COMMISSION OF THE EUROPEAN COMMUNITIES

Report on the Long and Medium Term Development of the Shipbuilding Market

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INTRODUCTORY REMARK

Material difficulties have delayed for more than one year the publication of the present report submitted to the Commission of the European Communities at the end of 1969. The reader should therefore be fully aware of the fact that the following forecasts were prepared during the autumn of 1968 and the spring of 1969, thus on the basis of statistical data which, in the field of seaborne trade, did not go beyond the calendar year 1967.

The acceleration of the growth of seaborne trade in 1968, 1969 and during the first six months of 1970, would lead the authors, today, to step up some of the forecasts appearing in this report, at least as far as the medium term is concerned.

It should be noted, in this respect, that the statistics published by the United Nations Organization for the calendar year 1969 place international seaborne trade at 2 280m. tons, that is to say slightly above the line representing the sum of forecasts of the sectoral analysis high estimates, such as plotted on figure B of this report.

Although this difference may have notably increased in 1970, on the other hand it seems that, during the first six months of 1971, a slow down has been recorded in the growth of seaborne trade, which would tend to bring the latter back to a level more in accordance with the above-mentioned forecasts.

Besides, on the basis of the tonnage in service and on order at mid-1971, it seems now obvious that the world merchant fleet should fairly well exceed, in 1975, the highest theoretical level determined in this report according to the forecasts of seaborne trade requirements.

This is attributable to an unprecedented boom in demand for newbuilding tonnage over the past two years, and the authors wish to point out here that they did not claim to foresee the short-term development of this demand—a phenomenon which is too greatly subject to cyclical hazards—but only to estimate newbuilding requirements in the long and medium term, according to the fundamental trends of the maritime economy.

Nevertheless, this past demand will have a definite bearing on the future evolution of supply, at the level of both transport capacity and shipyards' production capacity.

It is therefore deemed indispensable to bring the forecasts and conclusions of this report up to date.[1]

Under the circumstances, the authors seriously wondered whether it would not be advisable to abandon the publication of a document the forecasts of which already appeared to be partly contradicted by the facts.

However, they decided, in agreement with the Commission of the European Communities that in spite of the delays incurred the publishing procedure proposed by the Commission should be carried out, considering the deep interest aroused by the very existence of this report in the circles concerned, and the many references already made to it, especially as regards methodology in various recent publications and papers dealing with forecasting in the maritime economy.

August 1971.

(1) See Memorandum, p. 158.

CONTENTS

EEC SHIPBUILDING
LIAISON COMMITTEE

WORKING GROUP No. 1

November 1969

REPORT ON THE LONG AND MEDIUM TERM DEVELOPMENT OF THE SHIPBUILDING MARKET

Foreword

1. The present report has been drawn up at the request of the European Economic Community Shipbuilding Liaison Committee, in accordance with suggestions made by the Council of European Community Ministers' Committee for medium term economic policy.

2. Its preparation was entrusted to a Working Group of representatives of the Shipbuilders' Associations (employers) of West Germany, Belgium, France, Italy and Netherlands.

3. The composition of this Working Group was a follows:

Chairman:

Mr. de Mas Latrie, General Manager of the Chambre syndicale des constructeurs de navires et de machines marines (France).

Members:

Dr. Bracht, General Manager of Rheinstahl Nordseewerke (West Germany).
Dr. Eng. Gabbrielli, Commercial Director of Cantiere Navale Breda (Italy).
Dr. Molenaar, Head of the Economic Research Department at the Stichting Nederlandse Scheepsbouwindustrie (Netherlands).
Mr. Tribout, Group Director at Fabrimetal (Belgium).

Substitutes:

Mr. Bloch, Verband Deutscher Schiffwerften EV (West Germany).
Mr. Duddeldam, Economist at the Stichting Nederlandse Scheepsbouwindustrie (Netherlands).
Mr. Javor, Secretary of the Shipbuilding Section at Fabrimetal (Belgium).

Secretary reporter:

Mr. Dobler, in charge of international relations at the Chambre syndicale des constructeurs de navires et de machines marines, Paris (France).

Every effort has been made in the preparation of this report to refer to as many sources of statistical and economic data as were available, it being understood that time and means were strictly limited for the Working Group.

The material gathered has enabled a forecast of the medium and long term trends of demand and supply on the world shipbuilding market to be made.

Though, on many points, the authors would have wished to have access to more comprehensive and precise information, they have given in this report the estimates and figures they were asked to supply.

However, they ask that this report should be considered as a preliminary approach and not as an exhaustive and definitive survey. Particularly, the figures, estimates and conclusions must be considered only as working hypotheses submitted to the EEC Shipbuilding Liaison Committee.

Working Group No. 1 wishes its task to be continued in the coming years so that the basis of its forecasts may be built on and re-evaluated according to future developments in maritime economics.

INTRODUCTION

According to the traditional shipbuilding criterion, namely annual launchings, measured in gross registered tonnage, world merchant ships output has practically doubled in the last six years, rising from 8.5m. grt in 1963 to 16.9m. in 1968.

Over the same period, from 1 January 1963 to 1 January 1969, orders in the world's shipyards, also measured in grt, have more than trebled, rising from 16m. to 49m.

At 30 June 1969, the world orders reached 54.7m. grt, which, on average, corresponds to over three years' activity at the level of production in 1968. This order situation is the most favourable experienced since the beginning of the present decade.

This year, 1969, it may thus be said that, on the whole, the shipyards in the world, apart from a few exceptions, are working nearly at their full existing capacity, their workload on hand being sufficient to enable them to employ their staff resources fully and to use all their production facilities. In fact, at least in the main shipbuilding countries, the present level of output is determined by employment factors.

Despite the current buoyant situation in the international market of newbuildings and bright prospects of activities implied, in the short term, by present orders in the world's shipyards, the European Economic Community Shipbuilding Liaison Committee has thought it necessary to make longer range forecasts of the development of newbuilding supply and demand, in order to consider the future conditions in which the Common Market shipyards will operate.

Basis of the study

The Working Group has considered it impossible to provide a market study as such, including accurate estimates of newbuilding supply and demand during each of the next years. Normally numerous contracts are negotiated on the international market simultaneously : some of them are for vessels being delivered within a few months whereas others are for units to be commissioned several years later. Conversely, the ships delivered during any given period have been ordered at differing dates.

It would thus have been necessary to make an exhaustive classification of estimated requirements and building facilities available for each successive year according to size and type of vessel, in order to redistribute each element of the annual overall requirements at the suitable preceding year due consideration being given to the time elapsing between contract and delivery for this peculiar class of ships.

Moreover, annual forecasts could not take into account irrational factors which, more than calculable quantities, often explain the short term fluctuations of the newbuilding market.

Consequently, to be in a position to disregard the effects of these irrational factors as well as to leave out the difficulties arising from variations in length of delivery dates, it has been considered necessary to think in terms of periods long enough to make forecasts. For this reason, a comparison shall be made here, not between supply and demand in the immediate term, which cannot be properly assessed, but between accumulative requirements and facilities which are demonstrably quantifiable.

Demand for newbuildings

As regards the demand for newbuildings, the first part of the present report is thus dedicated to the estimated medium and long term trend of needs for additional tonnage to cope with the expansion and the replacement of the world merchant fleet.

The limit chosen for the period considered was thus 1980 as this year, ending the 8th decade of the century, happens to be that most frequently adopted in the recent works on the future of world economy which this report has taken as a basis for determining the estimated volume reached at that time by sea-borne trade and to infer from it the corresponding capacity that the world merchant fleet should have at the same period.

Similar estimates have been made for a closer target year: 1975, which at the time of writing this report, represents the end of the medium term and makes it possible to divide this trend analysis into two roughly equal periods of time.

It must also be pointed out, in connection with newbuilding demand, that the present report has only considered the needs of the world merchant fleet, whilst yards build other types of vessels, such as fishing vessels, service craft, dredgers, drilling platforms and, of course, warships.

Newbuilding capacity

Warship production was also left out of the foreseeable development of newbuilding capacity, as it was estimated, in the second part of this report, in terms of merchant ship tonnage. It is true, however, that in yards building both warships and merchant ships, part of the capacity planned for one can be turned over to the other, as limits between the two activities are not very strict.

This is also true for other categories of floating craft which are neither merchant ships, strictly speaking, nor warships. Nevertheless, at present, these craft only represent a small fraction of the shipyards' output and it has seemed possible to ignore them for the purposes of this report.

Likewise, the possibility of using part of the output capacity of some yards for ship-repairing was not taken into account.

The study of the future development of world shipbuilding capacity will be restricted to the medium term. The period considered was 1969-75, in order to allow comparison with estimated requirements over the same period.

In fact, it did not seem possible to make a direct forecast of capacity up to the year 1980. In the field of technical equipment, demand controls the development of the market and, in the long term, capacity must be adapted to needs.

However, in the medium term, the theoretical capacity of world shipyards may develop independently of requirements. This possibility must not be ignored at a time when the technological evolution of shipbuilding depends on increasingly costly equipment, requiring long-term planning and the spreading of capital outlay over prolonged periods. Therefore, our main concern in the second half of this report shall be to make a comparative study between, on the one hand, the accumulative requirements for newbuildings up to the year 1975, as estimated in the first part, and on the other, the total potential deliveries of the world's shipyards in the light of the foreseeable trend of their theoretical output capacity during the same period.

PART ONE

DEVELOPMENT OF THE NEWBUILDING DEMAND

CHAPTER I

METHOD ADOPTED

In this first part of the report, the medium and long term trends of demand for newbuildings will be estimated. As mentioned in the introduction, since the period concerned is spread over several years to come, these trends can be deduced from the development of world merchant fleet requirements as regards tonnage for replacement as well as additional tonnage.

1. *General conditions for establishing forecasts*

The needs for additional tonnage can be determined only by trying to know what will be the capacity required for the world merchant fleet in 1980, as well as in 1975, which is the key year chosen as the limit of the medium term study. These forecasts can be based only, on the corresponding forecasts for the level expected to be reached at that time by sea-borne trade.

To follow a logical order, Chapter II will be devoted to working out these forecasts on trade and Chapter III to estimating the fleet necessary in 1975 and in 1980 to achieve the planned sea-borne level of trade.

Forecasts for newbuilding requirements will be dealt with in Chapter IV. These forecasts will, in the long term, concern deliveries to be made from 1 January 1969, the starting point adopted for this study, to 1 July 1980, both to replace ships lost or scrapped and to meet the quantitative and qualitative alterations in sea-borne trade. In the medium term, the fraction of this tonnage to be delivered before 1 July 1975 will form the subject of a separate estimate.

Thus, by hypothesis, outstanding demand, at the end of the period, for deliveries to be made after the limit date selected will be excluded from calculations. This elimination does not affect much the long term study. On the contrary, in the medium term, demand may seem to be underestimated.

Consequently, it must be pointed out, at this stage, that by adopting the two periods, limited by 1 July 1975, in the analysis, an artificial division will be introduced. This date, of course, does not correspond to any foreseeable change

in the trend of future demand for newbuilding. Simply, a limit had to be adopted for the medium term study and had to be placed towards the middle of the long term period considered; as to the choice of this limit of the middle of one year, it is explained by the convenience of following the practice of the Lloyd's Register of Shipping, whose statistics on world fleet tonnage are made each year as at 1 July.

To assess the potential demand more exactly, at the beginning of the period, it has seemed necessary to introduce the notion of tonnage not ordered until after the starting date of the present study, namely 1 January 1969. This tonnage is obtained by substracting the ships on order at that date from the total requirement for newbuilding.

It must be made clear that it is only with tonnage still to be ordered from 1 January 1969 onwards, for delivery before 1 July 1980, that the long term forecast is concerned. In the medium term, only the fraction of this tonnage to be delivered before 1 July 1975, is taken into account.

However, there is every reason to believe that part of the demand which should normally have appeared in the first years of the period 1969-75 has been anticipated by shipowners during the 18 months which followed the second closure of the Suez Canal. Consequently, the medium term demand may also seem artificially reduced. This is why, at the end of the last chapter, this tonnage already ordered will be reintroduced so as to be able to determine the average annual needs for new ships to be delivered during both periods considered.

2. *Method applied for formulating forecasts*

Logically, the estimate of future needs for newbuildings should have been based on a very detailed study of the foreseeable trend of the various sectors of the world merchant fleet, classified according to type and size of ships. Nevertheless, the shortcomings of available statistical material have led us to adopt a different method for this report. Two independent studies have been carried out simultaneously. The first one represents an "overall approach" to the problem and has considered only the most general quantities: total volume of international sea-borne trade, world merchant fleet, total needs for newbuildings. The second one has consisted of a "sectorial analysis" designed to place into categories all the types of ships which are required in relation to the development of the transportation by sea of certain commodities or groups of commodities for which special forecasts could be made.

These two preliminary studies have been carried out independently one from the other; the Working Group was of the opinion that two sources of information would thus be available for this essential part of the report, the conclusions being checked against each other.

Therefore, the first part of the report will present comments upon and compare the conclusions of these two studies on the three fronts adopted as the basis for our forecasts : tonnage of international sea-borne trade merchant fleet capacity and finally newbuildings required.

CHAPTER II

FORESEEABLE DEVELOPMENT OF THE VOLUME OF INTERNATIONAL SEA-BORNE TRADE

A. *Overall approach*

1. *The role of sea-borne trade in world transportation*

a) Though shipping is only one of the means of transportation available to the world's economy, it is certainly foremost among those used by international trade.

Unfortunately, no comparative statistics are available to assess its share of the world market since general statistics on international trade are expressed in value, whilst those of its sea-borne fraction are calculated in volume.

Nevertheless, the prime importance of maritime transport in international commerce is self-evident.

b) In the case of transport between economically developed areas which are close-to each other on the same continent, shipping generally plays a minor part only. It remains geographically on the fringe whereas other means of transportation, such as road, rail, river craft, pipelines, air routes, form a closely-knit network in inland areas.

But most of the non-maritime traffic transported by these other means is internal, and only in North America and continental Western Europe do large quantities of goods cross land frontiers.

c) On the contrary, in the field of transportation between distant areas of the same continent, and evidently between the continents themselves, the only competition to shipping is from aviation.

This competition, successful for passenger transport, has had only a slight impact on the carriage of cargo up to now, as its cost strictly limits its application to urgent, fragile or perishable freight of substantial value and low tonnage.

d) Thus at present, shipping, which generally plays quite a secondary part in domestic transport, is on the contrary the main means of transport in international trade, in tonnage terms and even more in ton/miles.

Though international statistics do not provide precise details of the total annual volume of world trade, UNO publishes "indices of quantum" from which its annual variations can be followed.

Table I compares the development of world import figures and that of international shipping, both being presented in index form, with 1958 being the starting point represented by the figure 100.

TABLE I

Comparison of the development of world trade (imports) and international shipping

Index Base 100 = 1958

Year	Imports				International sea borne trade		Comparative development	
	World total.		Developed countries					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Index of quantum	% annual growth	Index of quantum	% annual growth	Index of volume	% annual growth	% (1) / (5)	% (3) / (5)
1959	109		111		105		103.8	105.7
		10		8.1		12.4		
1960	120		123		118		101.7	104.2
		5		6.5		6.7		
1961	126		131		126		100	104
		7.1		7.6		7.9		
1962	135		141		136		99.3	103.7
		7.4		9.2		8.1		
1963	145		154		147		98.6	104.7
		9.7		9.7		12.2		
1964	159		169		165		96.4	102.4
		7.5		9.5		7.8		
1965	171		185		178		96.1	103.9
		8.2		8.1		6.7		
1966	185		200		190		97.4	105.2
		5.9		6		5.8		
1967	196		212		201		97.5	105.5

The comparison of the developments of the Index of sea-borne trade with that of world import shows a strong correlation: nevertheless, over the last ten years, the former has had a growth rate slightly higher, on average, than the latter. On the other hand, the ratio between sea-borne trade and developed countries' imports has remained almost steady since 1959.

The fact that the growth of the developed countries' foreign trade has played a major part in the increase of international sea-borne transport is not surprising, but its statistical confirmation is significant to the body of this study.

2. *Correlation between sea-borne trade and the economic growth of developed countries*

a) Various recent studies such as those by B.R.T. Emery "The relation of Export and Economic Growth"(1) or of W.M. Mennes "A World Trade Model for 1970"(2) have stressed the close relation between growth of the Gross National Product and increase in exports. Now, the exports of a country are another

(1) *Kyklos* 20. No. 2, p. 470 and following.
(2) *Weltwirtschaftliches Archiv* 99. No. 2, p. 225 and following.

country's imports and international trade can be measured either by one or the other total.

b) It was thus necessary to try to find if, in the past, a correlation existed between the development of the total Gross National Product (GNP) of developed countries and sea-borne trade figures, since the latter have conformed to the same pattern of behaviour as the foreign trade figures of those countries over the past ten years. Besides, this correlation is extremely close as shown by Table II and Figure A.

The table and figure give a comparison of the evolution of two series of annual figures since 1957. The first—that of Y—indicates the variations of the annual volume of international sea-borne trade in million metric tons, according to UNO statistics; the second series—that of X—corresponds to the annual total GNP's of the OECD member countries, calculated in million US$ at the prices and rates of exchange of 1958 published by that organization.

c) It thus appears that, during the last decade, international sea-borne trade has varied in relation to the GNP of the OECD member countries according to the equation of regression $Y = 2.26019\ X—917.17$ which is shown at the foot of Table II.

In other words, on average over the last ten years, an increase of 1 billion in the total GNP of the OECD member countries, i.e. approximately the developed countries, has resulted in a corresponding increase of 2.26 million tons in the volume of sea-borne trade.

In order to have a means for forecasting future needs for sea-borne trade, it must be assumed that the correlation noted for the past will be valid for the future, during the period under consideration, and a probable growth rate for the GNP of the OECD countries must be projected.

3. *General prospects for the future of sea-borne trade*

a) For the future, it can be assumed that the position of sea transport in international trade will remain almost stable and the correlations noted during the last decade, will be valid for the next one.

b) Competition from aviation

Air freight will certainly record a strong growth during the ten coming years. The tonnage of air-borne cargoes will reach 2m. tons in 1975 according to the latest forecasts. But, as will be seen later on, total tonnage carried by ships will then reach the vicinity of 3000m. tons. Thus, in a foreseeable future, planes will not compete with ships for dry or liquid bulk cargoes which now represent over 3/4 of the sea-borne trade.

So far as general cargoes are concerned, the forthcoming extension of the use of containers for sea-borne transports will improve the competitive position of ships. Indeed, containerisation eliminates most of the sources of complications, delays and losses which now cause some shippers to prefer to transport urgent consignments and fragile objects by air rather than by sea. Containerisation, by introducing door-to-door transportation, will mean not only time-saving but also a proportionately greater cut in costs for ships than for planes.

TABLE II

Correlation between developed countries' economic growth and volume of international sea-borne trade

Year	Volume of sea-borne trade (Y) in million metric tons	OECD countries gross national product(X) in 1000 m. US $	$(Y-\bar{Y})$	$(X-\bar{X})$	$(Y-\bar{Y})^2$	$(X-\bar{X})^2$	$(Y-\bar{Y})(X-\bar{X})$
1957	930	815.77	— 325	— 146.17	105 625	21 365.7	47 505.3
1958	920	811.38	— 335	— 150.56	112 225	22 668.3	50 437.6
1959	970	844.39	— 285	— 117.55	81 225	13 818.0	33 501.8
1960	1 080	879.08	— 175	— 82.86	30 625	6 865.8	14 500.5
1961	1 150	916.20	— 105	— 45.74	11 025	2 092.1	4 802.7
1962	1 250	964.51	— 5	+ 2.57	25	6.6	— 12.9
1963	1 350	1 006.06	+ 95	+ 44.12	9 025	1 946.6	4 191.4
1964	1 510	1 066.90	+ 255	+ 104.96	65 025	11 016.6	26 764.8
1965	1 640	1 128.57	+ 385	+ 166.63	148 225	27 765.6	64 152.6
1966	1 750	1 186.50	+ 495	+ 224.56	245 025	50 427.2	111 157.2
					808 050	157 972.5	357 001.0

Arithmetical average $\frac{\Sigma X}{n} = \bar{X} =$ 961.94

$\frac{\Sigma Y}{n} =$ ..... $\bar{Y} =$ 1 255

Dispersion = Var. $X = \frac{1}{n} \Sigma (X-\bar{X})^2 =$ 15 797.3

Var. $Y = \frac{1}{n} \Sigma (Y-\bar{Y})^2 =$ 80 805

Co-variance $(XY = \frac{1}{n}) (X-\bar{X})(Y-\bar{Y}) =$ 35 700.1

Mean quadratic variation : $\sigma = \sqrt{\text{Var}}$

σX 125.68 and $\sigma Y = 284.26$

Coefficient of correlation = r (XY) $= \frac{\text{Cov (XY)}}{\sigma X \, \sigma Y} =$ 0.9993

Deduction of the equation of regression :

i.e. $Y-\bar{Y} = \beta (x) (X-\bar{X})$

in which: $\beta (x) = \frac{\text{Cov. (XY)}}{\text{Var. X}} = r (XY) \times \frac{\sigma Y}{\sigma X}$

From which is deducted:

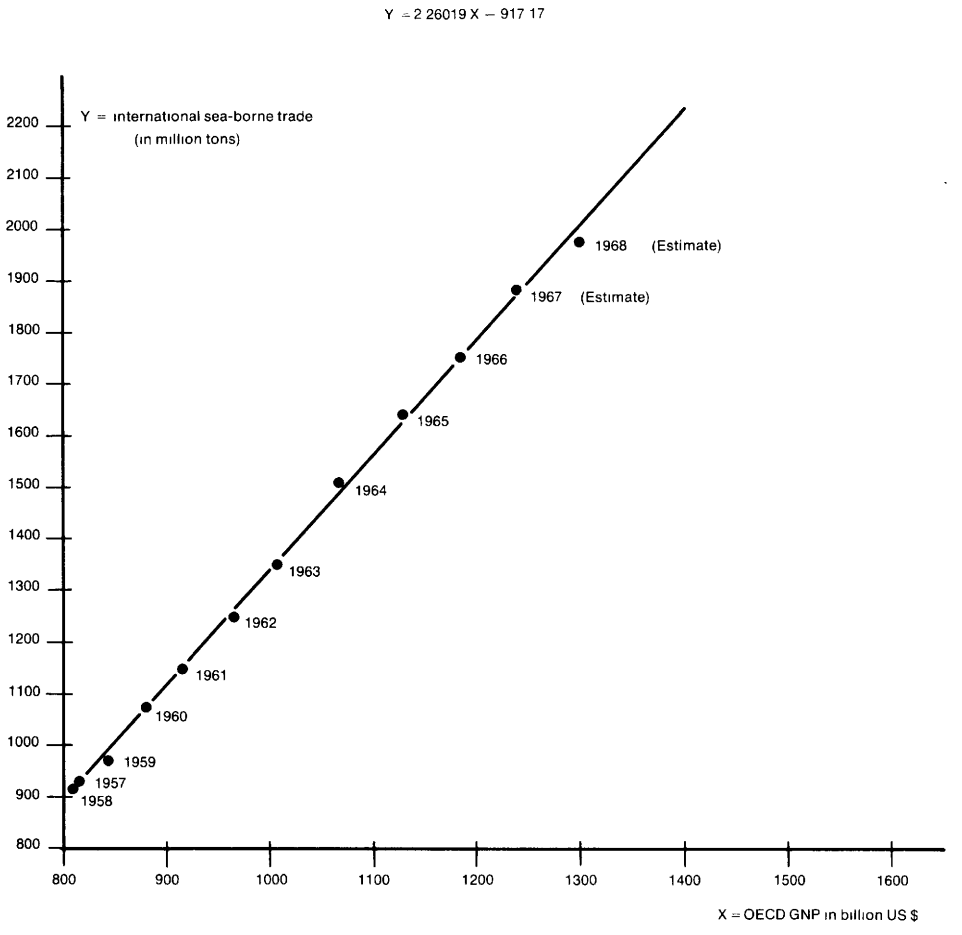
$$Y - 1255 = 0.9993 \times \frac{284.26}{125.68} \times (X - 961.94)$$

From which is derived:

$$Y = 2.26019 X - 917.17$$

FIGURE A

COMPARISON BETWEEN VARIATIONS OF INTERNATIONAL SEA-BORNE TRADE
AND OECD MEMBER-COUNTRIES' GROSS NATIONAL PRODUCT
DIAGRAM OF DISPERSION FOR THE PERIOD 1957–1968



c) Other competition

Let us mention, as a reminder, the future competition of sea tunnels or bridges: projects as the Channel tunnel could certainly compete with coast trade between the United Kingdom, France and the Benelux countries, from 1978 on, but the fraction of world sea-borne traffic in ton/miles lost this way will be marginal.

As regards pipelines, they rather appear as the complement and not the competitor of ships, at least for crude oil which constitutes a growing part of hydrocarbons shipped on tankers.

4. *Stability, in the future, of the correlation noted between the growth of the developed countries' GNP and expansion of international sea-borne transport*

a) Such a close correlation calculated over a long period as that indicated under paragraph II - A. 2, can reasonably be expected to be maintained in the next decade, i.e. over a period equal to the one chosen as a reference as it is unlikely to deteriorate suddenly in the future.

b) The closeness of this correlation is not due to chance; the comparisons, made in Tables I and II, only express an evident truth : sea-borne transport is a dependent variable of international trade. The latter is becoming increasingly dependent on the economic growth of the more developed countries, as is shown by Table III, which is based on statistics on international trade established by the United Nations. It shows the trend every 3 years, during the last decade, of the exchanges between the three major socio-economic areas into which the world is divided.

Table III first stresses the rapid growth in value of world trade, calculated in terms of exports, which has almost doubled, in US$, over the last decade. Taking into account the rise in prices, the increase in volume has certainly been lower. However, as the distribution of overall figures of the four years studied was made in percentages, the influence of variations of prices can be neglected in the assessment of the relative parts played in the development of world trade by the three groups into which the various countries whose statistics are published by the UNO are classified.

c) Generally speaking, since 1958, the share of the economically developed countries (OECD members, plus Australia, New Zealand and South Africa) has increased regularly, rising from 65.8% to 69.7% in 1967, whereas that of socialist countries varied little and the percentage of developing countries decreased.

When considering the trend of exports according to destination, it appears that exchanges between developed countries, which in 1958, already represented 44.5% of world exports, have further increased and reached 52.4 %. This preponderance confirms that these countries play the leading part in world trade.

On the other hand, exchanges within each group have decreased for developing and socialist countries.

Moreover, the developed countries have absorbed a growing share of the socialist countries' exports and still receive almost 3/4 of those from the developing countries. Exchanges between socialist and developing countries are indeed

TABLE III

Development of world trade (exports) between groups of countries, every three years, from 1958 to 1967

Value of total world exports (Million US$)		1958 107.9		1961 133.8		1964 172.2		1967 214.1	
Analysis by group of countries (%) of origin	of destination	Share in world exports	Share in exports of group of origin	Share in world exports	Share in exports of group of origin	Share in world exports	Share in exports of group of origin	Share in world exports	Share in exports of group of origin
Developed countries	other developed countries	44.5	67.6	47.8	70.8	50.6	74.3	52.4	75.2
	socialist countries	2.3	3.5	2.4	3.6	2.7	4	3	4.3
	developing countries	19	28.9	17.3	25.6	14.8	21.7	14.3	20.5
	Total	65.8	100	67.5	100	68.1	100	69.7	100
Socialist countries	developed countries	2	18.3	2.3	19.2	2.5	21.2	2.8	24
	other socialist countries	8.1	72.3	8.2	69.4	7.7	65.3	7.1	61.5
	developing countries	1.1	9.4	1.3	11.4	1.6	13.5	1.7	14.5
	Total	11.2	100	11.8	100	11.8	100	11.6	100
Developing countries	developed countries	16.9	73.3	15	72.5	14.7	73	13.8	73.9
	socialist countries	0.8	3.5	1.1	5.4	1.1	5.6	1.1	5.8
	other developing countries	5.3	23.2	4.6	22.1	4.3	21.4	3.8	20.3
	Total	23	100	20.7	100	20.1	100	18.7	100
Every country considered		100		100		100		100	

increasing, particularly exports from the former to the latter. Nevertheless, in 1967, they still represented less than 2% of world trade.

d) Under these conditions, it can be deemed that, during the next decade, world trade will still be influenced mainly by the present developed countries, even if the growth of their share of world trade will probably slacken and eventually stop.

The potential foreign trade of socialist and developing countries is indeed considerable but it will materialize only when the growth rate of the GNP exceeds that of the population, i.e. when the national income rises rapidly in relation to the population.

The increase in individual countries' income is expressed, in terms of consumption, by a relative drop in the demand for essential foodstuffs in favour of more luxurious and varied goods.

At this stage, self-sufficiency is no longer possible and imports are assuming a growing part, which will shortly bring about a parallel increase in exports.

In fact, among socialist countries, only the USSR and some East European countries seem able to reach this level of development during the period considered; their economic system, however, still restricts the growth of their foreign trade.

As regards developing countries, only some Latin American areas seem able to "take off" in the ten coming years as well as some privileged but sparsely populated countries in North Africa and the Middle East.

In fact, the latest long-range demographic forecasts as those of Wilhelm Fuchs(1) or Gordon and Helmer(2) indicate an average growth rate of 3% up to the year 2000 for the population of developing countries as against 1% for all the developed ones; such a growth rate for the populations will absorb the rise of the developing nations' GNP for many years and will maintain world disparities of national revenue in relation to population in favour of the developed ones beyond the period considered in this report.

5. *Determination of a future growth rate for the OECD countries' GNP*

a) Once it is admitted that the increase in international trade—and therefore seaborne trade—will depend closely on the rise of the OECD member countries' GNP, one or several economic growth rates must be chosen for the periods and countries considered, to establish forecasts for the volume of shipping in 1975 and 1980, by taking the equation of regression, calculated in Table II, as a matrix.

b) During the ten years under study in this table, the average annual growth rate of the OECD countries' GNP amounted to 4.3%. But if we consider the shorter period of 1960-66, which eliminates the slight recession of 1957-58, the rate is noticeably higher and reaches 5.1. Figures for 1967 and 1968 are not yet published, but taking into account the diminution of this growth rate recorded in developed countries in 1967 and the advance experienced in 1968, the average annual growth of the last ten years will probably be about 5%.

(1) "Formel zur Macht". Stuttgart 1966.
(2) "Report on a Long Range Forecasting Study". Randlord, 1964.

c) Can such a rate be accepted as a forecast for the period 1970-80?

The present boom in the economic growth of the major industrial countries is accompanied by all the markings of international inflation which will have to be countered by measures of restraint, whose severity will depend on how late they are applied.

Consequently, a certain slackening in the growth rate of these countries' GNP can be anticipated for the coming years. It seems thus reasonable to choose an annual rate of 4.5% as a working hypothesis.

Besides, this is the rate, according to economists, which allows, without inflation, sufficient expansion without progress in productivity resulting in a deterioration in the employment situation.

This is why this rate is now the one adopted for most medium-range plans or forecasts concerning developed countries and it seems reasonable to take it for the first period covered by the present study. However we must underline the fact that 4.5% p.a. is a rather moderate rate.(1)

For the period 1976-80, the choice of a probable growth rate for the developed countries' GNP is of course more difficult.

Indeed, the general picture in the developed countries covers quite different situations owing to the level of development reached. The average annual growth rate of 5.1 noted for the OECD member countries' GNP for the period 1960-66 is an average representing various stages of evolution. The average annual growth rate of the United States and of the European countries ranges between 4 and 5% whereas in Japan it exceeds 9.5%.

The growth rate of developed countries of longer standing is of course lower than that of economically younger countries, which is mainly explained by less flexibility of labour resources.

If the membership of the "club" of industrially developed countries remained unchanged, it would be necessary to take into account its economic ageing and forecast a growth rate of the GNP slightly lower for the second half of the next decade than the one adopted for the first one.

However, as we have seen at the end of the preceding paragraph, some other countries will be able to "take off" economically during the period considered.

Moreover, the fact that the rate of expansion of the United States in recent years was slightly higher than that of the European OECD member countries leads to the assumption that quite a substantial margin of expansion is still available in these countries which is not likely to be entirely absorbed by the progress of productivity before the date of 1980.

This is why it has seemed reasonable to retain, for the period 1975-80, the average growth rate of 4.5% for the annual GNP of the group of developed countries, the list of which will probably grow in the meantime.

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(1) In a recent Japanese study, the author, Mr Onozuka, Managing Director of Hitachi Shipyard, has accounted for an annual growth rate of 4.8% plus or minus 0.2% for the GNP of the same group of countries up to 1980.

o. *Forecast of the volume of international sea-borne transport in 1975 and 1980*

a) Table IV presents the conclusions of the overall approach as regards the level to be reached in 1975 and 1980 by the volume of sea-borne cargoes on the basis of the maintenance, in coming years, of the almost perfect interdependence noted between the total amount of the developed countries' GNP and the volume of sea-borne trade according to the equation of regression Y = 2.26019X—917.17 and on the assumption that the average annual growth rate of the GNP will be 4.5%.

To put the position into perspective, additional hypotheses of slower or quicker economic growth rates have also been calculated: average annual rate of 3.5 and 5.5% for the whole period and successive rates of 4% up to 1975 and 3.5% afterwards.

Nevertheless, the figures to be adopted for international sea-borne trade according to the overall forecasts presented above, correspond to an annual growth rate of the GNP of 4.5%, i.e. 3 068 million metric tons in 1975 and 4 049 million metric tons in 1980.

b) These figures imply an average annual growth rate of sea-borne trade slightly above 6% up to 1975 and of about 5.7% between 1975 and 1980.

A regular growth rate of the developed countries' GNP thus corresponds, in this overall approach, to a growth rate of sea-borne trade which is at a higher level, but shows a slight decrease. This result is certainly due to the form of equation of regression selected, but it is interesting to note at this stage that the sectorial analysis presented hereafter also suggests a slight slackening in the rate of growth of maritime transport during the second half of the next decade.

B. *Sectorial analysis*

1. *Sections of maritime transport under study*

The sectorial analysis of maritime transport has distinguished three major categories of cargo: oil, including refined products, dry bulk cargoes and other dry cargoes.

These cargoes are shipped on tankers, bulk carriers and cargo-vessels, either liners or tramps.

For dry cargoes, the sectorial analysis, like the overall approach, refers to international sea-borne trade; on the other hand, as regards oil, available statistics include national traffic.

2. *Estimated future development of shipping of crude oil and petroleum products*

a) Sources of forecasts on consumption

This part of the sectorial study is mainly based upon the forecasts on petroleum products consumption published in 1966 in an important OECD study, "Energy policy". This study predicts the future increase of overall energy requirements

TABLE IV

Forecast volume of sea-borne trade based on developed countries' economic growth

	1966 (completions)	Annual growth rate	1975				1980			
Developed countries Gross National Product (in 1 000 m. US$)	1 186.50	3.5%	1 617				1 921			
		4.5%		1 763				2 197		
		5.5%			1 921				2 511	
		4/3.5%				1 722				2 045
International sea-borne trade transport (in million metric tons)	1 750		2 732	3 068	3 424	2 974	3 425	4 049	4 758	3 705

of the member-countries of that organization until 1980 and estimates the proportion of these needs to be covered by petroleum products. It thus provides estimates of the future demand for petroleum products in the main industrial areas of the world: North America, Western Europe and Japan.

For the rest of the world, it was necessary to make a separate estimate based on the past trend of petroleum product consumption per capita. This trend was calculated for the period 1957-67, through a comparison between the population statistics published by the United Nations year-book and those on the petroleum consumption of the various countries concerned supplied by "B.P.'s Statistical Review of the World Oil Industry". Forecasts of the Keyzer report were also used (1965 Netherlands Shipbuilding Commission Report).

Finally, interviews with executives of oil companies have enabled us to check and improve the estimates adopted for the future trend of consumption over the period 1970-80.

b) Basis of the estimate of sea-borne oil imports

The same sources were used for assessing the volume to be reached in 1975 and 1980 by imports to the various areas considered as regards sea-borne crude oil and petroleum product movements from other regions of the world. This trade is known as "inter-regional", and is carried out by long-haul tankers. The genuinely "regional" trade will be dealt with later, under paragraph II-B.2e.

c) Forecasts for "inter-regional" oil shipment

Table V presents the forecasts adopted for the volume of inter-regional sea-borne oil shipment in 1975 and 1980, in relation to the expected consumption in the various areas into which the world has been split up.

According to the information obtained from the sources mentioned above, the annual growth rates which it has seemed reasonable to adopt for world petroleum product consumption, are 7.3% up to 1975, then 6.3% in the period 1976-80. This diminution takes into account the probable development of other sources of energy. The corresponding rates for sea-borne oil imports are 9% and 7.7% respectively, for the two successive periods.

It has appeared unnecessary to formulate several growth hypotheses, in view of the great steadiness of the growth rates of oil consumption and sea-borne transport noted in the past.

