1974		1975		1976		1977		Remarks
Quantity of exports and imports	Exports	347,350		360,685		441,134		403,578		408,172		428,203		538,500		508,832		543,352		623,228		Data from the central bank
	Imports	403,362		358,064		415,042		372,494		338,837		381,007		516,737		409,004		513,227		562,897		
	Total	750,712		718,749		856,176		776,072		747,009		809,210		1,055,237		917,836		1,056,579		1,186,125		
Volume of transport by means of transport		(750,744)		(718,845)		(856,178)		(776,079)		(747,151)		(809,211)		(1,055,200)		(917,200)						Asistencia Tecnica
	River	686,772	91^4	635,476	88^4	752,249	87^9	669,264	87^9	591,873	79^2	629,873	79^2	792,424	75^1	739,282	80^5				80	Tomo 3
	Railway	42,933	5^7	55,877	7^8	63,618	7^4	58,700	7^6	97,713	13^1	78,427	9^7	96,054	9^1	65,629	7^2				5	
	Air	1,137	0^2	1,337	0^2	1,601	0^2	1,663	0^2	1,803	0^2	1,242	0^2	3,166	0^3	2,753	0^3					
	Truck	19,902	2^7	26,155	3^6	38,700	4^5	46,542	6^0	55,742	7^4	100,236	12^4	163,556	15^5	110,136	12^0				15	

6-3 Estimate on Volume of Transport by Ship and River

On the basis of the foregoing, the volume of transport by ship and river is estimated at 1,032,000 KT in 1980, 1,236,000 KT in 1985 and 1,444,000 KT in 1990.

7. Estimate on Fluvial Cargo Movements in 1985, by Port

7-1 General

An estimate on fluvial cargo movements in 1985 by port must be based on the customs data available at the customs houses, but there exists a numerical differential of 20-30% between the customs data and the data of the central bank used in the preceding chapter's export and import analysis and the reliability of these data as the basis for an analysis is skeptical. Consequently, it is difficult to make an accurate estimate. With the unavailability of accurate data, therefore, the estimate carried out here must be rated as a conjecture. The analysis is conducted as a sort of estimate for the survey team while making reference to the data from the UNDP and the International Development Center as well as the report of the JICA survey report. The results of this estimare are shown in Table VIII-7-1.

Table VIII-7-1

(Unit: 1,000 KT)

	Quantity of exports and imports	Cargo movement by river	Asuncion (excluding small nearby ports)	Concepcion	Encarna-cion	Others
General merchandise	710	588	412	6	13	157
Cereals	369	184	62	-	110	12
Meat	25	24	14	3	-	7
Fuels	441	440	5	-	-	435
Total	1,545	1,236	493	9	123	611

7-2 Estimate on Cargo Movements between Asuncion and Encarnacion

For an estimate on cargo movements between Asuncion and Encarnacion in respect to barge transport, the subject of this report, there is no other choice but to depend on a conjecture due to the unavailability of data as mentioned above.

On the basis of the survey of a Japanese shipping firm in Argentina and other sources, the volume is estimated at about 70% of the fluvial transport of general merchandise (excluding oil, soybeans and cereals). For this reason, the volume of general merchandise movements between Asuncion and Buenos Aires in 1985 may be estimated at about 412,000 KT.

7-3 Estimate on Movements of Soybeans and Other Seeds

There are signs for a rise in the diversion of soybeans and other seeds to Europe via Paranagua Port. With the assignment of barges about which mention is made in this report, the quantity of soybeans and other seeds to be shipped out from Encarnacion (and smaller nearby ports) in 1985 may be estimated at 120,000 KT.

8. Data for Estimate on Cargo Movements

8. Data for Estimate on Cargo Movements

8-1 Actual Export of Main Products (1968-77)

(Unit: 1,000 KT)

		1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Remarks
Forestry and stock farming	Lumber	183,635	198,962	195,305	152,318	103,318	114,814	151,785	116,713	75,452	113,327	*
	Meat	17,719	17,211	23,994	25,510	32,939	35,531	18,842	21,308	12,647	15,276	
	Leather, etc.	9,284	8,980	11,011	11,158	17,452	16,716	11,895	9,293	7,639	11,527	
	(Sub total)	(27,003)	(26,191)	(35,005)	(36,668)	(50,391)	(52,247)	(30,737)	(30,601)	(20,286)	(26,803)	
Farm products	Tobacco	15,007	19,650	19,344	16,069	21,453	17,523	24,054	24,959	27,456	22,348	
	Seeds	10,581	11,667	18,898	22,238	54,130	59,926	121,248	111,787	216,691	253,669	Primarily, soybeans
	Corn	3,329	-	23,281	15,599	863	7,800	4,580	5,815	12,000	-	
	Vegetables	4,751	3,084	3,480	9,907	7,407	5,472	14,246	38,663	6,679	5,040	
	Coffee	2,879	1,517	1,269	1,473	4,152	2,858	4,025	5,935	3,559	1,869	
	Cotton	4,451	8,558	11,216	2,886	7,592	18,605	17,464	26,525	32,638	58,813	
	Sugar	340	318	108	-	11,754	6,500	20,000	13,580	3,500	-	
	Palm oil	8,080	8,080	10,389	12,346	7,025	10,951	12,406	7,041	3,594	9,477	
	Tung oil	12,939	11,002	10,069	17,534	21,115	6,655	14,041	11,057	16,127	15,842	
	Feed cakes	30,235	32,350	55,128	11,144	26,940	61,880	50,282	54,609	64,115	67,610	
	Taros	17,428	16,118	14,485	15,243	16,054	16,054	5,218	12,665	15,110	14,997	
	Others	8,944	7,049	7,817	4,867	5,395	7,261	4,306	4,008	16,448	6,453	
	(Sub total)	118,964	120,153	175,484	129,306	183,880	216,485	291,870	316,644	417,917	456,118	
Industrial products, etc.		17,748	15,380	35,342	85,293	70,725	44,658	64,107	44,874	29,697	26,980	
Total		346,350	360,686	441,136	403,585	408,314	428,204	538,499	508,832	543,352	623,228	

* Logs are included for 1968-72 and only sawn wood is included for 1973 and the subsequent years.

8-2 Composition of Export of Main Products

(Unit: %)

		1968	1969	1970	1971	1972	1973	1974	1975	Remarks
Forestry and Stock Farming	Lumber	52.9	55.2	44.3	37.7	25.3	26.8	28.2	22.9	Logs are included for 1968-72 and only sawn wood is included for 1973 and the subsequent years.
	Meat	5.1	4.8	5.4	6.3	8.1	8.3	3.5	4.2	
	Leather, etc.	2.7	2.5	2.5	2.8	4.3	3.9	2.2	1.8	
	(Sub total)	(7.8)	(7.3)	(7.9)	(9.1)	(12.3)	(12.2)	(5.7)	(6.1)	
Farm Products	Tobacco	4.3	5.4	4.4	4.0	5.3	4.1	4.5	4.9	
	Seeds	3.0	3.2	4.3	5.5	13.3	14.0	22.5	22.0	Primarily, soybeans
	Corn	1.0	-	5.3	3.9	0.2	0.7	0.9	1.1	
	Vegetables	1.4	0.9	0.8	2.4	1.8	1.3	2.6	7.6	
	Coffee	0.8	0.4	0.3	0.4	1.0	0.7	0.7	1.2	
	Cotton	1.3	2.4	2.5	0.7	1.9	4.3	3.2	5.2	
	Sugar	-	-	-	-	2.9	1.5	3.7	2.7	
	Palm oil	2.3	2.5	2.4	3.1	1.7	2.6	2.3	1.4	
	Tung oil	3.7	3.1	2.3	4.3	5.2	1.6	2.6	2.2	
	Feed cakes	8.7	9.0	12.5	2.8	6.6	14.5	9.3	10.7	
	Taros	5.0	4.5	3.3	3.8	3.9	3.7	1.0	2.5	
	Others	2.6	2.0	1.8	1.2	1.3	1.7	0.8	0.8	
	(Sub total)	(34.2)	(33.3)	(39.8)	(32.0)	(45.0)	(50.6)	(54.2)	(62.2)	
Industrial Products, etc.		5.1	4.3	8.0	21.1	17.3	10.4	11.9	8.8	
Total		100	100	100	100	100	100	100	100	

8-3 Actual Rises in Export of Main Products

		1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Remarks
Forestry and stock farming	Lumber	100	108.3	106.4	82.9	56.3	62.5	82.7	63.6	41.1	61.7	Logs are included in 1968-72 and only sawn wood is included for 1973 and the subsequent years.
	Meat	100	97	135.4	144.0	185.9	200.5	106.3	120.3	71.3	86.2	
	Leather, etc.	100	96.7	118.6	120.2	188.0	180.1	128.1	100.1	82.3	124.2	
	(Sub total)	(100)	(97.0)	(129.6)	(135.8)	(186.6)	(193.5)	(113.8)	(113.3)	(75.1)	(99.3)	
Farm Products	Tobacco	100	130.9	128.9	107.1	143.0	116.8	160.3	166.3	183.0	148.9	
	Seeds	100	110.3	178.6	210.1	511.6	566	1,145.9	1,056.5	2,047.9	2,397.4	Primarily, soybeans
	Corn	100	-	699.3	468.6	25.9	84.1	137.5	174.7	360.5	-	
	Vegetables	100	64.9	73.2	208.5	155.9	115.2	300.0	813.8	140.6	106.1	
	Coffee	100	53.7	44.1	51.2	144.2	99.3	139.8	206.1	123.6	649	
	Cotton	100	192.3	252.0	64.8	170.6	418.0	392.3	596.0	733.2	1,321.3	
	Sugar	100	93.5	31.8	-	3,456.1	1,911.8	5,882.3	3,994.1	1,029.4	-	
	Palm oil	100	109.4	128.6	152.8	86.9	135.6	153.5	87.1	44.5	117.3	
	Tung oil	100	85.0	77.8	135.5	163.2	514	108.5	85.5	124.6	122.4	
	Feed cakes	100	107.0	182.3	369	89.1	204.7	166.3	180.6	212.1	223.6	
	Taros	100	92.5	83.1	87.5	92.1	92.1	29.9	72.7	86.7	86.1	
	Others	100	78.8	87.4	54.4	60.3	81.2	48.1	44.8	1,839	72.1	
	(Subtotal)	(100)	(101.8)	(147.5)	(108.7)	(154.6)	(182.0)	(245.3)	(266.2)	(349.6)	(383.4)	
Industrial Products, etc.		100	86.7	199.1	480.5	398.5	251.6	361.2	252.8	167.3	152.0	
Total		100	103.8	127.0	116.2	117.6	123.3	155.0	146.5	156.4	179.4	

8-4 Breakdown of Actual Export of Main Products

(Unit: 1,000 KT)

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Sawn wood	31,124	56,347	58,457	56,818	83,829	107,451	142,773	107,012	67,308	100,969
Boads	30,008	50,949	46,063	38,551	53,696	23,849	111,749	83,411	23,382	61,498
Doors	-	3,703	7,062	12,367	14,715	11,191	7,278	1,776	5,815	10,263
Wood pieces	-	291	483	210	4,637	12,640	12,330	3,247	17,642	27,147
Others	1,116	1,431	4,849	5,690	10,781	9,771	11,416	18,578	20,469	2,061
Fabricated materials	1,323	3,717	4,243	4,366	4,666	7,374	8,940	9,736	8,144	12,358
Plates	172	415	117	34	220	1,932	4,656	5,041	5,689	8,904
Others	1,151	3,302	4,126	4,332	4,446	5,442	4,284	4,695	4,695	3,454
Logs	148,843	137,371	130,236	88,410	14,830	-	-	-	-	-
Meat	16,041	16,696	22,964	24,394	30,985	33,814	17,258	20,177	11,704	13,873
Canned food	15,012	13,055	11,106	9,651	9,399	11,221	7,852	14,665	8,273	9,249
Frozen meat	22	1,795	9,564	12,428	19,242	20,317	7,245	4,091	1,602	2,797
Condensed meat juice	326	657	559	442	841	591	1,080	811	1,000	1,017
Entrails	681	1,189	1,735	1,873	1,503	1,685	1,081	610	829	810
Leather	7,464	6,849	8,513	8,323	10,631	9,356	8,362	7,723	5,400	6,894
Seeds	13,581	11,667	17,098	22,237	54,130	59,926	121,244	111,787	219,691	253,669
Tartago	10,580	10,789	17,075	10,199	12,578	6,458	19,072	9,588	8,440	7,660
Sunflowers	-	-	-	-	-	-	-	-	2,750	3,480
Soybeans	3,000	875	-	12,000	41,467	53,447	100,651	101,946	208,339	241,202
Others	1	3	23	38	85	21	1,521	253	162	1,327
Tobacco	15,007	19,650	19,344	16,069	21,451	17,524	24,055	24,959	27,456	22,348
Cereals	3,409	49	25,139	17,170	1,054	3,803	7,300	5,965	13,458	1,195
Corn	3,329	19	23,281	15,036	862	3,241	4,580	5,815	12,000	-
Others	80	30	1,858	2,134	192	562	2,720	150	1,458	1,195
Fruits	2,357	1,660	1,087	3,553	3,506	1,723	4,436	2,874	1,874	1,506
Processed fruit	1,141	674	1,863	2,412	2,218	3,792	2,735	1,843	1,043	1,626

(Unit: 1,000 KT)

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Vegetables	2,811	1,501	2,810	6,382	3,900	3,750	9,810	35,790	4,806	3,534
Tomatoes	1,905	1,380	2,265	3,586	1,430	2,652	4,326	2,270	2,750	1,953
Pepper	60	41	125	811	298	714	1,301	864	736	1,496
Others	846	80	420	1,985	2,172	384	4,183	32,656	1,320	85
Coffee	2,878	1,517	1,269	1,473	4,150	2,843	4,025	5,935	3,559	1,869
Mate	5,309	5,970	5,330	1,063	2,928	574	1,490	679	1,348	1,994
Palm tea	4,621	5,684	8,333	6,195	6,455	3,607	3,370	2,464	1,239	1,121
Vegetable oil	21,860	19,946	22,269	32,139	28,945	21,938	28,490	20,429	30,166	28,280
Palm oil	8,079	8,840	10,489	12,787	7,104	11,652	12,547	7,041	10,003	10,008
Tung oil	12,940	11,003	10,069	17,533	21,115	6,655	14,041	11,057	16,127	15,841
Others	841	103	1,711	1,819	726	3,631	1,902	2,331	4,036	2,431
Cotton	4,450	8,559	11,216	2,887	7,593	18,606	17,465	26,525	32,638	58,813
Feed	30,235	32,350	55,128	11,144	36,940	61,880	50,282	54,609	64,115	67,610
Taros	17,426	16,119	14,485	15,241	16,054	16,054	5,218	12,665	15,110	14,997
Sugar	339	318	108	8	11,754	6,500	20,000	13,580	3,500	-

8-5 Buying Countries by Main Product (1968 - 1977)

(Unit: KT)

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Remarks
Sawn wood	31,124	56,347	58,457	56,818	83,829	107,451	142,773	107,012	67,308	100,969	Minus fabricated materials
Uruguay	1,078	909	1,445	565	861	3,837	4,604	3,153	4,663	5,725	
Argentina	29,139	54,385	54,744	53,890	74,425	81,728	113,207	81,522	16,816	51,126	
Brazil	-	-	-	187	829	6,621	11,916	19,496	30,681	28,094	
U. S.	213	344	85	400	4,275	8,329	8,088	880	11,169	11,713	
Others	694	709	2,183	1,776	3,439	6,936	4,958	1,961	3,979	4,311	
Meat	16,041	16,696	22,964	24,394	30,985	33,814	17,258	20,177	11,704	13,873	
Great Britain	6,247	4,891	5,465	2,901	6,065	5,822	6,480	10,010	5,141	7,380	
U. S.	7,621	7,618	5,650	5,797	4,470	6,500	2,851	5,175	3,696	2,846	
West Germany	52	44	171	252	8,807	11,408	3,666	1,081	904	1,038	
Belgium	295	388	1,920	3,852	4,003	2,725	535	327	170	35	
Holland	1,213	1,068	3,545	4,705	3,367	2,097	1,661	2,210	336	41	
Spain	-	805	2,666	2,128	1,464	1,460	233	319	445	716	
Others	613	1,882	3,547	4,759	2,809	3,802	1,832	1,055	1,012	1,817	
Seeds	13,581	11,667	17,098	22,237	54,130	59,926	121,244	111,787	219,691	253,669	Primarily, soybeans
Holland	5,742	6,211	3,274	200	5,679	747	26,330	21,213	86,449	137,342	
West Germany	5,180	3,907	12,750	12,767	16,152	10,050	31,000	37,136	47,380	30,520	
Brazil	-	-	50	430	445	202	25	53	15,804	21,212	
Great Britain	-	-	-	196	266	-	6,000	9,000	8,000	1,110	
Switzerland	-	-	-	-	-	14,000	50,217	31,330	59,400	43,606	
Argentina	1,209	133	8	1,514	1,728	1,327	4,122	300	52	310	
Argentina (transshipment)	150	-	-	7,100	29,860	33,200	-	-	-	-	
Others	1,300	1,416	1,016	30	0	400	3,550	12,755	2,606	19,569	
Tobacco	15,007	19,650	19,344	16,069	21,451	17,524	24,055	24,959	27,456	22,348	
France	4,052	3,611	3,703	4,518	5,150	4,598	7,994	11,274	14,169	6,637	
West Germany	568	1,488	531	1,146	902	1,666	1,134	2,891	3,413	3,975	
Others	10,387	14,551	15,110	10,405	15,399	11,260	14,927	10,794	9,874	11,736	

(Unit KT)

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Remarks
Cotton	4,450	8,559	11,216	2,887	7,593	18,606	17,465	26,525	32,638	58,813	
U. S.	-	-	-	-	-	343	-	220	684	7,737	
West Germany	52	191	296	641	2,123	3,150	4,471	8,222	2,491	7,142	
France	-	125	1,405	79	25	2,249	1,323	1,908	1,332	4,568	
Switzerland	28	-	20	-	-	465	2,019	6,918	9,779	3,931	
Belgium	-	878	224	103	1,605	3,734	2,677	694	-	255	
Uruguay	3,927	2,932	3,616	522	145	334	848	1,130	5,391	5,530	
Portugal	-	100	142	-	-	677	1,891	466	3,170	7,939	
Argentina (transshipment)	183	2,411	1,869	1,395	2,203	4,769	-	-	-	-	
Argentina	200	10	-	-	363	380	680	44	85	4,573	
Others	60	1,912	3,644	147	1,129	2,505	3,556	6,923	9,706	17,138	
Vegetable oil	21,860	19,946	22,269	32,139	28,945	21,938	28,490	20,429	30,166	28,280	
U. S.	4,490	4,635	3,383	1,500	2,820	709	4,200	2,100	6,650	7,330	
West Germany	185	400	320	609	200	3,350	2,475	5,500	4,150	3,590	
Switzerland	-	-	-	-	-	1,330	8,000	3,300	3,130	4,440	
Argentina (transshipment)	7,058	2,746	3,806	-	13,505	3,300	-	-	-	9	
Argentina	3,242	1,401	2,257	6,785	2,470	4,816	4,919	3,966	4,119	4,483	
Others	6,885	10,764	12,503	23,245	9,950	8,433	8,896	5,563	12,117	8,428	
Flour	30,435	32,745	59,670	53,021	60,442	81,526	70,452	71,709	86,915	86,986	
West Germany	13,322	22,360	30,740	12,539	33,896	29,975	30,090	31,122	33,420	28,448	
Holland	12,793	4,550	20,076	14,534	10,000	20,095	22,739	36,087	50,495	42,401	
Others	4,320	5,835	8,854	25,948	16,546	31,456	17,623	4,500	3,000	16,137	

8-6 Actual Exports by Buying Country (1968-77)

(Unit: KT)

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
North America	35,537	33,808	28,886	27,933	41,647	48,494	39,890	30,098	43,799	64,699
Canada	355	1,706	395	771	2,159	3,378	1,804	362	744	631
U. S.	34,582	32,716	25,328	24,322	38,300	41,421	36,002	28,536	42,573	63,673
Puerto Rico	600	16	3,163	2,840	1,188	3,695	2,084	1,170	482	395
Lation America	219,039	228,904	252,942	241,372	166,051	148,038	230,530	184,594	120,312	171,872
Mexico	414	1,208	3,500	2,966	3,459	3,307	2,970	10,665	6,246	1,609
Colombia	42	75	279	147	704	238	79	189	71	165
Equador	1,075	2,824	3,309	3,008	1,685	1,548	1,202	100	30	9
Venezuela	62	195	59	4	4	62	3,379	7,201	1,090	500
(Sub total)	(1,593)	(4,302)	(7,147)	(6,140)	(6,152)	(5,155)	(7,630)	(19,155)	(7,439)	(2,283)
Brazil	770	175	8,935	10,067	14,876	24,857	22,690	30,998	54,833	59,973
Uruguay	13,242	11,504	14,020	10,522	2,909	5,595	7,497	5,882	12,233	16,744
Argentina	200,415	208,968	216,888	206,772	135,882	107,269	185,725	125,272	33,417	78,405
Bolivia	-	-	-	15	1,505	-	20	2	2	12
(Sub total)	(214,427)	(220,647)	(239,843)	(227,361)	(155,172)	(137,721)	(215,932)	(162,154)	(100,483)	(155,134)
Peru	20	344	503	302	317	289	641	1,873	1,750	186
Chile	2,999	3,611	5,449	7,509	4,710	4,873	6,327	1,412	10,640	14,269
(Sub total)	(3,019)	(3,955)	(5,952)	(7,871)	(4,727)	(5,162)	(6,968)	(3,285)	(12,390)	(14,455)
Europe	(72,351)	(81,053)	(126,506)	(87,033)	(141,378)	(154,706)	(260,109)	(285,725)	(370,733)	(370,405)
North Europe	(66,374)	(73,459)	(111,729)	(78,041)	(131,928)	(145,480)	(244,966)	(269,614)	(363,208)	(353,441)
West Germany	22,606	30,397	47,254	31,244	67,863	62,133	79,026	97,719	97,103	79,182
Belgium	2,436	3,270	8,569	5,578	11,352	9,006	6,603	16,588	1,287	3,149
France	6,528	7,911	8,600	8,707	8,670	12,941	12,996	14,402	19,223	14,768
Holland	25,158	20,508	35,112	26,315	28,097	31,711	62,888	71,585	154,743	185,967
Austria	34	4	25	-	26	207	200	50	15	-
Denmark	1,005	4,040	1,500	-	507	5	925	1,437	209	2,825
Norway	-	-	32	-	60	-	2	-	-	-
Great Britain	8,078	7,215	8,487	5,779	9,331	9,574	16,478	21,363	14,368	11,316

(Unit: KT)

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Sweden	3	9	-	2	3	25	2,048	72	100	52
Finland	255	-	-	-	-	-	-	-	-	301
Iceland	-	-	-	-	-	1	-	-	-	-
Switzerland	271	105	2,450	416	6,019	19,877	63,800	46,398	76,160	55,881
South Europe	(5,977)	(7,894)	(14,777)	(8,992)	(9,450)	(9,226)	(15,143)	(16,111)	(7,525)	(16,964)
Portugal	-	100	142	-	-	2,269	1,891	472	3,170	7,992
Italy	772	609	1,244	890	1,277	1,814	3,470	2,190	1,825	5,439
Spain	5,205	6,098	11,643	6,991	8,153	5,113	6,282	9,449	2,530	3,533
Greece	-	787	1,722	1,111	-	30	3,500	-	-	10
Yugoslavia	-	-	26	-	20	-	-	4,000	-	-
Asia and Africa	20,422	16,920	3 ,800	47,240	59,239	76,965	7,971	8,415	8,508	16,253
Total	347,349	360,685	441,134	403,578	408,315	428,203	538,500	508,832	543,352	623,229

8-7 Export Products by Major Buying Country (1968-77)

(Unit: KT)

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Argentina	200,415	208,968	216,888	206,772	135,882	107,269	185,758	126,274	33,417	78,405
Sawn wood	30,281	57,013	57,625	56,873	76,344	83,868	115,888	95,653	18,555	53,411
Material wood	142,754	132,235	123,110	83,952	14,514	-	-	-	-	-
Fruits	3,077	1,751	2,321	3,240	3,457	2,944	5,992	3,748	2,452	2,960
Vegetables	2,786	1,501	2,810	6,153	3,795	2,725	6,612	4,989	4,130	3,530
Vegetable oil	3,242	1,401	2,257	6,786	2,470	4,816	4,919	3,966	4,119	4,483
Feed	250	-	400	16,510	12,246	372	11,450	-	-	4,037
Others	18,025	15,067	28,365	33,258	23,056	11,544	40,897	17,918	4,161	9,984
Uruguay	13,142	11,504	14,020	10,522	2,909	5,595	7,497	5,883	12,233	16,744
Cotton	3,927	2,932	3,616	515	145	334	848	1,130	5,391	5,530
Sawn wood	1,078	910	-	565	861	3,837	4,604	3,153	4,603	5,725
Material wood	6,051	5,075	6,314	4,458	315	-	-	-	-	-
Others	2,086	2,587	4,090	4,984	1,588	1,424	2,045	1,600	2,179	5,489
Brazil	770	175	8,935	10,067	14,876	24,857	22,690	30,998	54,833	59,973
Sawn wood	-	-	-	216	913	8,001	16,271	23,690	35,408	36,389
Cereals (soybeans)	-	-	50	450	445	202	29	53	15,804	21,212
Vegetable oil	630	45	2,097	877	221	3,482	2,031	675	925	1,700
Others	140	130	6,788	8,524	13,297	13,172	4,359	6,580	2,696	672
Argentina (transshipment)	16,517	12,804	20,725	41,350	54,151	68,967	-	-	-	-
Cotton	184	2,411	1,869	1,396	2,202	4,769	-	-	-	-
Vegetable oil	7,058	2,746	3,806	9,746	13,505	2,300	-	-	-	-
Cereals (soybeans)	150	-	-	100	29,860	33,200	-	-	-	-
Feed	2,865	1,400	1,000	318	1,000	22,120	-	-	-	-
Corn	1,862	-	9,469	10,402	-	-	-	-	-	-
Others	4,398	6,247	4,581	19,388	7,584	5,578	-	-	-	-

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
U. S.	34,582	32,716	25,328	24,322	38,300	41,421	36,002	28,536	42,573	63,673
Sawn wood	215	344	85	400	4,275	8,329	8,088	880	11,169	11,713
Meat	7,621	7,618	5,650	5,797	4,470	6,500	2,850	5,175	3,696	2,846
Cotton	-	-	-	-	-	343	-	220	684	7,737
Vegetable oil	4,490	4,635	3,383	1,500	2,820	709	4,200	2,100	6,650	7,330
Taros	16,988	18,908	12,716	12,767	13,048	16,009	5,048	10,202	14,471	14,937
Sugar	8	8	8	8	6,700	6,500	13,500	4,000	3,500	-
Others	5,260	1,203	3,486	3,850	6,987	3,031	2,316	5,959	,2403	19,110
Great Britain	8,078	6,215	8,487	5,779	9,331	9,574	16,478	21,363	14,368	11,316
Meat	6,247	4,891	5,465	2,901	6,065	5,822	6,480	10,010	5,141	7,380
Sawn wood	-	-	-	-	-	176	348	-	185	1,676
Others	1,831	2,324	3,022	2,878	3,266	3,576	9,650	11,353	9,042	2,260
France	6,528	7,911	8,600	8,707	8,670	12,941	12,996	14,402	19,223	14,768
Cotton	-	125	1,405	79	25	2,249	1,323	1,908	1,332	4,568
Tobacco	4,052	3,611	3,703	4,518	5,150	4,598	7,994	11,274	14,169	6,637
Cereals	1,300	1,416	1,016	-	-	400	2,050	255	2,500	2,000
Others	1,176	2,759	2,476	4,110	3,495	5,694	1,629	965	1,222	1,563
Spain	5,205	6,098	11,643	6,991	8,153	5,113	6,282	9,449	2,530	3,533
Tobacco	4,184	2,760	7,149	2,074	3,062	1,235	2,555	1,173	1,068	1,296
Meat	-	805	2,666	2,128	1,464	1,460	233	319	445	716
Taros	438	2,211	1,669	2,455	2,321	-	-	-	-	-
Others	583	322	159	334	1,306	2,418	3,494	8,007	1,017	1,521
Belgium	2,436	3,270	8,569	5,578	11,352	9,006	6,603	16,588	1,287	3,149
Cotton	-	878	224	103	1,604	3,734	2,677	694	-	255
Meat	295	388	1,920	3,852	4,003	2,725	535	327	170	35
Tobacco	2,132	1,693	1,457	1,393	1,556	1,727	2,159	1,019	701	686
Feed	-	-	1,960	-	1,800	-	-	1,500	-	1,500
Others	9	311	3,008	230	2,389	820	1,232	13,048	416	173

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Holland	25,158	20,508	35,112	26,315	28,097	31,711	62,888	71,585	154,743	185,967
Cotton	59	586	549	-	140	948	282	1,331	1,215	1,851
Meat	1,213	1,068	3,545	4,705	3,367	2,097	1,661	2,210	336	41
Cereals (soy-beans and maize)	5,742	6,211	3,273	200	5,679	747	26,330	21,213	86,449	137,342
Feed	12,793	4,550	19,428	-	10,000	20,095	3,347	36,087	50,495	42,401
Others	5,351	8,093	8,317	21,410	8,911	7,824	31,268	10,744	16,248	4,332
West Germany	22,606	30,397	47,254	31,244	67,863	62,133	79,026	97,719	97,103	79,182
Meat	52	44	171	252	8,807	11,408	3,666	1,081	904	1,038
Tobacco	568	1,488	531	1,146	902	1,666	1,134	2,891	3,413	3,975
Cereals	5,180	3,907	12,750	12,767	16,152	10,050	31,000	37,136	47,380	30,520
Cotton	52	91	296	641	2,123	3,150	4,471	8,222	2,491	7,142
Vegetable oil	185	400	320	609	200	3,350	2,475	5,500	4,150	3,590
Feed	13,322	22,360	30,740	12,539	33,896	29,975	30,090	31,122	33,420	28,448
Others	3,247	2,107	2,446	3,290	5,783	2,534	6,190	11,767	5,345	4,469
Italy	772	609	1,244	890	1,277	1,814	3,470	2,190	1,825	5,439
Cotton	-	135	166	-	40	130	552	231	815	2,148
Others	772	474	1,078	890	1,237	1,684	2,918	1,959	1,010	3,291
Switzerland	271	105	2,150	416	6,019	19,877	63,800	46,398	76,160	55,881
Cotton	28	-	20	-	-	465	3,019	6,918	9,779	5,931
Vegetable oil	-	-	-	-	-	1,330	8,000	3,300	3,130	4,440
Cereals	-	-	-	-	-	14,000	50,217	31,300	59,400	43,606
Feed	-	-	100	-	-	1,621	673	2,000	2,000	2,000
Corn	175	-	1,854	-	5,000	-	-	1,700	1,500	-
Others	68	105	176	416	1,019	2,461	1,891	1,180	351	904
Japan	2,759	2,318	8,467	3,272	1,352	2,059	2,131	2,297	4,723	4,787
Cotton	-	592	1,635	-	-	-	100	1,348	2,557	2,313
Cereals	-	-	6,250	2,400	-	-	-	-	-	-
Sawn wood	-	-	-	-	321	1,219	1,272	543	1,374	1,909
Other	2,759	1,726	582	872	1,031	840	759	406	792	565

8-8 Actual Imports by Main Product

(Unit: KT)

		1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Food	Wheat	91,606	67,431	71,593	61,714	55,150	32,423	71,161	25,398	56,756	44,335
	Salt	20,636	21,567	22,739	23,166	28,085	28,165	27,317	22,965	23,687	24,895
	Others	6,167	7,803	5,244	5,566	5,015	5,102	5,450	5,508	8,821	10,108
	(Sub total)	118,409	96,801	99,576	90,446	88,250	65,690	103,936	53,871	89,264	79,338
Oil	Crude oil	159,105	147,934	186,528	169,166	144,922	166,083	228,822	205,221	229,816	213,373
	Fuels, etc.	35,161	24,875	40,259	27,558	21,510	30,911	64,396	45,866	84,847	101,469
	(Sub total)	194,266	172,809	226,787	196,724	166,432	196,994	293,218	251,087	314,663	314,842
Chemical products Medicines, etc.		5,211	7,072	6,050	7,140	7,522	16,608	26,432	16,867	13,952	26,735
Automobiles and parts		7,918	7,836	6,082	5,898	5,041	7,710	9,595	8,806	10,560	17,749
Textiles		2,571	3,003	2,656	2,151	1,731	1,632	3,287	2,160	2,116	3,629
Steel		20,294	15,154	11,845	16,920	17,934	25,512	24,845	21,261	21,086	29,292
Machinery		6,312	7,646	5,422	6,742	6,676	12,348	11,924	11,159	10,601	19,016
Others		48,381	47,743	56,624	46,474	45,251	54,513	43,500	43,793	50,985	72,296
Total		403,362	358,064	415,042	372,495	338,837	381,007	516,737	049,004	513,227	562,897

8-9

(Unit: %)

		1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Food	Wheat	22.7	18.8	17.2	16.6	16.3	8.5	13.8	6.2	11.1	7.9
	Salt	5.1	6.0	5.5	6.2	8.3	7.4	5.3	5.6	4.6	4.4
	Others	1.6	2.2	1.3	1.5	1.4	1.3	1.0	1.4	1.7	1.8
	(Subtotal)	(29.4)	(27.0)	(24.0)	(24.3)	(26.0)	(17.2)	(20.1)	(13.2)	(17.4)	(14.1)
Oil	Crude oil	39.4	41.3	44.9	45.4	42.8	43.6	44.3	50.2	44.8	37.9
	Fuels, etc.	8.8	7.0	9.7	7.4	15.3	8.1	12.4	11.2	16.5	18.0
	(Sub total)	(48.2)	(48.3)	(54.6)	(52.8)	(58.1)	(51.7)	(56.7)	(61.4)	(61.3)	(55.9)
Chemical products Medicines, etc.		1.3	2.0	1.5	1.9	2.2	4.4	5.1	4.1	2.7	4.7
Automobiles and parts		2.0	2.2	1.5	1.6	1 5	2.0	1.9	2.2	2.1	3.2
Textiles		0.6	0.8	0.6	0.6	0.5	0.4	0.6	0.5	0.4	0.6
Steel		5.0	4.2	2.9	4.5	5.3	6.7	4.8	5.2	4.1	5.2
Machinery		1.6	2.1	1.3	1.8	2.0	3.2	2.3	2.7	2.1	3.4
Others		12.0	13.3	13.6	12.3	13.4	14.3	8.4	10.7	9.9	12.8
Total		100	100	100	100	100	100	100	100	100	100

8-10 Increases in Main Imports

		1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Food	Wheat	100	73.6	78.2	67.4	60.2	35.4	77.7	27.7	62.0	48.4
	Salt	100	105.9	111.7	113.8	137.9	138.3	134.2	112.8	116.3	122.3
	Others	100	126.5	85.0	90.3	81.3	82.7	88.4	89.3	143.0	163.9
	(Subtotal)	(100)	(81.8)	(84.1)	(76.4)	(74.5)	(55.5)	(87.8)	(45.5)	(75.4)	(67.8)
Oil	Crude oil	100	93.0	117.2	106.3	91.1	104.4	143.8	129.0	144.4	134.1
	Fuels, etc.	100	70.7	114.4	78.4	61.2	87.9	183.1	130.4	241.3	288.6
	(Subtotal)	(100)	(89.0)	(116.7)	(101.3)	(85.7)	(101.4)	(150.9)	(129.2)	(161.9)	(162.1)
Chemical products		100	135.7	116.1	137.1	144.3	318.7	507.2	323.7	267.7	513.0
Medicines, etc.											
Automobiles and parts		100	99.0	76.8	74.5	95.0	97.4	121.2	111.2	133.4	224.2
Textiles		100	116.8	103.3	83.7	67.3	63.5	127.8	84.0	82.3	141.2
Steel		100	74.7	58.4	83.4	88 4	125.7	122 4	104.8	103.9	144.3
Machinery		100	121.1	85.9	106.8	105.8	195.6	188.9	176.8	167.9	301.3
Others		100	98.7	117.0	96.1	93.5	112.7	89.9	90.5	105.4	149.4
Total		100	88.8	102.9	92.3	84.0	94.5	128.1	101.4	127.2	139.6

8-11 Actual Imports by Bloc

(Unit: KT)

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
North America	61,834	31,363	56,577	61,628	57,565	17,477	20,177	15,889	18,183	-
Canada	800	957	1,406	353	350	805	122	171	184	-
U. S.	53,152	25,909	39,987	53,363	53,594	11,412	12,881	10,844	12,973	13,598
Puerto Rico	7,882	4,497	15,184	7,912	3,621	5,260	7,174	4,874	5,026	-
Latin America	139,976	135,932	130,049	105,279	110,792	143,313	321,275	169,503	227,300	-
Mexico	381	489	269	646	826	993	230	648	252	-
Colombia	49	43	37	36	27	108	111	69	84	-
Equador	11	39	22	28	7	33	26	8	31	-
Venezuela	155	1	129	1	33	405	12	2	7,156	-
(Sub total)	(596)	(572)	(457)	(711)	(893)	(1,539)	(379)	(727)	(7,523)	-
Brazil	3,525	3,361	3,755	15,717	26,431	25,312	32,851	33,983	29,118	71,908
Uruguay	974	3,588	4,546	3,493	4,604	2,993	12,493	11,017	24,802	30,149
Argentina	134,422	127,005	119,202	81,163	77,133	110,724	209,429	117,787	160,518	136,446
Bolivia	9	3	5	2,081	1	1	63,333	3,118	5	-
(Sub total)	(138,930)	(133,757)	(127,508)	(102,454)	(108,169)	(139,030)	(318,106)	(165,905)	(214,443)	-
Peru	180	12	110	266	12	232	108	69	1,457	-
Chile	270	1,391	1,974	1,848	1,718	2,512	2,682	2,802	3,877	-
(Sub total)	450)	(1,403)	(2,084)	(2,114)	(1,730)	(2,744)	(2,790)	(2,871)	(5,334)	-
Europe	36,760	37,123	29,722	27,953	25,826	25,334	28,640	31,825	32,630	53,548
North Europe	27,426	33,287	27,282	25,474	23,064	22,876	26,513	30,035	25,976	33,869
West Germany	14,254	16,928	12,811	9,012	11,074	7,816	9,176	8,027	9,982	10,453
Belgium	1,921	1,999	1,100	984	732	623	413	3,980	1,950	4,308
France	896	1,116	1,152	2,365	1,372	819	1,437	2,202	1,576	8,084
Holland	729	654	1,657	1,807	1,473	1,408	3,317	1,172	642	795
Austria	391	379	438	416	277	283	360	783	505	-
Denmark	195	233	582	586	470	473	248	267	288	-
Norway	216	266	409	369	145	157	184	272	49	-

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Great Britain	5,782	8,699	6,599	7,689	5,529	8,886	9,494	11,763	9,975	8,807
Sweden	2,688	2,442	1,772	1,934	1,690	1,875	1,693	1,225	758	1,206
Finland	166	47	485	73	177	216	3	2	56	-
Iceland	-	-	-	-	1	1	-	1	1	-
Switzerland	188	524	277	239	124	319	188	341	194	216
South Europe	(9,324)	(3,836)	(2,440)	(2,499)	(2,762)	(2,458)	(2,134)	(1,790)	(6,654)	(19,679)
Italy	7,282	2,540	1,158	1,067	1,354	1,322	689	875	1,497	1,008
Portugal	14	14	20	22	28	39	35	35	100	-
Spain	1,916	1,185	1,109	1,313	1,371	1,093	1,392	877	5,057	18,671
Greece	2	27	91	74	9	3	1	3	5	-
Yugoslavia	120	70	62	3	-	1	17	-	2	-
Asia and Africa	164,792	153,646	198,694	177,635	144,654	194,883	146,638	191,787	235,114	-
Algeria	159,105	146,340	184,340	168,682	139,943	190,691	86,025	181,861	227,049	212,878
Japan	2,579	3,945	3,506	3,257	2,886	2,517	3,049	4,754	3,638	13,257
Total	403,362	358,064	415,042	372,495	338,837	381,007	516,737	409,004	513,227	562,897

Part IX Assessment of the Project

Part IX Assessment of the Project

1. Outline of the Project

According to the request for a feasibility study of the Paraguayan fleet expansion project, the project included the following as of November 1977:

6,000-DWT ocean-going ship	1
1,400-DWT ocean-going ship	1
2,600-3,000 PS Pusher	1
2,600 PS Pusher	1
1,400 PS pusher	1
2,000 m^3 oil barges	4
1,000-DWT barges	4
600-DWT barges	6
370-DWT barges	20

With these vessels taken into account, the survey team carried out an on-the-spot survey. The aforementioned fleet expansion project was somewhat amended as follows in May 1978 after its return to Japan, considering the result of exchange of both Party's opinion.

(1)	6,000-DWT ocean-going ship	1
(2)	1,500-DWT river/ocean-going ship	1
(3)	2,400 PS pushers	2
(4)	1,200 PS pushers	2
(5)	300 PS pusher	1
(6)	2,000 m^3 oil barges	4
(7)	800-DWT barges	10
(8)	360-DWT barges	20
(9)	Pontoon with Transhipment machine	1
(10)	Spare parts for exsisting vessels built by yen-credit in 1961	

Moreover, after the explanation of the draft report by the survey team, one more 1,500-DWT ocean-going ship was added, and pontoon with transhipment machine was deleted by the Government of Paraguay in September 1978.

Accordingly, final scope of the project was surveyed upon in this assessment and pontoon with transhipment machine was also studied only for reference.

2. Relationship between Cargo Movements and Ship Tonnage (Quantity of Transport)

In Chapter VIII, the cargo movements relating to this project are separately estimated. Here, an attempt will be made to elucidate on the balance between the estimated amount and the tonnage of ships (transport volume). For an ascertainment of the feasibility of this project, it is important to analyze and estimate the demand and supply. In the case of this project, the question may be boiled down to what tonnage of ships is available at present to cope with the present and future cargo movements and what rise may be estimated for the future cargo movements.

In the light of the nature of this project, a strict analysis from this point of view would not be much meaningful, and it will be adequate if the relationship between the cargo movements and the tonnage of ships is numerically grasped. In Paraguay, many foreign vessels (mostly Argentine) are assigned at present in addition to Paraguayan ships. As a whole, an adequate number of ships are available for the cargo movements, and if the cargo movements increase in the future, the shortage may easily be offset by foreign vessels.

From another point of view, it is important to realize the degree to which the ratio of loading by Paraguayan ships may be raised by the implementation of this project. In other words, it is necessary to check and see if the Paraguayan share is sufficient or if a possible overtonnage would not cause much friction to foreign vessels or Paraguay's transport sector.

In conclusion, it might be said that this project is reasonable in respect to the above two points. In the following, the relationship with the transport demand will be elucidated for each project, and what will be described may be summarized as follows (with the transport volume based on the values estimated for 1985).

o Soy bean Transport - Small Barge System

Of probable 110,000 tons of cargo movements, the transport volume is about 20,000 tons or the share is 18%.

* At present, about 50,000 tons is all transported by Argentine ships. The share is small, but it will be significant, and reasonable as the first step, to transport them by Paraguayan ship.
* If there is progress in the implementation of a system of transhipment at Confluencia between small and large vessels, the share is likely to reach 50-60%.

Incidentally, an adequate share may be still left for Argentine ships in this situation.

o Cement Transport -- Small Barge System

Of 200,000-300,000 tons of cargo movements, the transport volume is about 30,000 tons or the share is about 10%.

* Reasonable as the first step.
* The competitors will be railways, trucks or small CAF shipowners. Numerically, however, there will be no trouble. Rather, there may appear a shortage of transport capacity. In this situation, all use of the barges off season may be allocated to the transport of cement.

o General Merchandise Transport on Main Route (Asuncion / Buenos Aires) Large Barge System

Of about 550,000 freight tons (410,000 KT) of cargo movements, the volume of transport by the FME is about 250,000 freight tons or the share is 45%.

* Of about 450,000 freight tons of cargo movements at present, 120,000 freight tons or about 26% (about 20% in terms of KT) is transported by FME motorboats and barges, and the rest by Argentine ships. The addition of a large and small barge system will double the volume of transport. The volume of transport by large barges will be increased by 96,000 freight tons and that of small barges by 32,000 freight tons, to a total of 250,000 freight tons.
* Under this system, the share of Argentine ships will drop to 55% but the decrease in the volume of transport will be about 10%, so that there will not appear so much friction.

o Oil Transport (Buenos Aires /Asuncion) - Oil Barge System

Of about 440,000 m^3 of cargo movements, the volume of transport is 170,000 m^3 and the share is 39%.

* Of 350,000 m^3 of cargo movements at present, the FME's share is said to be 13% (51% for Paraguay's NAVIPAR and 36% for Argentine ships), but in the last two or three years, 60,000 m^3 or 17% has been loaded by the FME.
* The newly built barge system is capable of carrying about 110,000 m^3, so that the share of the FME will be 170,000 m^3.

* There will be a loss of 20 percent in the volume of transport for NAVIPAR and Argentine firms. Therefore, there will be a need for some adjustment on the part of the REPSA.

o Direct Navigation Between Paraguay and Europe -- Small Ocean-going Ships

Of 55,000 freight tons of cargo movements, the transport volume is 15,000 freight tons and the share is 27%.

* Some of the trade cargoes between Paraguay and Europe are transported by direct ship, and the rest is transhiped at Buenos Aires Port to a fluvial voyage on the main route. The general merchandise carried in trade with Europe is estimated to run up to a total of about 120,000 KT (370,000 KT minus 250,000 KT of soyabenas) or about 160,000 freight tons, of which about 47,000 freight tons is loaded by direct ship.
* Of the direct ships, those of the FME carry about 7,000 freight tons, having a share of about 15%. With the addition of 8,000 freight tons, the volume of transport by newly built small ocean-going ships, the share will be about 15,000 freight tons or about 27%.
* This system is reasonable for a gradual replenishment. There will not appear much friction with foreign vessels.

Large Ocean-going Ship Project

The share is small, because the cargoes to be transported under this project will be diverted to international markets. Even in respect to Paraguayan cargoes, the share is merely 1-2%, and the situation is such that it is too premature to argue about the share.

3. Considerations on Specifications, Construction Cost, Transportation Cost, etc.

3-1 360 DWT Dry Cargo Barge

This is destined to transportation of general cargo, grain, cement and other dry cargo between the port of Presidente Stroessner and Confluencia or Buenos Aires.

3-1-1 Specifications

Type of barge	Rectangular pontoon type, non-self-propelled dry cargo barge

Classification	American Bureau of Shipping or Germanischer Lloyd
Flag	Paraguay
Length, o.a.	40.80 m
Breadth, mld	9.50 m
Depth, mld	2.20 m
Designed draft, mld	1.50 m
Max draft, mld	1.95 m
Dead weight (at designed draft)	360 tons
(at max. draft)	540 tons
Hold capacity (Grain)	Approx. 730 m^3
(Bale)	Approx. 670 m^3
Hold and Tank Arrangement	
	1-Fore void space
	2-Cargo holds
	2 pairs - Double bottom void spaces
	1 - Aft void space
Hull construction	Transverse framing system
Bilge piping system	Independent line for each void space to be led on upper deck
Bilge pump	Portable type
Hatch cover	Steel, end sliding type
Size	(length) x (width)
	27.60 m x 7.00 m
Hold ventilation	Natural ventilation
Corrosion protection	
Bottom	3-Chlorinated rubber anti-corrosive paint
	2-Chlorinated rubber anti-fouling paint
Top side	3-Chlorinated rubber anti-corrosive paint
Upper deck & outside of hatch coaming	2-Chlorinated rubber anti-corrosive paint
Hold	1-Bleached tar epoxy paint
Void space	2-Lead zinc chromate primer

3-1-2 Comments on the Specifications

The above described characteristics of 360 DWT dry cargo barge are based on the request of FME.

Installation of side cofferdam was studied according to the requirement of FME, but here we do not recommend it because of the considerable increase in the hull structure steel and piping weight and also decrease of hold volume that should not be compensated by some advantage like easy treatment of grain remained between the frames.

When not fully loaded with grain, coverage of surface by bagged grain in sack is necessary to keep grain stability because of the very extensive hold length.

3-1-3 Construction Cost

Construction cost per vessel is as follows:

Material cost	
hull structure	12.4 million
out-fitting	5.4 "
spares	0.3 "
Labour cost	19.3 "
Design fee	0.5 "
Administration charge	3.0 "
Total construction cost	40.9 million yen

obs. This cost per vessel is estimated on the basis of series construction of 20 barges.

3-2 1,200 PS Pusher

This pusher is applied to the 360 DWT dry cargo barge mentioned in the clause 3-1. Consequently her service route is the same one of this barge, i.e., between the ports of Presidente Stroessner and Confluencia or Buenos Aires. This pusher has towing function as well as pushing.

3-2-1 Specifications

Type of Ship	Single deck pusher tug for river use with raked stem and tunnel stern
Classification	American Bureau of Shipping or Germanischer Lloyd

Flag	Paraguay	
Length o.a.	Approx.	27.5 m
Length p.p.		24.50 m
Breadth, mld		9.50 m
Depth mld		2.80 m
Designed draft, mld		1.65 m
Operating draft, mld		1.52 m
Gross tonnage	Approx	200 tons
Gross tonnage	Approx	200 tons
Deadweight (at designed draft)		75 tons
Deadweight (at operating draft)	Approx	55 tons
Tank capacity		
Fuel oil tank	Approx	70 m^3
Fresh water tank	Approx	15 m^3
Main engine	Diesel engine	3 sets
Max. continuous output	3 x 450 PS	
Normal output	3 x 405 PS	
Engine control system	Remotely controlled from navigation bridge	
Propeller revolution		
Max. continuous output	Approx	510 rpm
Normal output	Approx	492 rpm
Propeller	3 bladed fixed pitch propeller in Kort nozzle	3 sets
Electric generator	Diesel Engine driven AC 380 V, 50 Hz 3ϕ	2 sets
Speed at the condition of pushing four (4) 360 DWT dry cargo barges in calm water		7.0 knots
Max. static bollard pull	Approx.	18 tons
Endurance based on total fuel oil tank capacity and speed of 7.0 knots	Approx.	1,500 sea miles
Fuel oil consumption of main engine at normal output based on lower calorific value of 10,200 kcal/kg	Approx	5.1 tons/day
Pushing device	Pushing knee	1 set
	Coupling winch (manual)	4 sets

Towing device	Towing hook	1 set
	Towing arch	1 set
Deck machinery		
Windlass	Electric	1 set
Steering gear	Electro-hydraulic	1 set
Accommodation		
Complements	Total 10 persons	
Cabins		
Captain & Chief Engineer	Private room with bath room	
Others	Two-tier bed room	
Air conditioning	Air conditioner	
Corrosion Protection		
Bottom	3-Chlorinated rubber anti-corrosive paint	
	2-Chlorinated rubber anti-fouling paint	
Top side	2-Chlorinated rubber anti-corrosive paint	
	2-Chlorinated rubber top side paint	
Weather deck	2-Chlorinated rubber anti-corrosive paint	
	1-Chlorinated rubber deck paint	
Engine room		
Ceiling and wall	2-Lead zinc chromate primer	
	1-Finish paint	
Under floor	1-Tar epoxy paint	
Fresh water tank	2-Epoxy paint	
Ballast water tank	1-Tar epoxy paint	
Fuel oil tank	No coating	

3-2-2 Comments on the Specifications

The above described characteristics of 1,200 BHP pusher are studied according to the FME's request.

(1) Ship's form

This ship, as projected for river service, has very shallow draft and, moreover, must keep a big volume of fuel necessary to 1,500 sea miles continuous navigation. So, this boat has turned bigger than normal 1,200 PS class tug boat.

(2) Draft

In spite of the draft limitation of 1.52 m [5'] by FME's request, a little larger draft is adopted by the reason that fuel oil is loaded at Buenos Aires and the draft is limited at the upper stream of Confluencia. As the result, the draft is designed to be 1.52 m at Confluencia.

(3) Speed

The very shallow draft of this boat set limit to propeller diameter. In this condition, it is important to increase propeller efficiency through the maximum diameter of propeller within the above mentioned limit and through the decreased horse power per shaft. From this point of view, tunnel stern and triple screws are adopted. Taking into consideration a small number of boats of this type constructed hitherto and some unknown factors regard to relation between the pusher and barge, final confirmation of speed in model test is desiarable.

(4) Fixed Kort-nozzle or steerable Kort-nozzle

If fitted out steerable Kort-nozzle, maneuverability would be notably facilitated, but, on the other hand, a big rudder stock would decrease propelling efficiency and complex machanism would bring more trouble and cost increase. Consideration of these factors lead us to recommend fixed type Kort-nozzle.

3-2-3 Construction Cost

Construction cost per vessel is as follows:

Material cost	
hull structure	10.1 million yen
hull out-fitting	43.2 "
machinery out-fitting	75.5 "
electric out-fitting	28.8 "
spares (for 3 years)	7.3 "
Labour cost	60.7 "
Design fee	16.0 "
Administration charge	8.0 "
Total construction cost	249.6 million yen

obs. This cost per vessel is estimated on the basis of series construction of 2 boats.

3-3 800 DWT Dry Cargo Barge

This barge is put in the transportation service of general cargo and grains along the river to Buenos Aires.