The problems being encountered today in the development of atomic power stations, capable of producing electricity at a price able to compete with that of solid fuel, have led to the conclusion that the use of atomic energy is unlikely to develop rapidly during the next ten years to an extent that would justify any hypothesis based on a greater deceleration of the growth rate of the consumption of petroleum products than the one adopted.

For the future, only power production supplied by nuclear plants, at a lower cost than thermal plants fed with fuel, could entail a slackening in the growing share of hydrocarbons in world energy consumption. But this possibility now seems to

TABLE V

Forecast volume of inter-regional oil sea-borne trade towards the various consumer areas in 1975 and 1980

Geographical areas	1975				1980			
	Million tons		Sea-borne imports as % of consumption	Share of each area in world total sea-borne imports	Million tons		Sea-borne imports as % of consumption	Share of each area in world total sea-borne imports
	Total consumption	Sea-borne imports			Total consumption	Sea-borne imports		
North America	825	215	26	12.3	935	280	29.9	11
Western Europe	985	950	96.5	54.3	1 380	1 330	96.4	52.5
Japan	350	350	100	20	550	550	100	21.7
Rest of the world	950	235	24.7	13.4	1 355	375	27.7	14.8
World total	3 110	1 750	56.3	100	4 220	2 535	60.1	100
Of which:		%				%		
Crude oil		84				87		
Refined products		16				13		

go beyond the limits of the present study, at the time when breeder reactors, still to be perfected, are operating.

On the basis of these hypotheses, inter-regional sea-borne oil transport should reach a total of 1 750m. tons in 1975 and 2 535m. in 1980. If compared with the 1966 figure, which was 823m. tons, these forecasts imply that the volume carried should double by 1975 and treble by 1980.

d) Western Europe and Japan, main clients for oil transport

At the regional analysis level, imports by Western Europe are of prime importance: in 1967, these imports already represented half the total long distance tonnage and their percentage should keep increasing until 1975 and decrease very slightly afterwards.

Nevertheless, the strongest relative increase during the period considered is that of imports into Japan. From 14% in 1967, they should rise to 20% in 1975, then go on increasing, though at a slower rate, reaching 22% in 1980.

Therefore, in 1980, Western European and Japanese requirements for energy will represent 3/4 of the demand for shipping of hydrocarbons as against 2/3 in 1966.

Unlike North America and the rest of the world, these two geographic areas have little or no oil resources of their own. This fact explains the increase in the share of sea-borne imports in world oil consumption; it amounted to 40% in 1957, reached 50% in 1967 and should exceed 60% in 1980.

Moreover, the growing part played by Western Europe and Japan in sea-borne oil trade means that one can expect to see a continuation of the trend noted since the end of the Second World war as regards the ratio between crude oil and refined products among cargoes shipped on tank vessels. Whereas, is 1950, 51% of these cargoes were still composed of refined products, this percentage rapidly dropped to 42% in 1957 and 22% in 1967.

This decline should continue, as it is in Western Europe and Japan's interests to import petroleum products in their crude state. These savings are obtained from the cut in transport costs due to the use of ever larger tank-vessels and to the concentration of traffic on a few well equipped terminals. Besides, this system avoids additional expenditure of foreign currency that the purchase of refined products from the producing countries would represent.

For the same reasons, refineries will be built in other countries without hydrocarbon resources, as soon as the home consumption of petroleum products justifies it.

However, oil producing countries are concerned with maximising their exports and they will put growing pressure on oil companies and importing countries to develop their own refining capacity. It can thus be predicted that the relative decrease of refined oil tonnage will continue, but at a slower rate than the one recorded during recent decades.

The forecasts for 1975 and 1980 which appear at the foot of Table V fix the share of refined oil out of total oil shipping at 16% and 13% respectively.

In absolute terms, inter-regional shipping of refined oil is still growing: dealing with 145m. tons in 1957, it reached 196m. in 1967 and should attain 280m. in 1975, then 330m. in 1980. The tonnages concerned are thus very substantial and all the more interesting for shipping in that they are carried on tankers much smaller but also more sophisticated than those designed for crude transport.

e) Forecasts for regional oil transport

Apart from long-haul inter-regional trade, oil is also shipped on a "regional" basis by the domestic coastal trade or international transport between neighbouring countries.

Among domestic coastal trades, the most substantial is that of the United States. However, the tonnage carried has remained for ten years between 80 and 90m. tons (85m. in 1966); this stability means that its relative importance in the shipping of oil has decreased.

In the future, the development of pipe-lines in the United States will probably reduce the tonnage carried along the Eastern and Southern coasts of this country.

However, the future of this traffic is difficult to foresee due to the rich fields recently discovered in North Alaska. The conditions for exploiting and transporting these deposits are not yet fully determined but it seems probable that maritime shipment will be chosen for part or all of the route.

If such is the case, it shall be considered legally as a US domestic trade, but geographically and economically this transport will be related to inter-regional trade as it will concern huge quantities of crude oil likely to be carried on ships very much larger than those now operating along the US coasts. The lengths of haul will be about the same as those between Venezuela and the United States and it can be deemed that this trade, if it increases during the next decade, will take the place of inter-regional shipments which were accounted for in the estimates indicated above.

As for short-sea international routes, the most important, at present, concerns Venezuelan crude oil bound for refineries located in the Lesser Antilles: Curaçao, Trinidad and Tobago. This route carried 53m. tons in 1966. It does not seem that this trade can develop much in the future, since these refineries sell their products on the international market which, as regards refined oil, has only limited potential for expansion, which is likely to be absorbed by the oil-producing countries.

As for the other regional routes, national as well as international, which, according to the study on shipping published by the OECD, carried a total of 67m. tons in 1966, it is difficult to establish forecasts because of the problems of obtaining accurate records of small tonnages of miscellaneous commodities from which no clear pattern emerges.

The general expansion foreseen for inter-regional oil transport can be deemed, however, to have a bearing on regional transport, even if it is only for transshipment between oil terminals and refineries. But in other cases, pipe-lines will replace coastal shipping as soon as the tonnages concerned justify their construction.

Taking into account a certain diminution of trade along the United States coastline (excluding Alaska), the quasi-stagnation of trade between Venezuela and the

Lesser Antilles, and a moderate expansion of trade on other routes, it may be foreseen that the tonnage of sea-borne oil products within the various regions will reach 250m. tons in 1975 and 300m. tons in 1980.

All things considered, the following forecasts can be established for the volume of sea-borne oil transport.

TABLE VI

Expected tonnage of oil sea-borne trade in 1975 and 1980

(in millions of tons)

	Tonnage in 1966	Forecasts 1975	Forecasts 1980
Inter-regional routes	823	1 750	2 535
Regional routes	215	250	300
All routes	1 038	2 000	2 835

3. *Forecasts for dry bulk cargoes*

a) Six main bulk commodities

For this part of the sectorial analysis, the six main bulk commodities carried by sea were first considered. Their trade forms the subject of statistics published for several years by the Norwegian Ship Brokers, Fearnley & Eagers Chartering Co, in their annual reports "Trade of World Bulk Carriers".

These six commodities are: iron ore, coal, grain, manganese ore, bauxite and alumina, finally phosphates.

Although this was not done in the case of hydrocarbons, it has seemed necessary to formulate two hypothetical growth rates for each period considered.

Not only are the forecasts of world consumption for most of these commodities more open to error than those concerning energy, because of variations of special circumstances in the various consumer industries, but also the shipped tonnage of these products is not as directly related to foreseeable consumption as in the case of oil products.

This is obvious for grain, the exchanges of which are subject to weather hazards, but it also applies to coal and iron ore, the maritime shipment of which will grow more or less rapidly, according to the rate at which West European countries choose to reduce the tonnage extracted from their own pits.

This reduction seems inevitable as local production is burdened with operating costs which prevent it from meeting the competition of fuels or ore imported on large bulk-carriers but social considerations will certainly prove the findings of forecasts based on criteria of profitability alone to be inaccurate.

Besides, in the past, the growth rates noted for these commodities, according to Fearnley and Eagers' statistics have fluctuated greatly and even been negative from one year to another.

This is why it is not surprising to find wide differences in the forecasts published.

Sources of such forecasts are few. Apart from the Keyzer report, mentioned above, this part of the sectorial analysis has used various studies published by the British firm Westinform, which has specialized in forecasts on sea-borne trade and which has given growth estimates up to 1970 or 1975 for iron ore, coal and phosphates.

Table VII presents the forecasts indicated for the volume of the six main bulk commodities to be carried by sea in 1975 and 1980.

b) Explanation of the annual growth rates adopted

These forecasts call for the following explanatory comments: generally speaking, the maximum growth rates adopted for both periods considered are noticeably more reduced than the single rates previously retained for hydrocarbons. This is particularly true of coal and grain which, in 1967, represented over 37% of the total shipments of the six commodities under study.

i) Coal

World coal production has been static for some years and it seems logical to think that it will even decrease during the next decade. The progress in mining expected in developing or socialist countries will be more than offset by the rapid fall in production in the traditional coal fields of North Western Europe.

The role of solid fuels in meeting world energy requirements is declining steadily and it is obvious that sea-borne coal transport cannot increase at the same rate as that of oil products.

However, it is considered that this trade will keep growing, at least slightly, during the next decade, particularly in view of the needs of the steel industry for coke, especially in Japan, but also in Western Europe where new plants are built within easy access of the sea to benefit from lower costs of raw materials brought from overseas by giant ships.

Furthermore, coal mining in Western Europe may be run down more rapidly than the fall-off of demand for solid fuel, which has caused us to adopt a relatively high maximum rate for the period up to 1975.

ii) Grain

Forecasts are much more difficult because of weather hazards and the influence of the Common Market agricultural policy on this trade.

It is probable that, as in the past, series of bad harvests will occur in India, China, USSR, or other areas of the world. However, thanks to the progress of agricultural techniques, countries which, not long ago, were the main importers, should, on the whole, during the next decade, reach a better balance between their food production and needs, despite the foreseeable increase in population.

TABLE VII

1975 and 1980 forecasts for sea-borne trade of main dry bulk cargoes

(million tons)

Commodities	Sea-borne trade in 1967	Annual growth rates to 1975	1975 forecasts		Annual growth rates from 1976 to 1980	1980 forecasts	
			Low estimate	High estimate		Low estimate	High estimate
Iron ore	164	4% to 6%	225	261	3% to 5%	261	334
Coal	67	2% to 5%	78	99	1% to 3%	83	115
Grain	68	2% to 4%	80	93	1% to 3%	85	108
Manganese	7	4% to 5%	10	11	4% to 5%	12	15
Bauxite and alumina	25	4% to 6%	34	40	4% to 6%	41	54
Phosphates	30	4% to 6%	41	48	4% to 5%	50	61
Total of six commodities	361	3.3% to 5.4% (1)	468	552	2.5% to 4.4% (1)	532	687

(1) Round averages, to the first decimal place.

This is why the growth rates retained for grain have been the lowest of the six main commodities for the period up to 1975. For the second half of the decade, the rates, which show a further reduction, are the same as those adopted for coal.

iii) Ores

For iron ore, manganese and bauxite, the growth rates adopted which are between 4 and 6% up to 1975 and between 3 and 6% from 1976 to 1980, seem to comply with the expected development of the metal using industries involved in steel and aluminium production.

World needs will certainly continue to grow, but the present rate will not be maintained for long. Furthermore, the competition of plastic materials is bound to be felt in the next decade, at least in the case of ordinary steel.

iv) Phosphates

The demand for fertilizers should develop considerably in the coming decade, but phosphate fertilizers are not the only ones and the recent trends have favoured nitrates. Besides, maritime shipment of hard phosphate rock is no longer the only solution for supplying fertilizer plants, as shipment of phosphoric acid or even liquid phosphorus on special tankers has recently been introduced.

c) Other bulk commodities

Apart from the main trade in "dry bulk cargoes", the estimated development of which has been examined above, a substantial tonnage of extremely diverse products is now carried in bulk on specialised ships or in the holds of cargo-vessels, mainly tramps.

Among these cargoes, some would deserve separate studies, like the main commodities previously considered. Such is the case, for instance, of wood and its by-products, sugar, dry chemicals and fertilizers. Unfortunately, for the past trade of these commodities, no series similar to those of Fearnley & Eagers are available and forecasts on these products are few.

Wood and its by-products, however, were the subject of a recent Westinform forecast, but loads are estimated in "cu.m. of roundwood equivalent" and not in tons, which is logical, as it generally deals with low density commodities, but makes comparisons difficult. According to this study, the international trade in 1965 of sawn timber, wood-pulp and paper was equivalent to 120m. cu.m. of roundwood. In 1975, the corresponding volume should reach about 225m. i.e. an average annual growth rate of 6.5% over 10 years.

This lack of statistics for bulk commodities other than the six main ones studied by Fearnley & Eagers even makes it difficult—though it is necessary—to distinguish between general cargoes and "other bulk commodities" among shipped cargoes.

d) Estimated sea-borne "other bulk cargo" tonnage in 1966

In order to estimate, by indirect means, the tonnage of "other bulk commodities" carried by sea in a year recent enough to be used as basis for a forecast, it has been necessary to combine various estimates, distinguishing the two types of ship transporting dry bulk cargoes: tramps and specialized bulk-carriers.

i) Tramps

A Westinform study estimated that 3 520 "standard tramps" of 15,300 tdw was the fleet necessary for all dry bulk transport in 1966. This would correspond to a total fleet of 53.3m. tdw. When deducting from this figure the deadweight of specialized bulk-carriers above 10 000 tdw which reached, in mid 1966, 30.8m. tons, the remaining total is 22.5m. tdw for the other ships.

As the other ships are mainly tramps, the efficiency calculated for this section of the fleet in chapter III-B for the year 1966 suggests an estimate of 178m. tons at most and 160m. tons at least of the total bulk tonnage carried that year on cargo-vessels.

Now, out of this total, somewhat more than 80% is attributable to the six main commodities, which leaves 29 to 33m. tons for the "other bulk commodities" shipped on tramps in 1966.

ii) Specialized bulk carriers

In the same year, large bulk carriers over 10 000 tdw which were accounted for by Fearnley & Eagers, carried 46m. tons of "other bulk commodities".

Consequently, all the "other bulk commodities" represented about 75 to 79m. tons in 1966.

e) Estimated trend of sea-borne "other bulk commodity" transport

It should be noted that, in the future, "other bulk cargoes" should include a substantial amount of new types of cargo. These will be products previously handled as packaged goods, but for which the increasing demand for transport by sea has made it necessary to adopt bulk-carriage. Their growth rates will be high, therefore.

As the growth rate foreseen up to 1975 for the transport of wood and its by-products, which are certainly the most important of the traditional commodities of this group, is also important, it has seemed possible to allow for higher annual rates of expansion for the whole of "other bulk cargoes" than for the six main commodities. The range adopted has been 5 to 7% up to 1975 and 4 to 6% for the period 1976-80.

Table VIII, summarizes the forecasts for 1975 and 1980 as regards the total tonnage of sea-borne dry bulk cargoes.

4. ***Forecasts for other dry cargoes***

a) Estimated sea-borne transport in 1966 for this category of cargo

With this category "other dry cargoes" the sectorial analysis tackles a part of sea-borne trade for which forecasts are particularly unreliable, because of the heterogeneous products in this category, whose limits are ill-defined.(1)

The OECD Maritime Transport Committee has started a pilot study to examine the possibility of improving the statistical information in the field of dry cargoes.

TABLE VIII

Forecasts for dry bulk cargo shipments in 1975 and 1980

(million tons)

	1975		1980	
	Low estimate	High estimate	Low estimate	High estimate
6 main commodities	468	552	532	687
Other dry bulk commodities	115	145	141	194
Total	583	697	673	881

For the year 1966 being used as a reference, the sea-borne "other dry cargo" trade was about 360 to 364m. tons.

This range is obtained from the difference between the total amount of sea-borne dry cargoes that year—800m. tons according to UNO statistics—on one hand, and all the sea-borne bulk trades which aggregated about 435 to 440m. tons on the other.

b) "General cargoes" shipped on cargo-liners

To formulate forecasts in this indefinite and intricate field of maritime transport, first the freight carried by long-haul cargo-liners has to be assessed: this category will be called hereafter "general cargoes".

For lack of basic statistical data on quantities shipped and on the tonnage of this section of the merchant fleet, it has first been necessary to make an estimate of the world deadweight of cargo-liners operating in 1966 and, after a rough examination, the tonnage has been estimated at about 43m. tdw.

The estimates of productivity for this section of the world fleet, which will be further explained in the following chapter, have fixed a ratio between tons carried per year and deadweight tons, of 4.4 to 5.1 for cargo-liners.

The range of this ratio leads to a corresponding range for estimating general cargo trade which, in 1966, averaged between 190 and 220m. tons. This explains why forecasts had to be established on two basic hypotheses as can be seen on Table IX.

In this table, forecasts for 1975 and 1980 were determined on the basis of maximum annual growth rates of 6.5% up to 1975 and 5.5% for the period 1976-80. For the low estimate, a rate one point lower has been adopted up to 1975, the difference being reduced to half a point only for the second period.

These high growth rates have been adopted considering there may still exist, for general cargoes, an important potential for trade which should appear as con-

TABLE IX

Forecasts for 1975 and 1980 on general cargo maritime shipment

(million tons)

Estimated volume carried in 1966		Annual growth rates foreseen	Forecasts			
			1975		1980	
Minimum	Maximum		Low estimate	High estimate	Low estimate	High estimate
190		1) Up to 1975 5.5 to 6.5%	295	335	375	440
	220	2) For the period 1976-80 5 to 5.5%	340	390	435	510

tainerisation develops and tariff-barriers and other practices restricting international trade are reduced.

Despite the slight difference between the maximum and minimum growth rates, the range of forecasts is wide because of the uncertainty as to the level at which the volume of trade carried in the basic year 1966 must be fixed.

c) Miscellaneous cargoes

Apart from bulk commodities and general cargoes shipped on cargo-liners, dry cargoes also include so-called miscellaneous cargoes. In 1966, they represented quite a substantial tonnage which ranged between 152 and 186m. tons, considering the high and low estimates previously made for "other bulk cargoes" and "general cargoes".

As regards the future of this sector of sea-borne trade, it is not possible to establish direct growth forecasts, for lack of precise knowledge of the nature of the commodities concerned.

Under these conditions, the problem can be tackled only indirectly, by taking, as a basis, the past rate of expansion of the total tonnage of sea-borne dry cargoes and by formulating forecasts on the future annual growth rate of this very general category.

Between 1959 and 1966, the average annual expansion rate of dry cargoes noted in the UNO maritime shipment statistics was 5.1% per year.

It seems possible to predict, up to 1975, a minimum average rate of 4% per year and a maximum rate of 6%.

For the following period, up to 1980, the corresponding rates would be 4% and 5%. Taking into account the forecasts previously formulated for other groups of dry cargoes (bulk and general cargoes), the foreseeable volume of other sea-borne dry cargoes can be calculated for 1975 and 1980.

These calculations are presented in Table X.

TABLE X

1975 and 1980 forecasts on maritime shipment of "other dry cargoes"

	Shipment in 1966		Growth rates until 1975	Forecasts for 1975		Growth rates 1975-80	Forecasts for 1980	
				Low estimate	High estimate		Low estimate	High estimate
All dry cargoes (million tons)	800		4 to 6	1 119	1 390	4 to 5	1 383	1 786
of which:								
1) six main bulk carrier commodities	349		3.25 to 5.4	468	550	2.5 to 4.4	532	687
2) other bulk commodities	Minimum 75	Maximum 79	5 to 7	116	145	4 to 6	141	194
3) general cargoes (cargo-liners)	190	220	5 to 6	295	390	5 to 6.5	375	510
Total (1) + (2) + (3)	614	648		879	1 085		1 048	1 391
Remaining other dry cargoes	At most 186	At least 152		240	305		335	395

C. *Comparison of the conclusions of the two methods for estimating the volume of sea-borne trade*

1. *The sectorial analysis at first sight more optimistic than the overall approach*

Table XI compares the sum of pessimistic and optimistic forecasts established for the various trades adopted in the sectorial analysis with the single forecast formulated by the overall approach as regards the levels that the total volume of international sea-borne trade should reach in 1975 and 1980.

This volume is estimated by the overall approach, for 1975, at a level very near that of the pessimistic forecast of the sectorial analysis, which results from the addition of the low estimates adopted by this study for dry cargoes and from the single estimate formulated for oil products. The overall approach is 51m. tons or 1.6% lower than this pessimistic forecast. The difference with the optimistic forecast is, of course, greater, being 322m. tons or 9.5%.

For 1980, the differences are more pronounced at 4% and 12.4%.

2. *Significance of domestic oil transport*

It must be noted, however, that the overall approach only relates to international sea-borne trade, whereas the sectorial analysis under the heading of regional oil shipment includes figures for tonnage handled within individual countries.

The sectorial analysis must thus be corrected, by deducting the anticipated domestic oil transport tonnages for 1975 and 1980 from the forecasts.

A very rough estimate can be attempted by referring to BP's statistics used by OECD in its study on maritime transport in 1967.

According to these figures, in 1966, the total regional transport of petroleum products amounted to 215m. tons.

Out of this total, 85m. tons which correspond to the coastal trade of the United States are obviously national, and 53m. attributable to the Venezuela/Lesser Antilles coastal trade are obviously international. This leaves 77m. tons of regional transport to be distributed between national and international trades. As precise statistics are not available, it may be taken that half this figure corresponded to trade between ports of the same country.

The whole of national oil trades adopted by the sectorial analysis for the basic year 1966 can therefore be estimated at 123m. tons, which corresponds to somewhat over 57% of the whole of regional transport. If it is assumed that this proportion will be maintained in 1975 and 1980, the conclusions of the sectorial analysis should be corrected, that is, reduced by 143m. tons in 1975 and by 172m. tons in 1980, to obtain valid estimates for international transport, consequently more likely to be directly comparable to the forecasts of the overall approach.

Once this correction has been made, the overall forecasts for 1975 and 1980 are situated between the pessimistic and optimistic estimates of the sectorial analysis. They are, however, nearer the pessimistic ones in 1975 and are almost level with them for 1980.

TABLE XI

Comparison of the volume of international sea-borne trade in 1975 and 1980 as forecast by the sectorial analysis and the overall approach

(million tons)

Estimates	Forecasts for 1975		Forecasts for 1980	
A) Sectorial analysis 1) Oil products (Table VI)	2 000		2 835	
2) Dry cargoes	Low	High	Low	High
a) Dry bulk cargoes (Table VIII)	583	697	673	881
b) General cargoes (Table IX)	295	390	375	510
c) Other dry cargoes (Table X)	240	305	335	395
Total dry cargoes	1 119	1 390	1 383	1 786
Total sectorial analysis	3 119	3 390	4 218	4 621
B) Overall approach International shipping	3 068		4 049	
Difference in favour of the sectorial approach	+ 51	+322	+169	+572
C) Sectorial analysis (corrected) (National oil shipment excluded)	2 976	3 257	4 045	4 448
Difference with overall approach	— 92	+189	— 4	+399

3. *Compatibility of the two studies*

Too much importance must not be given to the differences in figures, which can be noted in Table XI, between the results of the two studies, but one must rather take into consideration the medium and long range trends revealed by the forecasts about the volume of sea-borne transport.

These trends are, on the whole, quite compatible, which is worth emphasizing, as calculations were made independently one from the other, by two members of the Working Group, in two different countries. It can be noticed, however, that the sectorial analysis is on average more optimistic than the overall approach and this tendency is clearer at the end of the period considered than in the middle.

This fact is to be linked with the use of a moderate growth rate in the overall approach as regards the developed countries' GNP.

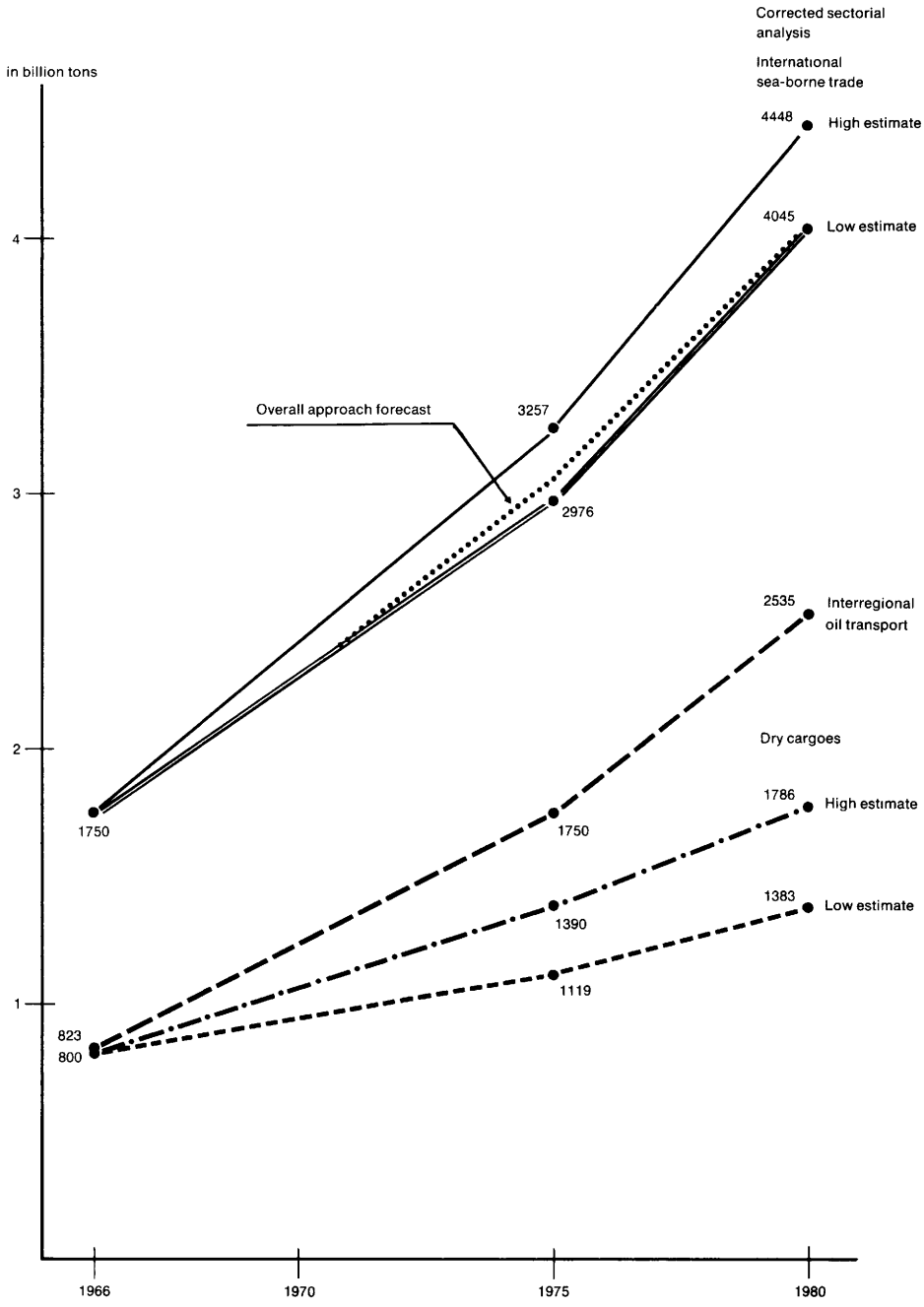
Besides, the difference between the optimistic and pessimistic forecasts of the sectorial analysis grows wider during the period considered, despite the fact that the high and low hypotheses retained for dry cargo trade only have slightly different growth rates. In 1980, the difference exceeds 400m. tons in absolute figures, but in relative value it only represents 10% of the pessimistic forecast which, once corrected, comes to the same as the overall estimate.

Figure B presents, in graphic form, the comparison of the various estimates, represented by curves.

The intermediate points on the curves leading up to 1975 and between 1975 and 1980 are not intended as forecasts for the corresponding years. They merely represent the trends on which the long and medium term forecasts in this chapter have been based.

FIGURE B

INTERNATIONAL SEA-BORNE TRADE IN 1975 AND 1980
CURVES REPRESENTING THE OVERALL FORECAST AND THE SECTORIAL FORECASTS



CHAPTER III

ESTIMATED DEVELOPMENT OF WORLD SHIPPING TONNAGE

A. *Overall approach*

1. *Projection into the future of the trends revealed in the past*

This approach is based on the premise that future medium and long term trends can be deduced from past achievements, provided a long enough period is covered, so that the influence of short term fluctuations is eliminated.

This implies that it is assumed that during the period considered no basic change, which would compromise the structure of the model itself, will occur in the parameters studied.

To establish forecasts on the tonnage of world shipping to be reached by 1975 and 1980, in relation to those previously indicated for the volume of international sea-borne transport by the same years, research was first made into whether there was a correlation between the development of both quantities in the past. This approach is a logical progression from that, in the previous chapter, of bringing out the very close correlation between the development of the volume of international sea-borne trade and of the GNP of the OECD countries (Table II and diagram A).

2. *Past correlation between world merchant fleet tonnage and international sea-borne trade volume*

This investigation, detailed in Table XII and diagram C, has dealt with the years 1950 to 1968.

The series considered are: on one hand, the annual volume of international sea-borne trade, in million tons, as calculated by the UNO statistical departments, and, on the other hand, the tonnage of the world merchant fleet in gross registered tons, published in Lloyd's Register of Shipping Statistical Tables. In the first series, however, referred to as "Y", as in Table II of the first Chapter, the figures for 1967 and 1968 are estimates based on the earlier hypotheses on the growth of sea-borne trade. The second series, referred to as "Z", includes the US reserve fleet in the figures for the world shipping tonnage, but excludes the US and Canadian Great Lakes fleet.

During the period studied, the world fleet has more than doubled whereas the volume of maritime transport has nearly quadrupled. The annual growth rates

TABLE XII

Correlation between international sea-borne trade and world merchant fleet

	World merchant fleet (Z) in million grt	International sea-borne trade (Y) in million metric tons	$(Z-\overline{Z})$	$(Y-\overline{Y})$	$(Z-\overline{Z})^2$	$(Y-\overline{Y})^2$	$(Z-\overline{Z})(Y-\overline{Y})$
1950	81.6	525	— 42.6	—593.9	1 814.76	352 717.21	25 300.14
1951	84.2	615	— 40.0	—503.9	1 600.00	253 915.21	20 156.00
1952	87.0	635	— 37.2	—483.9	1 383.84	234 159.21	18 001.08
1953	90.1	655	— 34.1	—463.9	1 162.81	215 203.21	15 818.99
1954	94.1	710	— 30.1	—408.9	906.01	167 199.21	12 307.89
1955	97.1	800	— 27.1	—318.9	754.41	101 697.21	8 642.19
1956	101.8	880	— 22.4	—238.9	501.76	57 073.21	5 351.36
1957	106.8	930	— 17.4	—188.9	302.76	35 683.21	3 286.86
1958	114.6	920	— 9.6	—198.9	92.16	39 561.21	1 909.44
1959	121.4	970	— 2.8	—148.9	7.84	22 171.21	416.92
1960	126.2	1 080	+ 2.0	— 38.9	4.00	1 513.21	— 77.80
1961	132.4	1 150	+ 8.2	+ 31.1	67.24	967.21	255.02
1962	136.5	1 250	+ 12.3	+131.1	151.29	17 187.21	1 612.53
1963	142.4	1 350	+ 18.2	+231.1	331.24	53 407.21	4 206.02
1964	149.7	1 510	+ 25.5	+391.1	650.25	152 959.21	9 973.05
1965	157.2	1 640	+ 33.0	+521.1	1 089.00	271 545.21	17 196.30
1966	167.8	1 750	+ 43.6	+631.1	1 900.96	398 287.21	27 515.96
1967	178.7	1 880	+ 54.5	+761.1	2 970.25	579 273.21	41 479.95
1968	190.7	2 010	+ 66.5	+891.1	4 422.25	794 059.21	59 258.15
					20 092.83	3 748 578.99	272 610.05

Arithmetical average $\overline{Z} = 124.2$ and $\overline{Y} = 1\,118.9$

Dispersion Var. Z = 1 057.517

Var. Y = 197 293.6

Cov. (ZY) = 14 347.89

Mean quadratic variation : $\sigma Z = 32.52$

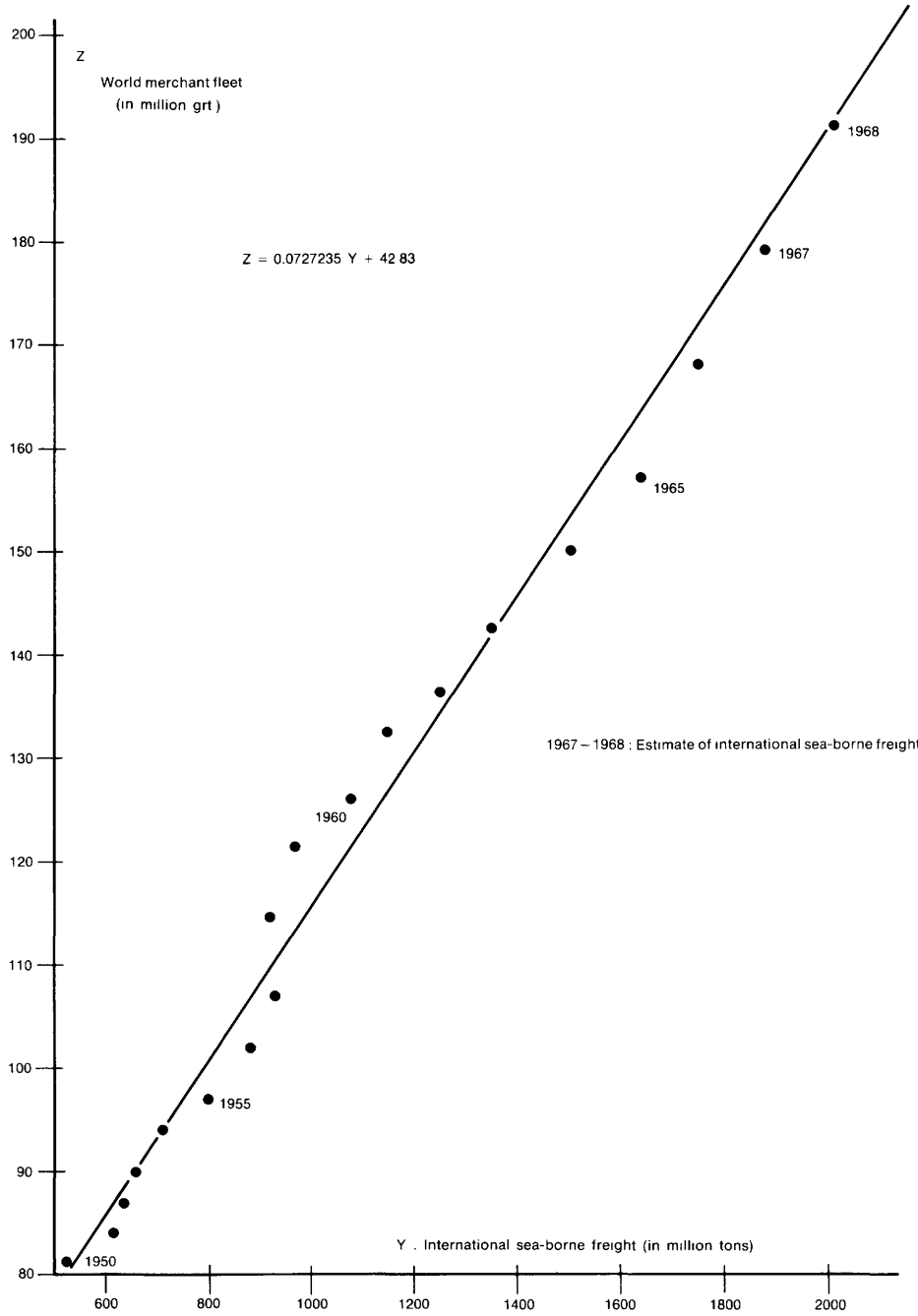
$\sigma Y = 444.18$

Correlation coefficient : $r(ZY) = \frac{\text{Cov. (ZY)}}{\sigma Z \, \sigma Y} = \frac{14\,347.89}{14\,444.64} = 0.993$

Corresponding equation of regression : $Z = 0.0727235\ Y + 42.83$

FIGURE C

COMPARATIVE DEVELOPMENT OF THE WORLD MERCHANT FLEET AND
INTERNATIONAL SEA-BORNE FREIGHT
DIAGRAM OF DISPERSION FOR THE PERIOD 1950 – 1968



(which appear in Table XIII) have varied considerably without direct relations with each other.

For this reason, Figure C shows a greater dispersion of the points plotted each year for the co-ordinates "Z" and "Y" than that seen in Figure A. It is normal that there should be greater disparity between the annual growth rates of the merchant fleet and the maritime transport than between the latter and the GNP of the OECD countries.

However, the length of the period considered eliminates the effects of short term fluctuations, and in the calculations appearing at the foot of Table XII, the correlation between the two series is very near parity.

Furthermore, the "cloud" of the points of diagram C has an axis which may be looked on as a straight line corresponding to the equation of regression $Z = 0.07272235\ Y + 42.83$. This means that, on average, in the past, additional tonnage needs for 72 700 gross registered tons corresponded to an increase of 1m. tons in international maritime cargoes. The absolute factor of the formula, + 42.83, shows that, in the past, the carrying capacity, per gross ton, had a slight upward tendency.

This point is clearly illustrated by Table XIII which compares the development of the world fleet and international sea-borne trade from 1950 to 1966, showing, for each series, the annual growth rate, as well as the annual trend of the ratio :

$$\frac{\text{metric tons carried per year}}{\text{gross registered tons}}$$

This ratio which measures the mean productivity of the world fleet, rose during the period considered, from 6.43 in 1950 to 10.43 in 1966.

3. *Overall forecasts for merchant fleet tonnage in 1975 and 1980*

If it is admitted that the correlation, noted in the past, between the volume of sea-borne trade and gross tonnage of the world merchant fleet will be closely maintained in the future, the straight line on diagram "C" representing the equation of regression calculated at the foot of Table XII may be continued.

As forecasts have been established for the volume of international sea-borne trade in the years 1975 and 1980, corresponding forecasts for merchant fleet tonnage can be established by using the equation of regression.

Table XIV presents these forecasts which—let us remember—are related, through the double correlation established, to an average annual growth rate of the OECD countries' GNP equal to 4.5% during the period considered (ref. Chapter I-A.).

It has also seemed appropriate to show, in table XIV, what would be the alternative tonnages for the merchant fleet which would be deduced from the other annual growth rates of the GNP; the effects of these other rates on sea-borne trade have been calculated, as examples, in Table IV. However, we recall that, for this overall approach, the single economic growth rate retained was that of 4.5% per year. Consequently, within these terms of reference, the only estimate

TABLE XIII

Comparison of the development of the fleet of world sea-borne cargoes and trend of the fleet productivity between 1950 and 1966

	World merchant fleet (1)		International sea borne trade		Productivity of the fleet: sea-borne trade
	Million grt	Annual growth rate %	Million tons	Annual growth rate %	Fleet grt
1950	81.6	2.5	525	—	6.4
1951	84.2	3.2	615	17	7.3
1952	87.0	3.3	635	3	7.3
1953	90.1	3.6	655	3	7.3
1954	94.1	4.4	710	8	7.5
1955	97.1	3.2	800	13	8.2
1956	101.8	4.8	880	10	8.6
1957	106.8	4.9	930	6	8.7
1958	114.6	7.3	920	— 1	8
1959	121.4	5.9	970	5	8
1960	126.2	4.0	1 080	11	8.5
1961	132.4	4.9	1 150	6	8.7
1962	136.5	3.0	1 250	9	9.1
1963	142.4	4.3	1 350	8	9.5
1964	149.7	5.1	1 510	12	10.1
1965	157.2	5.0	1 640	9	10.4
1966	167.8	6.7	1 750	7	10.4

(1) Ships over 100 grt excluding the Great Lakes fleet but including the US reserve fleet.

to be considered is the figure of 266m. gross tons for the world merchant fleet in 1975, and that of 337.3m. in 1980.

B. *Sectorial analysis*

1. *Method of estimation*

In order to estimate the tonnage of the merchant fleet in 1975 and then in 1980, the sectorial analysis had to assess, for each group of cargoes considered in Chapter II-B, what will be the total deadweight of shipping necessary to carry the anticipated cargoes.

Various methods of estimation had to be adopted for each group according to the type of data available.

In the case of bulk cargoes, the concept adopted was that of "coefficient of utilization" of the corresponding section of the fleet, i.e. the foreseeable ratio—for both years studied—between sea-borne traffics in terms of ton/miles and the theoretical capacity of the fleet, which is the product of the average daily distance covered and the total of cargo deadweight.

On the other hand, for the other groups, it has been either possible or compulsory to pass directly from the volume to be carried to the necessary deadweight of the

TABLE XIV

Forecasts of the world merchant fleet gross tonnage in 1975 and 1980 in relation to volume of international sea-borne trade and developed countries' economic growth

	1966 (true figures)	1975				1980			
Annual growthrate of GNP		3.5%	4.5%	5.5%	4-3.5%	3.5%	4.5%	5.5%	4-3.5%
Developed countries gross national product (in 1000m. US$)	1 186.50	1 617	1 763	1 921	1 722	1 921	2 197	2 511	2 045
International sea-borne trade (in million tons)	1 750	2 732	3 068	3 424	2 974	3 425	4 049	4 758	3 705
World merchant fleet (in million grt)	167.8	242	266	291.8	259.1	291.9	337.3	388.8	312.3

corresponding section of the fleet, by directly assessing the fleet's productivity through a coefficient expressing the ratio between its total deadweight and the annual volume of cargoes shipped.

2. *Forecasts for the tanker fleet*

a) Definition of this section of the world merchant fleet

This section of the world merchant fleet comprises tankers of more than 2 000 tdw normally designed for crude oil or refined product transportation.

Although in the past, some tankers of more than 2 000 tdw were used for trades other than that of liquid hydrocarbons, especially grain, there existed and still exists an extremely close relation between the world tanker fleet tonnage and crude oil and refined products shipping requirements.

At present, however, ore/bulk/oil carriers are growing in number and most of those commissioned during the last two years have been used for crude oil transportation, because of the increased need for tonnage following the closure of the Suez Canal.

By contrast, in 1966, only 45% of the tonnage of these OBO's was used for crude oil shipment.

Versatility being the main characteristic of this section of the world fleet, it was not considered possible to make separate forecasts of its tonnage.

In other words, in the present section as well as in the following one on bulk-carriers, no assessment has been made as to how the tonnage considered necessary for 1975 and 1980 would be distributed between fully specialized ships and combined vessels.

But the latter will have to be taken into consideration in Chapter IV in the assessment of newbuilding requirements.

b) Importance of the tanker fleet

At 1 July 1968 the tanker fleet represented 35.6% of the total of world merchant fleet expressed in gross tonnage. The corresponding percentage, in deadweight tonnage, is not known exactly (at the same date), but it already exceeded 45% at the beginning of 1968 according to an estimate published by the American Bureau of Shipping in its annual report.

The share of petroleum products in the volume of international sea-borne trade was 53% in 1966, according to UNO statistics. It must have continued to increase since then.

From the relation between these percentages, it can be deduced not only that the tanker fleet is by far the most important section of the world merchant fleet, but also that its productivity is considerably above average.

c) Tanker fleet efficiency and prospects of development

For the purposes of this study, productivity is defined in terms of the ratio between the annual volume of a given sea-borne trade and the deadweight of the shipping

used. Such ratio can also be considered as the annual average of roundtrips for the type of ship considered.

This concept is valid for a fairly homogeneous fleet as in the case of the world tanker fleet.

Table XV shows the trend of this productivity coefficient in recent years as regards the world tanker fleet in service.

TABLE XV

Productivity of the tanker fleet

Year	Inter-regional oil trade (million tons)	World tanker fleet in service (million tdw)	Productivity coefficient: tons/year Fleet deadweight
1963	666	75	9.2
1964	745	81.6	9.5
1965	812	90.1	9.5
1966	890	99	9.45
1967	963	107.9	9.3

Therefore, since 1965, the productivity of the world tanker fleet can be said to have decreased. This result, surprising at first sight, is explained by the fact that the average distances covered have increased.

In 1966, about 20m. tons of crude oil were brought to Western Europe from the Persian Gulf round the Cape of Good Hope, which has resulted in a slight fall in the productivity rating that year.

The more pronounced decline in 1967 is of course the direct consequence of the Suez Canal closure which made the detour round the Cape necessary for both outward and homeward voyages. This event happened in June and its consequences were felt only during the second half of 1967. The effect of the Suez Canal closure for a full year will certainly be much stronger, but the 1968 figures are not yet known.

It seems reasonable to anticipate that the productivity coefficient will remain at the level of 9 to 9.2 until 1970.

For the medium and long term future, an upward trend in the coefficient can be anticipated because of various technical or geographical factors, but the speed of this recovery will depend on when the Suez Canal is reopened to traffic.

Indeed, it may be said that the longer the Canal is closed to shipping, the less effect its reopening will have on oil transportation, because of the acceleration that its closing has given to the building of supertankers.

The general uncertainty over this matter has led us to adopt two alternative productivity coefficients for 1975 and 1980. According to the low estimate, this

coefficient should remain at 9 until 1975 and increase afterwards very slightly to reach 9.1 in 1980. According to the high estimate, the coefficient should rise to 9.3 in 1975 and 9.4 in 1980.

d) Expected tanker fleet deadweight tonnage in 1975 and 1980

When applying these productivity coefficients to the volume of inter-regional oil transport foreseen for 1975 and 1980, two estimates can be made, a high and a low one, as regards the tonnage which will be necessary to carry this cargo.

However, these productivity coefficients, calculated for long distance inter-regional trade routes, cannot be applied directly to the volumes of regional oil cargoes carried over distances which are only two fifths as long on average.

Because of the uncertainties, already stressed, over statistics concerning regional oil transport, it was not possible to establish a specific productivity coefficient for this section. It has thus been necessary, in order to make the overall estimate of the total deadweight of the world tanker fleet in 1975 and 1980, to adjust the figures for the total volume of sea-borne petroleum products, calculated in Chapter II-B. 2. The coefficient of compensation chosen is 1 for inter-regional transportation and 0.4 for regional transportation, which makes it possible to calculate the volume of trade in tonnage of "inter-regional equivalent". The elements and results of this calculation are presented in Table XVI.

The forecasts adopted are of the order of a world tanker fleet which will reach at least 199m. tdw and at most 205.6m. tdw in 1975. The corresponding figures for 1980 are 282.4 and 290.7m. tons deadweight.

3. *Expected bulk-carrier and tramp fleet*

a) Distribution of bulk cargo transports between specialized ships and tramps

Whilst there is a very close relationship between the size of the tanker fleet and of sea-borne hydrocarbon cargoes, the parallel between bulk-carrier fleet and sea-borne dry bulk cargoes is far from being as close at present. In fact, many bulk cargoes are still shipped not only on specialized single-deck carriers, but also on twin-deck cargo-vessels, mainly tramps.

This can be explained by the fact that the large bulk-carrier (over 10 000 tdw in Fearnley and Eagers' statistics) is a relatively recent type of ship which has not entirely replaced the traditional tramp, the disappearance of which was probably slowed down in the last decade by the mass of Liberty-ships built between 1942 and 1945. This is why it has been necessary to deal with the forecasts for the development of the tonnage of the bulk-carrier fleet and tramps together, as both types of ship are concerned with the same category of commodities.

b) Expected six main bulk cargo traffics in ton/miles

Table XVII summarizes the forecasts for traffics, in ton/miles, for the six main bulk commodities, according to the expected sea-borne trade volumes adopted in Chapter II-B. 3 and the estimated average lengths of haul between ports in the years 1975 and 1980.

TABLE XVI

Forecasts for the tanker fleet deadweight tonnage in 1975 and 1980

A) Foreseen volume of oil shipmant	1975			1980		
Routes	interregional	regional	total	interregional	regional	total
1) Annual volume of petroleum products shipped (million tons)	1 750	250	2 000	2 535	300	2 835
2) Average length of haul (nautical miles)	4 400	1 820	4 080	4 340	1 670	4 020
3) Sea-borne oil cargo (1000 m. tons/miles)	7 700	455	8 155	10 900	500	11 400
4) Annual total adjusted volume of oil shipment (in million tons of "interregional equivalent")	1 750	100	1 850	2 535	120	2 655
B) Provisional calculation of the corresponding fleet tonnage	1975			1980		
Productivity estimates	High	Low		High	Low	
Productivity coefficient: number of tons of the "total volume" (A-4) carried annually for each tdw of the fleet	9.3	9		9.4	9.1	
Estimates of tonnage needs	Low	High		Low	High	
Total deadweight of the expected tanker fleet (in million tons)	199	205.6		282.4	290.7	

The estimated average lengths of haul have taken into account the forecasts for the needs of the main consumer regions and the distribution of sources of supply, between old and new producing areas. As the new producing areas are generally further away from consumer regions than the old ones, it has been foreseen that the average load transport distances would increase quite strongly until 1975 and more slowly between 1975 and 1980. The only exception to this general trend concerns grain for which stability of distances covered has been anticipated until 1975 and a slight reduction thereafter, and manganese for which a very slight reduction of distances has also been predicted for 1975 and 1980.

TABLE XVII

Forecasts for the traffic of the six main bulk commodities in 1975 and 1980

Commodities	Achievements 1967			Estimates of growth	Forecasts 1975			Forecasts 1980		
	Volume shipped (million tons)	Average length of haul (nautical miles)	Traffic (bln tons/ miles)		Volume shipped	Average length of haul	Traffic	Volume shipped	Average length of haul (nautical miles)	Traffic
Iron ore	164	3 970	651	Low	225	4 200	945	261	4 500	1 174.5
				High	261		1 096.2	334		1 503
Coal	67	4 015	269	Low	78	4 500	351	83	4 700	390.1
				High	99		445.5	115		540.5
Grain	68	5 588	380	Low	80	5 600	448	85	5 300	450.5
				High	93		521	108		572.4
Manganese	7	4 571	32	Low	10	4 500	45	12	4 500	54
				High	11		49.5	15		67.5
Bauxite and alumina	25	2 480	62	Low	34	3 200	108.8	41	3 500	143.5
				High	40		128	54		189
Phosphates	30	3 566	107	Low	41	3 700	151.7	50	3 800	190
				High	48		177.6	61		231.8
Total 6 commodities	361	4 158	1 501	Low	468	4 340	2 049.5	532	4 490	2 402.6
				High	552	4 380	2 417.8	687	4 520	3 104.2

The most significant increase of average distances occurs in the case of coal, due to the increasing importance of Japan as an importer of this product. Japan will import coal partly from Australia and partly from the East Coast of the United States.

c) Bulk-carriers' increasing share of main cargoes

The share of these cargoes that the single-deck bulk carriers will absorb also had to be estimated.

For iron ore, for instance, these single-deck units were already by 1967 carrying 87% of this traffic expressed in ton/miles. Considering the growing volume of sea-borne iron ore transportation and the tendency towards a concentration of trade between relatively few loading and unloading ports, the use of giant ore carriers proper (including oil/ore carriers) can only become more general in the future.

It has thus been foreseen that the share of bulk-carriers in the transportation of iron ore would reach 95% in 1975 and 97% in 1980.

For the five other main commodities, the domination of bulk-carriers proper is not yet as marked, but it is already in evidence and will certainly be strengthened in the future.

Table XVIII shows the trend foreseen for each case.

TABLE XVIII

Traffics of bulk cargoes carried by bulk carriers proper

(1000 m. ton/miles)

Commodities	1975			1980		
	Share of bulk carriers in total traffic	Estimate		Share of bulk carriers in total traffic	Estimate	
		Low	High		Low	High
Iron ore	95	906	1 030	97	1 140	1 450
Coal	90	316	401	93	363	503
Grain	75	336	391	85	387	487
Manganese	60	27	29	75	40	50
Bauxite/Alumina	80	87	102	90	130	170
Phosphate	65	98	115	80	152	186
Total	86	1 770	2 068	92	2 212	2 846

d) Expected bulk-carrier fleet deadweight necessary for transporting the main commodities in 1975 and 1980

To calculate the deadweight of the bulk-carrier fleet which will be necessary in 1975 and 1980 to carry its share of the six main commodities as defined above, the concept of "utilization coefficient" has been adopted.

This coefficient is derived from the ratio between the theoretical annual carrying capacity of the fleet and the actual sea-borne cargo transported. It has been calculated, in the past, on the basis of Fearnley and Eagers' statistical data on the total activity of the bulk-carrier fleet, including all "other bulk commodity" trades. However, smaller ships (10 000 to 14 000 tdw) have not been taken into account.

The result of this analysis is shown in Table XIX.

TABLE XIX

Performance of the world bulk-carrier fleet in recent years calculated biennially

Data used	Scheme of calculation	1961	1963	1965	1967
Average speed of the fleet in knots (V)		13.8	14.1	14.4	14.7
Theoretical annual mileage (A)	(A) = V x 24 h. x 350 d.	115 920	118 440	120 960	123 500
World fleet of bulk carriers of more than 14 000 tdw (in million tdw) (B)		8.18	15.52	22.79	38.71
Theoretical annual carrying capacity (in 1000 m. ton/miles) (C)	(C) = A x B	948	1 837	2 758	4 780
Actual hauls (in 1000 m. ton/miles (T)		304	522	833	1 378
Performance coefficient (U)	$(U) = \frac{T}{C}$	0.321	0.284	0.302	0.288

It appears that the "utilization coefficient" calculated in Table XIX has deteriorated in the past, falling from 0.321 in 1961 to 0.288 in 1967.

In fact, its upward and downward fluctuations during the period under study have remained within relatively narrow limits, and these variations may be attributed to short term fluctuations in the demand for sea-borne bulk cargo transport.

For the future, the tendency towards the concentration of traffic between harbours which are sufficiently deep to accommodate large ships should entail a slow improvement in the utilization coefficient, these harbours being well equipped with quick, efficient handling resources.

By assuming that this coefficient will recover its 1961 level, i.e. 0.32 by 1975, and will then increase slightly to 0.34 by 1980, the deadweight of the world bulk-carrier fleet theoretically necessary for carrying in 1975 and 1980 the main cargo trades foreseen in Table XVIII can be calculated.

This calculation is presented in Table XX.

In 1975, a bulk-carrier fleet, with a total deadweight of 42 to 50m. tons, is deemed to be sufficient to carry the world's cargoes of the six main commodities. The corresponding tonnage for 1980 would be at least 48m. tdw and at most 63m. tdw.

TABLE XX

World bulk-carrier deadweight tonnage corresponding to expected traffic of the six main commodities in 1975 and 1980

Scheme of calculation	1975		1980	
	Low estimate	High estimate	Low estimate	High estimate
(T) Expected traffic (in billion tons/miles)	1 770	2 068	2 212	2 846
(U) Anticipated performance coefficient	0.32		0.34	
(C) $= \frac{T}{U}$ Theoretical carrying capacity (in 1000 m. ton/miles)	5 531	6 463	6 506	8 371
(V) Expected average speed of the bulk-carrier fleet, in knots	15.5		16	
(A) Theoretical annual mileage (A) (V) x 24 x 350 days	130 200		134 400	
(B) Bulk-carrier fleet required (in tons deadweight) (B) $= \frac{C}{A}$	42.5	49.6	48.4	62.3

e) Additional bulk carriers required for "other bulk cargoes"

As regards other bulk commodities, the share of cargoes shipped on these single-deck vessels was 46m. tons in 1966, namely 62 to 65% of the total volume of these cargoes which were estimated at 75 to 79m. tons at that time.

In the future, the single-deck bulk carriers will certainly increase their share in the transport of "other bulk cargoes" but, in this sector, tramps will hold their

position better, because of the multiplicity of low tonnage shipments and of the great number of routes on which this category of goods is carried.

Therefore it has been foreseen that bulk carriers will carry 81% of these "other bulk cargoes" in 1975 and 88% in 1980.

When assuming that the bulk carriers used for these cargoes will have a productivity rating similar to the one calculated for those carrying the six main bulk commodities, it is possible to increase the deadweight tonnages, calculated in Table XX, in proportion to the additional sea-borne volumes transported.

Table XXI shows the deadweight tonnage expected to be reached by the world bulk-carrier fleet in 1975 and 1980, taking into account the proportion of the various cargoes that these vessels will be carrying by then.

TABLE XXI

Forecast deadweight tonnage of the world bulk-carrier fleet in 1975 and 1980

	1975 forecasts		1980 forecasts	
	Low estimate	High estimate	Low estimate	High estimate
Cargoes shipped on bulk carriers (million tons)				
1) Six main commodities	402	475	489	632
2) "Other commodities"	93	117	124	171
3) All bulk commodities	495	592	613	803
Share of other commodities	18.8%	19.8%	20.2%	21.3%
Ratio $\frac{\text{Other commodities}}{\text{6 main commodities}}$	0.2313	0.2463	0.2536	0.2706
Corresponding fleet (million tdw)				
1) For the six main commodities	42.5	49.6	48.4	62.3
2) For the other commodities	9.7	12.5	12.2	16.9
3) For all the bulk commodities	52.2	62.1	60.6	79.2

Theoretically, 52.2m. tdw in 1975 should be sufficient to carry the bulk tonnages anticipated by the low estimates and 62.1m. tdw if the high estimates of trade are realised.

In early 1969, the world fleet was already 57.6m. tdw. 10.2 of which admittedly are OBO's at present mainly used for transporting oil.

The present fleet, if it were entirely used for dry bulk cargoes, would be almost sufficient to carry the cargoes forecast for 1980 in the low estimate. Therefore, only the high estimate suggests a noticeable growth of this section of the world fleet, which would then reach nearly 80m. tdw.

f) Prospects of the development of tramp deadweight tonnage

There remains the study of the prospects of the development of the twin-deck tramp fleet which, together with single-deck bulk carriers, carries out the sea-borne carriage of dry bulk cargoes.

This fleet deadweight has been estimated previously in Chapter II (B.3d) at 22.5m. tons for the reference year 1966.

Table XXII compares the average efficiency of this fleet with that of bulk-carriers proper. The data used in this table are derived from Fearnley and Eagers' statistics published in the brochure "Trades of World Bulk Carriers in 1966".

TABLE XXII

Comparison between the average efficiency of the bulk carrier fleet and the tramp fleet in 1966

	Method of calculation	Bulk carriers	Tramps
1) Average data			
a) Speed (knots)		14.5	12.5
b) Roundvoyage distance (miles)		8 400	7 300
c) Days in port per roundtrip		8.5	17
d) Days at sea per roundtrip	$\frac{b}{(24 \times a)}$	24	24.5
e) Roundvoyage duration (days)	(c + d)	33	42
f) Loaded trips per year	$\frac{(350)}{c}$	10.6	8.3
2) Capacity of the world fleet (in million tdw)			
g) Total deadweight		30.8	22.5
h) Corresponding cargo deadweight	(0.96 × g)	27.9	21.4
3) Annual carrying capacity (in million tons)			
i) Theoretical	(h × f)	296	178
j) Actual	(0.90 × i)	266	160

This table, however, stresses the fact that the tramp fleet has a much lower efficiency than bulk carriers (—22%). This is explained by their lower operational speed and, above all, by the time spent in harbours, almost twice that of bulk carriers.

This is of course related to the fact that bulk-carriers proper take the best trade and, leave the less regular business, the smaller shipments and the most difficult harbours to the tramps.

In the future, it seems inevitable that tramps will be eliminated by the big single-deck ships from substantial and long distance bulk trade; consequently they will be used more and more on the most difficult routes.

It has thus been assumed that, up to 1975, the average length of haul covered by tramps would tend to shorten but that, despite this diminution, the average efficiency of the fleet would not change as compared with 1966. This led to the prediction that the present rate of efficiency, i.e. 8.3 loaded trips per year, would be maintained. On the other hand, for the period 1975-80, the current modernization of this sector of the world fleet suggests an increase in the rate, which may reach 9.7 by 1980.

By evaluating these estimates and the share of bulk cargoes shipped in 1975 and 1980 which will not be absorbed by specialized single-deck ships, table XXIII makes it possible to estimate the total deadweight of the tramp fleet that will still be in service at the end of both periods considered.

Therefore, the tramp fleet should already be reduced to a deadweight of between 14 and 17.3m. tons by 1975. The diminution of the fleet will continue from 1975 to 1980, and, for this last year, a fleet of between 8.8m. and 11.7m. tdw can be foreseen.

TABLE XXIII

Forecasts on total deadweight tonnage of tramps in 1975 and 1980

Growth estimates	1975		1980	
	Low	High	Low	High
I. 6 main commodity trade carried by tramps (1000 m. ton/miles)	280	350	191	256
II. Average cargo-carrying distance	3 200		3 000	
III. Quantities shipped (million tons)				
a) Main commodities $\frac{(I)}{(II)}$	88	109	64	85
b) Other bulk commodities	22	28	17	23
c) All bulk commodities	110	137	81	108
IV. Efficiency rate	8.3		9.7	
V. Corresponding fleet (in million tons)				
a) Cargo dw $\frac{(III\ c)}{(IV)}$	13.3	16.5	8.4	11.1
b) Deadweight tonnage (cargo dw × 1.05)	14	17.3	8.8	11.7

4. *Expected deadweight of the cargo-liner fleet, including container ships, in 1975 and 1980*

a) Effects of containerisation on sea-borne general cargo transport

The forecasts of the future tonnage of this section of the sectorial analysis correspond to the assessments made in Chapter II (B-3) about the development of the volume of sea-borne general cargoes up to 1975 and 1980.

Until recently, the fleet of cargo liners of more than 4 000 grt corresponded almost exactly to this section of maritime transport, which was defined in the preceding chapter according to the types of ship which carry it.

Today, the progress of containerisation and the appearance of a new type of ship which specializes in this transport, make it necessary for this prospective study, to divide the fleet into two sections and to establish which trade will be given to container ships out of what is left to conventional cargo liners. In fact, the expected efficiency of container ships is much superior to the one estimated for cargo liners.

b) Forecasts for the rate of containerisation

For the reference year 1966, various studies suggest that, out of a general cargo volume previously estimated at 190 to 220m. tons, 50m. could have been containerized.

For the future, the forecasts for the expected growth rate of this theoretical volume as well as the percentage which will be effectively containerized, are summarized in Table XXIV, which also shows the volume of other general cargoes which will still be shipped on conventional cargo liners. This volume is derived from the forecasts previously made in Chapter II (B-3) about the overall general cargo trade in 1975 and 1980.

The minimum and maximum estimates for transport by conventional cargo liners correspond to the uncertainty over the exact volume of general cargoes carried in the reference year 1966.

c) Estimated trend of the efficiency rating of cargo-liners and container ships

In order to calculate the deadweight tonnage of the world fleet of container ships and cargo liners in 1975 and 1980 required to meet the estimated transport needs in both categories of cargoes, it is first necessary to estimate the efficiency ratings to be expected for both types of ship. These estimates are shown in Table XXV.

i) Cargo liners position in 1968

It has not been possible to estimate the efficiency of container ships, in 1968, the way it has been done with cargo liners. Intercontinental container services were still at an experimental stage. On the other hand, the figures available for conventional cargo liners have provided an estimated range of the efficiency of the world fleet operating at present.

This range depends, in fact, on the estimated time spent in port by ships of this category; this time is particularly long now because of the high number of stop-over calls made on most regular lines. The operating cargo-liner fleet has been estimated

TABLE XXIV

Forecasts concerning the volume of general cargoes to be shipped on container ships and conventional cargo liners in 1975 and 1980

	1975			1980		
	Growth rate 1966/75	Low estimate	High estimate	Growth rate 1975/80	Low estimate	High estimate
Theoretical volume available for containerization (million tons)	6% to 8%	85	100	6% to 7%	113	147
Containerization rate		50%			75%	
Effectively containerized volume (million tons)		42	50		84	113
Volume of general cargoes left to conventional cargo liners						
1) Minimum estimate		253	285		291	327
2) Maximum estimate		298	340		351	397

at 46.5m. tons deadweight, for 1967, on the basis of a survey of the various types of cargo vessels in about twenty countries or regions. This figure should be reduced to 43m. tons deadweight for the reference year 1966.

ii) Development of container ships efficiency

For the future, it has been assumed that the development of the operation of container ships will have levelled off by 1975. In particular, the reduction of port time—the main source of the increased efficiency expected from this means of shipment—will have been achieved. The duration of calls should be reduced by about 3.5 times by 1975 as against those of today's conventional cargo liners.

Nevertheless, through this reduction seems to be assured, its scope cannot be determined because the organization of container ship lines is dependent on the number of ports which will be equipped for this traffic.

This is why two separate estimates of efficiency have been formulated, considering an average port time of 8 days minimum and 12 days maximum.

On the basis of a higher average speed, but a lower load factor, container-ship fleet efficiency, in 1975, should be superior by about one third to that of the present cargo-liner fleet.

TABLE XXV

Estimated development of the efficiency rating of cargo liners and container ships

Average data	1968	1975	1980
	Cargo liners	Container ships	
a) Average speed in knots	17.5	20	22
b) Average roundvoyage distance (miles)	14 000	14 000	14 000
c) Roundvoyage duration, in days	63-73	37-41	34.5-38.5
of which			
days in port	30-40	8-12	8-12
days at sea $\left(\frac{b}{24 \times a}\right)$	33	29	26.5
d) Number of loaded trips per year $\left(\frac{350}{c}\right)$	5.6-4.8	9.5-8.5	10.1-9.1
e) Load factor	2 x 45 = 90%	2 x 35 = 70%	2 x 35 = 70%
f) Rate of efficiency (d x e)	5.5-4.4	6.7-5.9	7.1-6.4

	Cargo liners	
Expected growth in the efficiency of cargo liners between the dates	1968 to 1975	1975 to 1980
(as a % of the efficiency calculated at the beginning of the period)	15%	5%
Corresponding rate of efficiency at the end of the period	5.9-5.1	6.2-5.4

Between 1975 and 1980, further, more modest progress (about 6 to 8%) has been anticipated. This is entirely attributable to the foreseeable increase in the average speed, in knots, of this fleet, which would rise from 20 to 22 knots between 1975 and 1980, according to the tendency already noted in the recent orders for ships of this type.

iii) Improvement of cargo-liners' efficiency

As regards cargo liners still serving regular routes without container handling equipment at both ends, and carrying general cargoes which cannot be containerized, considerable improvements in productivity are expected by 1975.

An increase of 15% may appear considerable in the light of the past experience. However, the latest ship and those on order have much higher speeds than the average of 17.5 knots calculated for the fleet now operating, which is relatively old, but is undergoing rapid renovation.

Besides, with the incentive of the competition from containers, shippers, shipowners and port authorities are trying to improve the handling of non-containerized

cargoes by using other means of rationalisation, such as palletization, the roll-on/roll-off system, etc.

Between 1975 and 1980, further more modest progress (about 5%) is expected from more advanced rationalization in maritime transport.

For cargo liners as well as for container ships, two alternatives of efficiency have been foreseen: "high" and "low" in 1975 as well as in 1980.

d) Expected total deadweight of the fleet of container ships and cargo liners in 1975 and 1980

Table XXVI shows the forecasts of the level to be reached in 1975 and then in 1980, by the total deadweight of the world fleets of container ships and cargo liners. They are derived from the forecasts previously formulated as regards, on one hand, the distribution of general cargo trade between these two types of ship and, on the other hand, the development of the efficiency rating of each fleet.

The combination of these various estimates leads to four alternatives for container ships. As regards cargo liners, the range allowed in the estimations of trade in 1966, which has been used as a basic reference, makes the problem still more intricate and could lead to eight different alternatives. However, it has been considered that the combinations "Maximum basis/low efficiency" and "Minimum basis/high efficiency" were not probable and should be eliminated as the minimum estimate corresponds to a low efficiency of the present fleet and the maximum estimate to a high efficiency. This leads to the adoption of a range of 49.6 to 57.6m. tons deadweight for 1975, and 53.9m. to 64m. tdw for 1980.

For container ships, the extreme figures of forecasts will be retained, i.e. 6.3 to 8.5m. tdw for 1975 and 11.8 to 17.7m. tdw for 1980.

TABLE XXVI

Forecasts for the container-ship fleet and the cargo liner-fleet deadweight tonnage in 1975 and 1980

(million tdw)

Traffic growth hypothesis			1975		1980	
			Low	High	Low	High
Type of ships		Estimates of efficiency				
1) Container ships		High Low	6.3 7.1	7.5 8.5	11.8 13.1	15.9 17.7
2) Cargoliners	Volume estimates for 1966					
	a) Maximum	High	50.5	57.6	56.6	64
	b) Minimum	Low	49.6	55.9	53.9	60.6

5. *Expected deadweight tonnage of the "other cargo vessels"*

a) Estimated tonnage of this section of the world fleet in 1966

The sectorial analysis has, in general, been concerned with merchant ships in service of over 1 000 grt excluding passenger vessels and the Great Lakes fleet. The year taken as a basis for the whole study has been 1966.

Therefore the fleet of "other cargo vessels" of over 1 000 grt in 1966 must be estimated by deducting the categories previously studied from the total. This category of "other cargo vessels" is a residual category which corresponds, on the whole, to short haul traders of very different types, of small dimensions, intended for the carriage of dry cargoes which are neither bulk commodities given to large specialized ships or tramps nor "general cargoes" carried by ocean-going cargo liners.

Table XXVII shows the method of calculating the basic tonnage of the category of "other cargo vessels".

TABLE XXVII

Classification of the world merchant fleet of ships over 1 000 grt. in mid 1966

	Million grt	Million tdw
World fleet (> 1 000 grt at 1.1.1966) (Lloyd's Register)	163.25	
of which: US reserve fleet	8	
other laid-up ships	0.85	
Great Lakes fleet	3.36	
	— 12.21	
Remaining operating sea-going fleet	151.04	
of which: tankers	62.05	
passenger vessels (estimate)	4.60	
	—66.65	
Remaining dry cargo vessels	84.39 equivalent to 119.8	
of which: bulk carriers		30.8
tramps		22.5
cargo liners		43
		— 96.3
Remaining "other cargo vessels"		23.5

To calculate the deadweight tonnage of the "other cargo-vessel" fleet in 1966, it has been necessary to start from the gross tonnage of the world fleet of ships of over 1 000 grt as calculated by the statistical tables of Lloyd's Register. Available statistics being heterogeneous, it has been necessary to begin the series in gross tonnage and end it in deadweight. The conversion has been made at the level of the dry cargo vessel fleet, by applying a coefficient of 1.42 tdw for 1 grt which is a suitable estimate for such a group of ships of relatively small dimensions.

The total deadweight tonnage of "other cargo vessels" amounts thus to 23.5m. tons. This figure corresponds fairly well to the Lloyd's Register statistics which indicated, at 1 July 1966, 16m. grt for cargo vessels of less than 4 000 grt but more than 1 000 grt. These 16m. grt are equivalent to about 22.7m. tdw, consequently a figure slightly lower than the one resulting from the calculations presented in Table XXVII. This difference can be explained by the fact that the latter estimate includes all dry cargo ships not previously studied, including some specialized units of over 4 000 grt, for instance large fully-refrigerated cargo vessels. On the other hand, cargo liners of under 4 000 grt are excluded from the estimate in Table XXVII.

b) Efficiency of this section of the merchant fleet

"Other cargo vessel" trade corresponds roughly to the carriage of "miscellaneous cargoes" studied under Chapter II (B-4c) the volume of which was estimated at between 152 and 186m. tons in 1966.

This range, of about 20% as regards the volume carried, due to the lack of precise statistics, gives rise to difficulty in calculating the efficiency of the corresponding fleet, for the basic year, 1966.

Although the actual efficiency rate is not known, it should be calculable. This is why an attempt has been made to restrict the ranges of forecasts for the future, as regards the expected efficiency in 1975 and 1980.

At all events, a strong rise in the efficiency of this section of the fleet is to be anticipated, because its units are mainly employed on short-haul trade and there will be a noticeable increase in the number of roundtrips due to a significant reduction in port time. This reduction will be consequent on the more general use of modern cargo-handling equipment in Europe and North America. Cargoes will be increasingly carried in unit loads: containers, pallets, half-trailers, often handled according to the roll-on/roll-off method.

Actually, most "miscellaneous cargoes" are similar in nature to general cargoes and many transports made by the "other cargo vessels" will be transhipments to and from large terminals for container ships and other fast long-haul cargo liners.

On the whole, it has thus seemed possible to foresee, for 1975, efficiency rates of between 7.7 and 8.3%. For 1980 both estimates of efficiency are by 5% higher than those calculated for 1975.

It was assessed that, in this category of ships, the expected effects of the present revolution in port equipment and handling facilities would mainly be felt in the next few years.

c) Expected deadweight of the fleet of "other cargo ships" in 1975 and 1980

On the basis of these estimates and of the earlier forecasts as to the volume of miscellaneous cargoes shipped in 1975 and 1980 Table XXVIII shows the corresponding forecasts for the total deadweight of the merchant fleet of "other cargo vessels" at the end of both periods considered.

TABLE XXVIII

Forecast deadweight tonnage of the world "other cargo vessel" fleet in 1975 and 1980

(million tons deadweight)

	1975		1980	
Estimates of growth	Low	High	Low	High
Millions tons of ' other dry cargoes"	240	305	335	395
Estimated efficiency ratings	7.7 to 8.3		8.1 to 8.7	
Million tons deadweight of "other cargo vessels"				
1. High efficiency	28.9	36.7	38.5	45.4
2. Low efficiency	31.2	39.6	41.4	48.8

The tonnages required to carry the cargoes anticipated will thus total 29 to 40m. tons deadweight in 1975 and 38 to 49m. tons deadweight in 1980.

C. *Comparison between the forecasts formulated by the overall approach and the sectorial analysis on world merchant fleet tonnage in 1975 and 1980*

1. *Choice of gross registered tonnage which will enable this comparison to be made*

As the tonnage of the world fleet is traditionally expressed in gross registered tons, this unit has been chosen for comparing the results of both studies, making it necessary to convert the forecasts of the sectorial analysis estimated in tons deadweight. The ratio for conversion adopted is 1.6 tdw for 1 grt in 1975 and 1.65 in 1980; this increase takes into account the foreseeable increase of the size of the average vessels, the largest ships of today already reaching a ratio of 2.