3-3-1 Specifications

Type of barge	Rectangular pontoon type non-self-propelled dry cargo barge	
Classification	American Bureau of Shipping or Germanischer Lloyd.	
Flag	Paraguay	
Length, o.a.		48.00 m
Breadth, mld		12.50 m
Depth, mld		3.30 m
Designed draft, mld		2.00 m
Designed draft, mld		2.75 m
Dead weight (at designed draft)		820 tons
(at max. draft)		1,270 tons
Hold capacity (Grain)	Approx.	1,900 m^3
(Bale)	Approx.	1,750 m^3
Hold and tank arrangement	1-Fore void space 2-Cargo holds 2 pairs-Double bottom void spaces 1-Aft Void space	
Hull construction	Transverse framing system	
Bilge piping system	Independent line for each void space to be led on upper deck.	
Bilge pump	Portable type	
Hatch cover	Steel,end sliding type	
	(length) x (width)	
Size	36.0 m x 9.8 m	
Hold ventilation	Natural ventilation	
Corrosion protection		
Bottom	3-Chlorinated rubber anti-corrosive paint 2-Chlorinated rubber anti-fouling paint	

Top side	3-Chlorinated rubber anti-corrosive paint
Upper deck and outside of hatch coaming	2-Chlorinated rubber anti-corrosive paint 1-Chlorinated rubber deck paint
Hold	1-Bleached tar epoxy paint
Void space	2-Lead zinc chromate primer

3-3-2 Comments on the Specifications

The above described characteristics of 800 DWT dry cargo barge are presented on the basis of FME request.

This barge, as 360 DWT dry cargo barge, requires grain bagging in sack to keep grain stability within a certain limit when not fully loaded with grain.

3-3-3 Construction Cost

Construction cost per vessel is as follows:

Material cost	
hull structure	25.2 million yen
hull out-fitting	8.2 "
spares (for 3 years)	0.3
Labour cost	38.6 "
Design fee	1.2 "
Administration charge	3.0 "
Total construction cost	76.5 million yen

obs: The above cost per barge is estimated on the basis of series construction of 10 barges.

3-4 2,000 m^3 Oil Barge

This barge is used in transportation service of crude oil, diesel oil, naphtha, additives etc. along the River Paraguay to Buenos Aires.

Two (2) of the four (4) barges are destined to transportation of heavy fuel oil in adition to the above cargo.

3-4-1 Specifications

Type of barge	Rectangular pontoon type non-self-propelled oil barge

Classification	American Bureau of Shipping or Germanischer Lloyd.
Flag	Paraguay
Length, o.a.	73.20 m
Breadth, mld	12.50 m
Depth, mld	4.20 m
Designed draft, mld	2.60 m
Deadweight	1,700 tons
Cargo oil tank capacity	Approx. 2,150 m^3
Tank Arrangement	1-Fore void space 4 pairs-cargo oil tanks 4 pairs-Double bottom void space 1-pump room 1-Aft void space
Hull construction	Transverse framing system
Cargo oil piping system	Two (2) main lines shall be connected with main cargo pumps and stripping pump in pump room
Cargo oil pump	Electric, AC 380 V, 50 HZ, 3ϕ, 75 KW 200 m^3/hr x 70 m 2 sets
Stripping pump	Electric, 380 V, 50 HZ, 3ϕ 25 m^3/hr x 70 m 1 set
Bilge piping system	Independent line for each void space to be led to pump room
bilge pump	Electric, 380V, 50Hz, 3ϕ, 30 m^3/hr x 70m 1 set
bilge pump to be used as deck wash and fire pump	
Electric power	To be supplied from shore and/or pusher
Fire extinguishing	Foam fire extinguishing system
Hose handling gear	2 t derrick boom 1 set
Tank cleaning system	Adequate number of tank cleaning holes to be provided on upper deck Tank cleaning machines and driving water for them to be supplied from shore when necessary
Inert gas system	Inert gas line to be provided on upper deck. Inert gas to be supplied from shore.

Tank ventilation	Adequate number of man holes to be provided on upper deck for tank ventilation
Vent system	Main line system
Tank heating system	Heating pipe to be provided for heating fuel oil (Heating pipe to be provided on two (2) barges) Steam to be supplied from shore.
Corrosion protection	
Bottom	3-Chlorinated rubber anti-corrosive paint 2-Chlorinated rubber anti-fouling paint
Top side	3-Chlorinated rubber anti-corrosive paint
Upper deck	2-Chlorinated rubber anti-corrosive paint 1-Chlorinated rubber deck paint
Cargo oil tank	No coating
Pump room & void space	2-Lead zinc chromate primer

3-4-2 Comments on the Specifications

The above described characteristics of 2,000m^3 oil barge are based on the request of FME.

Some explanatory comments are as follows;

(1) Reasons for installation of double bottom only in the cargo tank part

FME wanted comparison of the three alternatives -- installation of double bottom and side cofferdam, double bottom only, and neither --, and here only one case with double bottom only is recommended. Installation of double bottom can solve difficulty of sludge removal and stripping problem which appears specially in the ship of transverse framing system. If installed not only double bottom but also side cofferdam, notable increase of hull weight and its negative influence on the construction cost cannot be covered by some advantage in tank cleaning.

(2) Naphtha loading

For carrying clean product such as naphtha, etc, no special consideration on painting, etc is paid by the request of FME.

As the result, such clean product will be loaded in the bare steel tank.

3-4-3 Construction Cost

Construction cost of this barge per vessel is as follows:

	with heating coil	without heating coil
Material cost		
hull structure	46.1 million yen	46.1 million yen
hull out-fitting	7.6 "	5.9 "
spares (for 3 years)	0.7 "	0.7 "
Labour cost	55.4 "	54.4 "
Design fee	3.9 "	3.6 "
Administration charge	3.0 "	3.0 "
Total construction cost	116.7 million yen	113.7 million yen

obs. This cost per vessel is estimated on the basis of 4 vessels series construction.

3-5 2,400 PS Pusher

This pusher is used for transportation of the fleet of 800 DWT dry cargo barge described in 3-3 and the other of 2,000 m^3 oil barge in 3-4 (one vessel to each fleet).

Consequently, she runs along the river to Buenos Aires.

She has towing function as well as pushing.

3-5-1 Specifications

Type of ship	Single deck pusher tug for river use with raked stem and tunnel stern
Classification	American Bureau of Shipping or Germanischer Lloyd.
Flag	Paraguay
Length, o.a.	Approx. 35.0 m
Length, p.p	32.0 m
Breadth, mld	12.00 m
Depth, mld	3.60 m
Designed draft, mld	2.14 m
Gross tonnage	Approx. 390 tons
Dead weight	Approx. 160 tons

Tank capacity		
Fuel oil tank	Approx. 150 m^3	
Fresh water tank	Approx. 25 m^3	
Main engine	Diesel engine	3 sets
Max. continuous output	3 x 900 PS	
Normal output	3 x 810 PS	
Engine control system	Remotely controlled from navigation bridge	
Propeller revolution		
Max. continuous output	Approx. 370 rpm	
Normal output	Approx. 357 rpm	
Propeller	4 bladed fixed pitch propeller in Kort nozzle	3 sets
Electric generator	Diesel engine driven AC 380 V, 50 Hz, 3ϕ	2 sets
Speed at the condition of pushing four (4) 2,000 m^3 oil barges in still water		7.0 knots
Max. static bollard pull		33.0 tons
Endurance based on total fuel oil tank capacity and speed of 7.0 knots		2,000 sea miles
Fuel oil consumption of main engine at normal output based on lower calorific value of 10,200 kcal/kg		Approx. 9.6 tons /day
Pushing device	Pushing knee	1 set
	Coupling winch (manual)	2 sets
Towing device	Towing hook	1 set
	Towing arch	2 sets
Deck machinery		
Windlass	Electric	1 set
Steering gear	Electro-hydraulic	1 set
Accommodation		
Complements	Total 14 persons	
Cabins		
Captain & Chief engineer	Private room with bath room	
Others	Two-tier bed room	

Air conditioning	Air conditioner
Corrosion Protection	
Bottom	3-Chlorinated rubber anti-corrosive paint
	2-Chlorinated rubber anti-fouling paint
Top side	2-Chlorinated rubber anti-corrosive paint
	2-Chlorinated rubber top side paint
Weather deck	2-Chlorinated rubber anti-corrosive paint
	1-Chlorinated rubber deck paint
Engine room	
Ceiling & wall	2-Lead zine chromate primer
	1-Finish paint
Under floor	1-Tar epoxy paint
Fresh water tank	2-Epoxy paint
Water ballast tank	1-Tar epoxy paint
Fuel oil tank	No coating

3-5-2 Comments on the Specifications

The above described specifications of 2,400 PS pusher are presented on the basis of FME requests.

(1) Ship's form

This boat has a very shallow draft adequate for fluvial navigation, and so her body become much bigger than normal 2,400 PS class tug boat.

(2) Speed

The very shallow draft of this boat sets limit to propeller diameter. To get higher propeller efficiency, it is necessary to obtain the maximum propeller diameter within the above said limit and the decreased horse power per shaft. At this point of view, tunnel stern is put to maximize propeller diameter, and triple screw system is adopted to delimit horse power per shaft for high propeller efficiency.

In spite of these measures, the FME request speed, 14 km/hr. (7.56 knots) with 4 barges of 2,000 m^3, is not schieved, but only approximately 13.0 km/hr. (7.0 knots) speed is available. And, with regard to the speed, final confirmation through model test is recommended because a small number of boats of this type has been constructed till now and because there are some unknown factors between pusher and barge.

(3) Fixed Kort-nozzle or steerable Kort-nozzle

Considering in the same way as in the case of 1,200 PS pusher, fixed type is recommended for this boat also.

3-5-3 Construction Cost

The construction cost per vessel is as follows:

Meterial cost	
hull structure	22.3 million yen
hull out-fitting	70.4 "
machinery out-fitting	131.6 "
electric out-fitting	35.3 "
spares (for 3 years)	11.6 "
Labour cost	112.6 "
Design fee	17.5 "
Administration charge	12.0 "
Total construction cost	413.3 million yen

obs. This cost per vessel is estimated on the basis of series construction of 2 boats.

3-6 1,500 DWT River/Ocean-Going Ship

This ship runs in the route of Asuncion to North Europe/South Europe/U.S.A. This is a multi-purpose cargo vessel for transportation of grain, general cargo, container etc.

3-6-1 Specifications

Type of ship	Single screw, diesel engine driven multi-purpose cargo vessel with engine room and accommodation quarters including navigation bridge located aft.	
Classification	Germanscher Lloyd.	
Flag	Paraguay	
Length, o.a.	Approx.	83.0 m
Length, p.p.		77.00 m
Breadth, mld		12.60 m
Depth, mld		6.00 m

Designed draft, mld		3.50 m
Scantling draft, mld		3.80 m
Gross tonnage	Approx.	1,500 tons
Dead weight (at designed draft)		1,500 tons
Dead weight (at scantling draft)		1,750 tons
Hold capacity (Grain)	Approx.	3,400 m^3
Hold capacity (Bale)	Approx.	3,200 m^3
Ballast tank capacity (incl. peak tanks)	Approx.	470 m^3
Main engine	Diesel engine	1 set
Maximum continuous output		1,500 PS
Normal output		1,275 PS
Propeller revolution		
Maximum continuous output	Approx.	270 rpm
Normal output	Approx.	256 rpm
Auxiliary boiler	Composite type	
	0.5 t/h x 7 kg/cm^2 G SAT.	
Electric generator	Diesel engine driven 2 sets	
	AC 380 V, 50 Hz, 3ϕ	
Engine control system	Main engine to be remotely controlled from control room in engine room and navigation bridge.	
Speed at fully loaded condition, at normal output of main engine without sea margin		12.0 knots
Fuel oil consumption of main engine at normal output based on lower calorific value of 10,200 kcal/kg	Approx.	5.1 tons/day
Endurance based on total fuel oil tank capacity and speed of 12 knots	Approx.	10,000 Sea miles
Hold and tank arrangement		
	1-F.P.T.	
	2-Cargo holds	
	1 pair-Double bottom tank (W.B.T.)	

	1 pair-Double bottom tank (F.O.T.)	
	1-A.P.T.	
Ballast piping system	1 main line	
Valve operation	Manual	
Hatch cover	Upper deck Steel, pontoon type	
	Tween deck Wood	
size	(length) x (width)	
No.1 & 2 hatch	22.40m x 7.0 m	
Cargo gear	5 t derrick boom	4 sets
	3 t derrick boom	4 sets
Deck machinery	Electro-hydraulic	
Windlass	With two (2) gipsy wheels,	
	two (2) hawser drums and	
	one (1) warping head	1 set
Mooring winch	3 ton type with two (2) hawser drum	
	and one (1) warping head	1 set
Cargo winch	3 ton type with one (1)	
	wire drum and one (1)	
	warping head	8 sets
Steering gear		1 set
Hold ventilation	Mechanical ventilation	
Fire extinguishing		
Cargo hold	CO_2	
Engine room	CO_2	
Accommodation		
Complements	Total 14 persons	
Cabin		
Captain &	Day and bed room	
chief engineer	with bath room	
Officer class	Private room with bath room	
Subordinate class	Two-tier bed room	
Hospital	Private room with bath room to be installed	
Air conditioning	Single duct air conditioning system	

3-6-2 Comments on the Specifications

The specifications above described are projected on the basis of FME request.

(1) Ship's form

This ship has a very shallow draft necessary for fluvial navigation and requested cargo hold capacity is very big for this class. Consequently, the ship gets a very big size.

Normal dimensions of 1,500 DWT class cargo carrier are as follows;

Length, p.p.	65.00 m
Breadth, mld.	11.00 m
Depth, mld.	6.00 m
Draft, mld.	4.50 m

(2) Midship section

As the main cargo of this ship is containers and general cargo, although this is designed to be multi-purpose cargo vessel for grain etc in addition to the above, installation of tween deck and elimination of top side tanks are adopted to facilitate easy stowage of the above cargo. Accordingly, in case of grain loading, shifting board should be temporarily provided or coverage of grain surface by bagged grain should be done from the point of grain stability.

3-6-3 Construction Cost

In case of series construction of two (2) vessels, the cost per vessel is as follows.

Material cost	
Hull structure	78.8 million yen
Hull out-fitting	120.2 "
Machinery out-fitting	112.0 "
Electric out-fitting	44.0 "
Spares (for 3 years)	10.9 "
Labor cost	196.5 "
Design fee	48.3 "
Administration charge	14.0 "
Total construction cost	624.7 million yen

If only one vessel is built, the cost attains to 651.5 million yens

3-7 6,000 DWT Ocean-Going Ship

This is the multi-purpose cargo ship which will navigate between ROSARIO, an estuary harbor of LA PLATA and north Europe/United States/South Europe (the Mediterranean) and carry grain, general cargo and containers, etc.

3-7-1 Specifications

Type of ship	Single screw, diesel engine driven multi-purpose cargo vessel with engine room and accommodation quarters including navigation bridge located aft.	
Classification	Nippon Kaiji Kyokai (NK) or Germanischer Lloyd.	
Flag	Paraguay	
Length, o.a.	Approx. 107.0 m	
Length, pp	100.00 m	
Breadth, mld	16.50 m	
Depth, mld	8.20 m	
Designed draft, mld	6.60 m	
Gross tonnage	Approx. 3,750 tons	
Dead weight	Approx. 6,000 tons	
Hold capacity (Grain) (incl. top side tanks)	Approx. 6,550 m^3	
Hold capacity (bale)	Approx. 5,850 m^3	
Vegetable oil tank capacity	Approx. 600 m^3	
Refrigerated meat hold	Approx. 550 m^3	
Ballast tank capactiy (incl. top side tanks and peak tanks)	Approx. 1,800 m^3	
Main engine	Diesel engine	1 set
Maximum continuous output	3,900 PS	
Normal output	3,520 PS	

Propeller revolution	
Maximum continuous output	Approx. 180 rpm
Normal output	Approx. 174 rpm
Auxiliary boiler	Composite type 1.0 t/hr x 7 kg/cm^2 G SAT
Electric generator	Diesel engine driven 3 sets AC 380 V, 50 Hz, 3ϕ
Engine control system	Main engine to be remotely controlled from control room in engine room and navigation bridge
Speed at fully loaded condition at normal output of main engine without sea margin	14.0 knots
Fuel oil consumption of main engine at normal output based on lower calorific value of 9,700 kcal/kg	Approx. 13.0 tons/day
Endurance based on total fuel oil tank capacity and speed of 14 knots	Approx. 10,000 sea miles
Hold and tank arrangement	
	1-F.P.T. 1 pair-vegetable oil tank 2-Cargo holds 2 pairs-Top side tanks 3 pairs-Double bottom tank (W.B.T.) 2 pairs-Double bottom tank (F.O.T.) 1-Refrigerated meat hold 1-A.P.T.
Ballast piping system	
Double bottom tanks	1-main line
Top side tanks	Branched from fire main line. Discharged directly outboard by gravity
Valve operation	Manual
Hatch cover	
Upper deck	Steel, pontoon type

Size	(length) x (width)	
No.1 & 2 hatch	22.40 m x 9.80 m	
Tween deck	Wood	
Size	(length) x (Width)	
No. 1 hatch	22.40 m x 9.80 m	
No. 2 hatch	7.00 m x 9.80 m	
Refrigerated meat hold	Insulated pontoon type	
	(length) x (width)	
Size	4.00 m x 4.00 m	
Cargo gear	5 t derrich boom	4 sets
	10 t derrich boom	2 sets
	25 t derrich boom	1 set
Deck machinery	Electro hydraulic	
Windlass	With two (2) gipsy wheels, two (2) hawser drums and one (1) warping head	1 set
Mooring winch	5 ton type with two (2) hawser drums and one (1) warping head	1 set
Cargo winch	3 ton type with one (1) wire drum and one (1) warping head	4 sets
	5 ton type with one (1) wire drum and one (1) warping head	2 sets
	7 ton type with one (1) wire drum	1 set
	7.5 ton type with one (1) wire drum	2 sets
Steering gear		1 set
Vegetable oil pump	50 m^3/h x 30 m	2 sets
Ref. machine for ref. meat room	Approx. 45 KW R-12 or R-22	2 sets
Hold ventilation	Mechanical ventilation	
Fire extinguishing		
Cargo hold	CO_2	

Engine room	CO_2
Accommodation	
Complement	Total 24 persons
Cabin	
Captain & Chief engineer	Day and bed room with bath room
Officer class	Private room with bath room
Subordinate class	Two-tier bed room
Hospital	Private room with bath room to be installed
Air conditioning	Single duct air conditioning system
Corrosion protection	
Bottom	3-Chlorinated rubber anti-corrosive paint
	2-Chlorinated rubber anti-fouling paint
Boot-top	3-Chlorinated rubber anti-corrosive paint
	2-Chlorinated rubber boot-top paint
Top side	2-Chlorinated rubber anti-corrosive paint
	2-Chlorinated rubber top side paint
Weather deck	2-Chlorinated rubber anti-corrosive paint
	1-Chlorinated rubber deck paint
Cargo hold	1-Bleached tar epoxy paint
Engine room	
Ceiling and wall	2-Lead zinc chromate primer
	1- Finish paint
Under floor	1-Tar epoxy paint
Water ballast tank	1-Tar epoxy paint
Fresh water tank	2-Epoxy paint

3-7-2 Comments on the Specifications

Hereunder shall be written the results of investigation for the specification of 3-7-1 which were prepared based on the requirements of FME.

(1) Ship's form

The form of this vessel is usual one and not extraordinary. Because of the installation of vegetable oil tank and refrigerated meat hold, the hold capacity for grain is rather small, which results in the storage factor of approx. 43.5 cubic feet/long ton based on the cargo weight.

(2) Form of midship section

This ship is a multi-purpose cargo ship which carries grain, general cargo, containers, etc. For this reason the ship has tween deck to load effectively general cargo and has top side tanks to trim easily grain cargo.

(3) Matters that demand special attention when loading grain cargo

It is necessary to cover the grain surface with bagged grain or to have shifting board in the slack hold in view of grain stability.

3-7-3 Construction Cost

The construction cost of this ship is shown below:

Material cost	
hull	166.5 million yen
hull out-fitting	270.3 "
machinery out-fitting	254.0 "
electric out-fitting	84.0 "
spares (for 3 years)	23.7 "
Labour cost	416.6 "
Design fee	94.5 "
Administration charge	18.0 "
Total construction cost	1,327.6 million yen

3-8 300 PS Pusher

This pusher shall be operated between the port of Presidente Stroessner and Confluencia, and also PARANA-River and PARAGUAY-River.

This pusher shall have towing function as well as pushing.

3-8-1 Specifications

Type of Ship	Single deck pusher tug for river use with raked stem and tunnel stern	
Classification	American Bureau of Shipping or Germanischer Lloyd.	
Flag	Paraguay	
Length, o.a.	Approx.	17.0 m
Length, pp		15.00 m
Breadth, mld		8.00 m

Depth, mld		2.30 m
Designed draft, mld		1.22 m
Gross tonnage	Approx.	95 tons
Dead weight	Approx.	17 tons
Tank capacity		
Fuel oil tank	Approx.	11 m^3
Fresh water tank	Approx.	5 m^3
Main engine	Diesel engine	2 sets
Maximum continuous output	2 x 170 PS	
Normal output	2 x 153 PS	
Engine control system	Remotely controlled from navigation bridge	
Propeller revolution		
Maximum continuous output	Approx.	604 rpm
Normal output	Approx.	583 rpm
Propeller	3 bladed, fixed pitch propeller in Kort nozzle	2 sets
Electric generator	Diesel driven AC 380 V, 50 HZ, 3ϕ	1 set
Speed at the condition of pushing one (1) 360 DWT dry cargo barge in calm sea		5.5 knots
Max. static bollard pull		4 tons
Endurance based on total fuel oil tank capacity and speed of 5.5 knots	Approx.	600 sea miles
Fuel oil consumption of main engine at normal output based on lower calorific value of 10,200 kcal/kg	Approx.	1.5 tons/day
Pushing device	Pushing knee	1 set
	Coupling winch	2 sets
Towing device	Towing hook	1 set
Deck machinery		
Windlass	Manual	2 sets
Steering gear	Manual-hydraulic	1 set
Accommodation		
Complements	Total 6 persons	

Cabin		
	Captain & Chief engineer	Private room
	Others	Two-tier bed room
	Air conditioning	Air conditioner
Corrosion protection		
	Bottom	3-Chlorinated rubber anti-corrosive paint
		2-Chlorinated rubber anti-fouling paint
	Top side	2-Chlorinated rubber anti-corrosive paint
		2-Chlorinated rubber top side paint
	Weather deck	2-Chlorinated rubber anticorrosive paint
		1-Chlorinated rubber deck paint
	Engine room	
	Ceiling & wall	2-Lead zinc chromate primer
		1-Finish paint
	Under floor	1-Tar-epoxy paint
	Fresh water tank	2-Epoxy paint
	Water ballast tank	1-Tar epoxy paint
	Fuel oil tank	No coating

3-8-2 Comments on the Specifications

Hereunder shall be written the results of investigation for the specification of 3-8-1 which were prepared based on the requirements of FME.

On such items as ship's from ship's speed, etc., the same comments as on the 1,200 PS pusher and 2,400 PS pusher will be made.

3-8-3 Construction Cost

The construction cost of this boat is shown below:

Material cost		
hull structure	4.5	million yen
hull out-fitting	12.7	"
machinery out-fitting	16.5	"
electric out-fitting	6.5	"
spares (for 3 years)	2.2	"
Labour cost	20.8	"
Design fee	8.0	"

Administration charge	4.0	"
Total construction cost	75.2 million yen	

3-9 Pontoon with Transhipment Machine

Cereals such as soybean, corn, tartago, and other pulse which are carried by the 360 DWT dry cargo barge shall be transferred directly to the 800 DWT cargo barge, other bigger barge and/or self-propelled ship by this facility.

3-9-1 Specifications

(1) Pontoon

Type	Rectangular pontoon type secured by anchors and sinkers at the river bottom	
Length, o.a.	30.00 m	
Breadth, mld	9.50 m	
Depth, mld	2.30 m	
Draft, mld	Approx. 1.60 m	

(2) Equipment

Pnenmatic unloader for grain		2 sets
Capacity	100 t/hr	
Boom length	Approx. 15 m	
Stroke	8.5 m	
Blower	Roots type vacuum pump AC 380 V, 50 HZ, 3ϕ	75 KW
Chain conveyor		2 sets
Capacity	100 t/hr	
Generator		
Main generator	Diesel engine driven AC 380 V, 50 HZ, 3ϕ	1 set
Auxiliary generator	Diesel engine driven AC 380 V, 50 HZ, 3ϕ	1 set
Anchor	5 t type	2 sets
Anchor chain	50 ϕ x 25 m	2 sets
Sinker	Concrete	2 sets
Electric winch	2 t x 15 m/min	2 sets

F.O. Transfer pump		1 set
Fresh water transfer pump		1 set
Sea water pump		1 set
Communication equipment	SSB	1 set
	VHF	1 set
Lighting equipment		
Launch	with Diesel engine	1 set

(3) Tanks & stores

Following tanks and store to be provided in pontoon

Fuel oil tank	Approx.	180 m^3
Fresh water tank	Approx.	50 m^3
Store	Approx.	20 m^2

(4) Accommodation

Complements	Total 4 persons
Cabin	2-Two-tier bed room
Other rooms	1-Galley & mess room
	1-Bath room
Air conditioning	Air conditioner

Corrosion protection

Bottom & Side	3-Chlorinated rubber anti-corrosive paint
Weather deck	2-Chlorinated rubber anti-corrosive paint
	1-Chlorinated rubber deck paint
Fresh water tank	2-Epoxy paint
Fuel oil tank	No coating
Void space	2-Lead zinc chromate primer
Ballast tank	1-Tar epoxy paint

3-9-2 Comments on the Specifications

Hereunder shall be written the results of investigation for the specification of 3-9-1 which were prepared based on the requirements of FME. The draft of this pontoon is 1.6 meter with 150 tons of fuel oil and 50 tons of fresh water.

When the pneumnatic unloader is operated, the unbalance moment of the unloader makes the pontoon heel by 0.38 meter approximately. In this design it is possible to maintain the freeboard of about 0.3 meter in this working condition.

3-9-3 Construction Cost

The construction cost per unit of this pontoon is shown below:

Material cost	
hull structure	12.1 million yen
out-fitting	48.7 "
unloading facility	66.0 "
spares (for 3 years)	8.0 "
Labour cost	27.9 "
Design fee	7.5 "
Administration charge	5.0 "
Total construction cost	175.2 million yen

3-10 Cost Required before Entering of Ship's Service

When the ship is placed into service, the total cost must include not only the expenses of the construction of the ship but also that of the transportation of the ship to the prearranged sea route.

In this chapter, we calculated all the cost including transportation fee on all types of ships before entering into service.

Especially with regard to barges, we compare the cost by the panel assembly method in Paraguay that is mentioned at chapter VII with that of barges constructed in Japan and transported to Paraguay.

3-10-1 Cost before Entering Service of Barges

The expenses before entering service are investigated in the following cases.

(1) In the case of the construction in Japan:

The transportation fee of barges from Japan to Asuncion via the Cape of Good Hope and Buenos Aires, and the construction expenses are included in total cost.

(2) In the case of the construction in Paraguay by the panel assembly method:

The cost includes the transportation fee of the panels from Japan to Asuncion via the Cape of Good Hope and Buenos Aires, plus the depreciation fee of equipment at the factory in Paraguay and the technical assistance fee and construction cost of barges.