Table XXIX shows the sum of the forecasts of the sectorial analysis for each of the low and high estimates and compares the findings for 1975, as well as 1980, converted into gross registered tons, with the conclusions of the overall approach presented in Table XIV.

TABLE XXIX

Comparison of world tonnage in 1975 and 1980 as foreseen by the sectorial analysis and the overall approach

	1975		1980	
	Low estimate	High estimate	Low estimate	High estimate
A) Sectorial analysis (million tdw)				
Tank vessels	199	205.6	282.4	290.7
Bulk carriers	52.2	62.1	60.6	79.2
Tramps	14	17.3	8.8	11.7
Cargo liners	49.6	57.6	53.9	64
Container ships	6.3	8.5	11.8	17.7
Other cargo vessels	28.9	39.6	38.5	48.8
All types studied	350	390.7	456	512.1
Conversion factor deadweight/gross tonnage	1.6		1.65	
Corresponding gross tonnage (million grt)	218.8	244.2	276.4	310.4
B) Overall approach	266		337	
of which (estimate)				
Passenger vessels	4.6		4.6	
US reserve fleet	5		4	
Ships of between 100 and 1 000 tdw	13		16	
C) Adjusted overall forecast	243.4		312.4	
	Low	High	Low	High
D) Comparison Difference between the adjusted overall forecast and the sectorial analysis estimate:				
— in million grt	+ 24.6	— 0.8	+ 36	+ 2
— as a percentage	+ 11.2%	— 0.3%	+ 13%	+ 0.6%

2. *Necessary adjustment to the overall approach*

For the two years studied, the sum of optimistic forecasts of the sectorial approach is lower than the single forecast of the overall approach, but the difference—less than 10%—is mainly due to the fact that the two studies do not cover quite the same fields.

Indeed, it must be stressed that the sectorial analysis did not deal with passenger vessels and that ships of under 1 000 grt were outside its terms of reference.

Besides, it deals with the operational fleet only, which excludes, on one hand, the US reserve fleet and, on the other, the Great Lakes vessels. These latter units were left out of the overall approach but all other merchant ships of more than 100 grt are included, even those which will not be in service during the two years under study.

Therefore, the overall approach needs to be adjusted in order to allow a valid comparison. This adjustment consists in subtracting from the forecast formulated, the sum of estimates likely to be made for the tonnage that, in 1975 and 1980, the US reserve fleet, passenger vessels, and units between 100 and 1 000 grt might represent.

Allowance has been made for a decrease in the US reserve fleet due to super-annuation, a stability in passenger-vessel tonnage on the assumption that the boom in cruises will offset the decline of regular lines and finally quite a fairly considerable increase in the tonnage of small ships, which is still on the increase, despite the rapid trend towards large units, since the tonnage of this group has grown by 12% between 1962 and 1966, i.e. a percentage hardly lower than that of shipping as a whole (13.6%).

3. *General compatibility of the forecasts established by the two studies*

Adjusted in this way, the overall approach gives the same forecast for 1975 as the high estimate of the sectorial analysis, it remains superior by 11% to the low estimate. Despite the different procedures, the two studies give compatible, even similar results. For 1980, the differences become slightly wider, but the correlation between the single forecast of the overall approach and the high estimate of the sectorial analysis remains very good.

On the whole, however, the overall approach appears to be more "optimistic" than the sectorial analysis, as regards the tonnage of the world fleet because, in 1975, the former foresees a figure reaching the higher level of the range of the latter and, in 1980, it even exceeds this level.

4. *Differences in standpoints between estimates of future sea-borne tonnages and carrying capacities*

Is it to be inferred from this that the high estimate of the sectorial approach is to be taken into consideration rather than the low estimate? In fact, the first point to recall is that, in contrast with what we have just seen in the assessment of future merchant fleet tonnage, the best correlation between both studies, as regards forecasts on the volume of sea-borne trade, was found at the level of the low estimate of the sectorial analysis.

This change in the overall approach which, after seeming pessimistic at the first stage of the study, suddenly appears optimistic at the second one, calls for some explanation.

At first, one may think that, as the sectorial analysis was unable to enter into details sufficiently, it overlooked some of the potential for growth of the fleet, represented by very specialized types of traffic. It would, indeed, have been

desirable to study, for instance, the possible trend of the fleet of gas tankers or refrigerated cargo vessels. In fact, these specialized ships are included in the sectorial analysis, but in more general categories, in particular in the "other cargo vessels".

Furthermore, these categories represent only a relatively marginal tonnage. For instance, the sea-borne trade of natural liquefied gas will show a strong expansion in the future, but during the period studied, the LNG carrier fleet cannot be expected to reach any substantial tonnage: methane carriers operating in 1975 are already almost all commissioned, under construction, on order or under consideration. There will be about twenty at most, representing a total carrying capacity of 900 000 to 1 000 000 cu.m, i.e. a total deadweight of around 0.6 to 0.7m. tons, which is a negligible figure in comparison with that of the estimated level of the world fleet. Even if this figure trebled between 1975 and 1980, this fleet would attain about 2m. tdw only, which is much lower than the margin of error allowed by each forecast in the sectorial analysis. Let us also stress that a rise quicker than scheduled, in sea-borne methane trade, would result in a slackening in the expansion rate adopted for cargoes of other fuels either liquid or solid.

On the other hand, it is certain that, during the next decade, completely new types of ship will appear, carrying commodities not yet known or marketed. However, past experience shows that the effect of new trades remains marginal for many years. Without reverting to the example of methane carriers, mentioned above, but keeping to the field of LPG tankers, let us note that the remarkable increase of this fleet over about twenty years has only added the equivalent of one million tons deadweight to the world's merchant fleet.

Finally, the building of these new types of ship, should correlate to new additional traffic. The sectorial analysis is indeed already more optimistic in this field than the overall approach.

5. Future efficiency of the fleet differently assessed by the two studies

It thus appears that the explanation of the difference in standpoints we have seen between the two studies is to be found in the ratio that each establishes between the volume of sea-borne cargoes and the size of the world fleet at each period considered.

In other words, the two studies have made different estimates of the future trend of the efficiency of merchant ships. Table XXX illustrates this.

To simplify the comparison, the sectorial analysis has been reduced to the mean average between the low and high estimates. Despite the fact that the figures concerning world fleet and sea-borne trade are not fully comparable in the two studies, the difference in standpoints between them is shown clearly by the Table: the sectorial analysis has allowed for a far greater improvement in efficiency than the overall approach, between 1966 and 1975, and the difference grows even wider between 1975 and 1980.

In other words, the sectorial analysis has anticipated—as regards world fleet efficiency—early results from the technological revolution which is taking place in the shipping industry today. In fact, as only a modest increase in efficiency is estimated for tankers, bulk carriers and tramps, the "optimism" of the sectorial

TABLE XXX

Trend of world merchant fleet efficiency according to the overall approach and the sectorial analysis

	1966		1975		1980	
	Based on overall approach	Based on sectorial analysis	Overall approach	Average sectorial analysis	Overall approach	Average sectorial analysis
A) Volume of world sea-borne trade (Million tons) a) International transport b) International + national oil sea movements	1 750	1 873	3 068	3 254.5	4 049	4 419
B) World merchant fleet (million grt) a) All sea vessels > 100 grt b) Operating sea vessels > 1 000 grt	167.8	151.04	266	231.5	337	283.7
C) Corresponding rate of efficiency $\frac{A}{B}$	10.4	12.4	11.5	14.1	12	15.6
			From 1966 to 1975		From 1975 to 1980	
D) Increase of this rate of efficiency between the years referred to (%)			10.6	13.7	3.5	10.6

approach is mainly explained by the improvement in efficiency of ships designed to carry general and miscellaneous cargoes, expected from the more general use of modern handling systems and from the increase in service speeds.

On the other hand, the overall approach, according to the general thinking on which it is based, and because of the methods adopted, must assume that world fleet efficiency will not grow faster in the future than in the past, i.e. that there will be no sudden jump in the long-term trend of sea-borne trade.

At this stage, it has not seemed possible to choose between the two premises without compromising the basic thinking behind one of them.

Besides, as will be seen in the following chapter, this difference in standpoints tends to reduce at the level of estimated needs for newbuilding, as a rapid improvement in the average efficiency of the world fleet—or a section of it—implies its renovation and consequently the acceleration of the scrapping of superannuated ships.

By the same token, if a large proportion of superannuated, less efficient, tonnage is kept in service, progress towards increased productivity is slowed down.

To meet an additional demand for sea transport, which is assumed to be the same in both cases, it is necessary, according to the first standpoint, to build more ships to meet replacement requirements; according to the second, the pace of newbuilding must be raised to meet the need to expand the fleet.

CHAPTER IV

ESTIMATED NEWBUILDING NEEDS OF THE WORLD MERCHANT FLEET UP TO 1975 AND FROM 1975 TO 1980

A. *Overall approach*

1. *Newbuilding requirements based on the expected expansion of the fleet*

From the forecast of the overall tonnage that the world merchant fleet should reach in 1975 and 1980, it is easy to deduce by means of a comparison with the 1968 figure, the tonnage which must be built up to 1975, then up to 1980, to meet the expected expansion of sea-borne trade.

With a laid up tonnage of around half a million grt in 1968, representing a negligible percentage of the total (0.3%), the merchant fleet can be deemed to have been used, that year, if not at its full theoretical capacity, at least to the best of its potential, considering the operational conditions.

At the time of writing this report, the latest available data on world merchant fleet gross tonnage referred to 1 July 1968, and were taken from the Lloyd's Register of Shipping Statistical Tables.

At that date, the world's merchant fleet amounted to 190.7m. grt. It has appeared useful, in order to work from a basis closer to the time of writing this report, to estimate the fleet at 1 January 1969, by assessing the variations of tonnage recorded during the last half year. These variations include, added deliveries of new ships; deducted: losses and scrappings.

The first figure was taken from the Lloyd's Register of Shipping quarterly statistics on shipbuilding. It amounted to 8.6m. grt. The second figure was not yet published by the Lloyd's Register at the time of writing this report, and has been estimated at 2.2m. grt.

Therefore, the world fleet must have increased by 6.4m. grt during the last half year of 1968, and the round figure of 197m. grt can be taken as the basic tonnage as at 1 January 1969.

The overall estimates made earlier for world fleet tonnage, in 1975 and 1980, are assumed to date from the middle of each year, as they have been derived from the series of annual figures of the Lloyd's Register of Shipping, always calculated at 1 July. Therefore, the forecast of a fleet of 266m. grt, at 1 July 1975 implies that the expansion needs of the world fleet, as from 1 January 1969, would be met by deliveries reaching 69m. grt.

Between 1 July 1970, and 1 July 1980, when the fleet should reach 337m. grt, the additional demand would be 71m. grt.

The conclusion drawn from the overall approach is that between now and 1980, 140m. grt in all will have to be built to meet the foreseeable expansion of the world fleet.

2. *Newbuilding requirements based on the need for replacement of the fleet in service*

However, the expansion of the fleet is only one of the two sources of the demand for newbuildings; the other corresponds to the demand for replacement of the tonnage in service, resulting from losses and scrappings.

Forecasting in this field is particularly difficult because no very clear trend emerges, as can be seen from Table XXXI, which shows how, over the last 15 years, the tonnages lost or scrapped have fluctuated in absolute figures as well as in terms of the percentage of the world fleet.

TABLE XXXI

Scrapped or lost tonnage in grt and as a percentage of the total fleet (1)

Year	Scrapped grt	%	Lost grt	%	Total grt (million grt)	%	Fleet in million grt
1953	1 136 454	1.22	322 222	0.35	1 459	1.57	93 352
1954	1 505 377	1.54	262 369	0.27	1 767	1.81	97 422
1955	920 426	0.92	254 658	0.25	1 175	1.17	100 569
1956	528 322	0.50	248 535	0.24	777	0.74	105 200
1957	729 939	0.66	270 963	0.25	1 000	0.91	110 246
1958	1 451 832	1.23	347 546	0.29	1 799	1.52	118 034
1959	3 124 571	2.50	281 523	0.23	3 406	2.73	124 935
1960	3 285 099	2.53	358 180	0.28	3 643	2.81	129 770
1961	3 726 618	2.74	471 097	0.35	4 198	3.09	135 916
1962	3 036 221	2.17	481 098	0.34	3 517	2.51	139 980
1963	3 292 491	2.26	496 805	0.34	3 789	2.60	145 863
1964	2 480 704	1.62	558 200	0.36	3 039	1.98	153 000
1965	2 522 538	1.57	739 047	0.46	3 362	2.03	160 392
1966	2 578 457	1.51	822 538	0.48	3 401	1.99	171 130
1967	3 865 393	2.12	832 803	0.46	4 698	2.58	182 100
1968	3 747 052	1.93	770 447	0.40	4 518	2.33	194 152

(1) *Source:* Lloyd's Register, Statistical Tables, Table 15, annual average of civil year.

The figure for annual losses tends to increase faster than world tonnage, but the inconsistency from one year to another is such that no valid estimate of the trend for the future appears possible.

The figure for scrapped tonnage develops in an even more erratic way because each year it depends not only on the age structure of the world fleet, but even more on the prevailing situation in the freight market.

For instance, at the time the Suez Canal was first closed, there was very little scrapping, but the average age of the world fleet was low, because post-war reconstruction was hardly finished.

In 1967, on the other hand, there was substantial scrapping as the average age of the fleet was higher, owing to the amount of tonnage built at the end of World War II, "Liberty ships" being the best known type. But it can also be noted that the second closing of the Suez Canal did not have as marked an impact on the level of freight as the first one. The incentive to keep technically obsolete ships in service has been less strong than ten years ago, therefore.

3. *Difficulties in forecasting needs for replacement*

It seems impossible, therefore, to foresee how the various factors which determine the elimination of ships in service will develop during each year up to 1980.

Furthermore, more generally, one may wonder whether the "technical revolutions" which have been occurring in many fields of maritime transport over the years will influence the very structure of the process of renovating the fleet. In addition to physical factors: shipwrecks, wear and corrosion, and economic factors: level of freight, prices of scrap, a concept of technical obsolescence which practically did not exist in the past must be borne in mind.

The search for increased efficiency, which is a feature of the recent evolution of maritime economy, makes it probable that this new factor will emerge, but the scope of its influence is extremely difficult to determine, as only few ships spend their whole working life in the fleet of the shipowner who ordered them. The contractor-owner is most often a national of a developed country and when he thinks that a unit of his fleet is no longer economically profitable, because of technical developments in his sphere of activity, he replaces it by a new more suitable vessel, but the obsolete ship is not scrapped. In fact, there will be other shipowners in the world who are of the opinion that the ship can still be run economically in the light of her purchase price, operating costs and the state of the market in which they intend to use her. Consequently, the second-hand value of a ship remains much higher than her scrap value for a very long time.

For this reason, in the overall approach, based on the projection of past experience into the future, only foreseeable alterations in the age structure of the world's merchant fleet could usefully be considered for the purposes of forecasting.

4. *Pattern of elimination of the tonnage in service*

The past rate of the elimination of tonnage in service can be calculated from the Lloyd's Register of Shipping Statistical Tables, which, each year, at 1 July, classify the world fleet in five-year age groups.

Table XXXII shows the results of this calculation for the last 10 years, taken from 1959, which, each year, compares the total amount of each age-group with that of the younger age-group as estimated 5 years before. Thus, the comparison for 1959 is made with 1954 and so on.

It has not been possible, in this calculation, to consider the elimination of ships less than 10 years old. In fact, the total amount of the vessel age-group of 5 to 9 years is regularly bigger than that of ships of 0 to 4 years, 5 years before.

This paradoxical fact can probably be explained by the difficulty of obtaining accurate data on the number and tonnage of the latest ships.

TABLE XXXII

Rate of withdrawal of ships in service over the last ten years
(% withdrawn in relation to the tonnage of the lower group of ships five years earlier)

Age group as per 1 July 1) of the year considered 2) of the reference year		10-14 5-9	15-19 10-14	20-24 15-19	> 25 > 20
Years compared					
Year considered	Reference year				
1959	1954	1.07	3.01	8.77	26.34
1960	1955	0	6.14	11.48	36.05
1961	1956	1.42	9.44	16.92	39.90
1962	1957	2.34	11.67	22.94	42.43
1963	1858	2.58	11.07	24.12	45.51
1964	1959	0.93	10.81	22.70	45.81
1965	1960	1.29	10	21.73	38.67
1966	1961	1.15	8.29	22.22	35.26
1967	1962	0.67	7.19	21.62	37.88
1968	1963	0	6.88	20.75	39.51
Average withdrawal rate of each five-year age-group, over a five-year period		1.14	8.45	19.32	38.74

In the same way, gaps in the statistics for the oldest ships have complicated calculations further. To calculate the elimination rate of ships over 20 years old, it has been necessary to create an additional group to show, for each year considered, the sum of the tonnages of the age-groups "20 to 24 years" and "25 years and over".(1) This group has provided the bases of comparison, with the tonnage of the vessel-group "25 years and over" noted after five years.

The difference between the tonnage of the year considered and that of the reference year measures the elimination of ships aged over twenty years.

It has been considered useful to set up a theoretical model for the elimination of successive age-groups in the form of a curve shown in Fig. D, which plots the relationship between the initial tonnage and its duration in years. The points of the curve have been placed in the middle of each five-year period and calculated as a percentage of the initial tonnage by successively applying the rates of elimination (calculated in Table XXXII) to the remaining tonnages. Beyond twenty years, it has been assumed, in order to continue the curve, that the rate, calculated for all ships exceeding that age, would be applicable during the following period. This, of course, gives an unrealistic picture, as every ship disappears eventually.

Though the theoretical model, set up in this way, cannot give an accurate account of the elimination of the longest surviving ships, it does provide an estimate very close to the average rate of elimination of obsolete vessels, noted during the last ten years: in particular, it shows that, over this decade, the withdrawal of tonnage takes place at a very advanced average age: it has taken about 27 years to eliminate only half the initial tonnage of an age-group.

(1) The Lloyd's Register of Shipping has introduced an age-group "25 to 29 years" in its statistical tables since 1964 only.

5. Use of this model for forecasting future needs for replacement

For the future, the observation of past rates of elimination gives a basis for forecasting, in successive five-year periods, the replacement needs of the world fleet.

By applying the average rates of elimination, calculated in Table XXXII, to the initial tonnage of each age-group observed or calculated at the beginning of each period, the probable tonnage of the higher age-group at the end of the period can be obtained.

The sum of the difference between the probable tonnage and the initial tonnage of each age-group corresponds to the total replacement needs of the period. Table XXXIII shows this calculation for the five-year periods ending at 30 June of the years 1970, 1975 and 1980.

According to the estimate made in this way, the total demand for replacement from 1 July 1965 to 30 June 1970, would amount to 20.6m. grt. When deducting from this total 14m. grt which represent the tonnage lost or dismantled during the second half of 1965, and the years 1966, 1967 and 1968, there remains demand for replacement for 6.6m. grt for the period from 1 January 1969 to 30 June 1970. This figure is to be added to the 21.5m. grt foreseen for the period 1970-75, to calculate the replacement needs of the world fleet from the beginning of 1969 until mid 1975, which thus amount to 28.1m. grt.

TABLE XXXIII

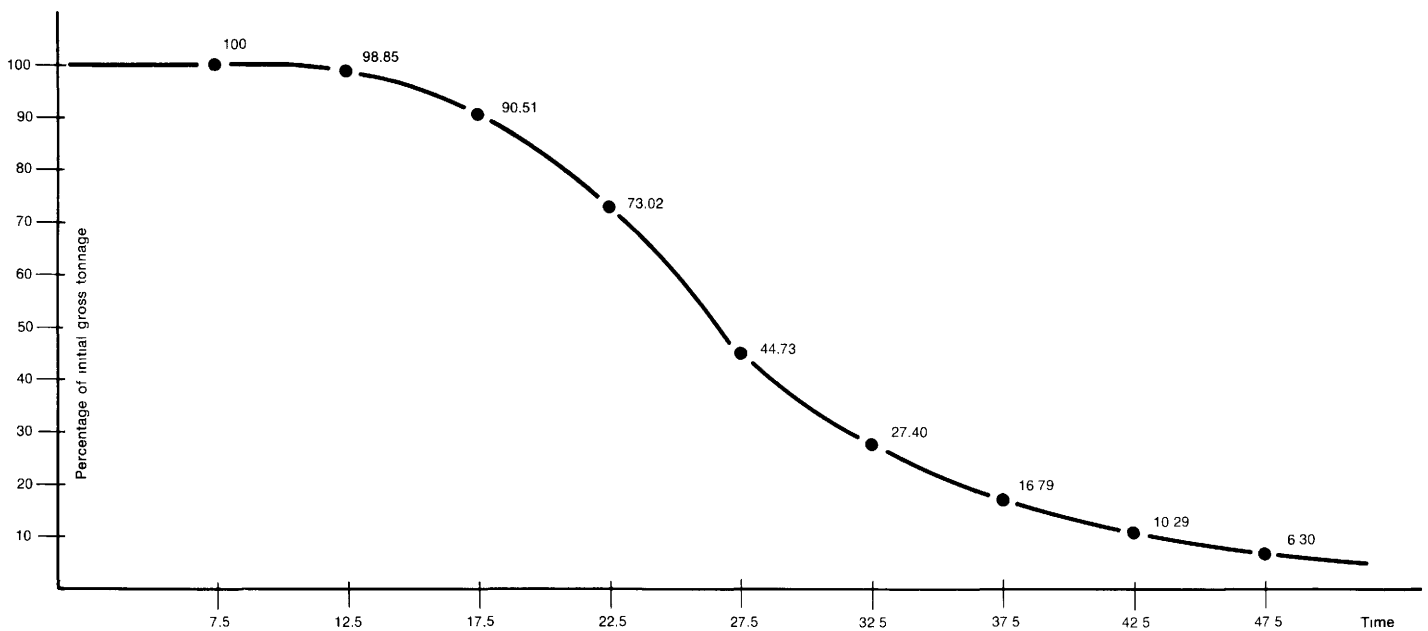
Estimated replacement needs of the world fleet for the three five-year periods ending in 1970, 1975 and 1980

(in million grt)

Position at the end of the periods	Age-group (years)	10-14	15-19	20-24	> 25 years	Total replacement needs
1.7.1965	Initial tonnage	41	22.9	12	41	
30.6.1970	Probable tonnage	40.5	21	9.7	25.1	
	Difference (replacement needs)	0.5	1.9	2.3	15.9	20.6
1.7.1970	Initial tonnage	43.5	40.5	21	35.2	
30.6.1975	Probable tonnage	43	37.1	16.9	21.7	
	Difference (Replacement needs)	0.5	3.4	4.1	13.5	21.5
1.6.1975	Initial tonnage	78.6	43	37.1	40.7	
30.6.1980	Probable tonnage	77.7	39.4	29.9	24.9	
	Difference (Replacement needs)	0.9	3.6	7.2	15.8	27.5

FIGURE D

MODEL FOR THE RATE OF ELIMINATION OF MERCHANT FLEET TONNAGE
ON THE BASIS OF THE EXPERIENCE OF THE PERIOD 1959 – 1968



By further adding 27.5m. grt for the period 1975-80 to that figure an overall forecast of 55.6m. grt for the demand for replacement during the whole period considered is obtained.

6. *Overall estimate of newbuilding requirements in the long and medium term*

The conclusions of the overall approach as regards the total for newbuilding needed to provide the expected expansion and replacement of the world merchant fleet, are grouped in Table XXXIV.

TABLE XXXIV

Overall estimate of new tonnage requirements for the periods 1969-75 and 1975-80

(in million grt)

Periods	1.1.1969 to 30.7.1975	1.7.1975 to 1.7.1980	Total (1.1.1969 to 1.7.1980)
Needs: 1. Expansion	69	71	140
2. Renewal	28.1	27.5	55.6
3. Total	97.1	98.5	195.6
Tonnage already on order as at 1.1.1969	49.2	—	49.2
Balance to be ordered for delivery before end of the period	47.9	98.5	146.4

This theoretical demand, calculated in terms of these two needs, should thus be met by average annual deliveries of new ships representing a tonnage of 17m. grt for the whole period of eleven and a half years under review, but if this period is divided at 1 July 1975, the annual averages drop to 14.94m. grt before that date, and rise to 19.7m. grt afterwards.

Of course, there will be no sudden fall-off in mid-1975 and these annual averages do not constitute forecasts; they are only intended as an illustration of the fact that the amount of newbuildings required will be relatively less substantial during the first six and a half year period, than during the second five years one.

It is worth mentioning here that there is cause for concern in the fact that, at the beginning of this first period of six and a half years, over half the total requirement is already covered by orders.

B. *Sectorial analysis*

1. *Tanker fleet needs for newbuildings*

a) Expansion needs

The world fleet of tankers of over 2 000 tdw in service at 1 January 1969, aggregated 119.5m. tdw; the needs for newbuilding to supply the expansion of the fleet expected by 1980 (ref. Chaper III-B.1) thus correspond to the high efficiency estimate, at 162.9m. tdw (of which 79.5m. tdw are to be delivered by 1975). According to the low efficiency estimate, the corresponding needs amount to 171.2m. tdw (of which 86.1m. tdw are to be delivered by 1975).

b) Replacement needs

As regards the needs corresponding to the renewal of the fleet in service, it has been assumed that losses due to accidents would, on average, represent 3% of the fleet deadweight, each year, up to 1980. This percentage has taken into account the last five years' percentages which varied between 1.5 and 4.5%.

For the ships to be scrapped during the period considered, various estimates have been made according to the age distribution of the fleet in service at 1 January 1969. The alternatives adopted are as follows:(1)

Alternative I : gradual withdrawal of obsolete ships.

Alternative II : systematic withdrawal of ships aged 20 years and older.

Table XXXV shows the impact of these two alternatives in 1975 and 1980 on the fleet in service as at 1 January 1969.

It has appeared useful to also present the foreseeable situation towards 1971-72 so as to give a better account of the anticipated process of elimination of old ships. This process is detailed as regards Alternative I. On the other hand, as regards Alternative II, Table XXXV only mentions the additional withdrawals implied by the quicker rate of replacement adopted for this estimate, and the total corresponding needs.

Finally, the demand for replacement is derived from a comparison of the tonnage in service at 1 January 1969, with the remaining tonnage of this fleet still operating in 1975 and 1980. This demand amounts to 39.6m. tons deadweight up to 1980 (of which 16.3m. tdw between 1969 and 1975) for Alternative I (as shown in Table XXXV).

Alternative II suggests an additional demand for replacement of 14.8m. tdw, of which 11m. by 1975. Alternative II, thus, implies a renewal proportionately much more marked in the first five year period of the next decade than in the second one. This is of course related to the present age structure of this section of the world tanker fleet.

c) Total deliveries of tankers needed and corresponding orders to be placed

Table XXXVI provides a basis for assessing the total need for new tonnage for the tanker fleet during the period under consideration in this report.

(1) See footnote to table XXXV.

TABLE XXXV

Forecast trend of the age structure of the world tanker fleet

Fleet at 1.1.1969			Fraction of the fleet in service at 1.1.1969 still operating					
			at 1.1.1972		1975		1980	
Years built	Age group (in years)	Deadweight (million tdw)	Age group	Deadweight (million tdw)	Age group	Deadweight (million tdw)	Age group	Deadweight (million tdw)
Alternative I - *Progressive withdrawal of obsolete ships*								
1945 & before	24 & +	6.5						
1946-1950	19 to 23	3.2	21 & +	6.5				
1951-1955	14 to 18	15.5	16-20	15.5	20 & +	11		
1956-1960	9 to 13	29.2	11-15	29.2	15-19	29.2	20 & +	14.8
1961-1965	4 to 8	34.9	6-10	34.9	19-14	34.9	15-19	34.9
1966-1968	0 to 3	30.2	4-5	30.2	8-9	30.2	13-14	30.2
All ships in service		119.5	Total	116.3		105.3		79.9
Cumulative losses since 1.1.1969				1.26		2.06		3.60
Remaining tonnage of the fleet in service at 1.1.1969				115.04		103.24		76.3
Cumulative replacement needs				4.46		16.26		39.6
Alternative II - *Withdrawal of all ships twenty years old and over* (1)								
Additional withdrawals with respect to alternative I				8.45		11		14.8
Cumulative replacement needs				12.91		27.26		54.4

(1) An alternative III - withdrawal of all ships aged 15 years and over - has also been examined; it led to cumulative replacement needs of 56m. tdw in 1975 and 89. 3m. tdw in 1980. This alternative has been left out, as it is hardly likely to become fact, at least during the first period, if we consider past experience. However, the coming out of super tankers might entail a renewal of the world tanker fleet during the second half of the next decade.

TABLE XXXVI

Long and medium term forecast needs of the world tanker fleet for newbuildings during the next ten years

(in million tdw)

Period			Fleet at 1.1.1969	Tonnage to be delivered during the period to meet needs				Already ordered at 1.1.1969	Orders to be placed after 1.1.1969
				For expansion	For replacement		Total		
					Alternative I	Alternative II			
1969/1980	Expected fleet in 1980								
	Estimates of productivity	High	282.4	119.5	162.9	39.6		202.5	52.6	149.9
							54.4	217.3	52.6	164.7
		Low	290.7	119.5	171.2	39.6		210.8	52.6	158.2
							54.4	225.6	52.6	173
1969/1975	Expected fleet in 1975								
	Estimates of productivity	High	199	119.5	79.5	16.3		95.8	52.6	43.2
							27.3	106.8	52.6	54.2
		Low	205.6	119.5	86.1	16.3		102.4	52.6	49.8
							27.3	113.4	52.6	60.8

On the whole, when combining the low efficiency estimate, which implies the strongest need for expansion, with Alternative II of ship-breaking which means the most substantial need for replacement, we attain a total demand for 225.6m. tdw, which constitutes the "optimistic" estimate. On the contrary, when combining the alternative of high efficiency, which implies the lowest need for expansion, with Alternative I of scrapping, which constitutes the lowest estimate of the replacement demand, we obtain a "pessimistic" estimate of 202.5m. tdw to be built between 1969 and 1980. However, the tonnage already on order at 1 January 1969, namely 52.6m. tdw must be deducted, to find the figures corresponding to the tonnage still to be ordered at that date, which thus amounts to a maximum of 173m. tdw and a minimum of 150m. tdw, for units to be delivered before mid 1980.

For the first period, the range of tonnage to be delivered before 1 July 1975, comes to between 95.8 and 113.4m. tdw and what remains to be ordered after 1 January 1969, represents only 82% to 115% of current tonnage on order.

Now, it must be noted that 90% of this tonnage will be delivered by the end of 1971 and about 7m. tons of OBO's should be added, which will not easily be employed in bulk shipping, as will be shown in the following section.

Despite the expected strong increase for this section of the world fleet, there is thus a risk of surplus capacity during the first years of the next decade.

2. *Bulk-carrier fleet needs for newbuildings*

a) Expansion needs

In 1980, the required bulk-carrier fleet would be a maximum tonnage of 79.2m. tdw to meet the high estimate of growth of the various trades. In the case of the low estimate, this tonnage is reduced to a minimum of 60.6m. tdw. Now at 1 January 1969, the tonnage in service had already reached 57.6m. tdw, which suggests, for this sector of the world fleet, expansion needs proportionately much lower than for tankers. Out of the tonnage in service in early 1969, there were indeed 10.2m. tdw of OBO's, three quarters of which at least were used for oil transport. However, the tonnage of these units must be included in the bulk-carrier fleet, for statistical reasons.

Therefore the expected expansion of the tonnage of this fleet, having regard only to the foreseeable increase in dry bulk trades, implies the delivery of 3m. tdw according to the low estimate and 21.6m. tdw according to the high estimate between the present day and the end of the next decade.

In the medium term, the inclusion, in the fleet capacity at 1 January 1969, of the whole deadweight of OBO's has of course a more misleading effect than in the long term.

In fact, whereas the high estimate of growth in trade leads to a possible expansion of 4.5m. tdw, the pessimistic estimate implies that the necessary tonnage is lower than the one operating in early 1969.

Nevertheless, if it is assumed that, at that date, 7.7m. tdw of OBO's were, in fact, being used for oil transportation, there would remain, even in the low estimate of

growth in trade, a remaining need for expansion by about 2.3m. tdw for dry cargo bulk-carriers proper, to be commissioned up to 1 July 1975.

b) Replacement needs

At first sight, these needs seem unlikely to be considerable. The bulk-carrier fleet is very recent, as we have already stressed in the preceding chapter, and this family of ships constitutes the youngest group within the world merchant fleet.

At 1 July 1968, 84% of the world bulk carriers were less than ten years old and units of five years of age and less represented 58.7%.

Therefore, the fraction of the fleet in service at the beginning of 1969 which will reach or exceed the age of twenty years will be only 4.9m. tdw in 1975 and 11.7m. tdw in 1980.

c) Uncertainties resulting from the inclusion of OBO's in the bulk-carrier fleet

World orders for bulk-carriers, including OBO's, reached 19.3m. tdw at 1 January 1969. This figure seems very high when compared with the foreseeable needs for newbuildings to be delivered before 1 July 1975.

This statement stresses the difficulties of forecasting in the field of bulk-carriers, because of the multipurpose design of OBO's.

The fact that statistics assimilate OBO's with other dry cargo bulk carriers can be traced back to the origins of this type of ship, which were created as a result of the idea of employing the side-tanks of ore-carriers to transport oil as homeward freight. The economic profitability of these units was consequently improved, but their carrying capacity in liquid cargo was lower than their iron-ore cargo dead-weight.

Today, techniques have evolved and the latest OBO's are genuinely multipurpose for their whole carrying capacity; therefore it is no longer possible to determine a priori what will be their main assignment during their working lives.

At all events, this type of ship is capable of maintaining a higher performance coefficient than a vessel of same capacity used exclusively for either oil or dry bulk cargoes.

Consequently, its competitive position on the freight market is better than that of a completely specialized vessel, which makes it popular with owners who, when ordering, cannot be sure of long-term charter contracts.

This is why very substantial orders for OBO's have been placed in the world since 1966, especially during the year 1968 when contracts reached the peak figure of 5.2m. tdw.

This trend has continued and most "bulk-carriers" ordered in 1969 are in fact OBO's.

Taking into account the expected growth in dry bulk cargo traffic, it cannot be assumed that the capacity of the OBO fleet in service or on order at 1 January 1969, the reference date of the present survey, will be used entirely for these cargoes during the period under review.

Such a use of this tonnage would entail too serious a lack of balance between transport capacity supply and demand. Under the circumstances, it has been assumed for this prospective survey that only a quarter of this fleet, in service and on order, at the reference date, would actually, on average, be used for dry bulk carriage.

This implies the corollary that 75% of the capacity of this fleet will be used—still on average—for oil transportation until 1980.

This estimate amounts to a transfer of 12.8m. tdw to the tanker fleet, which reduces the newbuilding needs estimated for this section of the world fleet by an equivalent amount.

Despite this transfer, the risk of a lack of balance mentioned above is not completely discounted and during the coming years temporary excess tonnage may appear as the bulk-carriers and OBO's now on order are delivered.

In fact, when taking a quarter of the deadweight of the present OBO carrier fleet into consideration, the world fleet of ships engaged in the transport of dry bulk cargoes can be estimated at about 60m. tdw at the beginning of 1969.

If the high estimate of growth in trades is adopted, the need for expansion until 1975 would reach 12.1m. tdw. This need, however, will be revealed only progressively during the 6 1/2 year period under review. Replacement needs must also be spread over the whole period.

At 1 January 1969, orders for ore carriers and bulk carriers proper, together with one fourth of the OBO tonnage on order, totalled 14.1m. tdw, most of which tonnage corresponds to ships which are to be delivered in 1969 and 1970.

Up to date, the expansion of sea-borne trade has facilitated the use of the new ships commissioned, but this situation may perhaps not carry on for many months. Consequently, temporary excess tonnage may appear during the first half of the next decade and this will have to be corrected by the laying up of a fraction of the fleet, in theory equal to the surplus noted.

If this situation lasts long enough, the least profitable ships, generally the oldest ones, will perhaps be scrapped. From this standpoint, for this section of the fleet, two alternatives of scrapping more drastic than that for tankers, have been adopted with reference to be replacement needs appearing in table XXXVII: alternative I corresponds to the systematic scrapping of all ships of 20 years and over, alternative II to the gradual elimination of vessels of 15 years and over.

d) Total newbuilding needs for bulk-carriers

Despite these hypotheses of particularly early scrapping, the figures presented in table XXXVII only reveal poor prospects as regards the newbuilding needs of this sector of the world merchant fleet and, consequently, new orders for vessels only intended for dry bulk cargo trades are also likely to be limited.

In fact, statistically, the whole 10.2m. tdw representing OBO's must be included in the bulk-carrier fleet in service at 1 January 1969, as they have not been classified elsewhere.

Consequently, the total need for newbuildings ranges between 15 and 42m. tdw for the long term period. In the medium term, only the combination of the high

TABLE XXXVII

Long and medium term forecast needs of the world bulk-carrier fleet for newbuildings

(in million tdw)

Period	Expected fleet in 1980 corresponding to dry bulk transports only (single deck vessels over 10 000 tdw)		Fleet at 1.1.1969 including OBO carriers	Tonnage to be delivered during the period to meet needs			Total needs for delivery during the period	Tonnage on order at 1.1.1969 including OBO carriers	Orders to be placed after 1.1.1969 OBO's for oil transport (1)	
				For expansion	For replacement					
					Alternative I	Alternative II			0%	75%
1969/1980	Expected fleet in 1980						14.7	19.3	—	8.2
	Estimate of growth	Low 60.6	57.6	3	11.7	20	23	do.	3.7	16.5
		High 79.2	do.	21.6	+do.		33.3	do.	14	26.8
							41.6	do.	22.3	35.1
1969/1975	Expected fleet in 1975						—	19.3	—	—
	Estimate of growth	Low 52.2	57.6	—5.4	4.9	8	2.6	do.	—	—
		High 62.1	do.	4.5	do.	do.	9.4	do.	—	2.9
							12.5	do.	—	6

(1) These are ore-bulk-oil carriers in service or on order as at 1 January 1969 which represented a total deadweight of 17.1m. tons; 75% of this figure thus represents 12.8m. tdw.

estimate of growth with the high alternative of scrapping would allow a forecast of delivery requirements amounting to 12.5m. tdw up to 1 July 1975.

As regards new orders to be placed after 1 January 1969, the amount of tonnage already on order at that date, for bulk-carriers proper as well as OBO's, reduces the needs still to be met. These needs, on the other hand, will be increased by the fact that, during the period considered, a capacity corresponding to three quarters of the deadweight of OBO's in service or on order at the reference date, will probably be used for oil transportation.

According to this assumption, and to the most favourable combination of expansion and replacement demand, additional orders for bulk carriers corresponding to the dry bulk-cargo trade only, should total 35m. tdw, to be delivered before mid-1980, out of which 6m. tdw should be commissioned before 1 July 1975.

e) The recent acceleration in the rate of orders for OBO's increases the uncertainties of forecasting

This forecast, concerning the maximum level of orders to be placed in the medium term, seems to be contradicted by the fact that particularly substantial orders for bulk carriers were recorded during the first two quarters of 1969. According to Fearnley & Egers, world orders amounted to 25m. tdw at 1 July 1969. This increase as against the beginning of the year, which occurred despite very substantial deliveries, is explained by the placing of new orders for 19m. tdw since the index date adopted for this study.

All these orders concern ships to be delivered before 1975.

One cannot simply conclude that 3m. at least of these new orders are in excess. In fact, more than half, namely 4.6m. tdw, are for OBO's with a deadweight of 100 000 tons or more. Units of this type represent around 12m. tdw of world orders at 1 July 1969, a fact which stresses the prominent part played by the growing number of ships of this type in the future development of the world fleet.

It must be emphasized again that the ordering of OBO's has less and less connection with the foreseeable needs for transportation of dry bulk commodities. At present, these units are most often used by owners for the crude oil trade. However, shipowners fear the competition of tankers of 200 000 tdw and over; this is why they choose multi-purpose units designed to give better profitability than tankers proper of same tonnage.

Under these circumstances, OBO's will tend to replace tankers of 50 000 to 120 000 tdw for carrying oil cargoes which cannot be given to bigger ships.

The versatility of a rapidly increasing section of the world fleet tends to increase its efficiency but this phenomenon considerably increases the uncertainties as regards the future balance between supply and demand in the field of sea-borne transport capacity.

In fact, one might be tempted to attribute all these additional orders for OBO's to the newbuilding needs of the tanker fleet. However, once commissioned, these units will also influence the market of the sea-borne transport of dry bulk cargoes. The importance of this impact will depend basically on the future development of oil transportation, a sector on which unforeseeable variations in the world political and economic situation have a strong influence.

Therefore, in the medium term, durable excesses of tonnage may appear as regards either the fleet likely to carry bulk cargoes, or the tanker fleet.

If this happened, the oldest ships now in service would become obsolete more rapidly, and would be laid up, and then probably scrapped.

Consequently, the size of recent orders would tend to make the high alternative of scrapping foreseen for this section of the world fleet the more probable one.

3. *Newbuilding requirements for the world cargo-vessel fleet*

a) Types of ship covered by the present section

Under this section are grouped all foreseeable needs for merchant ships over 1 000 grt which are neither tankers nor bulk carriers; namely, in general, twin or multi-deck cargo-vessels, including cargo-passenger vessels, but excluding passengerliners and ferry-boats mainly used for passenger transportation. Consequently, expansion needs for each section of the world fleet will be assessed as follows: tramps, ocean-going cargo-liners, container ships and "other cargo vessels". It has appeared necessary, when dealing with forecasts for these expansion requirements, to consider these various types of cargo-vessels as a whole; in fact, limits between the various categories are not very definite and their future development will certainly be interconnected. Furthermore, the statistical data available necessitated a re-grouping of this type for the purposes of estimating replacement needs.

b) Expansion needs

Table XXXVIII compares the sums of the various forecasts formulated in Chapter III-B, for these types of ships with the corresponding fleet in service as at 1 July 1968, which was taken from the Lloyd's Register Statistical Tables. These Tables have permitted an estimate of the fleet, through deduction from the other categories, at 71m. gross tons, which, when applying the coefficient of 1.4, gives an estimated total deadweight of 99.4m. tons.

This Table also shows the distribution of the total deadweight tonnage according to types of vessel in 1966, which is the last year with available data on the distribution in tdw.

According to the low estimate, no expansion needs can be expected until 1975.

The inclusion of tramps in this group, for the reasons mentioned above, has a misleading effect on the calculated needs for expansion. Tramps are, indeed, a type of ship for which quite a noticeable decrease in tonnage is due to occur, according to all the estimates, during the period studied. This is why it must be considered that, even in the hypothesis of lowest growth of the fleet, expansion needs will have to be satisfied until 1975, for the other categories. But these, in terms of tonnage, will not exceed the anticipated reduction in the tramp fleet deadweight.

c) Replacement needs

As regards the replacement needs, the fact that the average age of tramps is very high, has an offsetting, effect on the behaviour of the whole group studied. Table XXXIX gives an estimate of the replacement demand, according to the age structure of this section of the fleet.

TABLE XXXVIII

Medium and long term needs for the expansion of the world cargo-ship fleet

(in million twd)

Types of cargo vessel	1966	1968	Forecasts			
			1975		1980	
			Estimates			
			Low	High	Low	High
Tramps	22.5		14	17.3	8.8	11.7
Container ships			6.3	8.5	11.8	17.7
Cargo liners (high sea)	43.5		49.6	57.6	53.9	64
Other cargo vessels	23.5		28.9	39.6	38.5	48.8
Total	89.5	99.4	98.8	123	113	142.2
Newbuilding needs according to foreseen growth				23.6	13.6	42.8

As regards losses, the estimate has been made according to the average percentage experienced in recent years.

Concerning tonnage to be scrapped, two alternatives have been considered for cargo-vessels. Alternative I foresees the gradual scrapping of all ships over 26 yars; Alternative II shows the effect of elimination of ships exceeding 21 years.

It may be assumed that, if the fall in freight rates resulting from the anticipated surplus capacity of the bulk-carrier fleet, during the first half of the next decade, occurs, it will also affect the sector of tramps and perhaps the other cargo vessels.

In addition, in the field of cargo liners, the oldest section of the fleet will face difficulties arising from the competition of container ships. This is why it has appeared reasonable to foresee that the cargo-ship fleet will get younger, to a perceptible extent under Alternative I and considerably if Alternative II becomes reality.

Despite the difference between these two alternatives as regards the possible renewal of the cargo-ship fleet, the range of the replacement needs corresponding to each alternative is not too wide because of the age structure of the fleet which, at 1 July 1968, still had more than 15% of ships over 25 years old.

The maximum replacement needs up to 1980 total 47.3m. tdw and the minimum needs, 44.4m. tdw. When we consider the medium term prospects, up to 1975, these needs are set at a maximum of 33.3 and a minimum of 26.3m. tdw.

TABLE XXXIX

Long and medium term needs for replacement of the world cargo-ship fleet according to the alternatives adopted for the rate of scrapping

(in million tdw)

Date built	1.7.1968		1.7.1975		1.7.1980	
	Age group	Fleet	Age group	Fleet	Age group	Fleet
A. Alternative I - Gradual withdrawal of ships over 26 years old						
1938 and preceding years	30 years and over	4.54				
1939-1943	25-30	10.32	32 and over	3.00		
1944-1948	20-25	13.37	27-31	5.00	32 and over	2.00
1949-1953	15-20	11.02	22-26	10.00	27-31	5.00
1954-1958	10-15	19.40	17-21	19.40	22-26	16.00
1959-1963	5-10	20.52	12-16	20.50	17-21	20.50
1964-1968	0-5	20.23	7-11	20.20	12-16	20.20
Total		99.40		78.10		63.70
Accumulated losses				5.20		8.70
Remaining fleet of ships in service at 1.7.1968				72.90		55.00
Accumulative replacement needs				26.50		44.40
B. Alternative II - Gradual withdrawal of ships over 21 years old						
Additional withdrawals compared with Alternative I				7		2.9
Accumulated replacement needs				33.50		47.30

d) Total newbuilding needs for cargo vessels

Table XL presents the general forecast which can be formulated for world cargo fleet deliveries taking place between 1 July 1968, reference date adopted for this sector, and the end of both periods considered: the long term needs vary from 58 to 90m. tdw; the fraction to be delivered in the medium term represents 26 to 57m. tdw.(1)

As the orders at 1 January 1969, are relatively lower, when compared with delivery needs, than those for tankers, and, particularly lower than those for bulk carriers, this sector presents interesting prospects for the newbuilding market, especially during the first period, extending until 1975, a period during which the cargo-vessel fleet needs for replacement are particularly great. On the whole, for delivery before 1980, there remains a maximum tonnage of 78.2m. tdw to be ordered, and a minimum corresponding figure of 46m. tdw. The corresponding figures for tonnage to be delivered before 1975 amount to a maximum of 45.2 and a minimum of 14m. tdw.

(1) The needs have to be reduced by 1.8 million tdw to bring them into line with the reference date: 1 January 1969, which has been retained for the other sectors.

TABLE XL

Long and medium term forecasts on the needs of the world cargo-ship fleet for newbuildings

(in million tdw)

Period		Fleet at 1.7.1968	Tonnage to be delivered during the period				Tonnage on order at 1.1.1969	Orders to be placed after 1.1.1969
			Expansion needs	Replacement needs		Total (1)		
				Alternative I	Alternative II			
1969/1980	Expected fleet in 1980	99.4	13.6	44.4		56.2	10.1	46.1
	Growth estimates — Low 113				47.3	59.1	id.	49
	Growth estimates — High 142.2	id.	42.8	id.		85.4	id.	75.3
					id.	88.3	id.	78.2
1969/1975	Expected fleet in 1975	99.4	— 0.6	26.5		24.1	10.1	14
	Growth estimates — Low 98.8				33.5	31.1	id.	21
	Growth estimates — High 123	id.	+ 23.6	id.		48.3	id.	38.2
					id.	55.3	id.	45.2

(1) To bring the reference date back to 1 January 1969, totals have been reduced by the deadweight tonnage of ships delivered during the last two quarters of 1968, namely 1.8m. tdw.

C. *Comparison between the overall approach and the sectorial analysis*

1. *Conversion into gross registered tonnage of the need for newbuilding, as calculated in deadweight by the sectorial analysis*

For the last stage of this study of the prospects of demand on the world shipbuilding market, the newbuilding deliveries requirements, for each period considered, estimated by the overall approach, must be compared with the sum of the forecasts of the sectorial analysis, for both the high and low estimates.

To make this comparison, the results of the sectorial analysis expressed in tons deadweight must be converted into gross registered tons. But, unlike what was possible for the comparison of the tonnage of the whole world fleet, it has not been possible to retain a single coefficient to be applied to the results of the sectorial approach. Here, we are dealing with future ships, whereas the fleet in service includes a large fraction of old units, which has permitted us to foresee, in the preceding chapter, a gradual increase in the traditional ratio of 1.4 tdw/1 grt.

For tankers, which represent the major part of tonnage to be built in all the estimates, it has seemed necessary to distinguish three categories: very large tankers, for which a ratio of 2 has been adopted, tankers for refined products with a ratio of 1.5 and all other tank vessels which, generally, transport crude oil on trade routes, excluding giant units, to which a ratio of 1.7 tdw for 1 grt can be applied.

To find one average coefficient for all tank-vessels, the orders to be placed by 1980 have been classified according to these three categories. 77% of the total deadweight tonnage should be constituted by very large tankers, 9.5% by refined product tankers and consequently 13.5% by medium-sized tankers. The compensated ratio obtained is thus 1912 tdw for 1 grt or vice-versa 0.523 grt for 1 tdw.

The same conversion coefficient cannot be applied to ships to be delivered up to 1975. In fact, among these orders, the share of very large tankers will be smaller at the beginning of the next decade than at the end of this period. In addition, the needs for refined product tankers will be noticeably more substantial in the coming years than between 1975 and 1980, according to what was predicted in Chapter II-B.

Under these circumstances, the following distribution has been adopted for the period 1969-75: 64% of very large tankers, 11% of refined product tankers, and 25% of medium-sized ships. On the whole, the ratio is established at 1 873 tdw for 1 grt and vice-versa 0.534 grt for 1 tdw. For bulk carriers, only one coefficient of 0.625 grt per tdw has been used.

As regards cargo vessels, a compensation factor has also been applied, based upon a likely distribution between tramps, cargo liners, reefers, container ships and other vessels.

A high conversion coefficient of 0.85 has thus been obtained; it reflects the fact that, except for tramps, the cargo vessels recently ordered have a relatively high gross tonnage as compared with their deadweight.

TABLE XLI

Long and medium term needs for newbuildings to be delivered after 1 January 1969

(in million tdw or grt)

A) Sectorial Analysis	Coefficient for conversion of tdw into grt		Period 1969-1980 Estimates				Period 1969-1975 Estimates				Period 1975-1980 Estimates	
			Low		High		Low		High		Low	High
	Until 1980	Until 1975	tdw	grt	tdw	grt	tdw	grt	tdw	grt	tdw	grt
Tankers Total needs	0.523	0.534	202.5	105.9	225.6	118	95.8	51.2	113.4	60.6	54.7	57.4
Bulk carriers	0.625		14.7	9.2	41.6	26	—	—	12.5	7.8	14.7	18.2
Cargo vessels	0.85		56.2	47.8	88.3	75.1	24.1	20.5	55.3	47	27.3	28.1
Total			273.4	162.9	355.5	219.1	119.9	71.7	181.2	115.4	96.7	103.7

B) Comparison of sectorial analysis	Sectorial low	Overall	Sectorial high	Sectorial low	Overall	Sectorial high	Sectorial low	Overall	Sectorial high
and of overall approach (in million grt)									
Total needs for newbuildings for the period	162.9	195.6	219.1	71.7	97.1	115.4	96.7	98.5	103.7
Average annual needs	14.2	17	19.1	11	14.9	17.8	19.3	19.7	20.7
% "sectorial" compared with "overall"	— 16.7		+ 12	—26.2		+ 18.8	— 1.8		+ 5.3
		Average sectorial			Average sectorial			Average sectorial	
C) Completed sectorial analysis									
Passenger vessels	3		3	1.5		1.5	1.5		1.5
Vessels from 100 to 999 grt	9.5	203.5	9.5	5.6		5.6	3.9		3.9
Completed total needs	175.4	17.7	231.6	78.8	100.7	122.5	102.1	105.6	109.1
Average annual needs	15.3		20.1	12.1	15.5	18.8	20.4	21.1	21.8
% completed "sectorial" compared with "overall"	— 10.3	+ 4	+ 18	— 18	+ 3.8	+ 26.2	+ 3.5	+ 7.2	+ 10.8

2. *Comparison of newbuilding needs*

Table XLI shows the sums of the low and high estimates made by the sectorial analysis, as regards the long and medium term needs for new tonnage to be delivered from 1 January 1969 onwards, to satisfy the expansion and replacement needs of the world fleet for tankers, bulk carriers and cargo vessels, until mid 1980, distinguishing the proportion which is to be commissioned before 1 July 1975.

For each category of ships, the deadweight tonnage, as previously mentioned, has been converted into gross tonnage, so that results may be compared with those of the overall approach. It must be pointed out that, as the relative importance of cargo vessels is much greater in the estimate expressed in grt than in that expressed in tdw, the wide range of these forecasts during the first period leads to a high estimate which is 60% above the low estimate, expressed in grt, whereas in tdw the difference is only 50%. On the other hand, in the second period, the range is very narrow: 7% in tdw.

The result of the overall approach, at 195.6m. grt is in the long term, very near that of the average of the two estimates adopted by the sectorial analysis, which would be 19m. grt.

As regards medium term prospects, the differences are more marked: the needs forecast by the low estimate of the sectorial analysis are about 26% lower than the single overall forecast. Between the latter and the high estimate, the difference is not as wide but is still almost 19%.

These significant differences are of course compensated for, between 1975 and 1980, as, during this period, the overall approach approximates far more closely to the forecasts of the sectorial analysis, the range of which narrows. This lack of balance between the two successive periods is to be attributed to the divergences existing between both studies as regards the rate of replacement of the fleet. These divergences are of course more noticeable in the case of the high alternative of scrapping, especially during the first period studied, taking the age structure of the present fleet in service into account.

However, in general, if we look at the whole period, the consequences of the differences noted between both studies about the future efficiency of the merchant fleet happen to be self-adjusting when estimating the part of total demand derived from needs for replacement, as suggested at the end of Chapter IV.

3. *Comparison of the needs for replacement foreseen by the two studies*

Table XLII compares the very noticeable differences which result, as regards scrapping, between the standpoint adopted by the overall approach, according to which the rate of elimination of operating ships would be the same in the future, as in the past, and from the standpoint adopted by the sectorial analysis, which adopted, even in the lower alternative, a much higher rate of scrapping. Such a rate can be justified by the upsurge of new techniques in maritime transportation which accelerate the obsolescence of ageing ships by strongly increasing the efficiency of the most up-to-date tonnage.

Apart from this technical phenomenon, the sectorial analysis suggests that the consequences of a possible freight crisis in the sector of dry cargoes may be added. If such a crisis occurs during the first half of the next decade, it would probably

TABLE XLII

Comparison between long and medium term forecast needs for replacement according to the overall approach and the sectorial analysis

(million tdw or grt)

	Period 1969-1980				Period 1969-1975			
	Alternatives				Alternatives			
	Low		High		Low		High	
	tdw	grt	tdw	grt	tdw	grt	tdw	grt
A) Sectorial analysis								
Tankers	36.6	19.1	54.4	28.5	16.3	8.7	27.3	14.6
Bulk carriers	11.7	7.3	20	12.5	4.9	3.1	8	5
Cargo vessels	44.4	37.7	47.3	40.2	26.5	22.5	33.5	28.5
Total	92.7	64.1	121.7	81.2	47.7	34.3	68.8	48.1
Average of both alternatives (in grt)	72.65				41.2			
B) Overall approach (grt)	55.6				28.1			
C) Comparison between the results of the two studies	Alternatives				Alternatives			
	Low		High	Average	Low		High	Average
Additional needs foreseen by the sectorial analysis								
In gross tonnage	8.5		17.05	25.6	6.2		13.1	20
As a % of the overall forecast	+ 15.3		+ 30.7	+ 46	+ 22.1		+ 46.6	+ 71.2

result in the laying up and scrapping of the surplus tonnage which will correspond to the oldest ships.

Thus, the total needs for replacement up to 1980 as defined by the sectorial analysis amount to a minimum of 69.1m. grt and a maximum of 81.2m. grt, whereas the overall approach adopts a tonnage of only 55.6m. grt. The average foreseen by the sectorial analysis is thus about 30% above the figure reached by the overall approach. This difference becomes almost 47% as regards medium term prospects up to 1975, because of the considerable difference—over 70%—which exists between the overall forecast and the high sectorial alternative for this period.

4. *Complement to the sectorial analysis for passenger vessels and small ships*

a) Relevance of such a complement

At the level of the estimate of newbuilding needs, as well as that of the forecast of world fleet tonnage, the comparison of the two studies is somewhat distorted because of the lack of sectorial forecasts for the category of passenger vessels and that of small ships of 100 to 999 grt which are both included in the terms of reference of the overall approach. This is why a rapid estimate of delivery requirements, for these two categories of ships, will be found below.

These estimates have been made in gross tonnage, which was obligatory for passenger vessels and was also more normal for small ships, because of the definition in grt adopted for their tonnage limits.

Moreover, it has not appeared necessary to formulate alternatives of growth and rates of scrapping as far as these two sectors are concerned.

The forecasts formulated hereafter are thus single.

The method adopted in this way should theoretically have led to reduce the findings of the overall approach rather than to complete the sectorial analysis, but it has appeared more consistent with the aim of this report to cover as much as possible of the field of world demand for merchant ships.

b) Passenger vessels

It has been assumed in Chapter III-C that the tonnage of this sector of the merchant fleet would remain stable during the whole period considered.

Consequently, no need for expansion is foreseen for passenger vessels.

But this stability hides widespread transformations due to the foreseeable alterations of passenger traffic: the regular passenger services will almost completely disappear on high sea routes, because of competition from the air. On short sea routes, these services will continue and probably increase, but they will be provided more and more by units of the car-ferry type, of relatively small tonnage.

As regards lage passenger liners, it can be stated that sea cruises will keep increasing rapidly, and this will enable the survival of passenger vessels catering only for tourists.

This expected transformation of traffic cannot be achieved only by converting operating ships, many of which are too old to undergo the necessary conversion sufficiently economically.

It can thus be assessed that from now up to 1980, two thirds of the fleet in service, which at present aggregates 4.6m. grt, will be replaced. The figure will thus be 3m. grt half of which should be delivered before 1 July 1975.

c) **Ships from 100 to 999 grt**

For small ships of less than 1 000 grt, it has been foreseen, in Chapter III-C that the increase of the fleet should amount to 13m. grt towards mid-1975 and 16m. grt on 1 July 1980, as against 8.9m. at 1 July 1968. The need for expansion can thus be assessed at 7.1m. grt for the whole period, of which 4.1 by 1975.

At 1 July 1968 the section of this fleet consisting of ships of twenty years and over amounted to 2.4m. grt. In 1980, those units would be over 32 years old. Consequently, despite the surprising length of life of some small units, it seems reasonable to anticipate that, at least, an equivalent tonnage will be scrapped by that time, which enables us to calculate the replacement needs. Out of this total, 1.5m. grt represent ships of 25 years and over and will probably be withdrawn before 1975.

Thus, on the whole, the newbuilding demand for small ships can be estimated at 9.5m. grt for the period from 1 July 1968 to 1 July 1980. For the medium term, the corresponding figure is 5.6m. grt.

The statistical tables of Lloyd's Register do not show the tonnage of units under 1 000 grt delivered during the 2nd half of 1968, nor that of ships on order at 1 January 1969. Nevertheless, as regards these latter, statistics of their numbers are given in the two following tonnage classes: 100 to 499 grt and 500 to 999 grt.

When estimating the average gross tonnage of ships in these categories at 300 in the first case and 800 in the second, the tonnage on order at 1 January 1969, can be fixed at about 480 000 grt. This figure is probably not much above the annual output of ships of this size as delivery dates for these very small vessels are short. This thus permits an estimate of between 200 000 and 240 000 grt for the world production of ships of less than 1 000 grt during the second half of 1968.

Deliveries to be carried out from 1 January 1969 to 1 July 1980, thus amount to approximately 9.3m. grt out of which 5.4m. grt should be commissioned before mid-1975.

d) Summing up of complementary needs

On the whole, the high and low estimates of the sectorial analysis expressed in grt must be adjusted, by adding a need for passenger vessels and small ships deliveries of a total tonnage of 12.5m. gross tons up to mid-1980, out of which 7.1m. gross tons are required before 1 July 1975.

5. Possibilities for new orders from early 1969 onwards

a) **Long and medium term demand** for newbuildings

The future demand on the international shipbuilding market can be more accurately assessed from the sectorial analysis, by an addition of the orders still to be placed from 1 January 1969 onwards, and those estimated for tank vessels, bulk carriers and other cargo vessels and deducting from the delivery requirements, for each

category, the corresponding tonnage under construction or on order at 31 December 1968.

On Table XLIII these forecasts have been summed up and their deadweight converted into gross tonnage, according to the coefficients previously adopted.

At this stage, account is taken of the hypothesis formulated under the heading of bulk carriers, according to which 12.8m. tdw of OBO's would be assigned to oil trade.

This transfer reduces by the same amount the tanker deadweight tonnage still to be ordered in the corresponding estimate.

The passenger vessel order-book totalled, in January 1969, 490 000 grt and previously, the small ship tonnage under construction or on order was estimated, at the same date, at 480 000 grt.

The new tonnage delivery needs for each of these categories calculated under the preceding paragraph, have thus been reduced by 0.5m. grt each, on Table XLIII.

Therefore, at the beginning of 1969, there remained between 127.5 and 183.7m. grt in orders still to be placed for ships to be delivered before 1 July 1980.

When restricting needs to the medium term, the corresponding figures are respectively 34.1 and 73.9m. grt.

In both cases, the overall forecast: 146.7m. grt in the long term and 47.9m. grt in the medium term, is situated between the minimum and maximum alternatives of the sectorial analysis. As in the case of total delivery needs, the overall forecast is nearer the low estimate of the sectorial analysis.

b) Irregularities in the rate of concluding contracts for newbuildings

It seems impossible to predict how orders still to be placed will be spread over the future, to meet the foreseeable newbuilding needs. In fact, as we have seen especially when discussing the OBO carrier problem, shipowners do not decide to order ships according to these needs, but they rather consider the profits they can hope to achieve.

The favourable economic situation in shipping which has lasted for several years has continued in 1969 and, according to Lloyd's Register of Shipping quarterly return, over 14m. gross tons were ordered during the first half of 1969.

By comparison with all the estimates of the need for ships to be delivered before 1 July 1975, these orders represent a tonnage far superior to the foreseeable half-yearly average.

6. *The medium and long term prospects of the newbuilding market*

In conclusion of this chapter and of the first part of this report, it must be stressed that, despite the differences which have appeared between both studies at the various stages at which comparisons were made, the sectorial analysis confirms the overall approach, quantitatively in that its high and low estimates as regards the long and medium term prospects of newbuilding needs, expressed in gross tonnage, fall either side of the figures arrived at by the overall approach.

TABLE XLIII

Long and medium term needs for newbuildings still to be ordered after 1 January 1969

	Coefficient for conversion of deadweight into gross tonnage		Period 1969-1980				Period 1969-1975			
			Estimates				Estimates			
			Low		High		Low		High	
	Until 1980	Until 1975	tdw	grt	tdw	grt	tdw	grt	tdw	grt
A) Sectorial analysis										
Tankers	0.523	0.534								
Total needs			149.9		173		43.2		60.8	
part of which covered by OBO's			12.8		12.8		12.8		12.8	
Still to be ordered			137.1	71.7	160.2	83.8	30.4	16.2	48	25.6
Bulk carriers	0.625		8.2	5.1	35.1	21.9			6	3.8
Cargo vessels	0.85		46.1	39.2	78.2	66.5	14	11.9	45.2	38.4
Passenger vessels				2.5		2.5		1		1
Vessels from 100 to 999 grt				9		9		5.1		5.1
Total				127.5		183.7		34.1		73.9
B) Overall approach			146.4				47.9			

a) The trend towards the growth of newbuilding needs expressed in grt is steadier in the long term than in the medium one

These needs, converted into annual average deliveries according to the calculation made in table XLI can be considered as being on the low side having regard to the level of world deliveries reached in 1968.

But medium and long term forecasts cannot be compared with the results of one year only; the only basis for a valid comparison is the average recorder during a period of equal duration: thus the annual average of newbuilding needs to which the overall approach leads for the long term—17m. grt—must be compared with that of deliveries actually registered from 1 July 1957 to 31 December 1968, which amounted to 10.7m. grt. In the same way, the medium term forecast of 15m. grt per year is to be related to the tonnage actually delivered between mid-1962 and late 1968, i.e. 12.4m. grt on average per year.

As regards the medium term, the comparison of forecasts with past results reveals from one period to the other a growth in the average world demand for newbuildings of about 20%; this corresponds to an annual growth rate slightly higher than 3%.

The same comparison made in the long term is still more favourable, as the increase reaches almost 60% between the averages of the two periods past and future and reveals a growth rate of about 4.5% a year. It is noteworthy that this rate betokens a good correlation with the average growth rate of the gross tonnage of the world fleet.

Thus, future development seems steadier if considered in the long term than if restricted to the medium term. This difference is explained by unavoidable inconsistencies in the rate at which orders are placed. As regards deliveries, these inconsistencies level off, but less when the period is shorter.

In the short term, the effect of the ordering pattern is more noticeable and explains the fact that the gross tonnage of ships delivered during a given year can be lower than the corresponding figure of the preceding one.

b) The gross ton is an inadequate unit on which to base an accurate estimate of the newbuilding demand which world shipbuilding will have to meet

Newbuilding demand cannot, however, be considered from the quantitative aspect of gross tonnage only. In fact, though the grt, which is basically a measure of volume, is still a valid unit, despite its shortcomings for estimating in terms of capacity, the newbuilding needs of the whole world fleet, it is no longer the case when these newbuilding needs are considered as a measure of the potential demand on the international shipbuilding market.

The qualitative aspect then becomes more important and the sectorial analysis has shown that the future ordering pattern, i.e. orders still to be placed from early 1969 onwards, would differ, as regards the distribution of types of ship between the long and medium terms.

In fact, up to 1980, almost 59% of the tonnage to be ordered should be single-deck units of large size but relatively simple structure, intended for carrying liquid or dry bulk commodities. However, this proportion is only 43.7% for the part of this tonnage to be delivered before mid 1975.

Consequently, in the medium term, the sectorial analysis suggests that demand will mainly concern cargo vessels, passenger vessels and small ships, these units being mostly sophisticated and of high relative value.

The construction of these specialized ships requires from shipyards many more working hours per gross ton produced than for tankers, bulk carriers and OBO's which have provided, in recent years, the major part of the increase, in gross tonnage, of world shipbuilding production.

It was in order to obtain a better assessment of the effects of this foreseeable change in the orientation of world newbuilding demand, that the notion of compensation of gross tonnage has been introduced before passing on to the second part of this survey, which concerns the estimated output potential of the world's shipyards.

This concept of compensation was introduced more than ten years ago in France, when the administration had found it necessary to have a unit which could measure the shipyards output more accurately than by gross tonnage.

The compensated ton is a unit equal to the gross ton proper as regards standard cargo vessels over 5 000 tdw. For the other types of ships, coefficients for increasing or decreasing this ratio were established, according to the number of hours necessary to complete 1 grt in the various categories of ships, according to type and size.

On the international front, the concept of compensated tonnage was adopted by the AWES (Association of West European Shipbuilders) in 1967 and, more recently, by the Shipbuilders' Association of Japan.

The compensation coefficients adopted by the AWES are, however, somewhat different from the French system(1) and were adopted in this report since we are dealing with the world situation here.

At all events, whatever the system of compensation, the estimate in compensated tonnage is a better basis for considering the future supply and demand situation in shipbuilding over the next few years.

c) Estimated demand in compensated tonnage

Starting from the completed sectorial analysis, an attempt can be made to make an approximate estimate of demand in cgrt. For the fraction of demand concerning tankers, the distribution between large, medium and small tank vessels, which served for the conversion from deadweight tonnage to gross tonnage can be taken as a basis. We thus have a distribution from which to calculate a compensated conversion rate which, applied to deadweight tons, directly gives compensated tons, provided that the corresponding rate for each of the three categories is available. These particular rates can be calculated by converting the product of the ratio already adopted between gross tonnage and deadweight tonnage, into the AWES compensation coefficient which is suitable, on average, to the category. (This calculation is shown on table XLIV.)

(1) For this reason, in France, the AWES compensated tonnage unit is known as "tonneau de jauge brute pondéré" (weighed grt).

For refined product transportation, the coefficient is 0.80. For medium-sized ships, a coefficient of 0.42, which is intermediate between that of tankers of 80 000 tdw to 160 000 tdw (0.40) and the one foreseen for the 50 000 tdw class (0.45) but nearer the first, was adopted. In the same way, as regards very large ships, a coefficient of 0.32 was chosen, closer to that of vessels of 250 000 tdw and over (0.30) than to that of 160 000 to 250 000 tdw units (0.35).

For bulk carriers, the slack demand expected makes it possible to consider them as one category, without any great risk of error. The AWES coefficient chosen is 0.47, i.e. between that of ships of 50 000 to 100 000 tdw (0.45) and that of vessels of 30 000 to 50 000 tdw (0.50), but also nearer the former.

The problem, however, is more intricate for the other merchant cargo vessels, i.e. cargo vessels in general, which already represent between 30 and 45% of the orders still to be placed from 1 January 1969 onwards, calculated in deadweight tons, according to whether the low or high estimate of the sectorial analysis is adopted, and rise from 35% to over 50%, in terms of the estimate in gross tonnage, despite the fact that small ships and passenger vessels are covered by this category. Therefore the relative importance of demand for cargo vessels must become preponderant in terms of compensated tonnage, since, for all these ships, the AWES coefficient is equal to or above 1, but the range is wide as coefficients vary from 1 for tramps to 2 for refrigerated cargo vessels.

Under the circumstances, compensation coefficients according to main types of cargo vessels have proved essential. A hypothesis made by Working Group No. III of the Liaison Committee, for the distribution of demand, served as a basis for the estimate, in value, of future orders; it has already been used to convert deadweight tonnage into gross tonnage.

It was therefore considered that the demand for "other cargo vessels" would be distributed as follows: tramps (20%), high-sea cargo liners (60%), container ships (10%), reefers (5%), other specialized vessels and small cargo vessels (5%). These percentages are applied to forecasts indicated in tons deadweight for both the low and high estimates. All these categories have a well defined AWES coefficient, except the last one.

Since the category of specialized ships and small cargo vessels is not homogeneous, its composition had to be estimated. It was supposed that, among small cargo vessels to be ordered, many would be of the roll-on, roll-off handling type, and could be considered closer to ferries (coefficient 2) than to cargo vessels under 5 000 tdw (coefficient 1.6) whilst others would be small container ships used as feeders, the AWES coefficient of which should be at least equal to that of high-sea container ships (1.9). Furthermore, this category includes specialized ships, the coefficient of which is 2 or above. This is why a coefficient of 1.9 has been adopted for this sector of demand.

Table XLIV shows the results of the conversion into compensated tonnage of the new orders required, calculated by the sectorial analysis in deadweight tonnage, for both the high and low estimates.

Anticipated orders for small ships and passenger vessels were also inserted and their gross tonnage was directly converted into compensated tonnage.

A compensation coefficient of 1.8 was applied to the category of small vessels. It was chosen in consideration of the growing portion of very specialized vessels having a coefficient close or superior to 2, in the orders for ships of this size.

For the whole period it did not appear unreasonable to count half these vessels, the other half consisting of less specialized ships, with a coefficient of 1.6, like normal cargo vessels of less than 5 000 tdw.

As to passenger vessels, it was assumed that newbuilding demand might be equally divided between car ferries and cruise liners, the tonnage for the latter being possibly a little higher, since many car ferries have been built in recent years.

For this reason, the average compensation coefficient to be applied to passenger vessels was fixed at 2.7, which is somewhat higher than the average between the coefficient of passenger liners (3) and that of car ferries (2).

d) Medium term demand appears steadier when converted into compensated tonnage

The comparison between figures given in Tables XLIII and XLIV shows that the long term needs for new ships are not very different according to the two standards, when an overall view is taken.

The demand estimated in compensated tonnage is, on average, 6,2% lower than the demand calculated in gross tonnage, but, as might be expected, the distribution according to types of ship changes completely.

Large single-deck vessels—tankers and bulk carriers—represent hardly more than 25% of this demand in compensated tonnage as against nearly 60% in gross tonnage.

In the orderbook at 1 January 1969 these same ships, including OBO's represented over 80% of the total amount in gross tonnage.

On the whole, delivery periods are indeed longer or large ships than for medium and small sized vessels.

This preponderance of large single-deck vessels in the demand of the recent past arises to some extent from an anticipation of requirements as has been pointed out earlier.

Consequently, in the medium term, the additional orders required are relatively low for this category of ship, the conversion coefficient of which is well below 1, whereas for the other types of vessel, the coefficient of which is equal or superior to 1, there is some need to catch up with demand.

The distribution of future demand according to types of ship is thus mainly explained by that of past demand. But this fact implies a very important consequence for shipbuilders.