In regard to the construction cost, we assumed the cost is equal in both cases, (1) and (2).

(1) In the case of the construction in Japan.

The transportation of barges between Japan and Buenos Aires via the Cape of Good Hope will be made on the deck barges with tug boats, and between Buenos Aires and Asuncion, they are carried by pushers of 1,200 PS and of 2,400 PS.

(a) Japan - the Cape of Good Hope - Buenos Aires

The transportation of barges between Japan and Buenos Aires is operated by two tug boats of 3,000 PS and one with 5,000 PS.

The rental fee of tug boats and deck barges are as follows:

(Unit: thousand yen)

Tug Boat	5,000 PS	3,000 PS	3,000 PS
Deck Barge		90 m x 27 m	90 m x 27 m
The barges towed by the above tug boat	4-2,000 m^3 oil barges	10-800 DWT dry cargo barges 2-360 DWT cargo barge	18-360 DWT dry cargo barges
Period of transportation	131 days	181 days	181 days
Navigation	119 days	156 days	156 days
Loading and unloading	2 days	14 days	14 days
Replenishment of fuel	3 days	3 days	3 days
Allowance	7 days	8 days	8 days
Variable expenses	900 per day	1,010 per day	1,010 per day
Fixed cost	0	3,620	3,620
Rental fee	117,900	186,430	186,430

The transportation fee per ship between Japan and Buenos Aires of 2,000 m^3 oil barge, 800 DWT dry cargo barge and 360 DWT dry cargo barge based on the rental fee of tug boats and decks barge is as follows.

(Unit: thousand yen)

	2,000 m^3 oil barge	800 DWT dry cargo barge	360 DWT dry cargo barge
Rental fee of tug boats and deck barges	29,500	16,570	10,360
Loading/unloading	8,000	4,700	2,800
Total	37,500	21,270	13,160

Notes: the cost of loading/unloading includes both that in Japan and Buenos Aires.

(b) Transportation between Buenos Aires and Asuncion

2,000 m^3 oil barges and 800 DWT dry cargo barges are supposed to be carried by 2,400 PS pushers and 360 DWT dry cargo barges by 1,200 PS pushers.

Assuming the speed of pushers 11.0 knots when they are sailing by themselves, 7.0 knots when they are sailing with barges, and the current of the river 3.5 knots, the ship's speed becomes 3.5 knots by upstream and 14.5 knots by downstream. All the crews are supposed to be Paraguayan.

(Unit: thousand yen)

	2,400 PS pusher	1,200 PS pusher	Notes
Necessary days for a round trip	15 days	15 days	Total allowance for one day at both terminals
Number of round trip	4 times	5 times	
Total time required	60 days	75 days	
Fuel cost	18,450	12,240	14 days of a round trip. Incl. lub. oil, etc.
Personnel expenses	4,200	3,750	¥5,000/P/D
Food and water	2,100	1,880	¥2,500/P/D
Total	24,750	17,870	

(c) Transportation Cost Between Japan and Buenos Aires

(Unit: thousand yen)

		2,000 m^3 oil barge	800 DWT dry cargo barge	360 DWT dry cargo barge
Cost of transport	Tokyo-Buenos Aires	37,500	21,270	13,160
	Buenos Aires Asuncion	2,510	1,470	890
Insurance		1,150	790	410
Total		41,160	23,530	14,460

As a result of the above mentioned, the total cost of the transportation from Japan to Asuncion is about 689,000 thousand yen.

(2) In the case of the construction in Paraguay by the panel assembly method.

The cost of panel transportation, construction facilities of barges, and technical assistance fee correspond to transportation fee in case of the barges constructed in Japan.

(a) The cost of transportation of panels

With regard to the transportation of the panels, tug boats and deck barges are used from Japan to Buenos Aires, and river-boots from Buenos Aires to Asuncion.

For this operation, the size of a panel is restricted to 6 m x 2.5 m x 0.15 m and the weight 1.5 t.

Other fitting equipment are also carried on the same deck barges.

The rental fee of a tug boat and deck barges between Japan and Asuncion is as follows.

The rental fee of a tug boat and deck barges (Unit: thousand yen)

Tug Boat	6,000 PS
Deck barges	73 m x 22 m x 1 64 m x 21 m x 1
Necessary days between Japan and Buenos Aires	184 days
Navigation	158
Allowance	9
Loading and unloading	14
Replenishment of fuel	3
Variable expenses per day	1,276
Fixed cost	15,216
Total	250,000

Transportation fee from Japan to Asuncion

(Unit: thousand yen)

	2,000 m^3 oil barge	800 DWT dry cargo barge	360 DWT dry cargo barge	Notes
Transportation fee between Japan and Buenos Aires	14,800	8,700	5,200	
Loading/unloading	6,660	3,910	2,340	In Japan and Buenos Aires
Transportation fee between Buenos Aires and Asuncion	5,870	3,440	2,060	
Insurance charge	640	340	200	
Total	27,980	16,390	9,800	

(b) Cost of facilities for the construction of barges

The cost of facilities for the construction of barges is, as is shown in the chapter VII, 127.3 million yen by the panel assembly method. The cost of each barge is as follows.

(Unit: thousand yen)

Cost of facilities	2,000 m^3 oil barge	800 DWT dry carge barge	300 DWT dry cargo barge
	7,540	4,430	2,640

(c) Technical assistance fee

As shown in the chapter VII, four (4) Japanese specialists shall be sent for technical assistance for one year in case of panel assembly. Its cost is:

(Unit: thousand yen)

Items	Expenses	Notes
Personnel expenses	28,800	600 per person a month
Preparation for trip	480	20 per person a day
Air fare	2,600	650 per person for a round trip ticket
Total	31,880	

Technical assistance fee of each barge is as follows.

	2,000 m^3 oil barge	800 DWT dry cargo barge	360 DWT dry cargo barge
Technical assistance fee	1,890	1,110	660

(d) The total expenses of transportation, facilities, and technical assistance when the panels are assembled in Paraguay.

(Unit: thousand yen)

	2,000 m^3 oil barge	800 DWT dry cargo barge	360 DWT dry cargo barge
Transportation fee	27,980	16,390	9,800
Cost of facilities	7,540	4,430	2,640
Technical assistance fee	1,890	1,110	660
Total	37,410	21,930	13,100

(3) Cost Comparison of the construction of barges in Japan with that in Paraguay by the panel assembly method

When we compare two cases-one is to transport barges to Paraguay after construction in Japan and the other is to construct barges by the panel assembly method in Paraguay, the latter is more advantageous than the former case in the cost, that is,

the latter method saves

3,750 thousand yen in 2,000 m^3 oil barge

1,600 thousand yen in 800 DWT dry cargo barge and

1,360 thousand yen in 360 DWT dry cargo barges.

(4) The expenses before service of barges

(by the panel assembly method)

(Unit:million yen)

	2,000 m^3 oil barge		800 DWT dry cargo barge	360 DWT dry cargo barge
	With heating pipe	Without heating pipe		
Construction cost	116.7	113.7	76.5	40.9
Transportation fee	28.0	28.0	16.4	9.8
Facilities for construction of barges	7.5	7.5	4.4	2.7
Technical assistance fee	1.9	1.9	1.1	0.7
Total	154.1	151.1	98.4	54.1
Number of ships	2	2	10	20
The total amount	308.2	302.2	984.0	1,082.0

The total cost before the service of barges is 2,676.4 million yen.

3-10-2 Cost before the Service of Pushers

All pushers are supposed to be constructed in Japan and to enter service in Paraguay.

(1) Transportation fee

A 3,000 PS tug boat tows all the pushers on the barge decks from Japan to Buenos Aires

From Buenos Aires to Asuncion, two 2,400 PS pushers tow other pushers.

(a) Transportation from Japan to Buenos Aires via the Cape of Good Hope

One (1) 3,000 PS tug boat and one (1) 73 m x 22 m barge are used for this transportation.

The period of transportation is the same as mentioned 3-10-1 (a) and rental fee is estimated 158 million yen.

(Unit: thousand yen)

	2,400 PS Pusher	1,200 PS Pusher	300 PS Pusher
Towing fee	43,230	27,650	16,430
Loading, unloading and lashing	6,070	3,880	2,310
Cradle	6,600	5,280	3,960
Transportation fee between Japan and Buenos Aires	55,900	36,810	22,770

(b) Transportation between Buenos Aires and Asuncion

The transportation of 1,200 PS and 300 PS pushers shall be made by two 2,400 PS pushers which are transported from Japan on deck barge.

We assume that speed of pusher is 3.5 kts against the land, because the speed of the pusher is estimated 7.0 kts at calm water and the current of the river 3.5 kts.

The total necessary days for the navigation from Buenos Aires to Asuncion are 14 days taking 11 days for navigation, 1 day for fuel replenishment and 2 days for the delivery.

For this transportation, four (4) Japanese complements shall be dispatched to Paraguay in order to operate each 2,400 PS pusher.

Running cost per pusher of 2,400 PS for towing is as follows;

(Unit: thousand yen)

Items	Cost	Notes
Cost of fuel	3,620	for the navigation of 11 days charges for L.O. etc. included
Personnel expenses		
Japanese	2,000	20 days for four persons
Paraguayan	700	14 days for ten persons
Food and water	490	14 days for 14 persons
Air fare	2,600	Round-trip ticket for 4 people
Hotel charges en route	480	Six days for 4 persons
Total	9,890	

The cost for each pusher is as follows.

(Unit: thousand yen)

	2,400 PS Pusher	1,200 PS Pusher	300 PS Pusher
Transportation fee between Buenos Aires and Asuncion	5,410	3,450	2,060

(c) Transportation fee between Japan and Asuncion

(Unit: thousand yen)

		2,400 PS Pusher	1,200 PS Pusher	300 PS Pusher
Transportation fee	Japan - Buenos Aires	55,900	36,810	22,770
	Buenos Aires - Asuncion	5,410	3,450	2,060
Insurance charge		1,220	750	230
Total		62,530	41,010	24,990

(d) Cost required before entering of service

(Unit: million yen)

	2,400 PS Pusher	1,200 PS Pusher	300 PS Pusher
Construction cost	413.3	249.6	75.2
Transportation Fee	62.5	41.0	25.0
Total	475.8	290.6	100.2
No. of ships	2	2	1
Grand Total	951.6	581.2	100.2

3-10-3 Cost Required before Entering of Ship's Service for 6,000 DWT and 1,500 DWT Ocean-Going Ships.

These two (2) kind of ships shall navigate with self-propulsion from Japan to Buenos Aires via the Cape of Good Hope.

The assumed condition is shown on (1), transportation fee on (2) and cost required up to start of the navigation on (3).

(1) Assumed condition

	6,000 DWT cargo ship	1,500 DWT cargo ship	Remarks
Route	Japan - Buenos Aires (Via Cape of Good Hope)		12,600 Sea Miles
Mean speed	13 kts	11 kts	Sea margin abt. 50%
Necessary days	59 days	66 days	
Preparation	5 "	5 "	
Navigation	41 "	48 "	
Replenishment of F.O.	6 "	6 "	
Delivery	4 "	4 "	
Return to Japan	3 "	3 "	Japanese crew only
Crew	20	13	Persons
Japanese	10	8	
Paraguayans	10	5	

(2) Transportation fee:

The transportation fee from Japan to Buenos Aires via the Cape of Good Hope according to the assumed condition shown on (1) is as follows:

(Unit:thousand yen)

	6,000 DWT cargo ship	1,500 DWT cargo ship	Remarks
Fuel oil fee	15,500	10,020	C oil:26,000 yen/m^3 A oil:35,000 yen/m^3
Personnel expenses	17,550	14,780	
Food and water	2,800	2,050	
Air fare	6,500	4,230	For Japanese and foreigners
Hotel charge for Japanese (on the way of return to Japan)	600	480	Three (3) days 20,000 yen/day/person
Hotel charge for foreigness (stay in Japan)	8,250	4,130	Thirty-three (33) days 25,000 yen/day/person
Ship's insurance	2,450	1,230	
Agent fee	2,000	1,750	
Other expenses	1,700	1,200	
Grand total	57,350	39,870	

(3) Cost required before entering of ship's service

The cost required before entering of ship's service for 6,000 DWT and 1,500 DWT cargo ships, consists of construction cost and transportation fee.

(Unit: million yen)

	6,000 DWT cargo ship	1,500 DWT cargo ship
Construction cost	1,327.6	624.7
Transportation fee	57.4	40.0
Cost per Vessel	1,385.0	664.7
No. of Vessel	1	2
Total cost	1,385.0	1,329.4

3-11 Consulting Works on This Project

It is necessary to employ shipbuilding consultant for this project to complete it successfully, as it contains various kinds of ships and ship's sizes.

The consultants should not only be the communicator of the intention of the client but also be able to make decisions by their own judgement from the high technical level.

Moverover, in consideration of the technical capability of their own, consultants should be chosen among the countries with generally high technical potential of the shipbuilding industry to utilize all the informations that they might not have.

3-11-1 Necessity of Consultants

Following advantages will be given by the participation of the consultants for the organization and arrangement of this project.

(1) Saving of time and cost

As the consultants have abundant experiences and knowledges in their special fields, the problems and troubles which might appear in this project can be settled reasonably and effectively in practical ways.

Accordingly, the project will be carried out steadily and as scheduled through all the process of it.

As the result, quality and delivery of the vessels can be assured and waste of money will be avoided.

(2) Application and utilization of special technology and know-how

As the consultants have the special technology and know how that client might not have, approaches to the project can be made more reasonably and effectively for the purpose intended.

(3) Experiences

Generally, consultants have enormous data-files on their special fields and they can utilize them effectively according to the natural and socio-economic environment and make the project more adequate to the purposes.

(4) Technology transfer

Client will surely be able to absorb experiences and technology of the consultants through the project, which will lead their own country to the development of the technology in the future. Especially, in this project, positive participation of Paraguayan engineers will contribute to the technical

development of their own country, and the technology gained here will make consulting works possible by their own technology in the future and it will also contribute to the maintenance works of the vessels built in this project.

3-11-2 Scope of Consulting Works

Consulting works of this project are as follows.

(1) Prequalification of building yard.

Survey of the yards for implementing this project will be made and adequate yards for bidding will be selected.

(2) Compilation of tender specifications

Tender specifications of the vessels in this project are made fully suitable for the purpose intended and for the areas in service, and also they are made refined enough for the bidder to offer with the contents understood well.

(3) Evaluation

Building yard will be decided after such evaluations from the technical and economical points as specifications, drawings and prices submitted by the yards.

(4) Contract

After determination of the building yard, specifications, drawings, etc. submitted will be made refined reflecting the client's intents. And contract works between the yard will be carried out together with the client.

(5) Approval of drawing

Plans and drawings submitted by the yard will be fully checked and approved according to the contract specifications and client's standpoint.

(6) Supervision and inspection in the building process

Consultants will supervise and inspect the vessels and equipment to fully adapt them to the specifications and drawings including process control.

3-11-3 Consultant Fee

Consultant fee for the aborementioned works are as follows.

Prequalification ,Tender specifications and evaluation	65 million yen
Contract, approval of drawing, supervision and inspection	285 million yen
Total	350 million yen

3-12 Total Expenses of This Project

As the barges are constructed in Paraguay by panel assembly method, some portion of construction cost and consultant fee such as hotel charges, communication charges of surveyors is paid in local currency.

Local portion and foreign portion of the total project expenses are as follows

(Unit: million yen)

Item	Local portion	Foreign portion	Total
Construction cost	448.7	5,733.7	6,182.4
Transportation fee	-	841.4	841.4
Consultant fee	13.7	336.3	350.0
Total	462.4	6,911.4	7,373.8

(Note) Construction cost includes building facility cost and technical assistance fee.

Total expenses, local/foreign currency, etc. are shown on next page.

Total Expenses on This Project

(Unit: million yen / thousand dollars / million guaranis)

	2,000 m^3 oil barge	800 DWT dry barge	360 DWT dry barge	2,400 PS pusher	1,200 PS pusher	300 PS pusher	6,000 DWT ocean-going ship	1,500 DWT river/ocean-going ship	Consultant fee	Total expense	Spair parts on exist ships	Pontoon transhipment machine
No. of ship	4	10	20	2	2	1	1	2				(1)
Construction cost	498.4	820.0	886.0	826.6	499.2	75.2	1,327.6	1,249.4		6,182.4	purchasing cost 242.6	(175.2)
Transportation fee	112.0	164.0	196.0	125.0	82.0	25.0	57.4	80.0		841.4	3.4	(37.1)
Total expense	610.4	984.0	1,082.0	951.6	581.2	100.2	1,385.0	1,329.4	350.0	7,023.8 / 7,373.8	246.0	(212.3)
Local currency	99.3	174.7	174.7	0	0	0	0	0	13.7	462.4		
Foreign currency	511.1	809.3	907.3	951.6	581.2	100.2	1,385.0	1,329.4	336.3	6,911.4	246.0	(212.3)
Total expense in dallars 1$=200 yen	3,052.0	4,920.0	5,410.0	4,758.0	2,906.0	501.0	6,925.0	6,647.0	1,750.0	36,869.0	1,230.0	(1,062.0)
Foreign currency in dallars 1$=200 yen	2,555.5	4,046.5	4,536.5	4,758.0	2,906.0	501.0	6,925.0	6,647.0	1,681.5	34,557.0	1,230	(1,062.0)
Local currency in guaranis 1$=126 guaranis	62.6	110.1	110.1	0	0	0	0	0	8.6	291.4	0	(0)

(Note) 1. The figure in the upper side of total expense shows the sum of construction cost and transportation fee, and that in lower side shows grand total including consultant fee.

2. Above estimation is based on the price by yen in 1980.

4. Study on Shipping Service Planning and Profitability

4-1 System of Small Barge for Soybean Transport

1,200 PS pusher	two
360 DWT barge (Barcazas)	twenty
300 PS auxiliary pusher	one

Cost of the ships

1,200 PS pusher: 581.2 million yen, 366,156 mG (thousand guarani)

360 DWT barge : 1,082.0 million yen, 681,660 mG

300 PS auxiliary pusher: 100.2 million yen, 63,126 mG

Total: 1,763.4 million yen
(1,110, 942 mG)

4-1-1 Shipping Goods and Service

According to the trial calculation of FME soybeans transportation between Encarnacion and La Plata is assumed to be covered by 14 voyages by two fleets, each fleet consisting of 1 pusher and 4 barges and being in charge of 7 voyages, in 120 days (May to August) per year. For the remaining 240 days, the boats are assumed to be used for other purposes at the same turnover and freight, to cover total 42 voyages per year.

Fourteen voyages in 120 days for soybean transportation are reasonable. As for the use of the boats for other purposes in the remaining days, conceivable are the cement transportation between Vallemi and Encarnacion and the main route transportation between Asuncion and Buenos Aires.

A proper number of days usable per year is about 330 days, and it has been assumed to use 120 days for soybean transportation, a half of the remaining days, viz. 105 days for cement and 105 days for the main route. The distances are:

ab. 1,700 km between Encarnacion and Buenos Aires

ab. 1,100 km between Encarnacion and Vallemi

ab. 1,630 km between Asuncion and Buenos Aires

Therefore, it is reasonable to assume 10 voyages x 2 fleets = 20 voyages for cement transportation and 5 voyages x 2 = 10 voyages for the main route, considering the time for handling misecellaneous goods between Asuncion and Buenos Aires.

4-1-2 Loadage and Freight

As for the loadage, it is reasonable to assume 350 KT for Encarnacion route, and 500 KT of loadage can be assumed for the main route. Of course, ships cannot be full always, and the one-round freight ton per barge will be about 800 FT for the main route.

As regards the freight, calculation is made by FME for the cases of US$12.52 and US$18.00 as soybean freight rates. According to information in Buenos Aires, at present the soybean freight between Encarnacion and Buenos Aires is US$22.00 fio. Even if the transhipment charge of US$4.- at Buenos Aires is borne in the negotiation with shippers, US$18 can be net income. The freight of cement between Vallemi and Encarnacion is estimated at US$14.00. (Freight between Vallemi and Asuncion is 900 guarani = approx. US$7.)

The freight of the main route is US$9.80 to US$20.00 as mentioned above, being estimated at about US$15.00 on the average for one round.

4-1-3 Income

Calculating the income, based on the above data, on the assumption of 120 days for soybean transportation, 105 days for cement transportation and 105 days for main route,

(1) Soybean: 350 (KT) x 4 (barges) x 2 (fleets) x 7 (voyages) = 19,600 (KT)
19,600 (KT) x 18 (US$) x 126 (guarani) = 44,453,000 guarani

(2) Cement: 350 (KT) x 4 (barges) x 2 (fleets) x 10 (voyages) = 28,000 (KT)
28,000 (KT) x 14 (US$) x 126 (guarani) = 49,392,000 guarani

(3) Main route: 800 (FT) x 4 (boats) x 2 (fleets) x 5 (voyages) = 32,000 (FT)
32,000 (FT) x 15 (US$) x 126 (guarani) = 60,480,000 guarani

Total: 154,325,000 guarani

The above calculation includes sufficient allowance as general operation, with past results taken into consideration. However, to operate the above three types of service smoothly by the present force of FME, it is necessary to intensify ship operation capability and business capability.

Note: For the above, FME calculates as follows:

In the case of US$12.52 freight:

1,573 (guarani) x 58,800 (42 voyages) = 92,758,000 guarani

In the case of US$18.00 freight:

2,268 (guarani) x 58,800 (42 voyages) = 133,358,000 guarani

4-1-4 Expenditure

(1) Ship expenses

FME considers the ship expenses as fixed cost (Gastos Fijos).

1 Seamen expenses:

As per FME's calculation. No reserve fund is appropriated for crew expenses.

2 Repairing expenses:

FME estimates the expenses at a little over 3% of the cost of the ships, but since the amount is too large, considering results, the expenses have been estimated at about 1%.

3 Lubricating oil expenses:

FME includes the above in the voyage expenses, but here they are included in ship expenses in light of common method. Furthermore, since the expenses are calculated excessively, they have been corrected in reference to ordinary examples.

4 Insurance expenses:

FME estimates them at about 3% of the cost of the ships, but since they are usually about 1%, 1% has been employed.

5 Store expenses:

Since FME estimates them at a small amount, they have been increased to some extent.

6 Office expenses (= Sobre Carga):

FME does not appropriate any amount for office expenses.

A proper amount has been appropriated.

7 Depreciation and interest:

FME employs 20 years for depreciation with residual value of 10%, but 25 years for depreciation with residual value of 10% has been employed. No. particular reference to interest rate is made by FME, but 4% has been employed.

From the above, the total ship expenses for 2 pushers, 20 barges and 1 auxiliary pusher are as follows:

	Calculation by FME (in 1,000 Guarani)	Caluculation by survey team (in 1,000 guarani)
Seamen expenses	8,942	8,942
		(Auxil. pusher) 1,500
Repairing	22,302	11,000
Lubricating oil	21,771	3,000
Insurance	(US$ 120,000)	
	15,120	11,000
Stores	164	2,000
Office expenses	-	3,000
Depreciation	33,453	39,994
Interest		22,218
Total	101,752	102,654

(2) Voyage expenses (Account)

FME considers the voyage expenses as variable cost (Gastos Variables)

1 Fuel expenses (= Combustible):

FME seems to consider high speed engines for the pushers, incidentally to use expensive gasoil as fuel. However, for pushers, low speed or medium speed engines which can use diesel oil (heavy oil A) should be adopted, considering ordinary examples. The use of diesel oil allows to decrease the cost about 40%, compared with gasoil.

FME assumes 116 days based on 400-hour working x 7 voyages, and the working days correspond to 348 days per year, being larger than the actual situation. As mentioned before, it will be reasonable to assume 330 days as annual working days and about 250 days for actual voyages. During anchorage, the fuel consumption is small, and is neglected in the calculation.

The sailing consumption of 1,200 PS engine has been estimated to be 4.5 KT of diesel oil per day. The price has been calculated at 17,000 guarani per KT, as per FME calculation.

2 Port charges, etc.

In addition to the estimation of FME, there is an increase of expenses in the main route. That is, the tugboat charge in Buenos Aires Port

has been particularly calculated in addition. It can be, however, lessened if the operation in the port is favorable. From the foregoing, the voyage expenses are as follows:

	Calculation by FME (in 1,000 guarani)	Calculation by survey team (in 1,000 guarani)
Fuel	300 (lit) x 400 (h) x 14 (voyages) x 28 (guarani) = 47,040 per 120 days annual 141,120	Pusher 4.5 (KT) x 250 (days) x 17,000 (guarani) x 2 (boats) = 38,250 Auxil. pusher 3,000 Sub-total 41,250
Tugboat charge in Buenos Aires port	-	(2 fleets) x 4 (barges) x 4 (times) x 2 (tugboats) x 5 (voyages) x 80 (US$) x 126 (guarani) = 3,225
Commission	1% 927	1,500
Port charges, etc	2,322	2,000
Total	144,369	47,975

4-1-5 Summary

	Calculation by FME (in 1,000 guarani)	Calculation by survey team (in 1,000 guarani)
Income	133,358	154,325
Expenditure	246,021	150,629
Ship expenses	101,652	102,654
Voyage expenses	144,369	47,975
Balance	(-)112,663	(+)3,696

The above balance for the soybean barge system is a little severe, in light of operation capability of FME. However, by employing one auxiliary pusher additionally, the transportation efficiency will improve to some extent, though not indicated in figures. Anyway, from the viewpoint of national policy to secure transportation for domestic products, it will be necessary to maintain the following ship operational efficiency, to improve the profitability.

4-1-6 Relation with Transportation Demand

The export of soybean from Paraguay is supposed to level off at

300,000 KT, and of it, about 50,000 KT including the shipment from Argentine side via. Posadas, relies on river transportation.

On the other hand, the truck charge from Itapua area (place of production) to Paranagua Port (Brazil) is at present about US$30.00 per KT. Therefore, even if the short distance land transportation charge from the place of production to the Parana River bank is taken into account, freight as far as FOB La Plata of US$22.00 by barges is sufficiently competitive.

Therefore, there is a potential demand of two to three times of 50,000 KT for river shipments, and a demand of at least about 100,000 KT can be forecasted. The transportation volume of the new FME barge fleets is 19,600 KT and even if transshipment is made to larger barges at the confluence of the Paraguay River and the Parana River, the volume is about 50,000 to 60,000 KT, and the share against transportation demand remains about 60% at the maximum. Without transhipment system, new assignment has a share of 20 - 30%, which will be able to satisfy necessity for the time being in light of national demand.

Ten years later when Yacireta Dam is completed to provide a 12 feet deep waterway and even if the loadage of barges increases by 50% (350 KT to 500 KT), over tonnage is not surmised to be caused. A problem is the business activity of FME to shippers. At present, soybean transactions are in the hands of large cereals traders. Since producers sell their goods ex river bank or FOB (barges), FME as a shipping company must negotiate with those buyers sufficiently, in the effort to secure reasonable market freight. Also if any proper measure is not taken for transshipment with ocean-going ships in La Plata, it will not allow the successful operation of the barges.

As for the cement transportation for allocation of the barges, the private demand for cement in and around Encarnacion and cement for the dam mainly rely on land transportation at the moment. With the progress of dam construction, there will be a transportation demand of more than 2,800 KT annualy, and the direct transportation from Vallemi will reduce through cost. Therefore, barge transportation can be realized. But since there is neither proper unloading pier nor soybean shipping facilities, they are required to be improved as early as possible. A temporary pier or pontoon type may be adequate. As the cement shipper is a national corporation, the negotiation will proceed smoothly, and since this new transportation covers the additional

portion of shipments, the share of small shipowners as CAF members will be little affected.

The Main route will be described later.

With regard to the size and number of ships, the present idea is reasonable, since the low draft boats cover mainly soybean transportation and cement transportation, and can be used also for the Main route as 500 DWT type. If there is something to say, it is recommendable to increase the capacity in M^3 a little more.

As regards the number of barges, it is reasonable to take a multiple of the number of fleet formation (4) in light of operation efficiency, considering sailing days and lay days. Two pushers and twnty barges in this case are acceptable. However, since 20 boats are invested at one time, attention must be paid to efficient operation.

4-2 System of Large Barges

2,400 PS pusher	one
800 DWT barge	ten

Cost of the ships

2,400 PS pusher:	475.8 million yen,	299,754 mG
800 DWT barge:	984.0 million yen,	619,920 mG
Total:	1,459.8 million yen,	919,674 mG

4-2-1 Sailing Days and Voyages

This system is used mainly for the Main route between Asuncion and Buenos Aires. The number of sailing days of the pusher is assumed to be 10 for upward service, 6 for downward service and 3 as spare, total 19 days for one round. If the period for barges to stay at Buenos Aires is 20 days and that at Asuncion is about 18 days, then the composition of 3 fleets consisting of 12 barges, each fleet consisting of 4 barges, is reasonable, to make the most efficient use of one pusher. However, since ideal operation is practically difficult, 8 to 10 barges for one pusher would be appropriate on this route. In the case of 10 barges, once out of thrice, one pusher pushes two barges. If the number of annual working days of the pusher is 330 and that of sailing days is 19, then it makes about 17 voyages per year, corresponding to about 15 voyages in terms of full 4-barge pushing. The number of actual sailing days of the pusher has been assumed to be about 280.

4-2-2 Loadage and Freight

With regard to the loadage, cargo is estimated to decrease by about 20% than by 1,000 DWT motor boats, and one round freight ton per barge of 1,600 FT (the higher of KT freight or M^3 freight) and an average freight of US$15.00 have been assumed.

4-2-3 Income

Based on the above data, the annual income of the large-sized barge system is calculated as follows, for annual 15 voyages, with 4 barges as one fleet.

1,600 (FT) x 4 (barges) x 15 (voyages) = 96,000 (FT)

96,000 (FT) x 15 (US$) x 126 (guarani) = 181,440,000 guarani

4-2-4 Expenditure

(1) Ship expenses

With regard to ship expenses, no data of FME is obtained concerning the large-sized barge system, and estimation has been made from the data of other projects.

(In 1,000 guarani)

Seamen		8,000
Repairing expenses	(ab. 1% of cost of boats)	10,000
Lubricating oil expenses		3,000
Insurance premium	(ab. 1% of cost of boats)	10,000
Stores expenses		2,000
Office expenses		5,000
Depreciation	(25 years, less 10%)	33,108
Interest	(4%)	18,393
Total		89,501

(2) Voyage expenses

1 Fuel expenses:

The pusher has been assumed to have a medium or low speed diesel engine, as in the case of soybean barge system, and as fuel, (diesel oil has been assumed to be consumed by 9 KT per day. As the price, 17,000 guarani per KT is employed as estimated by FME.

9 (KT) x 280 (days) x 17,000 (guarani) = 42,840,000 guarani

2 Commision:

About 1% 1,800,000 guarani

3 Visa, etc 400,000 guarani

4 Port charges: 2,000,000 guarani

5 Tugboat charge in Buenos Aires port:

A barge requires shifting of 4 times in Buenos Port. Therefore, total 6 times including entry and departure are required.

A fleet of 4 (barges) x 6 (times) x 2 (tugboats used) x 15 (voyages) x 80 (US$) x 126 (guarani) = 7,257,000 guarani

From the above, the voyage expenses are as follows:

(In 1,000 guarani)

Fuel expenses		42,840
Commission	(about 1%)	1,800
Visa, etc.		400
Port charges		2,000
Tugboat charge in Buenos Aires Port		7,257
Total		54,297

4-2-5 Summary

(In 1,000 guarani)

Income		181,440
Expenditure		143,798
Ship expenses	89,501	
Voyage expenses	54,297	
Balance (profit)		37,642

4-2-6 Type and Size of Ships and Relation with Transportation Demand

(1) Type and size of ships

With regard to the size of barges, JICA survey team had recommended 600 DWT or less for barges. However, by the survey of this time, it was found that the tugboat forced to be used in Buenos Aires Port is approved as one in the case of Gabarra type barge of less than about 500 DWT only. Since this system uses Barcazas type barges by pushers, two tugboats must be used anyway. In conclusion, the size of barges must be considered, in light

of the forecast of cargo volume and keeping the period for boats to stay in Buenos Aires Port as short as possible.

While the arrangement of 2 fleets of 4 soybean barges of 500 DWT for 5 voyages satifies the demand for small-sized barges suitable for the present situations, 800 DWT is surmised to be an appropriate size of barges, considering the increase of cargo volume in future. This extent of size will not delay the turnover of fleets considerably, and will not cause users inconvenience for delaid delivery.

As regards the type of ships, JICA survey team had recommended to employ motor ships in combination with a barge system, to improve competitive position against Argentine boats by quick delivery. Needless to say, in river transportation, barge system is the best in view of future supply and demand of crew and other expenses, but it must be borne in mind that the combined use of motor ships is effective in light of service.

Existing 12 motor ships will be able to be used for about 10 years to come, and as the first stage, it is recommended to use them through thorough repairing, in quick turnover of boats (without being particular about the full load), in the effort to provide good service. And ten years later, when the motor ships are to be replaced, it is recommended to plan 800 to 1,000 DWT motor ships as semicontainer ships, investigating the trend of containerization. In this case, it is advisable to study a method to tow one 500 DWT Gabarra type barge.

Therefore, there is no reason to be against the 800 DWT size barge system at present.

(2) Relation with transportation demand

As already described in the analysis of the main route between Asuncion and Buenos Aires, this problems is whether or not the newly added 800 DWT barge system can take a sufficient share of loadage, in relation with the entire transportation volume.

The transportation volume of the newly added system is, as mentioned above, 1,600 (FT) x 4 (boats) x 15 (voyages) = 96,000 (FT). In addition to this, there is 32,000 FT of 500 DWT barges mentioned before. On the other hand, the loadage of the present fleet of FME (12 motor ships + 4 barges) is

1975: 124,679 FT

1976: 94,346 FT

1977: 125,083 FT

being about 120,000 FT. That is, total loadage will be 250,000 FT. Since the cargo volume for both ways on the route is 550,000 FT to 600,000 FT in terms of FT (with 1 KT for upward service as about 2 FT), the share is a little more than 40%. There remains some doubt as to whether FME can secure 250,000 FT, i.e. a little more than 40% all at once. Therefore, though the above amount of profit has been suppressed to a littler lower value, FME will have to intensify business efforts considerably, to attain the profit.

In this situation, FME supposes 50% can be secured according to their Cargo Reservation Law described separately, but as an actual problem, any technical operation or interpretation of the relative laws and ordinances may result in an international diplomatic problem and should not be enforced.

It is rather desirable to secure the loadage share by the competitiveness improvement and business efforts, and though it is a national corporation, this method must be the way for a shipping company to develop. It is said that Flota F.D.E. Argentina, a national company of Argentine, too, has developed through improvement of management. Also for FME, it is surmised not quite difficult to secure 40% on the main route by efforts.

For the sake of safety, 6 barges and 4 barges can be built at an interval of about two years in 2 stages, without increasing 10 barges all at once, and it is also worthy of considering to assemble barges locally, for substantially staged building.

4-3 System of Oil Barges

2,400 PS Pusher:		One	
2,000 M^3 oil barge with heating coil:	two	Total four	
2,000 M^3 oil barge without heating coil:	two		
Cost of the ships			
2,400 PS pusher: 475.8 million yen ,		299,754 mG	
2,000 M^3 oil barge: 610.4 million yen,		384,552 mG	
Oil Barge	154.1 million yen x 2		
	151.1 " x 2		
	Total: 1,086.2 million yen		684,306 mG

4-3-1 Sailing Days, Voyages and Freight

This system is intended to transport crude oil and some semi-products mainly from Buenos Aires Oil Quay to REPSA private pier near Asuncion.

Since the barges are a little larger than 800 DWT barges described separately, the number of sailing days is estimated to be 20 (12 days for upward sailing and 8 days for downward sailing.) If a barge stays in the port for 4 days, considering that the pier can moor only two barges, one round takes 24 days. If the number of annual working days is 330, 14 voyages will be made per year. (FME assumes 15 voyages.)

The freight is 1,500 guarani per M^3 (FME).

Annual transportation volume is

2,000 (M^3) x 4 (barges) x 14 (voyages) = 112,000 (M^3)

4-3-2 Income

From the above, the annual income is

112,000 (M^3) x 1,500 guarani = 168,000,000 guarani

4-3-3 Expenditure

(1) Ship expenses

1 Seamen expenses are assumed to correspond to 10% higher, for the oil barge system as compared with dry cargo barge system.

2 Insurance premium is assumed to correspond to about 1.2% of the cost of the boats.

3 Repairing expenses are assumed to correspond to about 1% of the cost of the boats.

4 Depreciation is made for 25 years, with residual value of 10%.

5 Interest is 4% as an approximate average.

	(In 1,000 guarani)
Seamen expenses	10,000
Repairing expenses	7,000
Lubricating oil expenses	3,000
Insurance premium	8,000
Stores expenses	2,000

Office expenses		5,000
Depreciation		24,635
Interest	(4%)	13,686
Total		73,321

(2) Voyage expenses

1 Fuel expenses

The amount of consumption has been assumed to be 9 KT per sailing day, and the amount consumed during anchorage is so small as to be negligible. For 280 sailing days at 17,000 guarani per KT of diesel oil (FME), the fuel expenses are

280 (days) x 9 (tons) x 17,000 (guarani) = 42,840,000 guarani

2 Commission: Assumed to be 1% 1,700,000 guarani

3 Port charges, etc: 1,500,000 guarani

4 Tugboat charge in Buenos Aires Port: Twice for entry and departure

2 (times) x 4 (barges) x 2 (tugboats) x 14 (voyages) x 100 (US$) x 126 (guarani) = 2,800,000 guarani

From the above, the voyage expenses are as follows:

(In 1,000 guarani)

Fuel expenses	42,840
Commission	1,700
Port charges, etc.	1,500
Tugboat charge in Buenos Aires Port	2,800
Total	48,840

4-3-4 Summary

(In 1,000 guarani)

Income		168,000
Expenditure		122,161
Ship expenses	73,321	
Voyage expenses	48,840	
Balance (profit)		45,839

4-3-5 Type and Size of the Ships and Relation with Transportation Demand

As for the type of the ships, barge system is the best, considering

that oil transportation is for one shipper, one loading port and one unloading port, and that cargo handling time is short. The selected size of barges is reasonable, in light of the cargo volume.

With regard to transportation volume, there is a certain problem. According to FME, the present transportation volume of 350,000 KT between Buenos Aires and Asuncion is shared by FME (13% = 45,000 KT), NAVIPAR ((51%) and Argentine ships (36%).

Meanwhile, the transportation results of oils by existing FME ships are:

1975: 50,564 M^3

1976: 52,493 M^3

1977: 74,184 M^3

Average approximately 60,000 M^3

In this situation, if the transportation volume of the new barge system amounting to 112,000 M^3 is added to that of the existing ships, the transportation volume of oils by FME becomes about 170,000 M^3. Considering the total transportation volume of oils will grow to be 400,000 M^3, this corresponds to 42% of the total volume. Therefore, taking the growth of transportation volume, too, into account, FME will have to take about 20% of the shares of NAVIPAR and Argentine ships, and sufficient discussion will be required to be made with REPSA. Fortunately, in the contract between the government and REPSA, there is a clause to give priotity to FME, and the amicable application of the clause is expected.

4-4 1,500 DWT Ocean-Going Ship

Capacity bale 2,400 tons, 12 knots, 1,300 PS

Crew: 14

Cost of the ship: 656 million yen (413.3 million guarani)

4-4-1 Income

FME estimates a freight income of 154,069,000 guarani for 4 voyages per year, based on the actual freight income of 134,810,000 guarani (3.5 voyages) for fiscal 1977 by the GUARANI.

One round is total 80 days consisting of 60 sailing days and 20 lay days, and therefore annual 320 days for 4 voyages are reasonable.

As for the loadage, from the past results, about 800 KT for outward

service and about 600 KT (1,200 M^3) for inward service, i.e. total 2,000 FT can be assumed. The freight is average US$150.000 per FT from the past results, but since the average freight tends to drop, it has been estimated to be as low as US$120.00.

From the above, the income is

120 (US$) x 2,000 (FT) x 4 (voyages) x 126 (guarani)

= 120,960,000 guarani

4-4-2 Expenditure

(1) Ship expenses (fixed cost, Gastos Fijos)

1 Seamen expenses:

For a regular crew of 14, FME calculates the expenses for 22 crew, which may includes standby crew. 12,604,000 guarani

2 Reparing expenses:

FME estimates them, at 3% of the cost of the boat, but this is too high. Considering the overseas service, 1.5% has been employed.

6,200,000 (guarani)

3 Insurance premium:

FME estimates it at about 2% of the cost of the boat, but even considering the overseas service, 1.5% is sufficient.

413,280,000 (guarani) x 0.015 ≒ 6,200,000 (guarani)

4 Stores expenses: 3,000,000 (guarani)

5 Lubricating oil expenses: 1,800,000 guarani

6 Office expenses, etc.: 5,000,000 guarani

7 Depreciation: 25 years with residual value of 10%

413,280,000 (guarani) x 90 (%) ÷ 25 (years) =

14,878,000 guarani

8 Interest: 4%, 2% as approximate average

413,280,000 (guarani) x 2 (%) = 8,266,000 (guarani)

From the above, ship expenses are as follows:

	(In 1,000 guarani)
Seamen expenses	12,604
Repairing expenses	6,200
Insurance premium	6,200
Stores expenses	3,000
Lubricating oil expenses	1,800
Office expenses, etc.	5,000
Depreciation	15,075
Interest	8,375
Total	58,254

(2) Voyage expenses (Variables)

1 Fuel expenses

5 (t) x 240 (days) x 17,000 (guarani) = 20,400,000 (guarani)

2 Port charges:

FME assumes 14,000,000 guarani, including pilotage, etc. Since stevedore charge, etc. are thought to be deducted from the freight income, in estimation of net freight, almost the same amount is estimated.

15,000,000 guarani

3 Agent fee, etc.

With the commission adjusted in the freight income, agent fee only is considered here. 500,000 guarani

4 Reserve fund:

FME assumes 4,366,000 guarani, and this is almost reasonable.

4,000,000 guarani

From the above, voyage expenses are as follows:

	(In 1,000 guarani)
Fuel expenses	20,400
Port charges	15,000
Agent fee, etc.	500
Reserve fund	4,000
Total	39,900

4-4-3 Summary

(In 1,000 guarani)

Income		120,960
Expenditure		98,154
Ship expenses	58,254	
Voyage expenses	39,900	
Balance (Profit)		22,806

4-4-4 Size of the Ship and Relation with Transportation Demand

The size of the ship is surmised to be the largest in light of draft, and is reasonable.

With regard to the relation with transportation demand, there is a certain problem.

As mentioned before (See 4 Ocean-going Shipping Company, Chapter 4), about 47,000 FT (approx. 35,000 KT) is transported by small-sized direct service boats for Europe. If the transportation volume of this ship of 8,000 FT is newly added to it, the total will be about 55,000 FT (aaprox. 41,000 KT), accounting for a considerable portion of about 120,000 FT, estimated loadage (excluding 250,000 KT of soyabeans) between Paraguay and Europe in 1977.

On the other hand, since cargo collection in Europe is exclusively handled by Vannievelt Goudriaan Co., it is surmised that the above freight and loadage can be secured. Though there remains a merit of the ship assigned for direct service, the competition among small-sized direct ocean-going boats will be revealed, and the future is not quite rosy.

Therefore, it is surmised important for this boat to have a little better performance. It is suggested to consider a 1 to 2 knots higher speed, modernization of cargo handling machines and the cpability to load containers. Furthermore, it is necessary to carefully study the new building of small ships in future, investigating the market, without taking an easy policy of expansion.

(Addition)

1,500 DWT Ocean-going ship : one

Cost of the ship : 664.7 million yen

(418.761 mG)

This ship was added by the Government of Paraguay after explanation of

draft report was presented by the survey team.

Even though FME agent in Europe, Van Nievelt, may manage to adjust loading of cargoes, this second vessel can not get freight more than 80 - 90% of the first vessel's aforementioned, in view of the total volume of the trade and competition of the other small direct vessels between Asuncion and the Europe.

Therefore it is assumed the this second vessel gets freight 85% and the result is as follows, which still shows feasibility of this project.

Income	102,816 mG
Expenditure	96,154 mG
Ship expenses	56,254 mG (office expense 2,000 mG off)
Voyage expenses	39,900 mG
Balance (profit)	6,662 mG

4-5 6,000 DWT Ocean-Going Ship

14 knots, 3,900 PS

Cost of the ship: 1,385 million yen (872,550 mG)

4-5-1 Income

FME intends to assign this ship on the route between Paranagua or La Plata and Europe and tries calculation by two ways. After the respective, proposals are examined, we will show our caliulation.

FME 1st proposal ... To expect 100% loadage in export and 60% loadage in import.

FME 2nd proposal ... To expect 70% loadage in export and 50% loadage in import.

(1) First proposal

Export freight is calculated on three types of cargo for 5 voyages.

1 Soybean: 5,000 (KT) x 2 (voyages) x 25 (US$) = 250,000 (US$)

2 Corn: 5,000 (KT) x 1 (voyage) x 25 (US$) = 125,000 (US$)

3 General cargo: 5,000 (KT) x 2 (voyages) x 120 (US$)

= 1,200,000 (US$)

Total 1,575,000 (US$)

198,450,000 (guarani) (US$1 = 126 guarani)

Import freight is calculated as follows:

General cargo and fertilizer:

5,000 (KT) x 60 (%) x 5 (voyages) x 114.05 (US$)

= 1,710,810 (US$)

215,554,000 (guarani) (US$1 = 126 guarani)

From the above, the total freight for export and import is 414,005,000 guarani.

(2) Second proposal

Export loadage of 70% by cereals and general cargo and import loadage of 50% by general cargo are expected, and the freight is the same as that of 1st proposal.

Ten percent rebates and 3.5% commision are deducted. By calculation as done for the 1st proposal, the total freight for export and import is 275,540,000 guarani.

The FME proposals will be studied hereunder. Assuming 34 sailing days between Paranagua and Europe, 42 days between La Plata and Europe and 22 lay days for general merchandise, one round of 60 days takes on the average, and annual 5 voyages are reasonable.

However, loadage and freight are problems. Of the outward loadage, cereals are now transported by 15,000 DWT to 50,000 DWT trampers, and the market rates are US$10.50 for 50,000 DWT ships and US$14.00 to 15.00 for 27,000 DWT to 15,000 DWT ships. As an example of less than these transaction units, there are only a few transactions by 6,000 DWT ships, and the highest freight is surmised to be about US$16.00. The net freight for fertilizer can be estimated to be 10% higher.

For general cargo, as more than thirty sailings per month of 10,000-ton fast-ships belonging to the freight conference are assigned, and the planned ship has no advantage in the direct sailing to Asuncion, it will be difficult to keep competitiveness. Even if there is cargo which is purchased by the government and can be instructed to be shipped exclusively by Paraguayan ships, the loadage will remain very small, as far as there are ships directly sailing to Asuncion. On the other hand, even if FME becomes a member of the freight conference and receive a quota, whether they are allowed to join is a question, much cannot be expected from their actual capability.

From the above, instead of the 1st and 2nd proposals of FME, the following estimate can be considered, assuming mild income of the ship, according to calculation of profitability close to actual situations.

As semi-liner, 4,000 KT of soybean and 800 FT of miscellaneous goods for outward service, and 3,000 KT of fertilizer and 800 FT of miscellaneous goods for inward service, with 5 voyages per year (the number of cargo handling days increases by call to respective ports of the continent).

Freight rates are US$16.00 fio for soybean, US$18.00 for fertilizer and US$70.00 (average net, with stevedore charge and rebate deducted) for miscellaneous goods.

Income through freight:

Soybeans etc.

4,000 (KT) x 16 (US$) x 5 = 320,000 (US$)

Fertilizer ...

3,000 (KT) x 18 (US$) x 5 = 270,000

} 590,000 (US$)

Miscellaneous goods ...

1,600 (FT) x 70 (US$) x 5 = 560,000 (US$)

Total: 1,150,000 (US$)

@126 144,900,000 guarani

With optimistic view in the present situation, the income will be a little more than 140 million guarani.

4-5-2 Expenditure

(1) Ship expenses (fixed cost)

1 Seamen expenses:

As the number of seamen 19 is employed as considered by FME.

The remuneration is doubled for foreign service as considered by FME. The seamen expenses include meals, travelling expenses, social insurance premium, etc. 24,315,000 guarani

2 Repairing expenses:

FME estimates at 3% of the cost of the boat as the maintenance expenses, and appropriate 8,000,000 guarani additionally as repairing expenses. These have been lowered to 1.5% of ship cost or less as a whole.

13,000,000 guarani

3 Insurance:

FME estimates at about 2% of the cost of the boat, but 1.2% is sufficient.

807,282,000 (guarani) x 1.2 (%) ÷ 10,000,000 guarani

4 Stores expenses: 5,000,000 guarani

5 Lubricating oil expenses: 3,600,000 guarani

FME estimates excessively

6 Others:

FME estimates at 8,300,000 guarani, including reserve fund, but this has been reduced to 3,000,000 guarani.

3,000,000 guarani

7 Office expenses: 5,000,000 guarani

8 Depreciation:

FME calculates with durable life of 30 years with residual value of 20%. This has been changed to depreciation of 25 years with residual value of 10%.

31,412,000 guarani

9 Interest:

Four percent is employed as an approximate average.

17,451,000 guarani

From the above, the ship expenses are as follows:

(In 1,000 guarani)

Seamen expenses	24,315
Repairing expenses	13,000
Insurance	10,000
Stores expenses	5,000
Lubricating oil expenses	3,600
Others	3,000
Office expenses	5,000
Depreciation	31,412
Interest	17,451
Total	112,778

(2) Voyage expenses

1 Fuel expenses:

FME estimates at 59,500,000 guarani.

If 240 sailing days and 90 lay days are assumed for one year, 13 tons of heavy oil (C) and 1 ton of diesel oil used per sailing day, and 1 ton of diesel oil used per lay day, result in 3,120 tons of heavy oil and 330 tons of diesel oil.

Heavy oil is priced at US$90.00 per ton and diesel oil at US$135.00 per ton.

3,120 (tons) x 90 (US$) x 126 (guarani) = 35,381 mG

330 (tons) x 135 (US$) x 126 (guarani) = 5,613 mG

Total: 40,994 mG

2 Port charges:

FME estimate 6,675,000 G including customs, tug and pilot, but it is necessary to increase about 30% 8,700,000 guarani

3 Manifest expenses:

3,000,000 guarani

4 Agent fee, etc.:

1,800,000 guarani

5 Reserve fund:

3,000,000 guarani

(Note: FME estimates at 9,500,000 Guarani)

Total (yearly) 57,494,000 guarani

4-5-3 Summary

	(In 1,000 guarani)	
Income	144,900	
Expenditure	170,271	
Boat expenses		112,777
Shipping expenses		57,494
Balance (loss)	-25,371	

As shown above, even if the income is estimated at a relatively high value, this operation will give a loss. Profitability depends on miscellaneous goods. For cargo relating to Paraguay, as described separately, there is a competition with small-sized ocean-going boats with the advantage of direct sailing to Asuncion on one hand, and for transit cargo, there is a competition with other fast liners on the other hand. Though one round is estimated to attain 1,600 FT, this is surmised still difficult as a matter of fact.

Soybeans and fertilizer are treated as tramper cargo, and the freight rates depend on the market. It is an accepted opinion that they will not improve for 3 or 4 years to come.

Next, in relation to demand for cargo transportation, its transportation of Paraguayan products will be limited to 2 voyages a year, at the most of 10,000 tons of soybeans and approximately 4,000 tons (about one half of the capacity of this vessel) of vegetable oil, frozen meat and general merchandise. Other transportation will consist of Argentine and Brazilian products or imports of general merchandise. The overall demand for ships bottom is sufficient in relation to agricultural products from Argentine and Brazil. The point will rather be to exert efforts to collect a small lot of 5,000 tons. Also there will be sufficient vegetable oil and frozen meat, the key here will be timing in loading and cargo collecting ability.

Therefore, as this 6,000 DWT ocean-going ship proposed by Paraguay is small compared with the usual vessel types employed as trampers engaged principally in transporting agricultural products, its operation is very difficult.

However, possession of its own means of transportation in relation to agricultural products will increase the profit for landlocked nations as a whole and it can well be understood that, for a nation like Paraguay, it will have merits such as raising its technological standards, increasing employment and contributing to its national reserves. On the other hand, it may be considered feasible if the foregoing barge systems and other projects were combined and processed as a single package project.

Although it will be preferable for the future if this type of vessel is at least of the 10,000 ton or 15,000 ton class, this problem entirely depend upon FME, who is responsible for ships operation, based upon presise survey on trade conditions of agricultural products. It will also be important for FME to secure government subsidizing measures in the event of the worst situation.

Furthermore it might be another way for FME to start with second-hand vessel in order to minimize the risk based on a step by step policy.

4-6 Conclusion on the Shipping Service Planning and Profitability

As a result of study on the five projects according to the priority demanded by FME, the following conclusion can be reached.

(1) The small-sized barges for soybean and the large-sized barges for general merchandise involve a certain problem, but have feasibility, if the operation is proper.

(2) There is little problem with the oil barges and the small-sized ocean-going ship.

(3) Although the operational profitability of the 6,000 DWT ocean-going ship is not satisfactory, it is sufficiently feasible from the standpoint of the overall project, and moreover has the following merits.

By possessing a 6,000 DWT ship,

1) Shipments of domestic products from Paranagua, a free port, will be facilitated.
2) It will be possible to save on foreign reserves.
3) It will enable acquisition of ocean navigation technology and training and will also be of significance as a step towards possessing large ocean liners in future.

4-7 Pontoon with Transhipment Machine

The construction and installation of this pontoon is intended to tranship the soybean shipped by small-sized barges (360 DWT) from the upper reaches of the Parana River, to large-sized barges (1,000 DWT to 1,200 DWT), by the pontoon with shipment machine, placed on Confluencia between Parana River and Paraguay River, for transportation to Buenos Aires, thereby elevating entire transportation efficiency. This is to overcome the condition of shallow Parana River.