In fact, regarding orders still to be placed after 1 January 1969 and to be delivered before 1 July 1975, the medium estimate in compensated tonnage exceeds 61m., i.e. a level 22.7 higher than the one referring to the same demand in gross tonnage.

Therefore, the medium term demand is much steadier when expressed in compensated tonnage than when estimated in gross tonnage.

This point had to be stressed, in conclusion of the first part of the report, before studying the medium term prospects of newbuilding supply.

TABLE XLIV

Estimated newbuilding demand in compensated tonnage deduced from forecasts in tdw or grt for ships to be ordered after 1 January 1969

Types of ship to be ordered	Demand forecast by the sectorial analysis (million tdw)				Rate calculated for converting tdw into cgrt					Estimated demand in compensated tonnage					
	Low estimate		High estimate		For each type	Distribution per type		Compensated rate per group		Low estimate		High estimate		Average of high and low estimates	
Periods	1969-1980	1969-1975	1969-1980	1969-1975		1969-1980	1969-1975	1969-1980	1969-1975	1969-1980	1969-1975	1969-1980	1969-1975	1969-1980	1969-1975
Tauhers	137.1	30.4	160.2	48		%	%								
of which:															
a) > 160 000 tdw					(0.5x0.32) = 0.16	77	64								
b) < 160 000 tdw					(0.588x0.42) = 0.247	13	25	0.209	0.223	28.65	6.78	33.48	10.70	31.07	8.74
c) Refined products					(0.667x0.8) = 0.533	10	11								
Bulk carriers	8.2	—	35.1	6	(0.625x0.47) = 0.294	100	100	0.294		2.41	—	10.32	1.76	6.37	0.88
Other cargo vessels	46.1	14	78.2	45.2											
of which:															
a) Tramps					(0.714x1) = 0.714	20									
b) Cargo liners					(0.8x1.6) = 1.28	60									
c) Container ships					(0.95x1.9) = 1.805	10		1.349		62.19	18.89	105.49	60.97	83.84	39.93
d) Reefers					(1.15x2) = 2.3	5									
e) Other specialized ships and small cargo vessels					(1.5x1.9) = 2.85	5									
	Estimated demand in million grt				1969/1980	1969/1975	Compensation coefficient								
Small ships < 1 000 grt					9.5	5.1	1.8			17.10	9.18	17.10	9.18	17.10	9.18
Passenger vessels	— do. —				3	1	2.7			8.10	2.70	8.10	2.70	8.10	2.70
All types of ocean-going merchant ships										118.45	37.55	174.49	85.31	146.48	61.45

PART TWO

ESTIMATED FUTURE TREND OF WORLD SHIPBUILDING SUPPLY

CHAPTER V

METHOD ADOPTED

1. *World supply in terms of the sum of output capacities*

In the first part of this prospective survey we have tried to calculate the medium and long term trends of demand for newbuilding on the world shipbuilding market. These trends have been deduced from the estimated theoretical needs for new-buildings which depend on the foreseeable rate of expansion and replacement of the world fleet.

It is therefore appropriate to study at the same time the trends of supply. Supply, at any time, results from the combined building potential of shipyards in the same way as demand is, at the same time, the result of owners' decisions to have new ships built.

In fact, the international market on which construction possibilities and requirements should be matched, is far from being perfectly open. At the level of political economy, many artificial factors of national origin entail distortions in competition and impede a work distribution, at the world level, in compliance with the theories of complete liberalism. Also, for some years, this world market has tended to be divided, from the technical point of view, into sizes and even types of ships: supplies of and demand for very large tankers do not interest simultaneously the same group of owners and builders as supply of and demand for small cargo vessels.

These special markets, however, are not insulated from each other, and the many possible substitutions between neighbouring categories of ships will contribute to bind the evolution of each sector to the evolution of the whole market.

Thus, theoretically, it is absolutely legitimate to try to estimate the trends of world supply which, at any time, must be the amount of work required from all the yards operating on the international market. As with demand, there is a difference in time between the tender and the delivery of the ship ordered, because of the time spent before commencing the ship and then needed to build her. But an extremely detailed sectorial analysis would have been necessary to take into account this difference in time, and it was not possible to carry it out. Conse-

quently it has been assumed that, in the future, the trends of supply of new-buildings would vary in accordance with the development of the shipbuilding capacity of all the yards in the world.

In this way, short term fluctuations, which may easily disguise significant realities, are left out. However, with this procedure, the amount of supply in relation to demand at any time will not be exactly determined. Nevertheless, as demand has been measured in the first part by the average tonnage required per annum, it is not illogical, in the second part, to estimate the supply according to total annual output capacities.

2. *Study of the development of output capacities limited in the medium term*

In the field of supply, it has not seemed necessary to extend the study beyond the limit of the medium term, since it is obvious that theoretical capacity, obtained by estimating the future production of ships, cannot develop, in the long term, very distinctly from demand. This theoretical capacity will tend to approximate to actual production which, still in the long term, will depend on foreseeable needs.

On the other hand, in this survey, it was necessary to devise a method of comparing the development of world shipbuilding output capacity, from the quantitative as well as qualitative point of view, with the demand expected up to 1975. This capacity can be forecast according to the level reached now and present or planned investments, as well as in the light of forecasts concerning variations of manpower and productivity.

The study of these factors denotes, even in the medium term, a great margin of uncertainty as regards both the developments of each and their mutual influence on each other.

This general observation has confirmed the working group's opinion that it was useless to try to extend such forecasts beyond the 1975 limit.

3. *The concept of output capacity in the shipbuilding industry*

In the field of shipbuilding it is far more difficult to determine the concept of output capacity than it is in other branches of activity, in which so many tons per day are processed or produced, or so many units of relatively fungible or homogeneous product as oil, steel or even cars.

The variety of types of ships built in the world is considerable and it seems to have kept increasing since steel construction began. Furthermore, the different types of ships are subdivided more and more into classes of size. The differences between the ships built by the various yards in one year make it difficult to find a common method for estimating total output and it is even hard to determine from which elements, in each case, the most realistic production capacity is likely to be obtained.

a) Gross tonnage and compensated tonnage

The traditional standard unit measuring merchant ships is the gross registered ton (grt), which is generally adopted to calculate the shipyards' output. Unfortunately, due to the diversification of technical development already mentioned above, which

has marked shipbuilding since the end of World War II, the gross registered ton is not as significant as originally, and is no longer suitable for taking all the relevant factors into consideration, as shown, for instance, by the fact that, in value, the gross ton of a cargo-liner is five times more expensive than that of a mammoth tanker.

At the end of the first part of this report, the concept of compensated gross registered ton (c.grt) has been introduced. This unit is calculated by applying a minimizing or maximizing coefficient to the gross ton of each group of ships, classified by type and, if necessary, by size.

This unit corresponds much better to the value added by the shipyard than the conventional evaluation in gross tonnage.

Up to now, however, the application of compensated tonnage has been restricted to statistics made within the AWES (Association of West European Shipbuilders). But this unit was introduced in 1967 only, and, with the exception of France, where a similar method has been used for about 10 years, there are no statistics made out in this unit for earlier years.

In 1968, the Japanese shipbuilders accepted to adopt the compensated gross registered ton for their statistics on production, but those of Lloyd's Register covering world shipbuilding, except a few socialist countries, are still calculated in gross registered tons. Consequently, when trying to study the past trend of world shipbuilding, only figures in gross tonnage are available. The comparison can be made from one year to the other, because the evolution of techniques is not sufficiently rapid to modify the average value of the gross registered ton to any great extent in such short period of time. But this is not so in the case of longer periods.

Within the scope of this survey, however, world output since 1960 has been estimated in compensated gross tonnage; the figures obtained have been compared to world production in gross tonnage as published by Lloyd's Register. The c.grt/grt ratio diminished during that period, from 0.9 in 1960 to 0.8 in 1965-66, and further to 0.7 in 1967-68. (1)

It can therefore be assessed that the recent swell in annual output figures and orders of the world shipbuilding industry reflects to a large extent that more very large ships are being built. The actual increase in output capacity is thus not so paramount as it seems when only figures in gross tonnage are considered.

b) Lack of uniform interpretation of production criteria

Still greater than the difficulties in accurately measuring the actual output of the world's shipyards is the lack of precision of the concept itself of output capacity. Each shipyard, taken individually, must be in a position to assess if its achieved or anticipated output corresponds more or less to its optimum capacity, calculated according to its own financial, social and technical data. But individual situations vary considerably throughout the world, first between the various national industries and then between each firm in any country.

Even in the same country, shipyards differ, in size and type of ships built, labour force employed, equipment available, working methods applied and importance of complementary or connected activities (repairing, engine-building, etc...).

(1) Cf. the relevant curves on Figure E in chapter VIII.

This is why the c.grt is not a completely satisfactory unit, particularly when trying to make forecasts. The evaluation of production in compensated tonnage is, to a certain extent, related to the types of ship and categories of shipyard involved.

4. *Fluctuations of supply in shipbuilding*

a) Past experience

In the past, considerable fluctuations were observed in world shipbuilding output calculated in grt and the newbuilding supply had to show great elasticity in order to satisfy the rapidly growing demand, especially in the periods after both world wars.

In 1919, launchings all over the world reached 7m. grt and this level of annual output was obtained again only in 1942. In 1943, world production was nearly twice as high as in the preceding year and reached almost 14m. grt for the countries covered then by Lloyd's Register of Shipping returns alone.

On the other hand, during the depression, a very rapid decline in the production rate was noticed. From 1930 to 1933 annual launchings fell from 2 200 000 grt to less than 500 000 grt.

Over a more recent period, i.e. since the end of the Second World War, the level of 7m. grt was reached again only in 1957. That of 14m. grt has been only exceeded since 1966.

In the meantime, from 1959 to 1961, world shipbuilding output suffered a period of decline corresponding to the fall-off in freight rates which followed the re-opening of the Suez Canal after its first blocking.

Since 1962, in order to comply with requirements, the increase of which has accelerated in the course of the last few years, most shipyards have been able to raise their production in grt, despite a reduction in the labour force employed in the industry in the main producing countries.

At the beginning of the period, this increase was mainly due to the Japanese shipyards which succeeded in satisfying half the world demand for newbuildings, calculated in grt, thanks to a dynamic policy which has been sustained since the Korea war and openly supported by the Japanese Government. In fact, this Government has seen that selling to foreign shipowners is a means of developing exports without coming up against geographical quota or tariff walls which are limiting international expansion of other Japanese industries.

In recent years, however, the West European shipyards, which had stayed on the defensive too long, have, in their turn, recorded a strong increase in business and set vast investment programs in order to hold or to recover a competitive position on the international scene.

b) Conditions of the recent increase in the level of the world shipbuilding output

This increase in production was made possible by different methods: overtime work, shift work, employment of labour force and equipment of other activities for shipbuilding, subcontracting, even of the hull of certain ships.

Thus, as in the past, shipbuilding has shown great elasticity which, even taking into account the growing proportion of world production, now building large vessels, has made it possible to raise the output, in grt, of many shipyards, from 20 to 30%, without the yards having had to change the structure of their production facilities.

However, mainly during recent times, considerable investments have been made and others are planned.

With the accelerated trend towards large tonnages, mammoth building docks, powerful hoisting devices and automation of steel hull production have been introduced and the result has been something of the nature of a technological revolution.

Although these achievements were often accompanied by the dismantling of old installations, they do, in most cases, result in an increase in the potential of production facilities of the main Japanese shipyards and of a certain number of European ones.

Despite the mechanization and automation of production methods, a bottleneck exists at present as to manpower, due to the world-wide tendency towards a reduction of the labour force in the industry, which has already been mentioned. The main shipyards are, however, undertaking training programmes, in order to obtain a skilled labour force and reach their target of increased output.

c) Adaptation of future demand

Under the circumstances, the comparison between the foreseeable development of the output capacity and newbuilding needs involves two distinct questions:

1. Taking into account the discrepancy, which will remain in the foreseeable future, between the target theoretical capacity and the actual maximum output, will world shipbuilding be able to satisfy expected medium term demand quantitatively and qualitatively?

2. What is the proportion of the actual annual output of the world's shipyards which corresponds to the elasticity of the newbuilding supply, in the short term?

This second question has to be asked, as it does seem that the demand of the recent past has noticeably anticipated future short term needs for newbuildings.

It would thus seem normal that a slackening in the rate of ordering should occur in the near future.

This slackening, the extent and duration of which cannot be foreseen because they basically depend on aleatory factors, could, however, be sufficient to entail, at the level of deliveries (the correct difference in time being taken into account), a reduction in the output of ships completed per annum, if not in compensated tonnage, at least in gross tonnage.

A phenomenon of this type, frequent in the past, is not alarming on the world scale as long as it remains within the normal limits of the elasticity of newbuilding supply.

At the level of individual companies, the problems resulting from a possible fall-off in business are different in shipyards which have increased their output by

basing themselves on the "labour force" factor, from those in the shipyards which have invested in transforming the very structure of their production facilities.

In fact, to be able to base an opinion on valid statistics, it would have been necessary to clearly check what represents a real increase in the output capacity and what is due to the elasticity of the industry, when considering the spectacular increase in world shipbuilding.

Such an analysis would make it possible to introduce a concept of "optimum capacity" which would correspond to the output reached by shipyards with normal utilisation of their facilities and labour force.

To study this question, it would be necessary to consider the main shipbuilding countries individually, and, within each one, the different situations in each shipyard.

5. *Survey among the shipbuilders' associations of the main countries*

It was of course impossible to obtain a reply from every shipyard in the world or even to take a sampling on which a survey could be based. Therefore the working group decided to question the shipbuilders' associations of the main maritime countries directly, asking them to fill in a questionnaire concerning the future short and medium-term evolution of the output capacity of their industry.

With two or three exceptions, the associations concerned were quite prepared to cooperate, but some replies were contradictory or lacking in coherency. Thus, this investigation has been rather difficult to act on; in order to make the global figures meaningful, it has been necessary to fill the blanks by extrapolating from answers given by the same association to other questions or by analogy, based upon replies provided by other associations to the same question.

Of the subjects dealt with in this questionnaire which included tonnage produced, labour force and maximum size of ships, the working group has considered that only forecasts of output capacity expressed in gross tonnage and compensated tonnage could be utilized.

These standards, as has been mentioned above, are far from being perfect, but their comparison clarifies the medium term prospects of the supply and demand situation on the international newbuilding market.

Considering the buoyant situation on this market in early 1969, when this inquiry was made, it is not surprising that the answers reveal outstanding prospects of growth in the output capacities of the main shipbuilding countries, calculated in grt. On the other hand, the difficulties of recruiting the necessary labour force in most major shipbuilding nations may explain that the growth forecasts for output capacities, as measured in c.grt, have been very moderate.

The estimates based on this inquiry must therefore be considered cautiously. They will serve to show a tendency towards a theoretical output capacity, but not to foresee the optimum output that might be achieved by the shipyards in the world in any given year.

At all events, actual output will be inferior to theoretical capacity because ideal conditions never occur everywhere at the same time, and, apart from factors

likely to affect the possibilities of supply itself, the most important element is, in the final analysis, demand, not only from the quantitative point of view of total tonnage to build, but, even more, because of its distribution according to type and size of ships, on which the actual evolution of the ratio c.grt/grt in production will depend.

CHAPTER VI

FORECAST DEVELOPMENT OF SHIPBUILDING PRODUCTION CAPACITY

1. *Results of the survey among the shipbuilders' associations*

The analysis of the replies to the survey has made it possible to give forecasts on the development of the theoretical production capacity of world shipbuilding between 1969 and 1975.

The inquiry covers the expected output for the years 1969, 1970, 1971 and 1972, and estimated total production capacity in 1975. When the questionnaire was drafted in early 1969, it was assumed that, due account being taken of the orders and investments in hand, the associations of the major shipbuilding countries could have a fairly exact idea of the production which might be actually reached in the first years of the coming decade.

For 1975, it was more difficult to ask a forecast on output. This is why the question referred to the maximum expected production capacity, taking into account the present facilities and the scheduled investment.

Table XLV shows the results of this inquiry, successively quoting: the Common Market shipbuilding countries, the other member-countries of the Association of West European Shipbuilders (i.e. the United Kingdom, the three Scandinavian countries, Finland and Spain), Japan, the United States, and the rest of the world. (Excluding USSR and People's Republic of China.)

Figures concerning the Common Market countries and the other West European countries are generally the result of aggregating the replies provided; however, in some cases, it was necessary to fill some blanks as regards forecasts on output in compensated tonnage. Figures concerning the United States were given by the American Association. On the other hand, the forecasts for Japan appearing in the table are estimates, for lack of an answer in due time from the Japanese shipbuilders association. (1) In the same way, forecasts for the rest of the world are based on overall estimates. The bases of the estimates are set out below.

2. *Comments on the findings of the survey*

Once mention has been made of the uncertainties contained in the insertions which had to be made to fill the blanks in the replies to the inquiry, the figures in table XLV require some explanation.

(1) For 1969 and 1971, however, these estimates were based on a survey issued by this Association.

TABLE XLV

Foreseen or foreseeable developments of the annual production capacity of the world shipbuilding industry (1)

(in thousand gross registered tons and compensated gross registered tons) *(fc = conversion factor grt into c.grt)*

	Forecasts 1969			Forecasts 1971			Forecasts 1975		
	grt	fc	c. grt	grt	fc	c. grt	grt	fc	c. grt
5 Common Market countries	3 920	0.84	3 290	4 240	0.80	3 390	5 500	0.96	3 620
Increase (in %)									4 210
a) from one period to the other				+ 8.2		+ 2.7	+ 29.7		+ 24
b) accumulated since 1969							+ 40.3		+ 28
Other West European countries	4 640	0.72	3 320	5 235	0.66	3 460	5 950	0.65	3 860
Increase (in %)									
a) from one period to the other						+ 4.2	+ 13.6		+ 11.6
b) accumulated since 1969				+ 12.0			+ 28.2		+ 16.3
Total Western Europe	8 560	0.77	6 610	9 475	0.72	6 850	11 450	0.70	7 480
Increase (in %)									8 070
a) from one period to the other				+ 10.7		+ 3.5	+ 20.8		+ 17.8
b) accumulated since 1969							+ 33.8		+ 22.1
Japan	9 100	0.53	4 820	9 800	0.53	5 190	11 500	0.50	5 750
Increase (in %)									
a) from one period to the other				+ 7.7			+ 17.3		+ 10.8
b) accumulated since 1969						+ 7.7	+ 26.4		+ 19.3
United States	560	1.06	590	485	1.22	590	550	1.27	700
Increase (in %)									
a) from one period to the other				— 15.6		—	+ 13.8		+ 19.2
b) accumulated since 1969							— 1.6		+ 18.6
Rest of the world	2 100	1.05	2 200	2 250	1	2 250	2 630	0.95	2 500
Increase (in %)									
a) from one period to the other				+ 7.1		+ 2.3	+ 16.9		+ 11.1
b) accumulated since 1969							+ 25.2		+ 13.6
World total	20 320	0.70	14 220	22 010	0.68	14 880	26 130	0.65	17 020
Increase (in %)									
a) from one period to the other				+ 8.3		+ 4.6	+ 18.7		+ 14.4
b) accumulated since 1969							+ 28.6		+ 19.7

(1) Excluding USSR and People's Republic of China for which no Lloyd's Register returns are available for the past.

a) Discrepancy between actual output and theoretical capacity for the year 1969

At the time of writing this report, it appeared useful to try to estimate what level world shipbuilding will actually reach in 1969, considering the output figures of the first two quarters and those of the two preceding years. It is thus possible to estimate to what extent the forecasts on output established at the beginning of the year, when the analysis of the inquiry was made, are likely to prove accurate.

Table XLVI shows this estimate. Figures are presented according to the same groups of shipbuilding countries as those adopted in table XLV. To indicate the level of activity of the various groups in each period considered, the average of ships delivered and commenced was taken. Deliveries are representative of the recent past, and keels represent the near future.

This comparison was only made in gross tonnage, but this unit gives an accurate indication of the variations of the level of activity of the various groups of countries.

On a world scale, the distribution of ships, according to type and size in production, cannot change much in such a short period of time and the grt/c.grt conversion factors will vary only very progressively.

It thus seems that the level of world shipbuilding will increase by about 6% between 1968 and 1969.

The actual figures noted during the first two quarters of 1968 and 1969 reveal a slightly lower increase, but the estimates made for the whole year 1969 suggest that, in the last two quarters, particularly substantial deliveries and keel layings will be recorded.

In any event, an actual growth of about 6% is relatively moderate, considering the increase of 14% between 1967 and 1968, and in view of the pressure on world shipbuilding from increasing orders, bottlenecks would appear to be having their effect.

The forecasts made at the beginning of 1969 in fact suggested an increase of twice this size, of over 12% in relation to average business in 1968, but it seems that only around 94% of these forecasts will be actually achieved. This confirms the fact that these forecasts must be considered as dealing with theoretical capacities, targets which would imply, if they were to be reached, that no disruptive element should intervene to slow down the expected production rate. These ideal conditions, of course, never occur in all the shipyards at the same time.

Table XLVI shows that the recent evolution of the big groups of shipbuilding countries differs very much, as shown by the percentage increases in the average activity of each in 1969, as compared with 1968.

Too much importance must not be attached to the absolute value of these percentages which vary strongly in some cases, according to whether half or the whole year is considered. This is inevitable because of the seasonal variations and of the existence of very large ships which represent a substantial part of the output of the main countries.

A tanker of 200 000 tdw represents about 100 000 grt and the fact that such a substantial tonnage is counted in one period or another can explain evident

TABLE XLVI

Actual output and theoretical capacity
comparison between world shipbuilding activity in 1968 and 1969
and the expected theoretical output capacity in 1969, in thousand grt

	1968						1969						Theoretical capacity	
	1st half-year			Whole year			1st half-year			Whole year (estimate)				
	Deliveries	Keels laid	Average activity	Deliveries	Keels laid	Average activity	Deliveries	Keels laid	Average activity	Deliveries	Keels laid	Average activity	Forecasts 1969	Foreseeable performance rate
5 Common Market countries	1 272	1 880	1 576	2 707	3 493	3 100	1 496	2 482	1 989	3 400	4 400	3 900	3 920	0.995
Increase over preceding year (in %)			26.5			28.1			+ 26			+ 25.8		
Other West European countries	2 019	1 921	1 970	3 902	4 248	4 075	1 826	1 838	1 832	3 900	4 000	3 950	4 640	0.851
increases (in %)			0.6			4.2			— 7			— 3.1		
Total Western Europe	3 291	3 801	3 546	6 609	7 741	7 175	3 321	4 320	3 821	6 500	8 400	7 850	8 560	0.917
increases (in %)			10.7			12			+ 7.8			+ 9.4		
Japan	4 113	4 232	4 173	8 349	9 006	8 678	4 363	3 966	4 165	9 000	8 500	8 750	9 200	0.962
increases (in %)			13.3			10.8			0			+ 0.8		
United States	152	169	161	368	562	465	280	140	210	500	500	500	560	0.893
increases (in %)			51.9			66.1			+ 30			+ 7.5		
Rest of the world	680	948	814	1 519	1 989	1 754	537	1 199	868	1 700	2 400	2 050	2 100	0.976
increases (in %)			40.1			34.6			+ 7			+ 16.9		
World total	8 237	9 150	8 694	16 845	19 298	18 072	8 502	9 625	9 064	18 500	19 800	19 150	20 320	0.942
Variations (in %)			11			14.2			+ 4.3			+ 6		

variations in percentage which, in fact, are not significant from the point of view of long-term trends.

Furthermore, the influence of the distribution according to type and size of ships delivered and commenced is more noticeable for production estimated in grt at the level of these groups than on a world scale. The increased proportion of very large ships built is recent and came later in Europe than in Japan; thus, unfortunately, the comparison cannot also be made in compensated tonnage, which would have given a better perspective of the relative evolution of the major shipbuilding areas.

Despite these statistical difficulties, some clear trends emerge from the recent development of the world's shipbuilding industry.

First, it can be noted that the Japanese production will remain steady in 1969. This fact confirms that the Japanese shipyards have reached a level close to their maximum theoretical capacity which would be reached at 96% or more.

More surprising is the fairly noticeable fall-off, in 1969, in West European countries outside the Common Market. It mainly concerns the United Kingdom and the Scandinavian countries.

This fall-off seems inconsistent with the expected increase in theoretical capacity which, according to statements of the shipbuilders' associations, should exceed the level of average activity in 1968 by 14%.

This fact is probably related to the difficulties encountered by the North European shipyards in recruiting manpower.

On the other hand, the five shipbuilding countries of the Common Market seem to be the more dynamic group, since their level of activity in 1969 will probably be 25% higher than in 1968, which was already 28% above that of 1967.

Theoretical capacity seems to have been reached in 1969; but this is due to the strong increase in the number of keels laid, which, in fact, reflect future rather than present capacity.

The relative progress of the Common Market in shipbuilding should therefore continue into 1970.

It is true that between 1960 and 1967 the European Economic Community suffered a serious setback on the world newbuilding market. At the beginning of that period, its share of the world shipbuilding market, measured in launchings, was equal to one third, whereas at the end it had dropped to barely 15%.

The increase in the other countries' output should also be noted. For the United States, whose building capacity is mainly utilized by the Navy, the percentages are not very significant, but reveal a recovery in the merchant ship production.

On the contrary, the "rest of the world" group shows strongly expanding activity. This is a heterogeneous group mainly composed of socialist bloc countries, except the USSR and China (figures not available) and semi-developed or developing countries.

The shipyards of this group do not find the same difficulties as those of the major shipbuilding countries in recruiting the necessary labour force and, in the future, their possible progress must be taken into account.

Up to 1975, however, technological, commercial and financial factors may impede them from increasing their share of the world market as quickly as they might wish. In this respect, their progress in 1969 is already inferior, in percentage terms, to the one recorded in 1968 in relation with 1967.

b) Period of consolidation at the beginning of the next decade

For the first years of the coming decade, the expected increase in theoretical output capacity, in comparison with 1969, seems to be moderate. Shipbuilders may anticipate a period of consolidation in 1970, 1971 and 1972. The forecasts made for those three years were not indicated separately in table XLV. Under the heading "forecast 1971" appears the average of forecasts for output during this period and thus it seems possible to have an estimated output capacity comparable to the one for 1975.

It is interesting to note that the European shipbuilders foresee a much lower increase in the capacity expressed in c.grt than in the capacity expressed in grt. This implies that they expect a growing proportion of their production to be represented by very large vessels.

In so far as Japan is concerned, the level of 9.8m. grt is taken from a recent Japanese survey which has no corresponding estimate in c.grt. Nevertheless, since large vessels form a substantial part of Japanese output, this country has been credited with a growth in compensated tonnage equal to the growth in gross tonnage.

The American forecasts, curiously enough, reveal a decreasing output for that period. In fact, this diminution is due to the forecasts given for 1970, which may be explained by particularly important deliveries of ships intended for the Navy during that year.

As regards the rest of the world, it has been estimated that the output in grt would keep increasing but at a slower rate than in the major shipbuilding countries. For this period, a certain increase in the size of ships built can be expected, which leads one to adopt a coefficient of 1 and thus to formulate the same forecast of 2.25m. tons in both tonnages.

Taken as a whole, the forecast for 1971 indicates a world output capacity exceeding 22m. grt, the increase of 8.3% being essentially attributable to a further increase in the average unitary tonnage of ships, since the corresponding production in c.grt is only 4.6% higher than the capacity expected as from 1969.

c) The increase in the theoretical capacity should continue until the middle of the next decade

To establish the forecast for the theoretical capacity of the world shipbuilding industries during 1975, the replies of the national associations have generally been utilized as regards Western Europe and the United States.

On the other hand, the evaluation of Japanese output capacity is not deduced from any statement from the country concerned.

The extrapolation of the increase which, between 1969 and 1971, is given by figures of Japanese source, appearing in table XLV, would have led to a forecast output capacity of 10.6m. grt in 1973 and 11.3m. grt in 1975.

However, as the same source provided a forecast of 10.8m. grt for 1973, it has seemed more plausible to adopt the figure of 11.5m. grt for 1975.

The forecast in c.grt has taken into account the commissioning, between 1971 and 1975, of a number of large building docks intended for giant vessels. This suggested a lower growth in output capacity in c.grt than in grt.

For lack of forecasts of Japanese origin, some uncertainties remain about the capacity to be reached by the Japanese shipyards in 1975. (1)

Such is also the case for the countries forming the group of "the rest of the world" about which there is almost no information available.

To formulate a hypothesis, it has been supposed that their output capacity would keep developing in the same way as the average of the other countries, but with a certain lag due to retardatory factors peculiar to the economic structure of the socialist and developing countries.

Despite these elements of uncertainty, the forecast of a world capacity slightly above 26m. grt and of about 17m. c.grt for 1975 seems plausible. In fact, when comparing these figures to the forecasts for 1969 and 1971, it appears that the expected increases remain in line with early development.

On the whole, in relation with the forecasts of theoretical capacity for 1969, the anticipated increase does not exceed 29% in grt and 16% in c.grt. The annual growth rate is thus 4.22% if the capacity is estimated in gross tonnage and 3.05% if compensated tonnage is the unit of measurement.

d) Medium term evolution of the grt/c.grt ratio according to forecasts made

Table XLV shows, under each heading, the conversion factor which gives output figures in compensated gross registered tons when applied to those expressed in gross registered tons. The variety of these factors may seem surprising, but it does correspond to the strong disparities noticed between the different factors appropriate to the various groups of countries when referring to launchings in 1968, the last year for which figures are available, in the two units, for most countries.

In particular, between Japan and the United States, the conversion factor ranges from simple to double, due to the fact that the production of Japan covers a very high percentage of large tankers and bulk-carriers, with conversion factors much below 1, whereas the output of the United States consists of sophisticated ships, generally of small size. The average gross tonnage of ships launched in the United States in 1968 amounted to 2 216 grt whereas the corresponding figure in Japan was 7 698 grt.

For the whole of Western Europe, the conversion factor is between those of the United States and Japan. But it must be noted that, as regards the group of the Common Market shipyards, this factor is somewhat above the one resulting from the information supplied by the other West European countries. The difference is due to the substantial Swedish output, within the latter group, including, like the Japanese production, a high number of large single-deck ships.

(1) The international maritime press has circulated a recent survey, by Mr Onozuka, General Manager of the Hitachi Shipyard, which estimates the capacity of the major Japanese shipyards in 1975 at 12.5m. grt.

For the rest of the world, for lack of information on output in compensated tonnage, the factor of conversion chosen has been 1.05, thus slightly above 1, because this production comprises a high number of ships (441) the average gross tonnage of which is relatively low (3,750 grt). On the whole, for the world, the average conversion coefficient is 0.69 c.grt for 1 grt, launched in 1968.

The same general conversion coefficient is found for the forecast of world output in 1969. In fact, the replies to the survey did not show a considerable change in the conversion factors of the various countries which supplied forecast launchings both in grt and in c.grt for that year. It can simply be noted that the statements of the West European countries outside the Common Market indicate a relatively noticeable reduction in the conversion factor. For the Common Market, on the other hand, a very slight increase is noted, which must not be given too much importance.

The conversion factor for the United States remains stable and, for the other countries, the same figure as the one adopted for 1968 has been kept. The same is true for Japan; the statistics of the first half-year do not suggest important changes in relation to 1968 as regards the distribution of output according to types of ship.

For longer range forecasts, the situation changes and there appears a noticeable reduction in the conversion factors. They fall from 0.68 in 1971 to 0.65 in 1975 for world output. This reflects the generally held view according to which the average increase in the sizes of ships is to continue due to increased production of mammoth tankers, OBO's and even bulk carriers.

However, an exception is constituted by the United States which, contrarily to the world trend, forecast a much stronger increase in the output capacity in compensated tonnage than in gross tonnage, which suggests that the American shipyards expect that the proportion of fast sophisticated ships in their production will keep increasing.

The forecasts communicated by the European shipbuilders' associations imply that these yards estimate that a growing part of their output will be in large single deck ships, the conversion factor of which is well below 1.

By 1975, the difference which now exists between the conversion factor of the Common Market shipyards and that of the other West European countries will have almost disappeared.

As for Japan, it has been assumed that, according to the general trend, the conversion factor would drop again, after 1971, reaching 0.5 in 1975.

In the rest of the world, it seems logical to suppose that the trend towards increasing average sizes will also entail a reduction in the factor of conversion. It has been deemed to be equal to 1 in 1971 and to fall to 0.95 in 1975.

Considering the very heterogeneous nature of this group which comprises socialist countries as Poland, East Germany and Jugoslavia as well as developing countries, such as Brazil or India, these assumptions are of course very hazardous, but the significance of possible errors is small because of the relatively low percentage of output of this whole group. In fact, the forecasts for 1971 and above all for 1975 are intended as an indication of theoretical output capacity, and variations in the market situation will certainly affect actual production to a far greater extent than

the margins of error implied by the assumptions made when the gaps in the replies to the questionnaire were filled in.

3. *Foreseeable trend of the relative importance of the main shipbuilding areas*

Starting from the figures shown in Table XLV, it has seemed interesting to analyse, in Table XLVII, the foreseeable development of the respective share of the major shipbuilding areas in world output up to 1975. The basis of comparison is launchings in 1968 and the estimate is made for each year considered, on one hand in gross tonnage and, on the other, in compensated tonnage.

It must be noted that the 1968 percentages are calculated according to real output, whereas those of 1969-71 and 1975 correspond to theoretical capacities. Where relative values are concerned, however, the series appears to be homogeneous enough.

During the period considered, the share of the "minor shipbuilding" countries does not change much, amounting to about 10% in grt and 15% in c.grt.

Within the group of major shipbuilding areas, the comparison is particularly interesting between Japan and Western Europe. The share of Japan tends to decrease slightly, falling from over 49% to 44% in gross tonnage and from 38% to 34% in compensated tonnage. Conversely, the share of the West European shipyards increases, rising from 38.4% to 43.8% in gross tonnage and from 43.5 to 47.4% in compensated tonnage. The table shows the special development of the 5 shipbuilding countries of the Common Market, whose share in gross tonnage rises from 16.6% to 21% and, in compensated tonnage, from slightly below 20% to nearly 25%.

Despite the many possibilities of error involved in such forecasts, they make it possible to estimate that during the first half of the next decade, the percentage of the world output capacity reached by the Common Market countries, expressed in gross tonnage, will amount to a minimum of about 20%. This level means a considerable improvement on the position during the last three years, but it must be borne in mind that the share of the Common Market countries in world launchings, stated in gross tonnage, was 20.4% in 1964 and 33.7% in 1960.

The output capacity forecasts established in c.grt show a relative increase of activity somewhat higher than that suggested by grt figures. This seems logical if the Common Market shipyards are to keep their traditional role as builders of sophisticated vessels.

Consequently, the forecasts made at present by the Common Market shipbuilders are not unreasonable, at least relatively, when considered alongside those for the general trend of world output capacity. The point, however, is whether, with regard to really possible future output, in the coming years, all over the world, the Common Market shipyards will be in a position to secure a sufficient number of orders to achieve the position they are aiming at.