Transportation volume:

Approx. 300 km between Encarnacion and Confluensa

Approx. 1,350 km between Confluensa and Buenos Aires

One small-sized barge fleet consists of one pusher and four barges. Since two pushers are provided, two fleets shuttle (the total number of barges is 20).

One round of a fleet between Encarnacion and Confluensa takes 5 days, and the soyabeans transportation period lasts for 120 days. By calculation, 24 voyages can be made, but considering some margin, 21 voyages are assumed.

The transportation volume is:

350 (KT) x 4 (boats) x 21 (voyages) x 2 (fleets) = 58,800 (KT)

(1) This is transhipped to the large-sized barges to be newly built, for the route between Confluencia and Buenos Aires.

One fleet consists of one pusher and four barges.

Since one round takes 13 days with 8 days for upward service and 5 days for downward service, 9 voyages can be made in the 120-day season. With total 10 barges assigned, a pusher carries 4 barges for the 1st voyage, 4 barges for the 2nd voyage and 2 barges for the 3rd voyage respectively, that is, 10 barges are pushed in 3 voyages. 9 voyages could carry 30 barges.

Loadage of one barge: Max. 1,200 KT

Transportation volume: 1,200 (KT) x 30 (barges) = 36,000 (KT)

(2) For the shortage, existing barge fleet (one tugboat + 4 barges) and two motor ships are used.

Since the existing barge fleet can make about 4 voyages, the transportation volume is 600 (KT) x 4 (barges) x 4 (voyages) = 9,600 (KT)

Two motor ships can transport in about 8 voyages:

900 (KT) x 2 (boats) x 8 (voyages) =	14,400 (KT)
Total:	60,000 KT

Summarizing the transportation means;

Between the vicinity of Encarnacion and Confluecia,

small-sized barges ...	58,800 KT

Between Confluensa and Buenos Aires,

large-sized barges ...	36,000 KT
existing barge fleet ...	9,600 KT
existing 2 power boats	14,400 KT
Sub-total	60,000 KT

The transhipment from small-sized barges to large-sized barges increases the soybean transportation volume from 19,600 KT(attained by direct sailing of small-sized barges to Buenos Aires), to 58,800 KT, about three times.

Expenses:

The above is examined below in light of income and expenditure.

Income through freight ...

58,800 (KT) x 18 (US$) x 126 (guarani) = 133,358,000 (guarani)

Less 1% commission 132,024,000 (guarani)

Expenditure ...

(1) Small-sized barge system (see the small-sized barge project)

Ship expenses

102,654,000 guarani x $\frac{120}{330}$ = 37,328,000 guarani

Voyage expenses

Fuel expenses: 41,250,000 guarani
Port charges, etc: 500,000 guarani } 41,750,000 guarani

41,750,000 guarani x $\frac{120}{330}$ = 15,181,000 guarani

Sub-total: 52,509,000 guarani

(2) Large-sized barge system (see the large-sized barge project)

Ship expenses

89,501,000 guarani x $\frac{120}{330}$ = 32,545,000 guarani

Voyage expenses

Fuel expenses: 42,840 x $\frac{120}{330}$ = 15,578,000 guarani

Port charges, etc.: 2,000 x $\frac{120}{330}$ = 727,000 guarani

Tugboat fee at Buenos Aires: 4 barges x 2 tugboats used x 2 times x 9 voyages x US$80.000 x 126 guarani

= 1,451,000 guarani

Total of voyage expenses 17,756,000 guarani

Sub-total: 50,301,000 guarani

(3) Existing barge fleet (600T x 4 + tugboat x 1)

Estimated from the result of 1977

Annual expenses of 4 Gabarra barges:

20,596,000 x $\frac{120}{330}$ = 7,489,000 guarani

Annual expenses of one tugboat:

10,416,000 guarani x $\frac{1}{2}$ = 5,208,000 guarani

(Since the turnover of tugboat is higher, the expenses are estimated at a half of annual expenses.)

Sub-total: 12,697,000 guarani

(4) Exisitng 2 motor ship

Exsimated from the result of 1977

Ship expenses per boat:

10,000,000 guarani $\times \frac{120}{330}$ =	3,636,000 guarani
Sailing expenses: 4,570,000 guarani	5,000,000 guarani
Total	8,636,000 guarani

Since 4 or 5 voyages are made per year at present between Asuncion and Buenos Aires, sailing expenses of about 5 million guarani are assumed necessary for 8 shuttling voyages for soybeans transportation of shorter distance between Confluensa and Buenos Aires

Total of 2 boats:	17,272,000 guarani

As grand total:

Income	132,024,000 guarani
Expenditure	132,779,000 guarani
1. Small-sized barge system	52,509,000 guarani
2. Large-sized barge system	50,301,000 guarani
3. Existing barge fleet	12,697,000 guarani
4. Existing 2 motor boats	17,272,000 guarani
Balance (loss)	(-) 755,000 guarani

On the other hand, the income and expenditure of the small-sized barge system for soybean transportation between Encarnacion and Buenos Aires for 120 days only are approximately as follows:

Income: Soybean freight US$18.00 for 19,600 T

	44,453,000 guarani
Expenditue: 150,629,000 $\times \frac{120}{330}$ = (Refer to 4-1-5)	54,774,000 guarani
Balance (loss)	10,321,000 guarani

The black-ink balance can be obtained only when the barges are used additionally for cement transportation, etc., and if they are used for soybean transportation only, a deficit of 10 million guarani will ensue. However, the transshipment from small-sized barges to large-sized barges at Confluencia makes almost even (loss of 755,000 guarani), as observed in the above calculation. It is efficient with the increase of transportation volume and the cost reduction of about 9 million guarani.

However, transshipment expenses are not added yet, and if they are too high, this method is not reasonable.

And the pontoon with transshipment machine is not feasible, as a result of the disadvantage that it can be used for only 120 days per year, as calculated below. That is, 14 million guarani is required as transshipment expenses, and even with the above profit of a little more than 9 million guarani, a loss of 5 million guarani will ensue. Apparently the whole loss is 15,043,000 guarani.

(755,000 + 14,288,000) Expenses of the pontoon (transshipment expenses)

Cost of pontoon:	212.3 million yen,	133,749,000 guarani
Annual expenses:	Depreciation ...	4,814,000 guarani
	Interest	2,674,000 guarani
	Repairing & insurance ...	2,800,000 guarani
	Operation & management ...	4,000,000 guarani
	Total:	14,288,000 guarani

Therefore, as a conclusion, the cost of transhipment equipment should be lowered, for example, by using a wooden pier and simple machine. A low cost method will be able to increase the transportation volume reasonably as mentioned above.

With regard to the relation with transportation demand, 58,800 FT is still a little more than 50% of the expected shipment volume of 110,000 tons, and it is a proper share. Since some are left unshipped for present Argentine ships, it is not surmised that any friction occurs.

A difficulty with this transhipment is that all the newly built barges, and existing barges and two motor ships must be assigned throughout 120 days between Confluencia and Buenos Aires. This means to spoil the FME transportation system between Asuncion and Buenos Aires for 4 months.

Therefore, not to affect the system so badly, it may be a method, to extend the service of half the small-sized barges as far as Buenos Aires, or to charter 1,000 T to 2,000 T barges for 4 months from Argentine for filling about half the transportation volume between Confluencia and Buenos Aires. In the case of the former, the transhipment equipment is required to be further reduced in cost.

Anyway, the problem of transhipment system was raised after return of the survey team, and is not sufficiently surveyed. It should be discussed at another opportunity, with sufficient data prepared.

Part X Economic Evaluation

Part X Economic Evaluation

Only calculable costs and benefits are taken into consideration in the evaluation of this project. As the types of ships are widely diversified, evaluation is carried out by considering the entire fleet of 42 ships as one project in order to obtain as accurate a figure as possible.

Calculation of Benefits and Costs

All benefit and cost figures, which shall be the prerequisite for evaluation, are applied from the survey described in this report. Income is directly used as is for benefits and transportation and ship expenses less depreciation and interests are used as cost. The summary will therefore be as shown in the following table.

(Unit: 1,000 guarani)

A. Benefit	872,441
B. Cost	533,370
A - B	339,071

The exchange rate used in this evaluation is 1US$=200yen =126 guarani

The project life is considered to run 25 years and construction costs are supposed to be invested within construction period of 2 years with 50% in each year.

Accordingly, the project will be operated from the 3rd year.

Inflation factors, increase in labor costs,etc. during the project cycle are not taken into account at the time of this evaluation.

As a result of calculation, a ratio of 4.7% is obtained as internal rate of return under the foregoing premises. This low ratio results from the absolutely minor benefits in relation to the problem of collection of cargoes.

It is noticed that for the smooth implementation of the project, great efforts shall be required for FME regarding collection of cargoes and transportation system.

Table

(Unit: 1,000 guarani)

Item \ Ship	1	2	3	4	5	
	360 DWT Barge (1,200PS)	800 DWT Barge (2,400 PS)	2,000 m^3 Oil barge (2,400PS)	1,500 DWT	6,000 DWT	Total
BENEFIT	154,325	181,440	168,000	223,776	144,900	872,441
COST	88,417	92,297	83,840	147,408	121,408	533,370

Part XI Spare Parts for (Existing) Vessels Built by Yen-Credit in 1961

Part XI Spare Parts for (Existing) Vessels Built by Yen-Credit in 1961

1. The List of Spare Parts Requested by FME.

REQUESTOS PARA BUQUES JAPONESES

1. PETROLERO Y CARGUEROS
   - 1.1 B/T. "LAGUNA VERA:
   - 1.2 B/M. "YHAGUY"
   - 1.3 B/M. "RIO NEGRO"
   - 1.4 B/M. "PARANA"
   - 1.5 B/M. "COMUNEROS"
2. BUQUE GANADERO
   - 2.1 B/G. "CHAQUEÑO"
3. REMOLCADORES
   - 3.1 Rdor. "ITACURUBI"
   - 3.2 Rdor. "ITA KYRY"

A) MOTORES PROPULS ORES

1. NIGATA - Modelo M6DS 1,000 P.S.
   No Serie 9365. (5) Cinco unidades.

2 y 3.
HANSHIN - Modelo Z 6 D N 350 P.S.
No Serie 3086. (6) Seis unidades.

B) MOTORES DIESEL GENERADORES PRINCIPALES

1.1. KUBOTA - Modelo 6 K
No Serie 6016. (2) Dos unidades

1.2/5.
KUBOTA - Modelo 6 H K
No Serie 6142. (8) Ocho unidades.

2.1.y 3.1/2.
YANMAR - Modelo 3 L D L
No Serie OF 1173 CX. (4) Cuatro Unidades

C) MOTORES DIESEL GENERADORES AUXILIARES

1.1/5.
KUBOTA - Modelo 2 L C
No Serie 2036. (5) Cinco unidades.

2.1.y 3 1/2.
YANMAR - Modelo 1 L D L

No Serie OF 100 4 AX. (3) Tres unidades.

D) MOTORES MOTOBOMBA DE INCENDIO Y LANCHAS

1.1/5.
MITSUBISHI DAIYA 8L TIPO DVA

No Serie 1812792. (10) Diez unidades

E) ACCESORIOS DE CUBIERTA

1.1/5; 2.1, 3 1/2.

100 - Cien unidades mangueras contra-incendio con su adaptador de 2 1/2".

100 - Cien picos para mangueras de 2 1/2"

10 - Diez anclas tipo tragadero de 1,100 a 1.200 kg.

5 - Cinco juegos de cadenas para Cargueros de 175 m c/u. con grilletes giratorios.

1 - Un juego de cadenas para B/Ganadero, de 175 m c/u. con grilletes giratorios.

2 - Dos juegos de cadenas para Remolcadores de 175 m c/u. con grilletes giratorios.

20 - Veinte grilletes giratorios para cadena anclas B/Cargueros.

10 - Diez grilletes giratorios para cadena anclas B/Ganadero.

20 - Veinte grilletes giratorios para cadena anclas Remolcadores.

20 - Veinte rollos de cabo de nylon de 200 m. de 2".

20 - Veinte rollos de cabo de nylon de 200 m. de 1 3/4".

20 - Veinte rollos de cabo nylon de 200 m. de 1 1/2".

20 - Veinte rollos de cabo nylon de 500 m. de 3/4".

20 - Veinte rollos de cabo nylon de 500 m. de 1/2".

20 - Veinte rollos de cabo de acero de 500 m. de 3/4".

5 - Cinco rollos de cabo de acero de 500 m. de 5/8".

300 - Trescientos rollos de loneta encerada de algodon y nylon grueso de 1 m. X 60 m. c/u., para uso en tapas escotillas y troja.

300 - Trescientos rollos de loneta encerada de algodon y nylon fino de 1 m. x 60 m. c/u., para uso en tapas escotillas y tcoja

A.1 MOTOR NIGATA MODELO M 6. D S.

1 - (6) Seis culatas completas.

2 - (10) Diez camisas cilindro.

3 - (30) Treinta pistones completos.

4 - (100) Cien aros de choque.

5 - (200) Doscientos aros de compresión.

6 - (100) Cien aros de aceite.

7 - (2) Dos juegos de regulador de velocidad.

8 - (2) Dos juegos de eje y caja completa parte acoplamiento de bomba de agua.

9 - (1) Un juego de engranaje completo.

10 - (2) Dos juegos de distribuidór de aire completo.

11 - (20) Veinte bombas de combustible completas.

12 - (2) Dos juegos de asiento balancín con caja.

13 - (2) Dos juegos de asiento de bomba con caja.

14 - (2) Dos juegos de rodillos de camón con brazo completo.

15 - (30) Treinta tubos de combustible de alta presión.

16 - (120) Ciento veinte toberas para inyector de combustible.

17 - (2) Dos enfriadores de aceite completo.

18 - (1) Un eje de leva de camón completo.

19 - (5) Cinco juegos de tuberiá de escape completo.

20 - (30) Treinta inyectores completos.

21 - (100) Cien termómetros con caja de protección de 100°C.

22 - (100) Cien pirómetros de gas de escape con caja de proteccion de 660°C.

23 - (40) Cuarenta juegos de sopapas de uretanos para bomba de agua de refrigeración.

24 - (40) Cuarenta guías de sopapa p/bomba de agua.

25 - (2) Dos bombas de aceite de lubricación acopla da con caja completo.

26 - (20) Veinte varillas de botador.

27 - (6) Seis tubos de amortiguador tubería salida turbosobrealimentador.

28 - (30) Treinta tubos amortiguadores multiple de escape.

29 - (30) Treinta cojinetes de biela super medida.

30 - (30) Treinta cojinetes de bancada super medida.

31 - (5) Cinco tacómetros con caño completo.

32 - (10) Diez caños para tacómetros.

33 - (50) Cincuenta manómetros de agua de 4 Kg/cm^2.

34 - (50) Cincuenta manómetros de agua de 6 Kg/cm^2.

35 - (50) Cincuenta manómetros para aceite.

36 - (1) Un rollo de tejido para filtro de aceite.

37 - (5) Cinco hélices de bronce.

38 - (30) Treinta arandelas de cobre para entrada de turbina
265 x 200 x 2.

39 - (100) Cien arandelas de cobre, junta de expansión para caño de escape 240 x 151 x 2.

40 - (100) Cien arandelas de cobre, caño de sucursal de escape
200 x 200 x 2.

41 - (200) Doscientas arandelas de cobre, de válvula de asiento
162 x 152 x 2.

42 - (30) Treinta arandelas de cobre, válvula de arranque
66 x 57 x 2.

43 - (60) Sesenta arandelas de cobre, caja de resortes de inyectores
44 x 39 x 0.5.

44 - (200) Doscientas arandelas de cobre p/inyectores
36 x 26 x 2.

45 - (200) Doscientas arandelas de goma, caja de válvula p/bomba de agua 159 x 149 x 5.

46 - (200) Doscientas arandelas de goma p/asiento de válvula de salida p/bomba de agua
150 x 142 x 4.

47 - (200) Doscientas arandelas de goma p/caja de válvula de bomba de sentina
108 x 98 x 5.

48 - (200) Doscientas arandelas de goma, asiento de válvula salida de sentina
99 x 91 x 4.

49 - (300) Trescientas arandelas de goma caja de válvula de escape entrada de agua
49 x 35 x 7.

A.2 y 3. - MOTOR HANSHIN - MODELO Z 6 D N 350 P.S.

No. Serie 3086.

1 - (12) Doce culatas completas.

2 - (12) Doce camisas de cilindro.

3 - (300) Trescientos aros de compresión.

4 - (100) Cien aros de aceite.

5 - (1) Un cigueñal de Estribor.

6 - (1) Un cigueñal de Babor.

7 - (2) Dos ejes de levas uno de Estribor y uno de Babor.

8 - (2) Dos juegos tubos de escape.

9 - (1) Un enfriador de aceite.

10 - (1) Un enfriador de agua.

11 - (2) Dos juegos caballete de cambio de marcha completos.

12 - (4) Cuatro tubos flexibles para escape.

13 - (4) Cuatro tacómetros con caño de Estribor y Babor.

14 - (4) Cuatro juegos de cojinetes de biela.

15 - (4) Cuatro juegos de cojinetes de bancada.

16 - (2) Dos juegos de distribuidor de aire.

17 - (2) Dos juegos de engranajes completos.

18 - (2) Dos reguladores completos.

19 - (20) Veinte inyectores completos.

20 - (60) Sesenta toberas para inyección.

21 - (20) Veinte válvulas de arranque.

22 - (120) Ciento veinte arandelas de cobre para asiento inyector.

23 - (120) Ciento veinte asientos de válvulas de escape y admisión.

24 - (40) Cuarenta tubos de alta presión inyección combustible.

25 - (50) Cincuenta juegos válvulas sopapa de aretano para bomba de agua de refrigeración.

26 - (1) Una caja completa de válvula sopapa de Estoribor.

27 - (1) Una caja completa de válvula sopapa de Babor.

28 - (25) Veinticinco manómetros de aceite lubricante.

29 - (1) Una hélice de bronce para el B/G. "CHAQUEÑO" de giro derecho.

30 - (1) Una hélice de bronce para id. de giro izquierdo.

31 - (12) Doce anillos de goma para hélices.

32 - (4) Cuatro bielas.

33 - (1) Un eje portahélice para B/G. "CHAQUEÑO".

34 - (60) Sesenta juntas de cobre p/asiento de válvula de escape y admisión.

35 - (30) Treinta juntas de cobre p/asiento culata.

36 - (50) Cincuenta pirómetros para gas de 600°C.

37 - (50) Cincuenta termómetros p/agua de 100° .

38 - (200) Doscientos anillos de goma p/asiento de válvula de escape.

B.1.1 MOTOR KUBOTA MODELO 6 K.

1 - (6) Seis Pistones con aros y Pernos de crueta. PISTON COMPLETE.

2 - (48) Cuarenta y ocho Aros de Compresión. PISTON RING.

3 - (24) Veinte y Cuatro Aros de Aceite. OIL SCRAPE RING.

4 - (20) Veinte Camisas de Cilindro. CLINDER LINERS.

5 - (3) Tres Tapas de Cilindro completos. CLINDER COVER COMPLETE.

6 - (12) Doce Válvulas de Admision Completas. INLET VALVE COMPLETE.

7 - (12) Doce Válvulas de escape completas. EXHAUST VALVE COMPLETE.

8 - (12) Doce Valvulas de Arranque completas. STARTING VALVE COMPLETE.

9 - (48) Cuarenta y ocho Aros de Compresión. PISTON RING "B".

10 - (6) Seis Balancines para válvulas de Admision. ROCKER ARM - INTAKE.

11 - (6) Seis Balencines para Válvulas de Escape. ROCKER ARM - EXHAUST.

12 - (6) Seis Pernos eje de Balancines. SHAFT - ROCKER ARM.

13 - (12) Doce Bujes de eje de balancines. BUSH - ROCKER ARM

14 - (1) Un Regulador Centrifugo Completo. GOVERNOR GROUP COMPLETE.

15 - (6) Sies Bombas de Inyección. FUEL INJECTION PUNP

16 - (6) Seis Elementos de bombas de Inyección. FUEL PUMP WORKING.

17 - (12) Doce Camones postizos para inyección. INJECTION CAM.

18 - (12) Doce Rodillos botadores bamba de inyección., compuesto de:

(12.-) Doce Bujes. BUSH BELL CRANK

(12.-) Doce Rodillos. ROLLER BEE CRANK.

(12.-) Doce Pernos. SHAFT BELL CRANK

19 - (12) Doce Inyectores completos. INJECTOR COMPLETE.

20 - (12) Doce Toberas para inyectores. NOZZLE (For Inyector)

21 - (40) Cuarenta Tornillos de montaje cabeza de biela. BOLT CONNECTING ROD.

22 - (40) Cuarenta Tuercas para tornillo montaje biela. NUT - ROD BOLT

23 - (40) Cuarenta Pasadores seguro tuercas montaje bielas. SPLIT PIN - NUT

B.1.2/5 MOTOR KUBOTA MODELO E D 6 H K

1 - (12) Doce Pistones con aros y pernos de cruceta.

2 - (100) Cien Aros de Compresión.

3 - (50) Cincuenta Aros de Aceite.

4 - (40) Cuarenta Camisas de Cilindros.

5 - (6) Seis Tapas de Cilindros completos.

6 - (24) Veinte y cuatro Válvulas de Admision completas.

7 - (24) Veinte y cuatro Válvulas de escape completas.

8 - (24) Veinte y cuatro válvulas de arranque completas.

9 - (12) Doce Balancines para Válvula de Amisión.

10 - (12) Doce Balancines para Válvulas de Escape.

11 - (12) Doce Pernos Eje Balancines.

12 - (24) Veinte y cuatro bujes de Ejes de Balancines.

13 - (2) Dos reguladores centrifugos completos.

14 - (24) Veinte y cuatro elementos de bombas de Inyeccion.

15 - (24) Veinte y cuatro rodillos botadores bomba de inyeccion completo, compuesto de:

(24) Veinte y cuatro Bujes.

(24) Veinte y cuatro Rojillos.

(24) Veinte y cuatro Pernos.

(30) Treinte Toberas pasa inyecctores.

16 - (40) Cuarenta Tornillos de montaje Cabeze de biela.

.17 - (40) Cuarenta Tuercas para tornillo montaje biela.

18 - (40) Cuarenta Pasadores seguro Tuercas montaje biela.

C.1.1/5 MOTOR KUBOTA MODELO 2 L C

1 - (6) Seis pistones con aros y pernos de crucetas

2 - (18) Diez y ocho aros de compresión.

3 - (24) Veinte y cuatro aros de Aceite.

4 - (10) Diez Camisas de Cilindros.

5 - (3) Tres Tapas de Cilindros Completos.

6 - (10) Diez Válvulas de Escape completos.

7 - (10) Diez Válvulas de arranque completos.

8 - (3) Tres Balancines para válvulas de admisión.

9 - (3) Tres Balancines para válvulas de escape.

10 - (6) Seis pernos ejes de balancines.

11 - (12) Doce Elementos de Bombas de Inyección.

12 - (12) Doce Toberas para Inyecctores.

13 - (2) Dos Ciguenãles completos.

14 - (2) Dos Arboles de levas.

15 - (2) Dos reguladores de velocidad.

16 - (8) Ocho Botadores.

17 - (4) Cuatro Varillas Botadores de Válvulas de Admisión.

18 - (4) Cuatro Varillas Botadores de Válvulas de escape.

19 - (4) Cuatro Rodillos de Inyección compuestos de:

(4) Cuatro BELL CRANK

(4) Cuatro BUSH BELL CRANK

(4) Cuatro SHAFT BELL CRANK

(4) Cuatro SET SCREW

(4) Cuatro ROLLER BELL CRANK

(4) Cuatro SHAFT ROLLER

D.1.1/5 MOTOR MITSUBISHI DAIYA 8 L TIPO DVA

1 - (2) Dos Cárter.

2 - (4) Cuatro Blocks de cilindros completos.

3 - (4) Cuatro juegos de embragues completos.

4 - (2) Dos Juegos de engranajes completos.

5 - (2) Dos ejes de leva de camón.

6 - (12) Doce camisas de cilindros c/juntas.

7 - (24) Veinte y cuatro juntas de cobre p/culatas

8 - (3) Tres volantes.

9 - (12) Doce bombas de combustibles.

10 - (12) Doce bombas de agua completas.

11 - (40) Cuarenta juegos de aros para pistones completos.

12 - (24) Veinte y cuatro pistones completos.

13 - (40) Cuarenta toberas para inyeccion.

14 - (24) Veinte y cuatro inyectores.

15 - (24) Veinte y cuatro juntas para inyectores.

16 - (40) Cuarenta manómetros de presión de acerte

Asuncion, 27 de Junio de 1978.-

2. Study Results on the Spare Parts

Study results on the spare parts of the existing vessels requested by FME are as follows.

2-1 Cost of Items Available

Following are the purchase cost and freight of all the goods available at present.

(thousand yen)

	F.O.B.	Freight
ACCESORIOS DE CUBIERTA	31,073	1,332
NIGATA-MODELO M6. DS	113,174	1,181
HANSHIN-MODELO Z6 DN	60,605	508
KUBOTA MODELO 6K	32,184	315
MODELO ED6HK		
MODELO 2 LC		
MITSUBISHI DAIYA 8L TIPO DVA	5,539	118
Total	242,575	3,454
Grand total	246,029	

(Notes) 1. All the items available at present, even though not satisfied with the requested number by FME, are included in the above cost.

2. Fire hoses are estimated based on the unit length of 15 m.

3. Pirometer is estimated based on the rated temperature of 550°C instead of 600°C which cannot be got at present.

4. Canvas cover is estimated based on the unit area of 0.93 m x 50 m and 300 rolls of them (both thicker ones and thinner ones)

2-2 Items Unavailable at Present

Not all the items that are requested by FME are not available at present, the reasons of which are shown in the following paragraphs.

On the chain and the related equipment they can be easily obtained soon after the chain diameter is informed. On the other items, makers have no drawings and have no intention to make them.

(a) Items chain diameter should be informed

ACCESORIOS DE CUBIERTA

5. - Cinco juegos de cadenas para Cargueros de 175 m. c/u. con grilletes giratorios.-

1. - Un juego de cadenas para B/Ganadero, de 175 m. c/u. con grilletes giratorios.-

2. - Dos juegos de cadenas para Remolcadores de 175 m. c/u. con grilletes giratorios.

20. - Veinte grilletes giratorios para cadena anclas B/Cargueros.

10. - Diez grilletes giratorios para cadena anclas B/Ganadero.

20. - Veinte grilletes giratorios para cadena anclas Remolcadores.-

(b) Items Unavailable by Lack of Stock

A.1. MOTOR NIGATA MODELO M6. DS.

8. - (2) Dos juegos de eje y caja completa parte acomplamiento de bomba de agua

12. - (2) Dos juegos de asiento balancín con caja.-

13. - (2) Dos juegos de asiento de bomba con caja.

27. - (6) Seis tubos de amortiguador tubería salida turbosobrealimentador.-

37. - (5) Cinco hélices de bronce.-

43. - (60) Sesenta arandelas de cobre, caja de resortes de inyectores 44 x 39 x 0.5.

A.2 y 3 - MOTOR HANSHIN-MODELO Z 6 DN 350 P.S. No Serie 3086.

10. - (1) Un enfriador de agua.-

11. - (2) Dos juegos caballete de cambio de marcha completos.-

12. - (4) Cuarto tubos flexibles para escape.-

D.1.1/5. MOTOR MITSUBISHI DAIYA 8L TIPO DVA

1. - (2) Dos Cárter

(c) Items partially unavailable by lack of stock

D.1.1/5 MOTOR MITUBISHI DAIYA 8L TIPO DVA

3. - (4) Cuarto juegos de embragues completos.-

	ecessary No.	Available No.
Clutch handle	4	0
Casing	4	0
Bevel gear for reversing	4	2
Brake band	4	1
Cover for adjusting hole	4	1
Stopper plate for thrust bearing	4	0
Casing cover	4	1
Seat for brake band	4	0
Bolts	8	0
Bolts	8	0
Knock pin	4	0

8. - (3) Tres volantes

Only one (1) set is available.

10. - (12) Doce bombas de agua completas

Only one (1) set is available.

3. Operational Payability after Repairs

A request was received from Paraguay to supply the type and quantity of components shown on the attached list for use as repair parts for the vessels shown below. These vessels were constructed in 1961 with funds loaned by Japan and are currently being operated by the FME.

Tankers	1	(Total of 3 FME vessels)
Power Vessels	5	(Total of 12 FME vessels)

Tugboats 2 (Total of 2 FME vessels)

The majority of the repair components are procurable and, as shown in the attached list, the total value amounts to ¥246 million (154.98 million Guarani).

From a previously conducted JICA survey, it was forecasted that it would be possible to operate these vessels for an additional 10 years if proper repairs can be carried out. Since FME will complete repairs on the hull, overall repairs may be considered completed if repairs are carried out on the engine machinery with the repair components requested at this time.

Payability

Although there is naturally no means of indicating the payability of the parts used by means of figures, and it will not be an easy task a general estimate may be carried out as shown below.

Estimates presumed

(1) If proper repairs are not carried out on the engine machinery, the above vessels will become practically inoperative in approximately 5 years.

(2) If repairs are carried out, the life of the vessels will be extended an additional 5 years for a total of 10 years of operation. Accordingly, the income out of the additional 5 years will be additional gainings.

(3) Depending on the repairs carried out, the operational percentage will be increased by about 30% in the first 5 years, and such 30% will be additional gainings.

Basic data

The following figures were taken out from performances in 1977.

(1) Tanker income is 40 million Guarani per year per vessel or 120 million Guarani for the 3 tankers for a profit ratio of 50%.

(2) Power vessel income is 170 million Guarani per year for the 12 vessels or 70.8 million Guarani for 5 vessels for a profit ratio of 10%.

(3) The annual income for tugboats is 30 million Guarani for a profit ratio of 20%.

If a rough estimate is made of the increased profits over the above 10 year period, it will be as follows.

(1) Tanker - 1

Annual income of 40 million Guarani X profit ratio of 50% X increase in profit ratio (increase in operating percentage) 30% x 5 years + 40 million Guarani x profit ratio of 50% x 5 years = 130 million Guarani.

(2) Power Vessels - 5

Annual income of 70.8 million Guarani X profit ratio of 10% X increased profit ratio of 30% X 5 years + 70.8 X profit ratio 10% X 5 years = 46 million Guarani

(3) Tugboats - 2

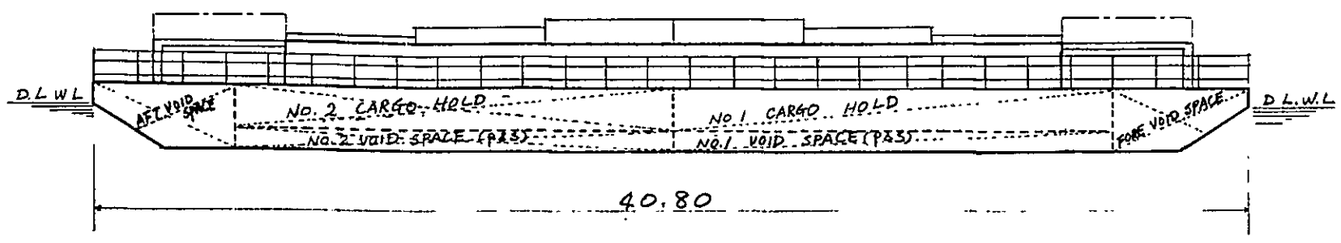
Annual incom 30 million Guarani x profit ratio of 20% x increase in profit ratio 30% x 5 years + 30 million Guarani x profit ratio of 20% x 5 years = 39 million Guarani

Increased profit over 10 years	215.0 million Guarani
The value of the components	154.98 million Guarani
Average interest over 10 years (estimated as 4% P.A.)	30.99 million Guarani
Total	185.97 million Guarani
Difference	+29.03 million Guarani

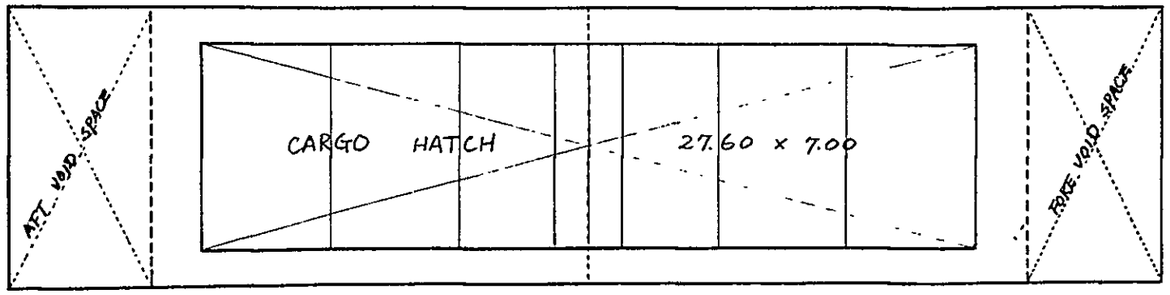
In other words, the amount invested can generally be recovered by increasing the operating ratio and extending the operating service periods.

GENERAL ARRANGEMENT
OF
360 DWT DRY CARGO BARGE
(SCALE 1/200)

PROFILE



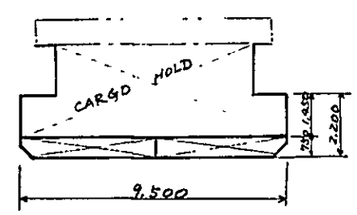
UPPER DECK



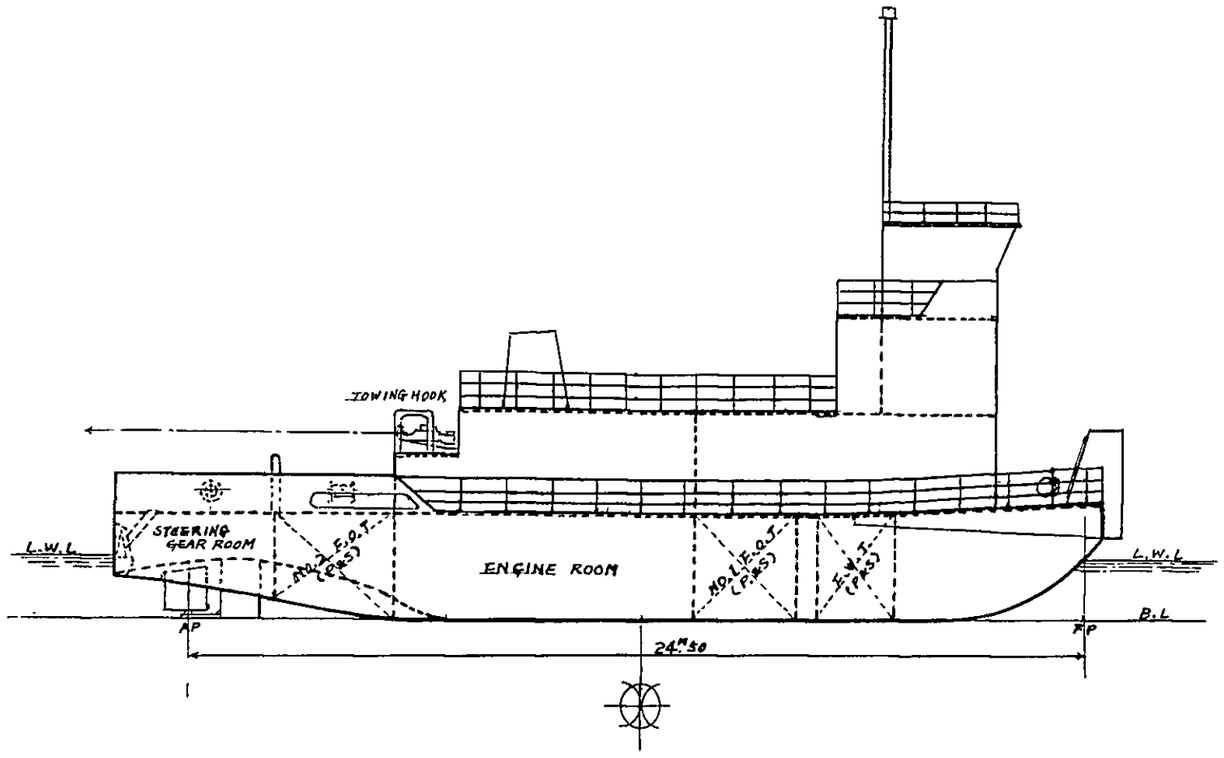
PRINCIPAL DIMENSIONS

LENGTH, O.A.	40.80	M
BREADTH, MLD	9.50	M
DEPTH, MLD	2.20	M
DESIGNED DRAFT, MLD	1.50	M
DEADWEIGHT	360	TONS
CAPACITY (GRAIN)	730	M^3
" (BALE)	670	M^3

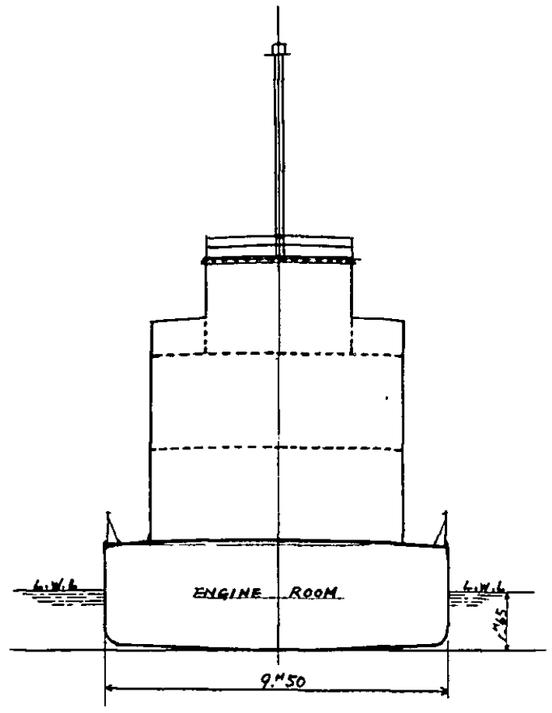
MIDSHIP SECTON

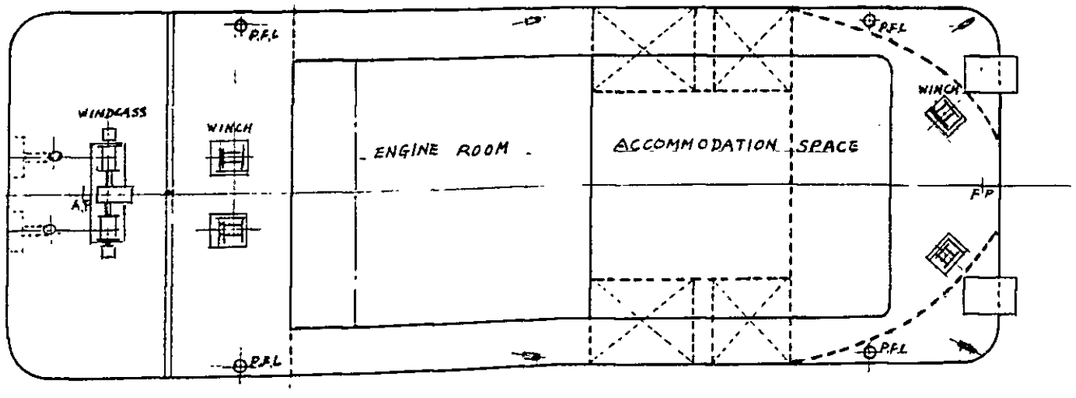


GENERAL ARRANGEMENT
OF
1,200 BHP PUSHER TUG (SCALE 1/150)



MIDSHIP SECTION

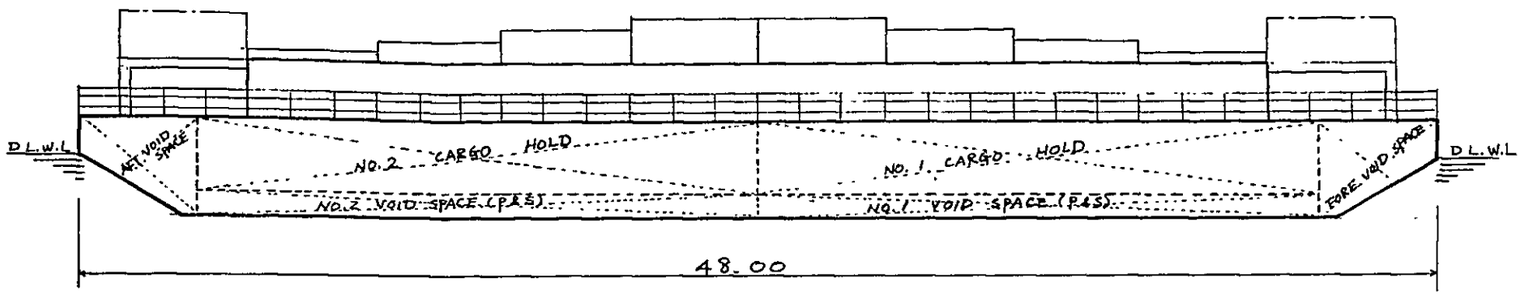




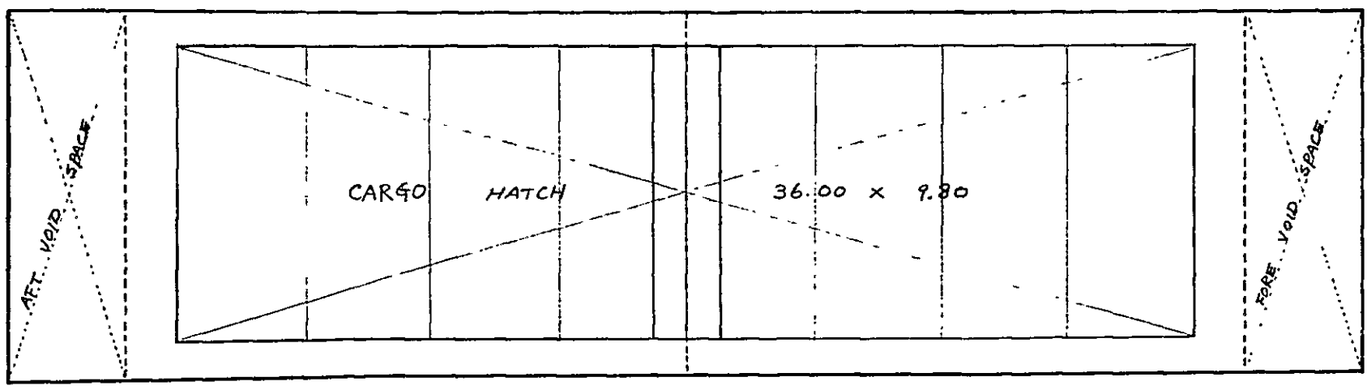
LENGTH (O.A)	(APPROX)	27.M50
LENGTH (B.P)		24.M50
BREADTH (MLD)		9.M50
DEPTH (MLD)		2.M80
DRAFT (MLD)	DESIGNED	1.M65
DRAFT (MLD)	OPERATAING	1.M52
ENGINE	DIESEL ENGINE	3.SETS
	M.C.R.	3 × 450.PS
	N.O.R.	3 × 405.PS
SPEED (AT PUSHING)		7.0 KNOTS
COMPLEMENT		10. PERSONS

GENERAL ARRANGEMENT
OF
800 DWT DRY CARGO BARGE
(SCALE 1/200)

PROFILE



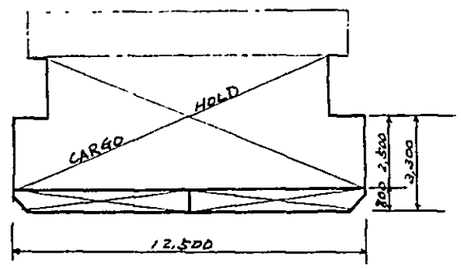
UPPER DECK



PRINCIPAL DIMENSIONS

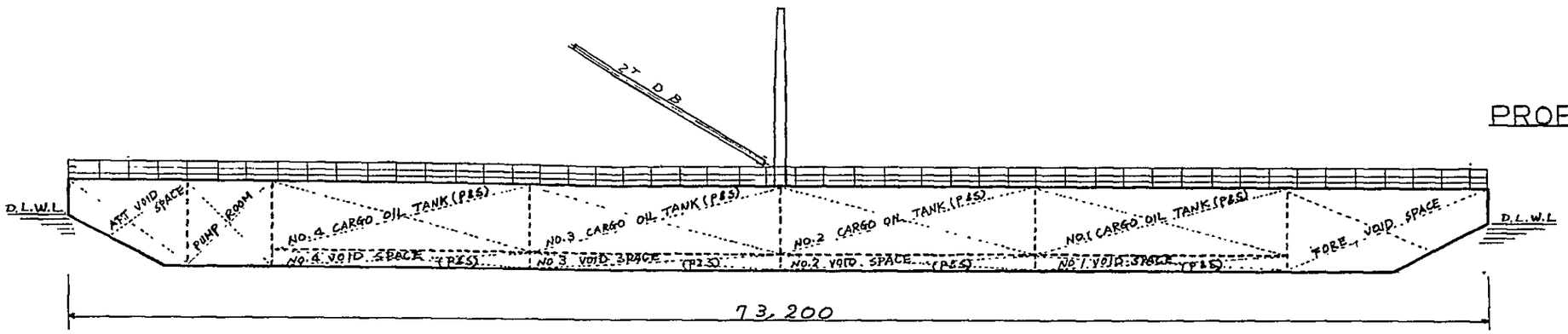
LENGTH, O.A	48.00	M
BREADTH, MLD	12.50	M
DEPTH, MLD	3.30	M
DESIGNED DRAFT, MLD	2.00	M
DEADWEIGHT	820	TONS
CAPACITY (GRAIN)	1900	M^3
" (BALE)	1750	M^3

MIDSHIP SECTION



GENERAL ARRANGEMENT
OF
2000 M^3 OIL BARGE
(SCALE 1/250)

PROFILE



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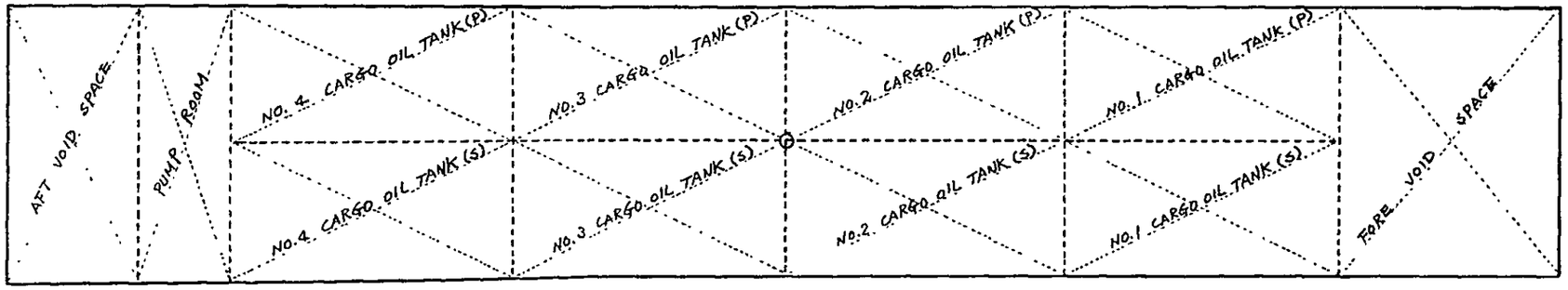
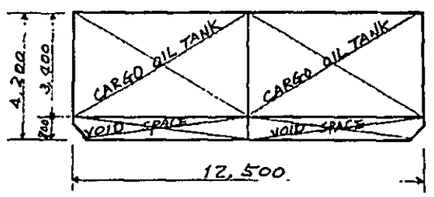


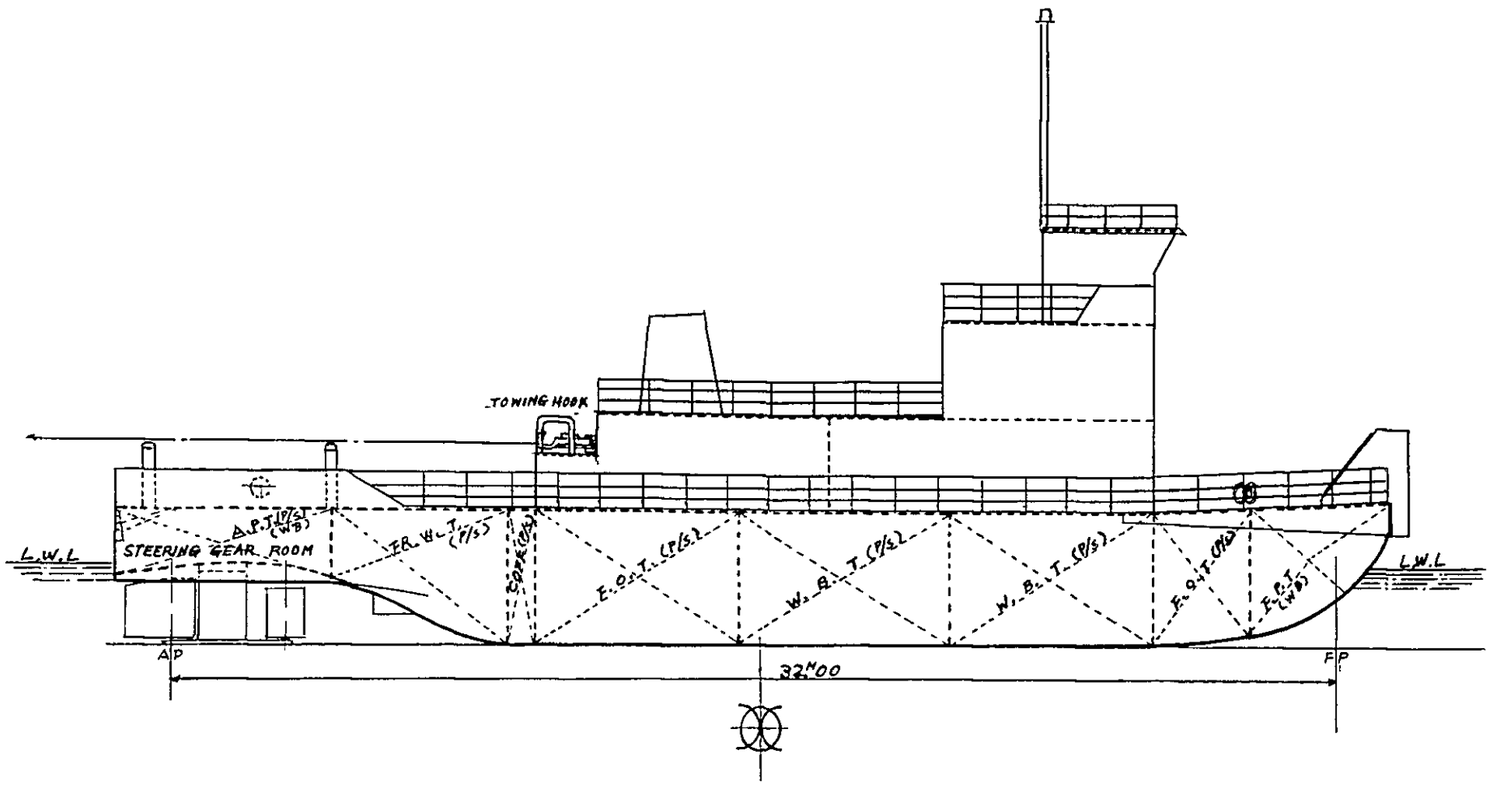
PRINCIPAL DIMENSIONS

LENGTH, O.A	73.20	M
BREADTH, MLD	12.50	M
DEPTH, MLD	4.20	M
DESIGNED DRAFT, MLD	2.60	M
DEADWEIGHT	1700	TONS
CAPACITY	2150	M^3

MIDSHIP SECTION



GENERAL ARRANGEMENT
OF
2.400 BHP PUSHER TUG (SCALE 1/150)