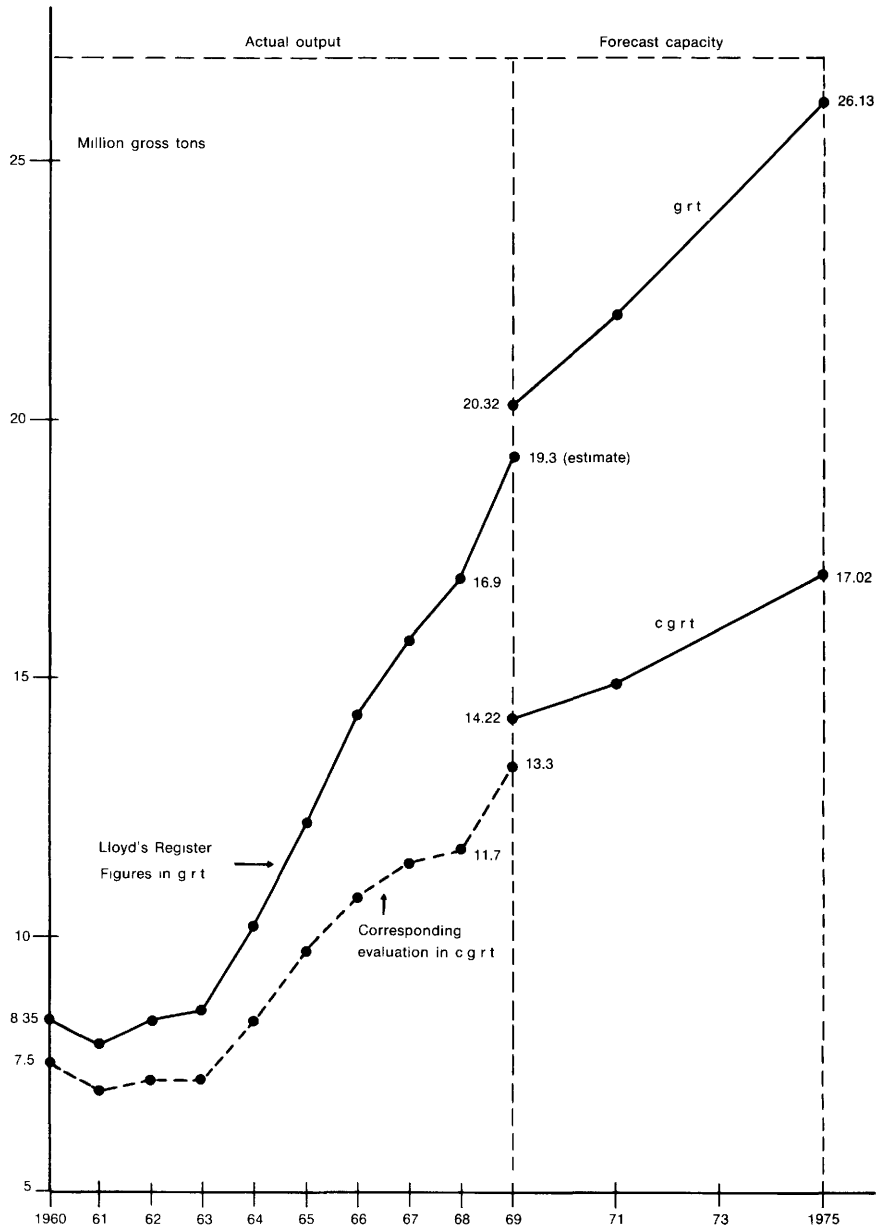
TABLE XLVII

Share of major shipbuilding areas in world output in 1968 and estimated trend of their respective capacities until 1975

Unit of output	Lauchings 1968		Forecasts 1969		Forecasts 1971		Forecasts 1975	
	grt	c. grt	grt	c. grt	grt	c. grt	grt	c. grt
World capacity	100	100	100	100	100	100	100	100
Minor shipbuilding countries	9.8	14.8	10.3	15.5	10.3	15.5	10.1	14.7
Major shipbuilding countries	90.2	85.2	89.7	84.5	89.7	84.9	89.9	85.3
of which:								
a) United States	2.5	3.8	2.7	4.1	2.2	4	2.1	4.1
b) Japan	49.3	37.9	44.8	33.9	44.5	34.8	44	33.8
c) Western Europe	38.4	43.5	42.2	46.5	43	46.1	43.8	47.4
Of which 5 countries of the Common Market	16.6	19.8	19.2	23.1	19.3	22.8	21	24.8

FIGURE E

PAST OUTPUT OF WORLD SHIPYARDS SINCE 1960 AS CALCULATED ON THE BASIS OF LAUNCHINGS, AND FORECAST OF THE THEORETICAL CAPACITY UP TO 1975



CHAPTER VII

FORESEEABLE TREND OF NEWBUILDING SUPPLY AND COMPARISON WITH EXPECTED DEMAND

1. *Supply potential estimated in relation to available delivery capacity*

Once the foreseeable increase in theoretical world shipbuilding output capacity has been estimated, it is advisable to define how the shipyards' optimum shipbuilding possibilities will develop in the course of time, taking into account existing orders at the beginning of the period, i.e. on 1 January 1969.

That is why the questionnaire sent to the Associations of the main shipbuilding countries asked for a breakdown of their order-books at that date by year of delivery.

Comparing each year's forecast deliveries and theoretical capacity, we obtain an outline of the evolution of the newbuilding supply potential corresponding to the delivery potential for new orders placed after 1 January 1969.

However, theoretical capacity is in fact always higher than the actual delivery potential on the world scale during a given year.

For 1969, the world delivery estimates shown on table XLVI have been adopted and it is seen that they are about 9% lower than the theoretical capacity.

For the subsequent years, the level of feasible deliveries can be estimated by applying, to the theoretical capacity, a reduction coefficient identical to that resulting from the figures adopted for 1969.

In fact, the theoretical capacity forecasts have been based on the assumption of a moderate but continuous increase. It can therefore be estimated that the lag existing at the beginning of the period between deliveries and output capacity, should remain practically unchanged until the end of the period.

For the period considered, from 1969 to 1975, a supply potential can be estimated, in gross tonnage and compensated tonnage, by finding the aggregate of total annual delivery potential which could then be compared to the demand potential calculated in the same units, according to the various estimates adopted during the first part of the present study.

2. *Comparison between supply potential and foreseeable demand*

In fact, the prospects of the market look different whether they are estimated quantitatively in gross tonnage to be ordered by shipowners or qualitatively in compensated tonnage to be produced by shipyards. The c.grt being the unit repre-

senting shipyards' activity, the latter comparison gives a much better account of the future employment conditions of the actual capacity of the world industry.

a) Comparison of possible deliveries and expected demand in grt

In table XLVIII the world shipbuilding order-book at 1 January 1969, totalling 49.2m. grt, has been classified according to years of delivery.

This classification was made according to the replies from the various associations, but they concerned a total amount of only 46.2m. grt. It was thus necessary to distribute the additional 3m. grt corresponding to small shipbuilding countries for which, in general, there exist no statistical data.

Besides, some associations did not indicate the annual breakdown of deliveries and it was necessary to make estimates through extrapolations.

The annual deliveries mentioned in table XLVIII must therefore only be considered as approximate figures.

With the above reservations, table XLVIII can give an idea of the distribution in time of possible deliveries of ships to be ordered after 1 January 1969. The total accumulative amount reaches nearly 98m. grt by the end of 1975, but this figure must be reduced to 86m. grt for 1 July 1975 to stay within the scope of the study of medium term demand.

The comparison, in gross tonnage, of potential deliveries with new orders to be placed after 1 January 1969, and commissioned before 1 January 1975, and listed in table XLIII, reveals a theoretical excess in newbuilding delivery capacity varying from 12m. grt in the case of the high estimate of the sectorial analysis, to 52m. grt according to the low estimate.

The newbuilding needs corresponding to the low estimate amount to only 34m. grt approximately and could, in theory, be entirely met by the potential supply as early as the end of the first quarter of 1973.

The high estimate of demand, with 74m. grt, would only cover the potential offer for deliveries up to the end of 1974, but then no ship would be commissioned during the first half-year of 1975.

It would of course be absurd to foresee, even in theory, that no ship would be delivered in the world over a period of between 27 and 6 months, up to 1 July 1975.

In fact, this "deficit" of needs in grt will be spread over the whole period, in a way impossible to foresee, since it will depend on the rate at which shipowners will actually place their orders.

As already emphasized, this rate will depend mainly, not on the actual development of world fleet newbuilding needs, but rather on the international economic situation and on the variations of the freight market. (1)

Various hypotheses can be made in this connection. If, as some may think, international inflation shows a fall-off in 1970 and the freight market records a downward trend, due to the number of the vessels commissioned, shipowners will

(1) Cf. for instance "Long Range Planning and Oil Tanker Supply and Demand in the 1970's", by R. Vaughan, in *Transactions of North East Coast Institution of Engineer and Shipbuilders,* May 1969.

TABLE XLVIII

Development of the theoretical potential supply in gross tonnage on the world shipbuilding market

(in million grt)

	1969	1970	1971	1972	1973	1974	1975	
Expected theoretical output capacity	20.3	20.7 (1)	22	23 (1)	24.1 (1)	25.1 (1)	26.1	
Delivery potential to be achieved								
a) per year	18.5	18.9	20	21	22	22.9	23.8	
b) accumulative	18.5	37.4	57.4	78.4	100.4	123.3	147.1	
Orders as at 1.1.1969	49.2							
a) annual expected deliveries	18.5	16.4	10	3.8	0.5			
b) remaining orders to be delivered at the end of each year	30.7	14.3	4.3	0.5				
Available delivery potential for future orders, after 1.1.1969							1st half year	Whole year
a) per year	—	2.5	10	17.2	21.5	22.9	11.9	23.8
b) accumulative	—	2.5	12.5	29.7	51.2	74.1	86	97.9

1) Capacity estimated through interpolation.

probably not utilize all the additional potential of deliveries offered by the world shipbuilding industry in 1972 and 1973.

Thus, the newbuilding needs still to be covered will have an impact on delivery levels at the end rather than at the beginning of the period considered.

Should there be a noticeable recovery in the freight market in 1972-73 due to a slackening in deliveries, a fraction of the tonnage required for delivery after 1 July 1975, might be expected to be ordered sufficiently in advance to entail anticipated deliveries which would take place at the end of the earlier period. But other likely assumptions could be formulated about the short term development of the maritime economy.

In this connection, it must be borne in mind that the date of 1 July 1975, chosen as a limit between the medium and long term, for the study of newbuilding demand, corresponds to no foreseeable change in the growth rate of merchant fleet requirements.

Consequently, that date should not be regarded as representing a change in the development of the international newbuilding market.

As regards shipbuilders, it should be noted that the anticipated increase of the actual output of the world shipyards in gross tonnage is unlikely, in the medium term, to reach the regular annual growth rate of 4.2%, rate deduced from the forecasts on theoretical capacity.

The quantitative deficit in newbuilding delivery needs calculated in grt, in comparison with the forecasts on output made in the same unit, will not be substantial. If the high growth estimate, formulated in the sectorial analysis, were carried into effect, it would not exceed 14%, which could easily be absorbed by the normal elasticity of newbuilding supply, even if the deficit were not evenly spread over the period.

On the other hand, the low estimate of new tonnage required would lead, in grt, to a level of deliveries 60% below the potential supply of the world shipbuilding industry. In fact, this estimate would involve a combination of all the low alternatives of each sectorial forecast and this is most unlikely to happen.

The average of the low and high estimates of the sectorial analysis places the tonnage required to be ordered after 1 January 1969 and to be delivered before 1 July 1975, at 54m. grt. a figure close, even somewhat superior, to the one arrived at by the overall approach which is about 48m. grt.

For a comparison with supply for which a single forecast was established in gross tonnage, it seems more normal to retain this average estimate which indicates a surplus capacity of around 37%. This percentage seems to exceed the limits of the normal elasticity of the world shipbuilding industry and would mean that one could not disregard the possibility of medium-term difficulties for the world shipyards within a context of fierce international competition, if supply and demand were only compared in gross tonnage. However, this unit by itself can be misleading.

b) Comparison of supply and demand in compensated tonnage

To make this comparison, it is necessary to calculate in compensated tonnage the delivery potential corresponding to the expected development of the theoretical capacity, measured in the same unit, taking into account the distribution of orders according to year of delivery.

Table XLIX shows the development of the potential of world newbuilding supply expressed in c.grt. according to the scheme adopted in Table XLVIII for supply expressed in gross tonnage.

The annual delivery potential likely to be achieved has been deducted from the expected theoretical output capacity, by applying the reduction coefficient already used for the estimate in grt.

The reasons explaining why deliveries are always inferior to the theoretical capacity are valid whatever the unit adopted.

However, the estimate, in compensated tonnage of the theoretical supply potential presents more difficulties than the one stated in gross tonnage. Orders at 1 January 1969, are calculated in compensated tonnage by the AWES and Japanese statistics only. The replies to the questionnaire supplied the figures for the United States and Poland. On the whole, the "converted" orders amount to 28.7m. c.grt. for these countries, and correspond to 46.2m. grt.

The ratio for this fraction of the world order-book is thus 0.62 for 1 grt. For the 3m. grt. remaining on the total order-book of 49.2m. grt., it has not been possible to adopt the same ratio. In fact, it concerns orders placed with minor shipbuilding countries which mostly refer to low tonnage vessels. The coefficient adopted for the production of this group of countries in 1968 and 1969, i.e. 1.05, has therefore been applied when estimating the corresponding orders in c.grt. We thus obtain an estimate of 31.9m. c.grt. for the world order-book, which brings the c.grt./grt. ratio to 0.65 for all known orders at 1 January 1969. This estimate is shown on Table XLIX.

As regards the breakdown of these orders into delivery years, in compensated tonnage, the answers to the questionnaire were incomplete and incoherent. It has thus been necessary to make a global estimate based on the expected figures in gross tonnage for annual deliveries, by reducing the c.grt/grt ratio each year, since the ships to be delivered in the more distant future are generally the largest ones.

Therefore, for 1969, the conversion ratio of 0.69, anticipated for the production of this year, has been retained. For deliveries in 1970, the ratio has been decreased somewhat and is 0.67. For 1971, a further reduction brings the ratio down to 0.65. This figure has to be compared with that of 0.68 for the forecast output for the same year. It is normal that the latter should be inferior to the former, since new orders for delivery in 1971 mostly concern ships with compensation coefficient equal or superior to 1, as the capacities of yards capable of producing large tankers and bulk-carriers are practically already employed for that year.

As regards ships on order at 1 January 1969, to be delivered in 1972 and 1973, the conversion coefficient has been considerably reduced to 0.40 and 0.30 respectively. Only very large ships can be the subject of such long delivery dates.

From table XLIX it appears that the potential of deliveries in compensated tonnage for ships to be ordered after 1 January 1969 and to be delivered before 1 July 1975, amounts to about 50m. c.grt.

If this figure is compared with the requirements for new ships to be ordered after 1 January 1969 and calculated in the same unit in table XLIV, it can be noted that the low estimate of demand in the sectorial analysis is able to absorb 64% of this delivery potential, which, in turn, is quite insufficient to meet the demand foreseen by the high estimate and in fact stands at a level roughly equal to the figure corresponding to the average of both estimates (61.5 c.grt).

3. *Difficulty of comparing supply and demand since the expected demand differs from the one anticipated by shipbuilders as regards the distribution of type and size of ships*

Does the expected distribution of demand, in terms of types of ship, offer satisfactory employment prospects, in the medium term, for the actual shipbuilding output capacity, even in case of a stabilisation or even reduction of delivery needs measured in grt ?

This question is significant, since it appears that the overall surplus capacity, revealed when comparing, in gross tonnage, the foreseeable development of new-building supply with the low estimate of demand, decreases substantially when assessed in compensated tonnage. It even disappears completely, as regards both total tonnage to be ordered and distribution of types of ship, in the event of the high estimate of demand becoming reality.

In fact, one comes to wonder what is the value of the forecasts made in c.grt as regards both demand and supply, and some remarks are to be made about it.

a) The estimate of demand in c.grt adds a further degree of uncertainly in comparison with forecasts made in grt

First, it must be borne in mind that the bases on which the conversions of demand into compensated tonnage were made, should be carefully checked and precised by a thoroughly detailed study of transports, which would permit one to distinguish the prospects of orders for every type of ships forming the world merchant fleet, apart from tankers and bulk carriers.

In fact, in the field of cargo vessels of all types and of other specialized ships, the forecasts of the sectorial analysis of demand were made more difficult, due to the statistics of the fleet and shipping industry now available.

The same remark is to be made for the estimate concerning passenger vessels and small coasters of less than 1 000 grt.

Now the ships required in these sectors form the greatest part of the demand assessed in c.grt.

However, the sectorial analysis permits one to anticipate that the distribution of types of ship, in demand until 1975 will include a high percentage of vessels the construction of which requires a comparatively large number of working hours per

TABLE XLIX

Development of potential supply in compensated tonnage on the world shipbuilding market

(in million c.grt)

	1969	1970	1971	1972	1973	1974	1975	
Theoretical production capacity	14.2	14.5 (1)	14.9	15.4 (1)	15.9 (1)	16.5 (1)	17	
Delivery potential to be achieved								
a) per year	12.9	13.2	13.6	14	14.5 (1)	15 (1)	15.5	
b) accumulative	12.9	26.1	39.7	53.7	68.2	83.2	98.7	
Orders as at 1.1.1969	31.9							
a) annual deliveries expected	12.9	10.8	6.5	1.6	0.1			
b) remaining orders to be delivered at the end of each year	19	8.2	1.7	0.1	—			
							1st half year	Full year
Available delivery potential for future orders, after 1.1.1969								
a) per year	—	2.4	7.1	12.4	14.4	15	7.8	15.5
b) accumulative	—	2.4	9.5	21.9	36.3	51.3	59.3	66.8

(1) Capacity estimated through interpolation.

ton produced. This qualitative aspect of the foreseeable demand is important and should be pointed out.

b) The production capacity in c.grt has been estimated according to the demand expected by shipbuilders

Furthermore, it should be noted that the forecasts on capacity, made both in grt and c.grt, imply some hypotheses of distribution according to types and sizes of ship, of the world ship production.

Now these hypotheses are in contradiction with the expected distribution of demand.

If the c.grt were a unit giving an accurate account of the shipyards' activities, the shipyards' production capacity, measured in this unit, should be perfectly identical—things being equal—whatever the distribution of the yards' output may be, according to the various types of ships they can build. But the c.grt is too recent a unit and neither its bases of estimate nor the way it is used are accurate. The estimates of capacity were most of the times made in grt and then converted into c.grt.

It can be assumed that the reduction coefficients used for large single-deck vessels are relatively accurate because they concern many units of the same type built in recent years in all the major shipbuilding countries and for which there is enough reference material.

The forecast trend of world shipbuilding capacity shows that it is now orientated towards the completion of a growing proportion of large vessels with a compensation coefficient well below 1.

Under the circumstances, potential supply in c.grt reflects the capacity of the world's shipyards if this estimate is borne out, but the forecasts may not remain valid if the composition of demand is the one foreseen by the sectorial analysis.

c) Supply and demand in c.grt will have to be adapted to each other

The shipbuilders will have to adapt themselves to such demand, and it can be stated that even if the actual needs are close to the high estimate of this analysis, the industry will probably succeed in coping with the whole of shipowners' demand. The flexibility it has recently shown in increasing its output in grt will also be available if necessary to enlarge its capacity in c.grt.

In this connection, it can also be assumed that the highest increase coefficients, such as those applied to some recent types of ships: container ships and gas carriers, for instance, will probably have to be reduced sooner or later, when these sophisticated vessels are numerous enough to be built by more than a limited number of specialized shipyards.

In fact, the c.grt is a unit which cannot be defined in absolute terms, and must develop on one hand according to modifications in the types of ships required and, on the other hand, according to shipbuilding techniques themselves.

This is why, despite foreseeable difficulties about the recruiting of labour, at least in the main shipbuilding countries, the estimates of future capacities in c.grt may prove to be too moderate, in that shipbuilders will succeed in adapting their facilities to the actual demand.

Considering the large discrepancy between the composition of the demand anticipated by shipbuilders and the one foreseen by the sectorial analysis, it would be necessary, in order to estimate more accurately the conditions under which medium term newbuilding supply and demand will evolve, to study the present and future capacities of the world shipyards more thoroughly, and also to consider other factors in addition to grt and c.grt.

Such a survey could be based on the ideas presented in the following chapter.

4. *The adaptability of world shipbuilding will enable it to meet the actual demand*

However, taking into account the information obtained about the comparison of the respective development of newbuilding supply and demand until 1975, the question set in chapter V can be answered as follows.

Despite the moderate growth expected, world shipbuilding production capacity will meet the foreseeable demand, even that suggested by the high estimate in the sectorial analysis, but this will only be possible if some shipyards reorientate their production effort.

Indeed, flexibility of supply will be necessary not only to meet quantitative variations of demand, but also—and possibly more—to cope with its qualitative modifications.

In the circumstances, one may anticipate a demand for production which will provide full employment, in general terms, for the existing world shipbuilding labour force.

Nevertheless, one cannot discount the possibility of the balance of the market, or sections of it, being upset, at least temporarily, between now and 1975.

CHAPTER VIII

FURTHER REMARKS ON NEWBUILDING SUPPLY

1. *Lack of sectorial analysis of newbuilding supply*

Whereas with demand, the sectorial analysis has been used to supplement and fill in the details of the overall approach in this report, we could only consider newbuilding supply overall; in other words, the world shipyards' capacities were not classified according to types or sizes of vessels built.

Obviously, the boundaries that could be established in such a study between the different classes of shipbuilders could not be very accurate and would be subject to many variations in the course of time, as, in spite of a recent trend towards specialization, most of the shipyards still build many types of ship.

There is, however, some relationship between the size and scope of the equipment of a given yard and the maximum size of the ships it may produce.

Besides, from the technical and commercial standpoint, sophisticated vessels are generally built in yards having the required experience and, consequently, a background which is considered satisfactory by the shipowners.

The difference in standpoint noted in the previous chapter, according to whether the comparison between newbuilding supply and demand was based on estimates in gross tonnage or compensated gross tonnage, shows that it would be useful to undertake in the future—despite unavoidable inaccuracies—a sectorial analysis of supply according to types and above all to sizes of ships, to be compared with that of demand.

2. *Actual output capacity is a single concept although it is expressed in various units*

A shipyard or group of shipyards has one single output capacity, whatever the measuring unit selected, and it cannot be admitted that any given shipyard or group of shipyards shows a surplus capacity in gross tonnage and not in compensated tonnage, or vice-versa. In fact, any given yard or group is equipped or anticipates acquiring the equipment required, to produce so many ships of any given type and size according to its facilities, labour force, experience and financial resources.

Each year, the optimum output, which a yard tries to achieve through obtaining orders, is represented by one figure in gross tonnage and another one in compensated tonnage.

It must therefore be considered that if a surplus production capacity has appeared on an international scale when comparing supply and demand in gross tonnage, it is not simply an inflationary phenomenon that can be explained by the defects

of the unit chosen. It may well be that this fact points to excessive investment in equipment for building giant vessels if all the programmes in hand or planned in this field are completed between now and 1975.

3. *Comparison between the foreseen evolution of output capacity and world shipbuilding activity from 1960*

From all the replies to the questionnaire provided by the shipbuilders' associations, except the United States, it appears that the foreseen increase of the theoretical output capacity is more rapid in gross tonnage than in compensated tonnage. As far as Japan is concerned and although the shipbuilders' association has not furnished a complete reply to the questionnaire, it is clear from the available information regarding the equipment and plans of the yards, that the situation will probably be the same as in the other countries under consideration. (1)

Fig. E shows, in diagram form, the expected evolution of theoretical capacities during the next five years, both in grt and c.grt. It makes use, for this point, of the figures given in table XLV and compares the evolution of the two curves representing world capacity in grt and c.grt with past trends of newbuilding tonnage output estimated from annual launchings since 1960.

Launchings have been preferred to deliveries in this context since, in spite of the fact that this technical operation tends to lose its traditional significance, they provide, on a world scale, a convenient and fairly accurate evaluation of the shipyards' activity.

The launching grt curve is based on the figures published by Lloyd's Register, except for the year 1969 which has been estimated by the Working Group.

The comparison between past and foreseen development underlines the fact that the capacity forecasts for the next five years correspond to a noticeable slackening of the increase rate recorded since 1963.

We find, however, that the shipbuilders have projected the past trend towards an increasing difference between the output curves in grt and c.grt into the future.

4. *Share of the major shipyards in the future capacity of the world shipbuilding industry*

It is with this trend in mind that the recent shipyard modernization programmes have been put in hand. According to a study in the Japanese journal "ZOSEN", there were already, at the beginning of 1969, 24 yards in operation capable of producing ships of 250 000 tdw and over, whereas 10 more were under construction and 8 are to go into service before 1975.

Shipbuilders generally consider that for a reasonable return on capital these facilities must produce 4 to 6 ships per year on average.

If we choose the low alternative to take into account the fact that these facilities are still only just going into service, we find, for each unit, an annual capacity of 1m. tdw if the average tonnage of the four vessels built is 250 000 tdw.

(1) According to the above-mentioned study, by Mr Onozuka, in which the foreseen capacity of the major Japanese yards in 1975 is higher by 1m. grt than the figure determined by the Working Group, it is expected that in spite of this increase of the foreseen grt output figure, the number of working hours in the Japanese shipbuilding industry will decrease during the 1969-75 period and, despite the expected progress in the field of productivity, this Japanese forecast confirms the fact that the capacity in c.grt could hardly increase more rapidly in Japan than in Europe.

If we multiply the number of yards now in service by 6 years, that of facilities under construction by 4 years—since most of them are to be commissioned at the end of 1970, or in 1971—and the planned facilities by 2 years, assuming that they will start operating in 1973 only, we reach a total supply theoretical potential of 200m. tdw for ships of over 160 000 to be built by 1975.

Out of this total, 45m. were already on order on 1 January 1969.

The remaining available theoretical capacity would thus be 155m. tdw, whereas the total demand for oil tankers of all types is considerably lower than half this figure in the high estimate of the sectorial analysis.

The facilities of these major shipyards alone would therefore represent, in 1975, an annual theoretical output capacity of some 40m. tdw, i.e. 20m. grt of 7m. c.grt assuming that they would be used only for building oil tankers of the 250 000 tdw class.

These figures seem to show that the shipbuilders' associations have not taken into consideration the total theoretical potential of the major shipyards in their own capacity forecasts in grt for 1975. If this were so, 6m. grt only, from a world capacity of 26m. grt would be left for the other yards. Now, in 1968, the 38 yards whose annual launchings amounted to a total of over 100 000 grt and the list of which practically coincides with that of the shipbuilders who have completed or are going to complete building facilities for ships of 250 000 tdw and over, have together launched 10.8m. grt out of a world total of 16.9m. grt. The share of the remaining yards thus amounted to 6.1m. grt and it seems difficult to admit that the total theoretical output capacity of the same yards should not exceed, within six years, their actual 1968 output, whilst the capacity of the major shipyards reached nearly twice the level of their present output.

Furthermore, in compensated tonnage, the major shipyards would leave for the other builders in 1975 a theoretical output capacity of 9m. c.grt. This would imply, for the latter's production, a conversion factor of 1.5 which is certainly too high, considering the estimates of type and size distribution which have prevailed in the establishment of output capacity forecasts of the various shipbuilders' associations.

These discrepancies between the evolution of the output capacity of the major shipyards alone and the forecasts made for the world industry as a whole, show how difficult forecasts on shipbuilding capacity are, owing to the influence, in this field, of the type and size distribution of the ships that the builders expect to produce.

In the case of the large building docks, it is obvious that the capacities, both in grt and c.grt, would be very different if, instead of taking the production of 4 tankers of 250 000 tons as a basis, these facilities were expected to be used for building a larger number of smaller ships of different types or a lesser number of large sophisticated vessels such as LNG tankers.

5. *Probable increase of the world conversion c.grt/grt factor during the next few years*

If we now consider the situation from the standpoint of demand as expected in the first part of this study, the prospects are entirely different as regards the distribution of world production according to type and size of ships.

The orders still to be placed after 1 January 1969, for delivery until the beginning of 1975, represent 54m. grt, based on the average of the low and high estimates of the completed sectorial analysis. After conversion, this average becomes 61.5m. c.grt.

In other words, at the basic date chosen for this study, the average conversion factor for these future orders is 1.14 whereas, for the orders already booked, it was 0.65.

On the whole, for the delivery requirements of the period extending from 1 January 1969 to 30 June 1975, the average conversion factor is 0.91 and therefore close to 1, whereas the output capacity forecasts showed a decrease of this conversion factor, for the same period from 0.69 to 0.65.

The errors that may have been made in the conversion of the tonnages to be ordered as well as the uncertainties of the forecasts themselves, may have resulted in an overestimation of demand in compensated tonnage. But if there has been such an overestimation, it is probably not of sufficient size to explain the difference which has been noted.

It therefore seems plausible that, contrary to the shipbuilders' forecasts, an increase of the conversion factor may occur during the 1970-75 period. Such an increase will cause the actual output figures measured in grt to come closer to the c.grt figures, inversely to what has happened since 1960, and therefore in opposition to the direction taken by world shipbuilding output capacity.

If we refer to Fig. E., we find at once that this closeness prevents the increase of the actual world shipbuilding production, measured in grt from continuing to increase since the curve of the same output, measured in c.grt, cannot, in principle, exceed the ceiling constituted by the curve representing the foreseen evolution of the theoretical output capacity measured in the same unit. In fact, as we have seen in the preceding chapter, we may consider that this future output capacity in c.grt has been somewhat underestimated by the shipbuilders' associations in their forecasts for the period up to 1975.

Nevertheless, we find that this unit provides the best correspondence between forecasts of output capacity and demand and we must therefore expect a medium-term increase of the actual output of the yards whose trend should not be very different from that corresponding to the output capacity curve in c.grt.

The average annual demand in this unit amounts to 15.1m. c.grt for the period from 1969 to 1 July 1975.

If this point were plotted on Fig. E, at the end of the first quarter of 1972, i.e. at the middle of the period under consideration, it would be located slightly above the output capacity curve.

6. *The shipyards' ability to adapt to expected demand*

As we have seen earlier, there is a substantial discrepancy between the demand expected by shipbuilders and the demand foreseen in the sectorial analysis, especially regarding the type and size distribution of ships in the world's production during the period up to the middle of 1975.

It would therefore be advisable to define the conditions under which the necessary adaptation may be made.

The following remarks can be made in this respect:

a) As an overall average, the annual increase of the theoretical capacity in c.grt expected for 1969-75 is only 3.05% per annum. Such a rate corresponds to a rather slow increase in productivity in the world shipbuilding industry if labour force remains constant, or to a somewhat higher increase if the reductions in the labour force and working hours observed during the past few years continue in the future.

In other words, the flexibility of newbuilding supply during the past few years as regards the increase of output measured in gross tonnage, should be much lower when considering the situation in terms of compensated tonnage.

However, as we have seen earlier, it is not impossible that, during a period covering 6 years, it should prove necessary to reduce some of the increase coefficients which are now applied for the specialized ships.

b) The risk of overequipment in production facilities for very large vessels does not imply unemployment in the yards equipped with these new facilities.

On the contrary, it seems that all their theoretical output capacity in c.grt should probably be used to meet demand.

c) In the shipbuilding industry, the principle according to which "he who can do more can do less" is widely applicable and it is quite possible to build, in big docks or on large slipways, ships much smaller than those of maximum size allowed by such facilities.

At all events, it is better to make use of existing equipment, even in inadequate technical conditions, rather than leaving it idle, and this reasoning is even more obvious in the case of new investments which have only just commenced to produce a return on capital.

d) As regards production costs, the competitive position of the most up-to-date yards will certainly not be as good if sophisticated ships, with a high conversion coefficient, are built instead of series of big single-deck ships.

Effectively, the building dock or slipway is only one part of the industrial concern formed by a modern yard and it is with large ships in view that, in general, the lifting devices and the metal production lines have been designed and, as far as the latter are concerned, rationalized and automated.

Apart from material factors, the considerable changes in the types of ships built have caused considerable problems in the rational use of shipyard labour forces.

Under the circumstances, production problems may be encountered in these "super-yards" in building medium sized and/or highly specialized vessels and it is only their high value per grt that will render such contracts financially attractive. However, although, as regards turnover, the substitution of smaller ships, of higher value per unit, for bigger ships of lower price per ton, seems to bring the same end result, the situation is quite different for the organization of the shipyards themselves, as regards the use of production facilities as well as the skill of labour and staff.

e) The foreseeable medium-term fall-off in demand for large oil tankers and bulk-carriers will cause the major shipyards to intensify their marketing efforts for the other types of ships so as to obtain the necessary orders enabling them to take advantage at least of their output capacity in c.grt, although failing to reach their objectives in grt. However, as their equipment will not be used at the optimum level, they will have to take this factor into consideration in respect of the prices they will quote on the international market.

This phenomenon will make the competition of the major shipyards less dangerous for the other yards than it could be expected at first sight.

f) During the next few years, no other shipbuilding country seems likely to enjoy such a tactical position of advantage of a social and economic nature, as that of Japan during the shipbuilding crisis which characterized the beginning of the last decade.

In fact, the wage increases granted by the Japanese yards in the past few years, have been relatively more rapid, on average, than those of most of their European counterparts.

This evolution has noticeably diminished the difference in cost prices which was favourable to the Japanese yards and had enabled them to absorb a considerable part of the additional demand recorded since 1962.

In the circumstances, it will probably be in the interests of the Japanese shipbuilders, during the next years, to fight against a decrease of the newbuilding prices on the international market, contrary to their attitude during the maritime crisis subsequent to the first closure of the Suez Canal.

The appearance on the international market of the yards of the socialist countries is too recent and marginal a phenomenon to allow, especially taking into account the lack of flexibility of planned economic systems, to consider that some of them could become, between now and 1975, the possible successors of Japan in a dominant position on the newbuilding international market.

In spite of these reassuring elements, there are still serious doubts as regards the possible medium-term development of the newbuilding international market.

The essential adaptations will be difficult from both the technical and financial points of view. They will therefore be likely to entail, if they are not scheduled sufficiently in advance, deteriorations in competitiveness for a certain time, at least for some types of ship.

Furthermore, it is possible that, once this adaptation has been carried out, the actual capacity in c.grt of the major shipyards may prove to be much higher when building a high percentage of sophisticated ships, than in the case of a complete specialization in the production of very large vessels.

In order to give a more complete answer to the questions raised by the adaptation of newbuilding supply to the future requirements of the world merchant fleet, a very detailed survey on the present building potential of the world shipyards would be needed. Such a survey would allow a better evaluation of the possibility of developing this capacity according to the type and size of ships in demand, on the one hand, and on the other hand, the flexibility of the main production

factors, among which we can list: labour force, equipment, supply sources and financing requirements.

Thus, it would be advisable to take into consideration other criteria in addition to demand and output tonnages since, in spite of the advantages in this field of the notion of compensation, the AWES c.grt system remains too closely dependent on the grt because it is not possible to multiply and/or modify the compensation coefficients frequently enough to adapt them to the changing realities of production.

In the absence of such surveys, it seems however reasonable to think that the development of the newbuilding world market during the next few years will be better for the shipbuilders than it appears from the plain comparison between supply and demand in grt.

Furthermore, the whole of the world supply and demand do not, in practice, meet on the open international newbuilding market. Certain domestic orders—and not the smallest ones—are practically reserved, de jure or de facto, for the yards of the shipowners' country.

It would therefore be advisable to classify supply and demand forecasts not only according to ship types but also according to flags and shipbuilding countries or groups of countries.

The Working group had not the time nor the means to carry out such surveys which exceeded widely the limits of a medium-term and long-term prospective study of world newbuilding supply and demand.

However, they wish to observe, at the end of this second part of the report, covering the evolution of the shipyards' capacity, that the influence of the situation prevailing on the international market must not be exaggerated, as regards the prospects of any national shipbuilding industry considered separately.

Indeed, in most national industries, the peculiar contingencies of the local economy play a pre-eminent part and it is quite conceivable that their weight could be sufficient to cancel most of the effect of external factors.

The above remark will be further commented in the second part of the conclusions of the present report in which will be discussed the particular prospects of the group formed by the shipbuilding industries of the European Economic Community.

CHAPTER IX

CONCLUSIONS

A. *Medium term economic prospects of the world shipbuilding industry*

1. *The shipbuilding industry belongs to a strongly growing economic sector: that of sea-borne trade*

In finishing this survey, it appears essential to stress that, contrarily to a widespread opinion, the shipbuilding industry is by no means threatened by technological and economic development. On the contrary, it is an industry which is growing rapidly as shown by the statistical data gathered in table L, opposite. It shows, in the form of indices, the past trend of the main economic factors retained in the overall approach because of their relevance to shipbuilding, and compares them with some of the main basic indices of world economy, as calculated by the Statistical Office of the United Nations.

All these indices have a basis of 100 in the year 1963, in accordance with current practice in international statistics, and their evolution can thus be compared quite accurately. This table shows that the most rapidly increasing index is that of sea-borne trade volume. It has nearly doubled between 1959 and 1967, whilst the other most dynamic indices, those which indicate the production of manufactured goods, the share of transport in the gross domestic product and the volume of international trade have increased by three quarters only.

These compared developments emphasize that the share of sea-borne trade in international commerce is growing and confirm that ships will remain an irreplaceable means of communication. However, the growth of the world merchant fleet is less rapid than that of international sea-borne trade. This is explained by a regular improvement in productivity and to a lesser extent by the fact that the growing number of large ships implies an increase in the fleet gross tonnage less rapid than the one of its carrying capacity expressed in deadweight tonnage.

2. *Prospects of maritime economy deduced from past trends*

Table LI gives a biennal summary of the past trends of the economic factors relevant to shipbuilding, the ones already detailed in Table L, and extends them to 1980 in accordance with the forecasts formulated by the overall approach. The forecasts of the sectorial analysis are also mentioned, in 1975 and 1980, regarding the sea-borne trade and the merchant fleet.

TABLE L

Comparison of the past developments of the main economic factors relevant to shipbuilding with the basic indices of the world economy

(Basis 1963 = 100)

	1959	1960	1961	1962	1963	1964	1965	1966	1967
A - Economic factors relevant to shipbuilding									
1) Volume of international sea-borne trade	72	78	85	93	100	112	121	130	139
2) Gross tonnage (as at 1 July) of the world merchant fleet	65	89	93	96	100	105	110	118	125
3) Gross national product of OECD countries	84	87	91	96	100	106	112	118	123
B - Basic indices of the world economy									
1) Production									
a) Energy	85	80	89	94	100	106	111	117	120
b) Primary commodities	89	93	94	97	100	104	106	110	113
c) Manufactured goods	78	84	88	94	100	108	116	125	130
2) Gross domestic product									
a) Global	82	87	90	95	100	107	113	120	125
b) Per capita	88	92	94	97	100	105	109	113	116
c) Share of transport	78	84	88	93	100	106	114	122	130
3) World trade (volume of exports)	76	84	88	93	100	110	118	127	133

The growth of the world merchant fleet, converted into indices by table L, reached 47% during the period 1959-67, which is a figure very close to the increase noted by the indices of the Gross National Product of the OECD countries.