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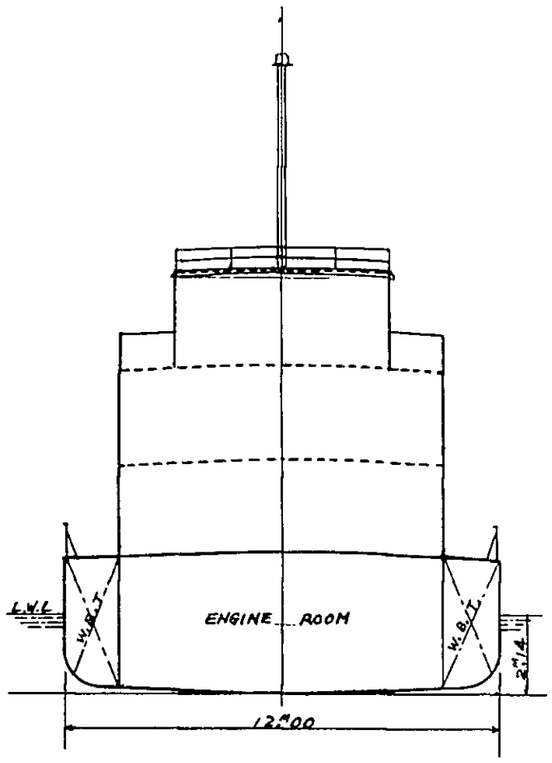
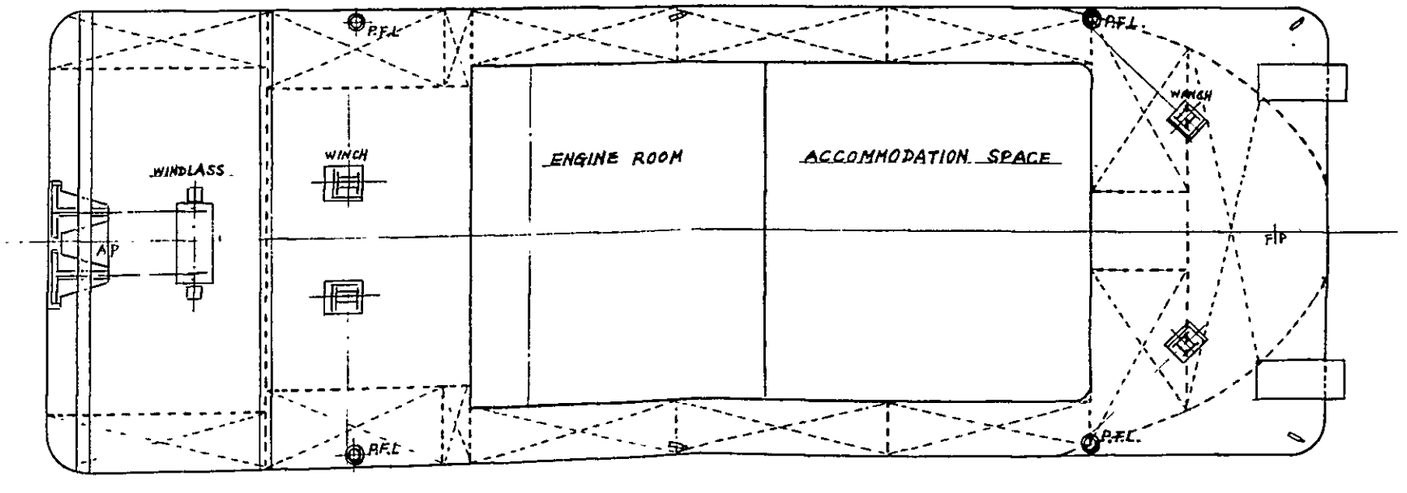
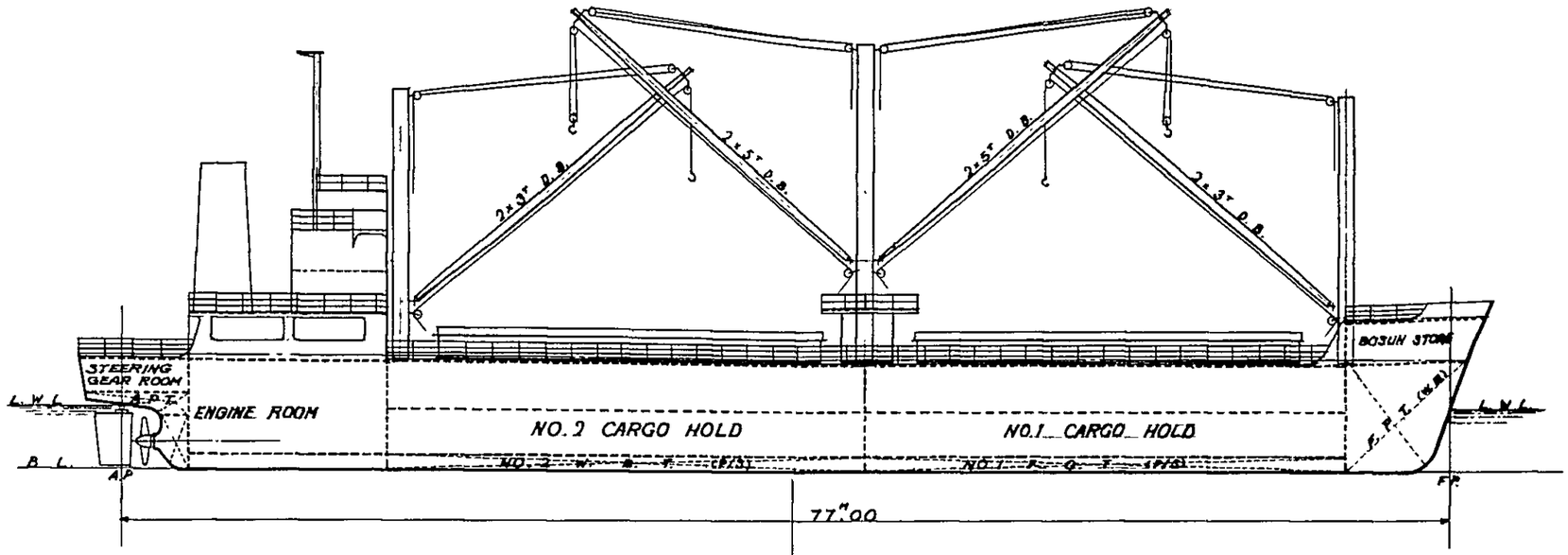
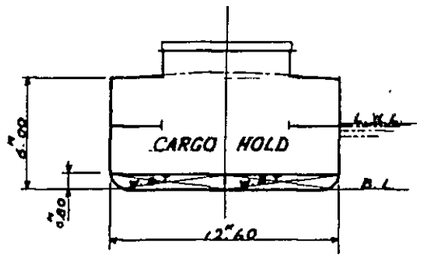




LENGTH	(O.A.)	(APPROX) 35'-00
LENGTH	(B.P.)	32'-00
BREADTH	(M.L.D.)	12'-00
DEPTH	(M.L.D.)	3'-60
DRAFT	(M.L.D.) DESIGNED	2'-14
ENGINE	DIESEL ENGINE	3 SETS.
	M.C.R.	3 × 900 PS
	N.O.R.	3 × 810 PS
SPEED	(AT PUSHING)	7.0 KNOTS
COMPLEMENT		14 PERSONS

GENERAL ARRANGEMENT SCALE = 1/300





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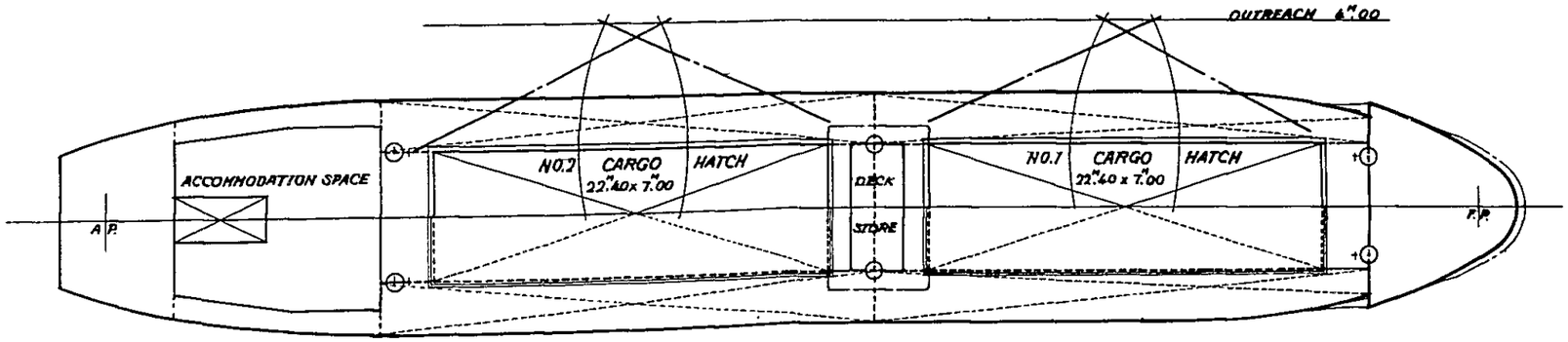
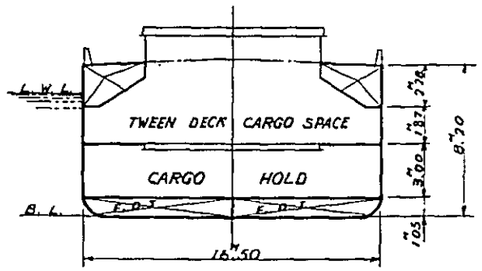


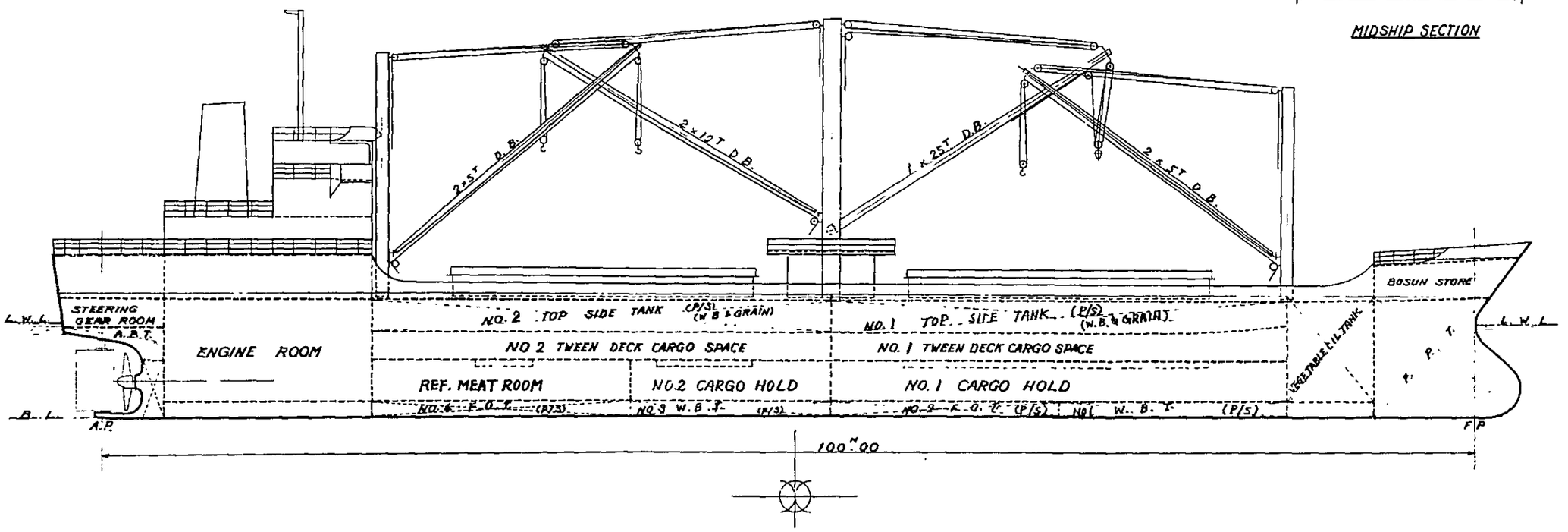
LENGTH	(B.P.)	77"00
BREADTH	(M.LD.)	12"60
DEPTH	(M.LD.)	6"00
DRAFT	(M.LD.) DESIGNED	3"50
DRAFT	(M.LD.) SCANTLING	3"80
DEADWEIGHT		1500MT.
SPEED	(SERVICE)	12 KTS.
COMPLEMENT		14 PERSONS

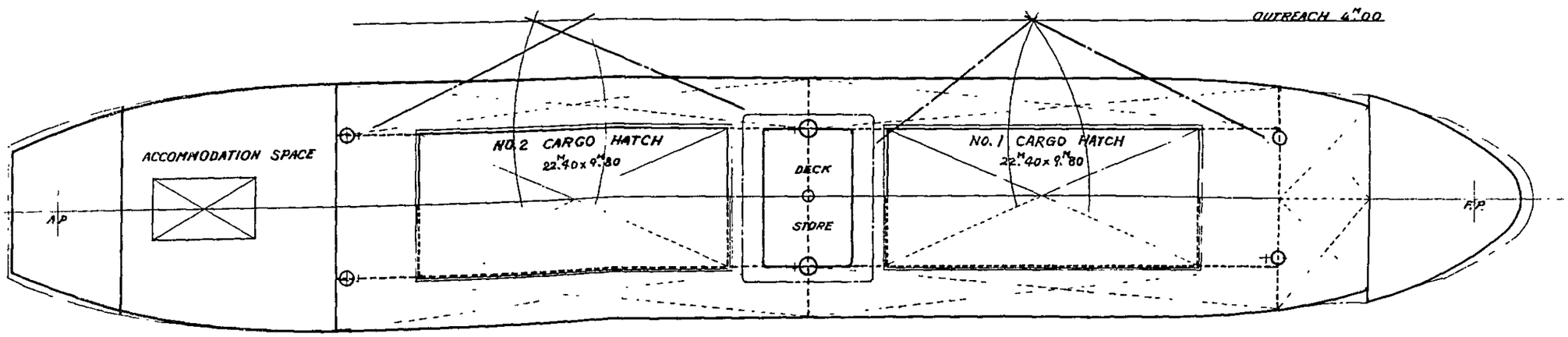
GENERAL ARRANGEMENT SCALE = 1/300

LENGTH	(B. P)	100M00
BREADTH	(M LD)	16M50
DEPTH	(M LD)	8M20
DRAFT	(M LD) *DESIGNED	6M60
DEADWEIGHT		6,000MT
SPEED	(SERVICE)	14.0 KTS
COMPLEMENT		24 PERSONS

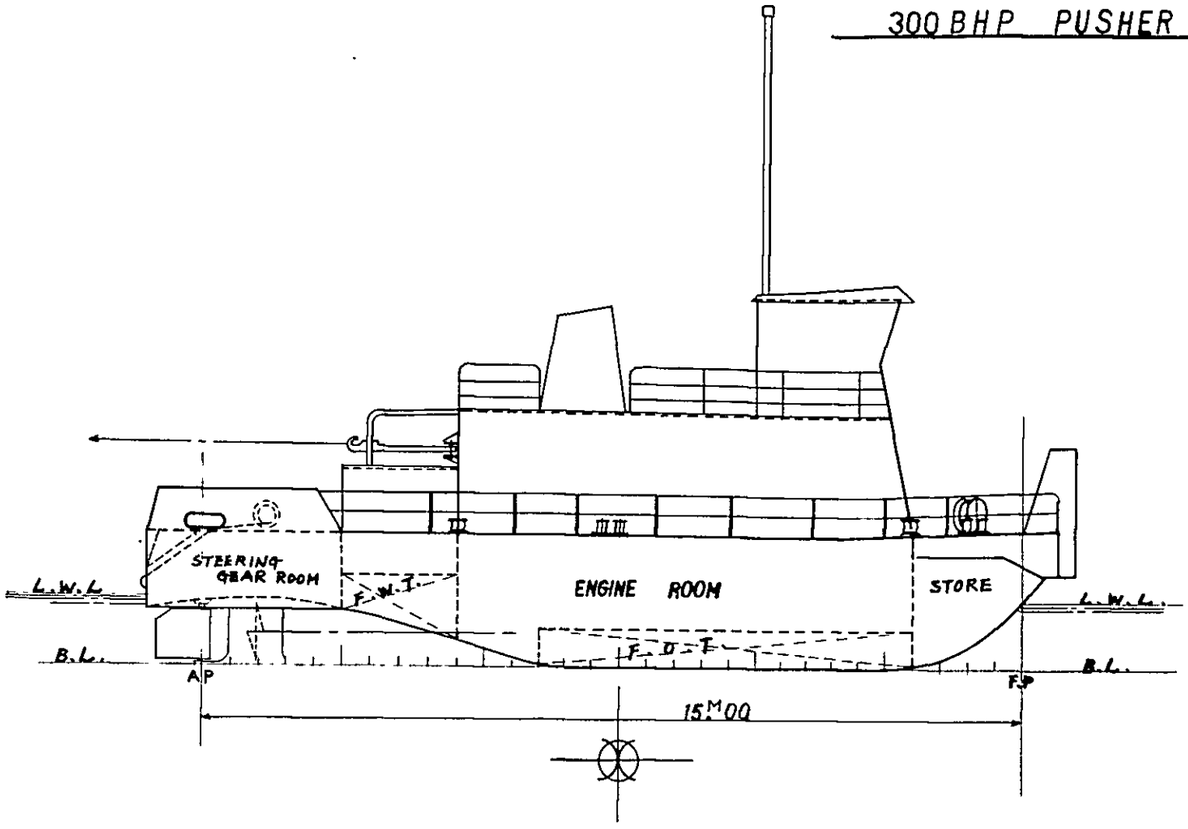


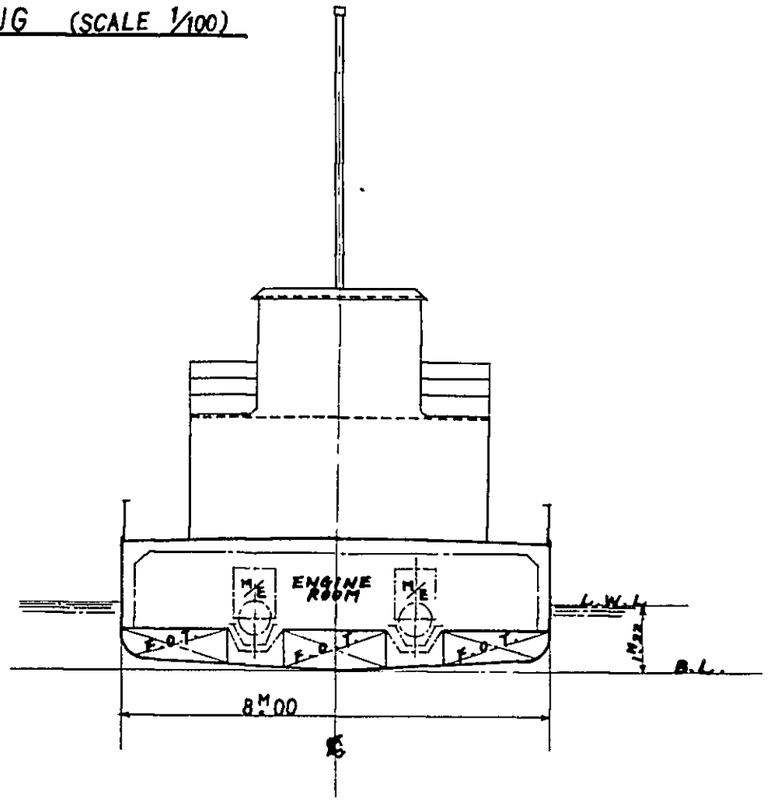
MIDSHIP SECTION



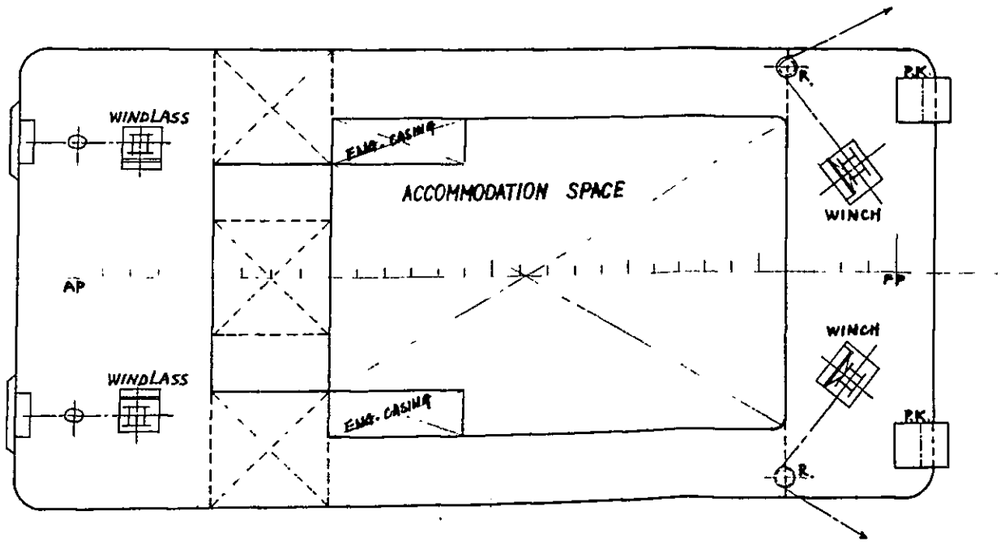


GENERAL ARRANGEMENT
OF
300 BHP PUSHER TUG (SCALE 1/100)



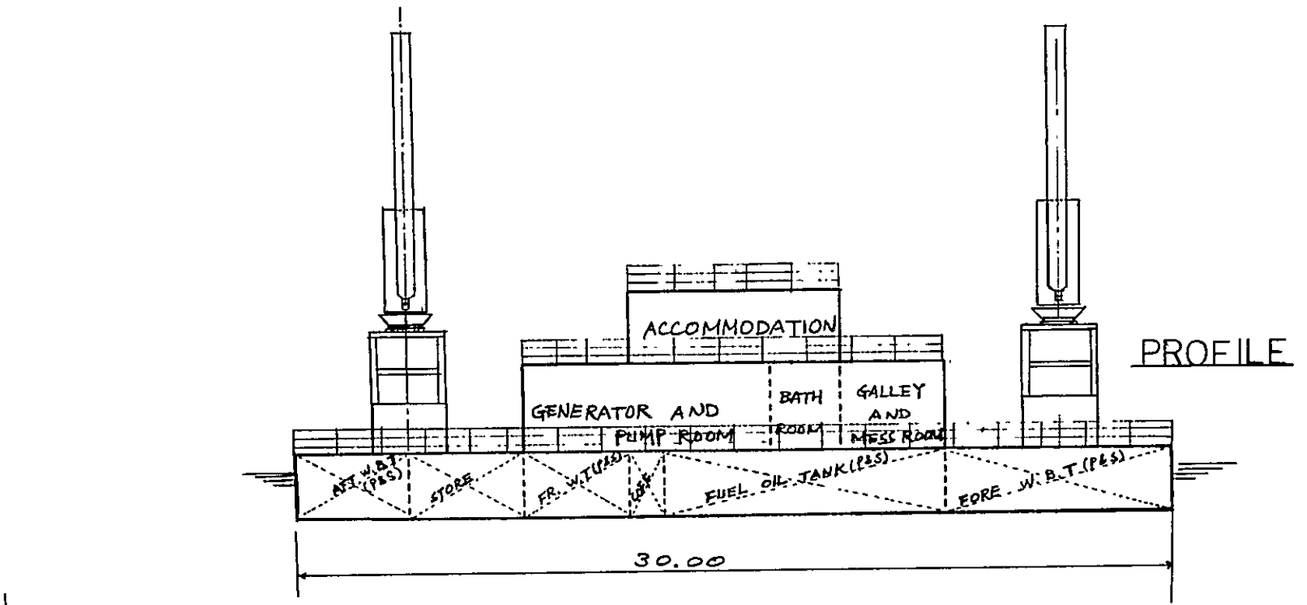


MIDSHIP SECTION

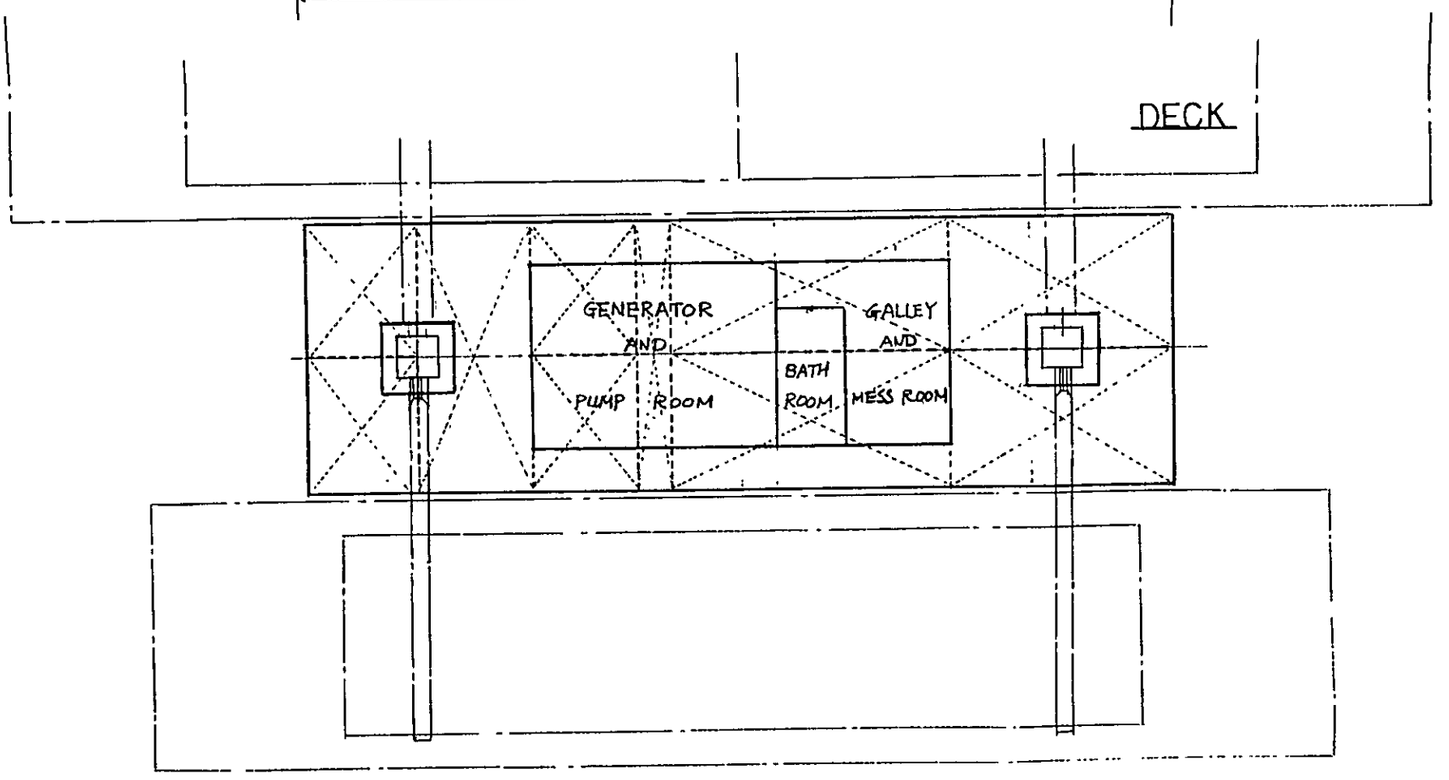


LENGTH (O.A)	(APPROX)	17.M0
LENGTH (B.P)		15.M00
BREADTH (MLD)		8.M00
DEPTH (MLD)		2.M30
DRAFT (MLD)	DESIGNED	1.M22
ENGINE	DIESEL ENGINE	2 SETS
	M C R	2 x 170 PS
	N O R	2 x 153 PS
SPEED	(AT PUSHING)	5.5 KNOTS
COMPLEMENT		6 P

GENERAL ARRANGEMENT
OF
PONTOON WITH PNEUMATIC UNLOADER
(SCALE 1/200)



PROFILE

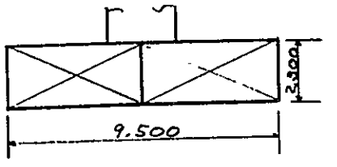


DECK

PRINCIPAL DIMENSIONS

LENGTH, O.A	30.00 M
BREADTH, MLD	9.50 M
DEPTH, MLD	2.30 M
DRAFT, MLD	APPROX. 1.60 M
PNEUMATIC UNLOADER	2 SETS
CAPACITY	100 TONS/HR
BOOM LENGTH	APPROX. 15 M
BLOWER	AC 380 V, 50HZ 75 KW

MIDSHIP SECTION



JICA