The overall approach, used in this report to disclose the medium and long-term trend of future newbuilding demand, has noted the double correlation showing the dependence of the increase of the world fleets' gross tonnage on the growth of the developed countries' GNP, through the logical intermediary of the volume of sea-borne trade.

The forecasts appearing in table LI express, in terms of indices, basis 100 in 1963, the figures given by the overall approach which, on the assumption that the past correlations will be maintained, are based upon the forecast of an increase of the sum of the OECD countries' GNP at the average rate of 4.5% per year until 1980. We shall not revert to the reasons for the selection of such growth rate, but we shall stress again that it is a conservative estimate. (1)

Despite this reasonable level of the economic growth rate on which the correlation retained by the overall approach is based, the increase in the volume of international sea-borne trade, remains rapid, as the index indicates that it will double over ten years (level 202 expected in 1973) and treble over 17 years, in relation to the basic year 1963.

The low estimate of the sectorial analysis, carried out simultaneously with the overall approach, confirms its forecast exactly. The high estimate would lead to an increase of 10% in the trade expected in 1980.

For world merchant fleet tonnage, the forecasts of the overall approach include a growth parallel with that of the OECD countries' GNP which implies that its productivity will keep rising at the same rate as in the past.

3. *Foreseeable trend of newbuilding demand in grt*

At the foot of Table LI, in the form of indices, the total gross tonnage of ships delivered in the world is shown, and from this a retrospective assessment can be made of the demand placed on the international shipbuilding market to satisfy the newbuilding requirements of the world merchant fleet.

The forecasts of the overall approach having made it possible to calculate the future needs for deliveries in the form of annual averages for the two periods covered by the report, 1969-75 and 1975-80, the first one lasting six and a half years and the second one five years, it has appeared more homogeneous to present past achievements under the form of five year moving averages of the annual delivery figures.

In this series, the basis of 100 is thus provided by the average of newbuildings delivered, measured in grt as published by Lloyd's Register of Shipping each year,

(1) A prospective Japanese survey carried out by Mr Onozuka, General Manager of the big Hitachi shipyard, dealing with the "Japanese Shipbuilding Industry in 1980" takes, according to press abstracts, the same basic factor to estimate long term newbuilding demand. For this forecast, the annual growth rate retained has been 4.8% with a low alternative at 4.6 and also a high alternative at 5%. The latter annual rate is also used in a study issued by the Shipbuilders' Association of Japan to assess world demand for new ships by 1973.

TABLE LI

Past and future developments of the main economic factors relevant to the world shipbuilding industry

Indices Basis 1963 = 100

	Achievements					Forecasts						Source		
	1959	1961	1963	1965	1967	1969	1971	1973	1975	1977	1980	Overall approach	Sectorial analysis	
													Estimates low	Estimates high
Gross National Product of OECD countries	84	91	100	112	123	135	147	160	175	191	218	x		
Volume of international sea-borne trade	72	85	100	121	140	159	180	202	(220) 227 (241)	254	(300) 300 (329)	x	(x)	(x)
World fleet gross tonnage (as at 1 July of each year)	85	93	100	110	125	140	154	170	(169) 187 (187)	205	(206) 237 (227)	x	(x)	(x)
Period covered by annual averages	1957-1961	1959-1963	1961-1965	1963-1967	1965-1969	1969-Mid. 1975			Mid. 1975-1980					
Newbuilding demand (Average annual deliveries in grt)	90	91	100	127	161	(118) (159) (190)			(206) (210) (221)			x	(x)	(x)

for the period 1961-65 in the middle of which is situated the year 1963 retained as a basis for the other indices.

We thus have a means for comparing in indices, on Table LI, the development, foreseen by the overall approach, of newbuilding grt demand, with the economic factors which control it. During the next decade, it seems that the expected levels of deliveries for both periods considered will keep pace with the growth of world merchant fleet. The average of the indices measuring that growth at 1 July 1975 is fixed at 163, a figure which is not far from the index of average annual demand which is situated, for an approximately equal period, at 159. For the period from 1 July 1975 to 1 July 1980, the average of the indices, corresponding to the fleet tonnage at the beginning and end of the period, is 212, as against 210 for the index of average annual demand during the same period. The forecasts of the sectorial analysis are very near the overall forecasts for the second period.

4. *Change from the phase of expansion to a possible phase of stabilization of world newbuilding gross tonnage requirements*

Though this report is essentially a long and medium term prospective survey, and though, in this perspective, the foreseeable trend of newbuilding needs confirms that shipbuilding is a growing industry, the Working Group has thought it advisable to examine more carefully the change from the present phase of expansion to a possible phase of stabilization. At first sight, the medium term forecast of the overall approach suggests a plateau in the development of demand: index 159, which estimates deliveries in grt for the period 1969-75, is almost at the same level as the one corresponding to the period 1965-69.

However, this global stabilization of newbuilding requirements expressed in grt is, in fact, as shown by the sectorial analysis, the result of foreseeable movements in opposite directions within the various sections of the world merchant fleet. The medium term needs for tankers and bulkcarriers are low owing to a particularly brisk recent demand for these types (including OO's and OBO's) whilst the other sections of the fleet, relatively neglected during the recent years, require substantial investments in the near future.

The distribution by types of both past and future demand will produce different effects on world shipping and shipbuilding during the early seventies.

a) A phase of stabilization seems necessary to restore the balance within the world merchant fleet

The sectorial analysis has shown that, in the recent past, the sector on which demand had probably anticipated too widely on the needs of the coming years, is that of bulk carriers. But it may happen that, for some other types, the commissioning of the ships now on order, will entail temporary surplus capacities in various sectors of the merchant fleet. The versatile OBO carriers are adding a rapidly growing element of uncertainty as regards the future balance between demand and supply of transport capacity in oil, and/or dry bulk trades.

These risks would appear if the current policies of economic restraint applied in the main developed countries caused a fall-off in the growth rate of sea-borne trade, which has been particularly high in the last two years.

Because of its very dynamism, the sector of sea-borne trade is very vulnerable to variations in the international economic situation; in the past, several fluctuations have been experienced. However, for the future, the developed countries' economic policies would probably entail a steadier development.

If the sector bulkcarriers seems to be more in danger in the event of a slackening in the demand for sea-borne trade, a consequent drop in freight rates would not affect this sector only. The existence of the above-mentioned fleet of OBO's, which should increase rapidly, according to the recent pattern of ordering, implies that the field of oil transport would be seriously affected, whilst the lack of precise boundaries between bulk-trade and general cargo trade would mean that the sector of cargo-vessels would probably suffer also. Consequently, if a substantial and durable surplus capacity appears in one sector of the merchant fleet, it can be expected that the whole freight market would be concerned.

b) The level of activity in world shipbuilding should remain high during the stabilization period

As regards shipbuilding, such a situation could have beneficial effects in the long term if it accelerates the obsolescence of ageing ships and causes not only layings up but also a strong increase in the rate of scrapping. However, in the short term, past experience proves that shipowners' orders for new ships decrease when the freight market is weak.

In any event, the change from the expansion phase to one of stabilization must result in much less marked fluctuations for deliveries than for orders. As world orders reached, in July 1969, the peak level of 54.75m. grt, representing work on hand spread over several years for the main shipbuilders, the change from expansion to stabilization would only entail for them a decrease in their orderbook without consequences to their level of activities, which, besides, cannot be accurately estimated according to the single criterion of gross tonnage of ships built.

The distribution of demand according to types and sizes of ships is, indeed, more important for shipbuilding than its overall volume in grt. The conversion into compensated tonnage of the medium term requirements for new orders, as calculated by the sectorial analysis, makes it possible to give a more accurate forecast of newbuilding demand likely to materialize in contracts placed after 1 January 1969, for tonnage to be delivered before 1 July 1975. These new orders should mainly concern cargo liners and sophisticated vessels, the building of which will require many more man/hours by grt than bulkcarriers and tankers.

Accordingly, despite the overall stabilization of grt newbuilding requirements, the demand foreseen should entail a moderate but real growth in the average output of the world shipyards measured in c.grt, between now and 1975.

5. *Future potential production of the world shipbuilding industry*

In the second part of this report, the study of the prospects of the newbuilding output capacity has been voluntarily restricted to the medium term, because it has been deemed that, in principle, in the long term, capacity cannot follow a different trend from that of demand. It also appears that the period of change in the cycle of newbuilding demand should probably occur during the first years of the next decade.

Despite the relative proximity, in time, of the years covered by the inquiry carried out by the Working Group, the data obtained have proved difficult to interpret. However, some factors likely to influence the medium term situation as regards newbuilding supply have been covered to some-extent and they are discussed below.

a) The target production capacity for 1975, in grt

Though production capacity expressed in grt does not reflect the activity of shipyards very accurately (viz IX-5b hereunder), the Working Group has thought it useful to make the following remarks: the newbuilding needs calculated in grt for the period 1969-75 do not in any case, even according to the highest estimates of the sectorial analysis of demand, tally with the aimed growth of the world newbuilding output capacity, as estimated in the same unit, according to the forecasts given by the main shipbuilders' associations.

It must be stressed, however, that these forecasts obviously deal with a theoretical output capacity, which can be achieved only on the assumption that the best technical conditions of operation of the existing equipment would be fulfilled. These conditions will be fulfilled only by shipyards continuously building the biggest vessels corresponding to their present or planned facilities. In practice it is obvious that this ideal level of production cannot be reached by every shipyard at the same time all over the world nor by a single yard during the whole period under consideration.

The experts of the Working Group therefore assumed that the total maximum possible output cannot exceed an actual level which would be some 10% below the theoretical world output capacity. This assumption is confirmed for 1969; at the current level of production recorded during the first half of the year, world shipbuilding will not reach the annual theoretical output forecast by the shipbuilders' associations at the beginning of the year. This fact is particularly significant at a time when the buoyant state of the market is an incentive to almost every yard to reach the maximum possible level of output.

Moreover the investigations emphasized the flexibility shown during recent years by the newbuilding supply and the ability of the industry to adjust its output to short-term changes in demand by increasing or decreasing subcontracting and/or overtime. The normal range of this flexibility is plus/minus 10-15% but it seems that the maximum level has nearly been reached, taking into account the facilities and labour force available at the present time.

Nevertheless, in conformity with the growing long term trend of the demand, huge investments have been or are being made in many shipyards. These investments are most often intended for the construction of large vessels and they have increased the theoretical capacity of world output, estimated in grt in this field and will continue to do so.

b) The expected growth of the world output capacity is moderate when estimated in compensated tonnage

Because of the increase in the average tonnage of ships produced in the last ten years, the use of grt to estimate the shipyards' output capacity, according to tradition and the statistical data of Lloyd's Register of shipping, may give rise to serious errors of judgement particularly in the field of forecasts, which are very often a projection of past trends into the future.

This is why the forecasts of output capacity have also been made in compensated tonnage. Besides, the c.grt is a unit which represents shipbuilding activity much better than the grt as it is adjusted in principle, in proportion to the value added by the builder, which, in an assembly industry, is more or less proportional to the number of hours spent.

The main obstacle to the progress of ship production during the present expansion phase is, in most countries, the shortage of labour force which is still widespread despite all the attempts to recruit new workers.(1)

Under the circumstances, it is not surprising that the forecasts of the theoretical capacity, expressed in c.grt only show a moderate growth rate for world shipbuilding taken as a whole.

c) A possible surplus of giant tanker production facilities does not imply a world-wide surplus capacity

Thus, as a whole, in the shipbuilders' Associations' forecasts, the target growth of world newbuilding capacity expressed in c.grt points to a slower rate than the same phenomenon estimated in grt.

These discrepancies must be linked to the fact that the builders are projecting the past trend towards a gradual reduction of the average conversion factor linking their production figures expressed in gross and compensated tonnage into the future. However, such a reduction would mean that a growing proportion of the world shipyards' output would have to consist of very large single-deck vessels.

Now, at least as regards the first half of the next decade, the conclusions of the sectorial analysis as to the distribution according to types of ship of the foreseeable medium term demand, are contrary to this widespread opinion.

This orientation of demand is so clear as to the relative weakness of the foreseeable medium term needs for large tankers, bulkcarriers and OBO's, that it is doubtful whether the building of new production facilities specially designed for ships of 250 000 tdw and above, which is expected to be completed by 1975, can be considered appropriate to market conditions.

On the other hand, on a world scale, if the foreseeable demand is converted into compensated tonnage, the expected increase of world output capacity measured in the same unit, seems reasonable.

This analysis would tend to prove that, in the medium term, there is no fear of a surplus capacity in the world shipbuilding industry. In fact, excluding short term fluctuations, the expected demand should provide full employment for at least the present labour force in the world shipyards. On the other hand, the "super-shipyards" at present being built or planned may, in the medium term, cause a surplus in production facilities for very large ships, if their completion is not spread over a period of time. These facilities will surely not remain idle, but it will probably be necessary for them to maintain a degree of adaptability.

d) Adaptation of the output capacity to the expected demand

Consequently, during the next few years, it seems that the adaptation of the world shipbuilding output capacity to future demand will have to be considered rather in terms of type and size of ships to be built, than in quantity of gross tonnage to be produced.

(1) The Onozuka survey, mentioned above, suggests that, in relation to 1967, the number of working hours in the major Japanese shipyards will decrease by 9.2% before 1975.

The concept of compensated tonnage is new and its use may lead to some misrepresentation, especially in the field of forecasts. In some cases, for new types of ship, the choice of coefficients already made seems questionable and adjustments may have to be introduced in course of time. It is thus to be desired that the study of the questions brought up in this report be continued, thoroughly examined and filled out in order that, in the future, more accurate means will be available to ensure a better adaptation of merchant ship supply to demand. The shipping scene is nowadays changing very fast and shipbuilding must be ready to turn out new products using new processes requiring new investment.

Furthermore, it is convenient to examine the potential demand by 1980 for the units necessary not only for prospecting, but also for exploiting the sea-bed under the continental shelf and the resources of the sea in general.

At present, part of the construction of drilling platforms is not done by the shipbuilding industry, but the more sophisticated units of the future should revert to it.

These surveys may appear too international in character, but it seems advisable to proceed with them at least within the frame of the EEC Shipbuilding Liaison Committee.

B. *Economic prospects of shipbuilding in the European Economic Community*

Thus, on the world scale, shipbuilding emerges as a growth industry, due to the fast expansion of international sea-borne trade; but it is also confronted with the problems raised by the widespread technical and economic changes which are now a characteristic of this sector.

At the beginning of this decade, no one could foresee the magnitude of such changes and the multiplicity of their effects on the world shipbuilding industry.

At the end of 1969, this situation is still developing, this explains the discrepancies between the future demand estimates published in various countries of the world. Both the leaders of the industry and the Governments of the major shipbuilding countries should accordingly remain in the closest touch with market movements.

1. *The favourable elements of the EEC yards' present situation should not conceal the real problems of this industry*

The maritime countries of the European Economic Community, taken as a whole, constitute, after Japan, the main shipbuilding area of the world. (1)

On 1 October 1969, the orders placed with the Common Market shipyards represented 24.3% of the world order reserve calculated in gross tonnage by Lloyd's Register. As this percentage is higher than the share of these yards in the present world output, it can be assumed that they enjoy, on the whole, a higher work load than others, enabling them to cope with possible short-term market fluctuations.

In the medium term, the expected distribution of types of ship in overall world demand is characterized by an increasing need for specialized ships. This should also be of advantage to shipbuilders who, like those of the Community, have the benefit of a wide experience in the use of advanced techniques.

(1) The EFTA countries, whose total output capacity is at least equal to that of the EEC countries, are to be considered separately since they have no common shipbuilding policy.

Nevertheless, this assessment of the prospects of the EEC shipbuilding industry which looks favourable on the whole, should be looked upon as a general appreciation only, which covers varying specific circumstances.

As regards the order reserve, the situation varies from one country to the other within the Common Market and, inside a given country, there are also noticeable differences from one yard to the other. Moreover, the conditions in which these orders were booked and will be fulfilled are as important as their volume, and perhaps more important. From this point of view, it can be noted that the risks increase as delivery times lengthen since the corresponding contracts have to be concluded at firm prices, in accordance with international practice.

In the future, whatever the magnitude and distribution of the world demand for shipping may be, the effective share of the European Economic Community's yards in newbuilding production will depend on the relative evolution of their competitiveness on the international market.

2. *Unlike other EEC activities, shipbuilding cannot be protected by a common external tariff which effectively creates an internal market*

Now the shipbuilding industry is entirely governed by the conditions set up by the overall relationship between world newbuilding supply and demand.

Except in a few countries, the ship, as a means of world trade operating permanently outside frontiers, is not liable to customs duties. Besides, there are no trade mark or transport and distribution cost considerations in the field of shipbuilding. The owner knows all the major yards of the world and, taken as a whole, they can always meet all his requirements.

The main feature of the newbuilding market is therefore the absence of any customs or geographic protection.

As regards the Common Market shipowners, whose activities are not controlled by the Treaty of Rome, they are also placed in this context of competition on a world scale; therefore, they have to be able like their colleagues in other countries, to place their orders on the basis of the prices and payment conditions in force on the international market; they cannot in fact accept to deal at prices which would jeopardize their own competitiveness.

The result is that the shipyards of the European Economic Community cannot avail themselves of an internal market proper, on which they could rely in the event of an external crisis or a restriction of international free trade.

The newbuilding international market conditions are therefore imperative for the Community's shipbuilders as regards the whole of their output, whether it is intended for owners in the Common Market or other countries.

3. *EEC shipbuilders do not control their conditions of sale*

The owner, who has free access to the whole international market when ordering a ship, chooses such or such yard according to numerous criteria which can be grouped as follows:

1. the contractual price (firm price or not, currency (1)

(1) Having also regard to whether it is firm or subject to a sliding scale and to the currency in which it is quoted.

2. the delivery dates offered by the shipbuilder
3. the conditions of payment accepted by the builder and especially the amount, duration and cost of credit granted after delivery.
4. the advantages of the technical solutions proposed by the builder.

From the owner's point of view, the order of importance of these criteria may vary according to the period when the contract is signed, the type of the ship, and his own situation. However, the main consideration, as far as he is concerned, is the return to be expected from the investment as a whole. Now, in most cases, this return depends essentially on the price and conditions of payment.

From the builder's point of view, what is really important is the extent to which he can control the various factors governing his competitiveness.

Contractual price and delivery time are indeed a function of the concern's organization, employment and purchasing policies, but these criteria are also deeply affected by external factors, since organization and policies are dependent on the framework of the national economy of the country where the yard is located.

These external factors, are, in particular, the cost of materials, employment and wage policies, labour regulation, credit policy, monetary fluctuations and the social variations.

As regards conditions of payment, it is obvious that the builder has practically no control over this factor. They are most frequently determined by Governments Administration, whether financing of home orders or export credits are concerned. Thus production costs and financing are determined for each builder by national conditions.

Finally it is only the technological potential of a yard which depends to any great extent on the management's business sense and on its research effort. However, it also depends on the yard's financing facilities which, in turn, are determined by past or expected profits.

Therefore, it must be emphasized that the circumstances allowing a yard to make a profit only occur, if there is a sufficient margin between the production conditions—national data—and the selling conditions—international data.

4. *Recent rise of Japan and decline of EEC on the world shipbuilding market*

On the international market, through the free action of supply and demand, selling prices always tend towards the level of the quotations from the group of yards in the national economy where production costs are lower, provided that this group represents an appreciable share of the total potential supply and its technical and commercial reputation is well established.

Likewise, financing conditions show a tendency to fall in line with those of export credits as set up by the countries willing to promote the sales of their shipbuilding industry in foreign countries, since this production, due to its very nature, is free from tariff barriers, which is not the case for exports of other industries.

By combining all these optimum conditions, the Japanese shipbuilders were able, at the beginning of the last decade, to impose their prices and particularly advanta-

geous credit conditions, thus rapidly affecting the relative competitiveness of their foreign counterparts.

Under these circumstances, despite their great strides in the field of productivity and their concentration policy, the yards of Western Europe could not absorb this reduction in selling, prices and rise in financing costs. As a result, their profits dropped and the steady increase in home production costs compelled them to apply for various forms of aid from their Governments.

But this government intervention generally came too late and proved to be insufficient; this caused a considerable relative reduction of the tonnage produced by the yards of the European Economic Community.

When the Treaty of Rome was signed, in 1958, their share in the world market amounted to 33%. Ten years later, this percentage had decreased to 16.

5. *The present recovery of the relative situation of the EEC shipbuilding industry should be improved through a common policy*

In the year 1968, this recession stopped and even gave way to a certain degree of recovery in Common Market shipbuilding activities as compared with the world total. This shows that the relative competitiveness of this industry has improved.

The fact that the proposal of the Commission to set up a common level of subsidies within the Community area has been accepted by the Council of Ministers of the European Communities, with a view to eliminating some of the anomalies in international competition, is a corner stone on which the improvement of the Common Market yards' position can be built.

This decision of the Council of Ministers comes within the scope of the specific sectorial action which has been adopted for shipbuilding under the second programme of medium-term economic policy of the Communities. The way is thus paved towards a common policy of Member States in the field of shipbuilding, the only EEC industry which cannot have the benefit of the protection of a common external tariff.

It should also be noted, however, that as in the case of their colleagues of Western Europe, the operating conditions of the EEC builders have also improved owing to the recent rise in the international price of ships subsequent to the increase of Japanese production costs in a sellers' market.

Among other things, this situation has made it possible, within the OECD, to come to an agreement restricting the maximum export credit conditions which owners are granted in the various shipbuilding countries.

However, the Common Market yards have also had significant rises in production costs, and the effect of the general increases of interest rates is also noticeable. Therefore, their financial situation is still not very satisfactory, more especially as a long no-profit period left them without the necessary reserves to meet contingencies and the risks of technological transformation.

The common shipbuilding policy initiated among the five maritime countries of the Common Market shall therefore have to be maintained and reinforced.

The Working Group has noted, in Chapter VI of this report, that the evolution up to 1975 of the output capacities of the major shipbuilding areas did not imply, in the medium term, deep changes in their relative positions.

In the middle of the next decade, the output capacity of the Common Market yards should reach 21% in grt and 24% in c.grt of the theoretical world output capacity.

In 1968, the share of these yards in world launchings was 16.6% in grt and 19.8% in c.grt.

So, the realization of these forecasts will require the higher relative increase in the output estimated in grt. But is should be remembered that most of this increase is already gained in 1969, since the estimates of business for this year suggest that the Common Market yards will build, in 1969, some 20% of the world output calculated in gross tonnage.

Similarly, in compensated tonnage, it can also be taken that, as early as 1969, the effective share of the Common Market yards will approach the level of 24% that was foreseen for their theoretical output capacity in 1975.

Although we have reasons to be satisfied with such a fast relative recovery, we ought not to think that it is definitely acquired.

In fact, whatever the development of the international market may be in the future, the share of world demand that can be obtained by the Common Market shipbuilding industry will depend, as in the past, on its degree of relative competitiveness. This competitiveness will depend, as we have seen before, on its own research and organization efforts in the various yards, as well as the evolution of numerous political, economic and social factors within the European Economic Community and the national economies of the various Member States.

These considerations should be borne in mind by those who will have, in future years, to determine the policy to be adopted in the field of shipbuilding, at both European Communities' Commission and national Government level.

In the long term, in the context of increasing international sea-borne trade, the dependence of the Community, whatever its extent, on overseas supply sources, can only increase and this implies a simultaneous growth of exports towards these outside markets.

This dependence presupposes, as shown by the Japanese example, that Western Europe constitute an adequate merchant fleet and set up a powerful shipbuilding industry.

Therefore, the fluctuations which are always possible on markets with so much international competition, should not cause the responsible Authorities to adopt restrictive policies. Likewise it is recommended that internal measures liable to reduce the relative competitiveness of the yards of the Community with their chief competitors should be avoided.

It is in fact essential that the recovery initiated should be maintained and even improved, through full-time collaboration between Industry and Public Authorities, as, if the situation continues to improve, it will enable the shipbuilders of the European Economic Community to play a part more consistent with the importance of the Common Market in world sea-borne trade.

MEMORANDUM OF WORKING GROUP No. 1—"MARKET SURVEY"—REGARDING THE REVISION OF THE FORECASTS PRODUCED IN 1969

As early as the autumn of 1970, the Liaison Committee of EEC shipbuilders considered that it was necessary to update the requirement and production capacity forecasts prepared by our working group at the end of 1968 and at the beginning of 1969, and presented in November 1969, in a "Report on the medium and long term developments of the shipbuilding market".

The phase of very high conjuncture of the world maritime economy in 1969 and 1970 brought about a new tonnage demand from shipowners in excess—at least as far as oil tankers and bulk carriers are concerned—of the medium term requirement forecasts first issued by our group.

Besides, this pressure of demand has been for two years the cause of a multiplication of investment programmes in the shipbuilding industry, which were to bring the theoretical new tonnage production capacity up to a level much higher than was appraised through the results of the international inquiry carried out by the working group early in 1969.

In particular, the Liaison Committee wished our working group to determine whether the risks of overcapacity referred to in the 1969 report had lessened or increased as a result of the evolution reported, since this document was submitted to the EEC commission, in the fields of both seaborne trade supply and world shipbuilding production possibilities.

At the present time, our working group which has completed the revision of its overall forecasts, expressed in gross tonnage, is able to submit its new conclusions on the expected development of demand and supply on the world shipbuilding market by 1980, according to the amount of new tonnage required by international seaborne trade on one hand, and to the delivery capacities of the various shipbuilding countries on the other.

A. *Estimate of new tonnage requirements*

1) The revision of the overall approach used in 1969 to obtain this estimate, expressed in grt, has been based on the following principles:
a) The "crude oil trade" sector has been considered separately, with respect to shipborne volumes as well as fleet gross tonnage and, consequently, new tonnage requirements.

Two different series of equations of regression—one for this crude oil trade sector and the other for the whole of other sectors—were thus used in parallel, in the

model set up. This made possible a more accurate determination of the double correlation used in 1969 between, on the one hand, the growth of OECD member countries' GNP and the whole of seaborne cargoes and, on the other hand, between the latter and the gross tonnage of the world fleet. In particular, it was possible to define, for the crude oil trade, a regression equation of "modified geometrical" form which gives a better account of the recent evolution than the linear equation previously used for the whole of international seaborne trade. However, the latter form of adjustment has been maintained for the sector of "dry cargoes" to which it is better suited.

b) Two alternate assumptions regarding the effective growth of the OECD GNP have been chosen, this time, for the 1970-1980 period, still covered by the new estimates.

The high assumption implies an average annual growth rate of 5.25%, in accordance with the 1970 forecasts for the 1980 range, prepared by OECD experts, regarding the economic expansion that should be achieved by member countries "in the absence of any major economic or political difficulties" and presupposing, besides, that "the trend towards a liberalization of international seaborne trade should be maintained".

These reserves led the working group to adopt also a low assumption reducing the average annual growth rate to 4.75%. This precaution seems to be justified by the recent developments and by the expected consequences of the present international monetary crisis.

However, this low assumption is higher than the single one mentioned in the 1969 report and which implied a rate of 4.5% per annum for the effective economic growth of OECD member countries.

c) As far as newbuilding requirements are concerned, due consideration was given, for the calculation of the world fleet replacement rate, to the recent trend towards advancing the average age of elimination of ships in operation, a phenomenon which derives from the acceleration of technological progress.

2) The results of this revision are shown in Table A herein, and call for the following comments:

a) The expansion of international seaborne trade expected in the present decade, should be based on an average annual growth rate ranging between 7.6 and 8.5% in the "oil trade" sector, and between 5.4 and 6% in the sector "other cargoes", i.e. "dry cargoes".

b) The forecasts formulated with respect to the gross tonnage of the world merchant fleet in 1980 correspond to average annual growth rates ranging between 7.2 and 7.9% as regards tankers and between 4.2 and 4.7% for other ships.

c) The total new tonnage requirements derived from the expected growth and replacement rates of both sections of the world merchant fleet are within a range extending from 244.3 to 259.3 million grt in the 1970-1980 period.

On an annual basis, these requirements would correspond to average newbuilding deliveries ranging between 22.2 and 23.6 million grt a year. This new forecast is therefore much higher than those appearing in the 1969 report.

d) Such a long-term forecast should be compared with the average annual deliveries of the world shipbuilding industry during the previous period—1960-1970—which amount to 12.8 million grt.

In centering these past average deliveries in the year 1965 and the estimated future average annual requirements in the year 1975, the overall approach has made it possible to consider that the long-term trend of evolution of the world shipbuilding production shows an annual growth rate in the order of 5.7 to 6.3% per annum to meet the new tonnage requirements, assuming that the latter would not be either advanced or deferred due to short-term conjunctural variations.

Owing to these variations, it does not seem possible to foresee the actual volume of deliveries in a given calendar year. Therefore, the only possible forecasts are average annual newbuilding requirements forecasts. However the extrapolation up to the end of this decade of the long-term trend defined in the overall approach, places the world shipyards' average level of output at this time between 29.4 and 32 million grt.

Indeed, The Working Group consider that, over and above the short-term conjunctural variations, the corrective mechanisms existing in the maritime economy tend, in the long term, to align newbuilding demand and deliveries with the actual requirements of seaborne trade.

B. *Evolution of production capacities*

The revision of the theoretical capacity forecast for the year 1975 appearing in the 1969 report has been conducted as follows:

a) The case of the major shipbuilding countries was considered separately but, apart from Japan which, due to its importance, stands alone as the main shipbuilding centre in the world, these countries were grouped in areas according to geographic, economic and political criteria: thus, Western Europe was divided into 3 regions: "North-Western", "South-Western and South-Eastern" and the Common Market in its present extension. Likewise, the rest of the world was divided into the countries of the "Socialist Bloc", United States and "Developing Countries".

b) An inventory of all the projects of creation, extension and modernization started up or announced as decided since the beginning of 1969 has been undertaken, according to the information available at the end of the Summer of 1971. The extra production capacities, corresponding to the production programmes announced—or estimated according to the characteristics of investments—have been in each case calculated in terms of grt for the year 1975. However, only the projects offering a high degree of credibility, due to their state of progression, the importance and quality of the investors and the concerned country, were taken into account.

2) Table B herein depicts the opinion now prevailing among the working group members as to the plausible evolution in coming years of the production capacity, estimated in grt, of the world shipbuilding industry. The figures appearing in Table B are commented as follows:

a) In order to evaluate the evolution of production capacity in the main shipbuilding areas, the Working Group has first calculated the probable level of deliveries to be expected in 1971 in each of them. Besides, it tried to appraise the effects of factors liable to bring about an increase or a reduction of the present capacity, taking into account the investment plans inventoried on one hand, and the possible effect of recent changes in the newbuilding market situation on the other.

b) It can be noted that the level of activities now reached by the shipbuilding industry is exactly the average level forecast for the whole 1970-1980 period in the high estimate of the overall approach. Although many shipyards may be considered to have now reached a stage of "over-employment" of the existing facilities, it can be feared that the advance gained in the past years with respect to requirements should be offset, in the medium term, by a reduction of yearly deliveries below the level corresponding to the correct use of the present equipment and labour force.

c) As regards the evolution forecasts for the world shipbuilding theoretical production capacities, there is still a quite marked trend toward their growth, in spite of the high deceleration rate which has been admitted after taking the decreasing factors into consideration: the prevalling growth rate of 12% p.a. should be diminishing after 1972, but the present impulse is so powerful that, toward the middle of this decade, the theoretical production capacity of the industry will most probably reach a level which make possible newbuilding deliveries amounting to about 32 million grt, of which some 30 from the shipyards now operating on the international market.

If we situate this forecast in the calendar year 1975 and if we refer to the average deliveries of the 1960-1970 period centered on the year 1965, we find that the long-term trend of the theoretical production capacity shows an average annual growth rate exceeding 10% whereas the maximum growth rate corresponding to newbuilding requirements has been previously estimated at 6.3%, also considering the long-term trend determined in the high estimate of the overall approach. We should remember in this respect that the latter makes it possible to anticipate that the annual newbuilding requirements will not reach the level of 30 million grt before the end of this decade.

d) The Working Group wishes, in particular, to stress the fact that the advance gained by Japanese shipbuilders over their European competitors in the implementation of major investment plans inevitably implies that the growth of the Japanese production capacities can only be carried into effect through heavy dismantlings of old facilities; the average Japanese shipbuilding productivity should thus increase in the coming years.

Contrarily, for the European traditional maritime countries, the inversion of the market situation may bring about the abandonment of investment programmes that would have been, however, absolutely necessary to enable the yards' activity to be maintained in proper conditions of productivity so that it might be capable of withstanding the international competition which is likely to become keener again.

This situation may aggravate the distortions which already exist, to the detriment of the European shipbuilding industry, in the competition opposing it, on a world-wide basis, to its Japanese counterparts. It is therefore essential that the modernization of facilities in European shipyards should be continued, even if such a policy implies a certain increase of capacity that it would seem advisable, at first sight, to avoid as far as possible.

Though it is not appropriate to attach too much importance to the very figures of newbuilding capacity and requirement overall forecasts expressed in terms of grt (considering the sensibility of this unit to the ship size and type distribution in the shipyards' production), it seems that, despite the very noticeable rise in requirement forecasts, the risks of overcapacity referred to in the 1969 report have been growing since then.

It is the prevailing multiplication of investments in the world shipbuilding industry, and especially in Japan and Southern Europe, which, beyond the short-term fluctuations creates the threat of a structural disequilibrium which might continue through most of this decade if strict measures are not adopted in the meantime, on a worldwide basis, to reorganize the market.

The study of such measures exceeds the present terms of reference of our working group. However, it presupposes that the revision of the 1969 report should be continued and deepened in the field of the sectorial analysis.

This revision will at first deal with large units, tankers, ore carriers and combined vessels, such sectors in which the data already gathered tend to situate more particularly the excess production capacities, considering the orientation given to the investment programmes now being carried into effect.

TABLE A

Up-dating global approach

Forecast of sea borne trade - world fleet gross tonnage newbuilding needs for 1970 - 1980

	Realizations 1969	Forecasts 1975 hypothesis		Forecasts 1980 hypothesis		Average annual growth rate 1969/1980	
		low	high	low	high	low	high
GNP / OECD (10^9 US$)	1 555	2 047.7	2 107	2 582.4	2 721.3	4.75	5.25
Sea-borne trade (10^6 tons)							
1 Oil	1 230	1 916	2 006	2 760	2 993	7.6	8.5
2 Dry cargo	1 030	1 390	1 439	1 825	1 937	5.4	6
3 Total	2 260	3 306	3 425	4 580	4 930	6.7	7.4
Grt. World fleet (10^6 tjb)							
1 Tankers	77.4	116.9	122.1	165.7	179.2	7.2	7.9
2 Other vessels	131	163.5	168	204	214.5	4.2	4.7
3 Total	208.4	280.4	290.1	369.7	393.7	5.4	6

NEWBUILDING NEEDS (in 10^6 tjb)	Period 1970-1975		Period 1976-1980		Period 1970-1980	
	low	high	low	high	low	high
1 Tankers						
expansion	39.5	44.7	48.8	57.1	88.3	101.8
renewal	15	14	20	17	35	31
total	54.5	58.7	68.8	74.1	123.3	132.8
2 Other vessels						
expansion	32.5	37	40.5	46.5	78	83.5
renewal	23	22	25	20	48	42
total	55.5	59	65.5	66.5	121	125.5
3 Newbuilding needs	110	117.7	134.3	140.6	244.3	258.8
Yearly average	18.3	19.6	26.9	28.1	22.2	23.6

TABLE B

Foreseen variation in world newbuilding output capacity up to 1975, distributed by main areas

(in thousand grt)

	Actual deliveries		Estimated deliveries 1970	Present increase factor 1971-1970	Expected effects on present capacity of modifying factors		Forecasted theoretical output capacity towards mid. 70s	
	1970	%			positive (1)	negative (2)	in grt	in % increase as against the 1971 estimate
JAPAN	10 100	4.81	11 000	1.089	7 800	3.800	15 000	36.3
II - EUROPEAN ZONE OF OECD								
a) NW Europe	4 328	20.6	4 200	1.040	8 800	300	5 000	11.1
b) EEC	3 503	16.7	4 400	1.256	1 800	600	5 600	27.2
c) SW and SE Europe	1 098	5.2	1 500	1.376	2 200	500	3 200	113
d) Total	8 929	42	10 400	1.165			13 800	32.7
III - REST OF THE WORLD								
a) Socialist Bloc	1 150	5.5	1 200	1.043	800	300	1 700	41.6
b) USA	375	1.8	500	1.333	500	600	700	40
c) Developing countries	426	2	500	1.173	700	400	800	60
d) Total	1 951	9.3	2 200	1.128			3 800	36.4
IV - WORLD TOTAL	20.980	100	23 600	1.125			31 800	34.8

(1) Investment plans - productivity improvement.

(2) Abandonment and delays of some projects, dismantling of existing facilities.

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