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Barge Carriers: Some Technical, Economic and Legal Aspects

Drs. W. Cordia
Mr. G. J. W. de Vries
Ir. N. Wijnolst

STICHTING TOEKOMSTBEELD DER TECHNIEK

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Preface

The whole world of traffic, transportation and conveyance is constantly on the move. This requires enterprises, organizations and public authorities to be just as constantly aware of future developments and to gain an insight into the implications of these changes.

The Havenvereniging Rotterdam in 1969 offered a prize for the best essay on a new development in transportation.
This prize was awarded in 1970 to W. Cordia and N. Wijnolst, then studying at resp. the Netherlands School of Economics and the Technological University Delft, for their study on barge carrier introduction. To the Havenvereniging Rotterdam and the Future Shape of Technology Foundation it appeared to be worth while to have this essay published, be it somewhat elaborated and amplified. The introduction of barge carriers not only being an economic and technological affair but also having a number of legal consequences, it was decided to ask G. J. W. de Vries, then law student at the Netherlands School of Economics, to make available his doctoral study on the subject.

This publication must be regarded as just an illustration of a more general world problem now under study at this Foundation: The mutual influence of developments in transportation and changes in industry.

May this publication contribute to a harmonic integration of a new system into the future world of transportation.

L. Schepers,
President of the Board

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Some technical and economic aspects of barge carrier systems

by W. Cordia and N. Wijnolst

Barge carrier or kangaroo ship

SOME TECHNICAL AND ECONOMIC ASPECTS OF BARGE CARRIER SYSTEMS

Chapter A. Introduction

1. General observations

Transport costs play an extremely important role in international trade. The importance of international trade is self-evident, in that it creates a higher level of prosperity, in the sense of a higher real income, for those countries involved in it.
Through international trade the world is becoming one cohesive market with the result that the productive factors which are considered to be immobile beyond the domestic border are nevertheless being exported indirectly to places where the reward is greatest, i.e. by exporting end-products. Take the example of Holland's relative land scarcity. While it is not possible to import land into Holland it is possible to import agricultural products. The importation of agricultural products does however reduce the problem of land scarcity. Every country will, under conditions of full competition, expand the production of certain goods and cut back on that of others until the domestic price ratio (= cost ratio) of the goods is in accordance with the price ratio of these goods on the world market. There will then be no point in creating further changes in the production structure, since the producers will have reached their maximum position. The adjustment of the domestic price and production structure to the demand and supply relationships simply means that the relative scarcity differences of productive factors can be dissolved between countries. It is, of course, just these relative scarcity differences which provide the main spring for international trade and which are the cause of relative differences in costs.

What role do transportation costs play in this?
By lower integral transport costs, international trade will be promoted and a higher level of prosperity reached through greater international specialisation. The search for efficient transport methods, thus attaining lower overall transportation costs, therefore deserves a great deal of attention. This particularly applies to those goods of which the transport costs are a relatively heavy burden on the total cost price e.g. raw materials such as ores. It is precisely these products which are relatively heavily taxed that usually originate from the developing countries, which means that these countries cannot profit to the full from international specialisation. The tariffs in the world of transport, however, do allow for this because, in general, the transportation costs are as high as the product can bear.
In many cases transportation costs determine the export of a product, but this is certainly not the only consideration. Sometimes these costs bear no relation to the services offered, or irrespective of the quality of transport, the price of the product does not allow high transport costs. In other cases it is a matter of a combination of transport costs and import duties or transport costs plus the time element between production and the availability of the product on the market. Yet, all these considerations do not alter the fact that minimal integral transport costs would strongly promote the international division of labour.
Many products would, however, be able to bear higher transport costs (usually high value products) if the quality of transport (e.g. speedier) were better.
For example, cheese and chocolate which are exported to the tropics can bear higher transport costs when transported in cold storage spaces by fast ships.
In a world where international trade is beginning to play an increasingly important role in the economy, the efficiency of the transport industry becomes an economic question of the highest order. As already shown, transport costs are in many cases the deciding factor as to the extent to which, and quantity of, a product can be drawn into international trade in order to remain competitive.
Transport costs very often cover many separate elements such as sea transport, road transport, rail transport, stevedores, shipbrokers, inland navigation. The sum of the costs of these transport elements determines the integral transport costs.

2. How can we reduce the integral cost of transport?

In the first half of the 20th Century, transport of goods lagged far behind, relative to other industrial processes, in the application of mechanisation and automation. The transport industry, and in particular the maritime and inland shipping element, has trailed badly in its application of new technology. During a period when labour productivity in the sense of unit labour achievements per man generally increased in the industry as a result of progressive mechanisation, productivity in the handling of cargo in the port often decreased because of less efficient use of unaltered labour methods (shorter working days, growing unutilised working time and strikes). This, coupled with the fact that the wages in the ports were in line with those in the more mechanised areas, resulted in a disproportionate rise in the costs of cargo handling. See figure 1. During the last decade however, this sector too has entered in on the industrial revolution and in no other sector has it proceeded at such a pace as in the shipping sector, where developments are more than spectacular. During the last ten years the revolution in maritime and inland shipping has been greater

Figure 1 - Cargo handling productivity has often decreased because of less efficient use of unaltered labour methods.

than the entire historical development of the previous centuries.
The term mechanisation is usually associated with some standard article or a constantly repeatable operation.
General cargo is always defined as a large number of heterogeneous things in an endless sequence of possible size and weights. As long as general cargo was identified with this definition, very little could be done about mechanisation and hence the cost of cargo handling swallowed a disproportionate amount of the total transport costs.
The versatility of the cargo determined, in many cases, the shape of the ship, which was traditionally designed to carry anything to anywhere. This led to the lower holds of the ships often being fitted for bulk goods as well as for general cargo, with the latter requiring the laying of wooden floors, dunnage between its separate layers, and the use of complicated separation systems. Small hatch-heads, inadequate loading and unloading gear, in addition to strange shapes of the holds, and the necessity of horizontal stowage within the ship, add to the inefficiency of the conventional ship.
All the costs arising as a result of the ship having to remain in harbour longer than necessary, must be assimilated into the cargo handling, as during this segment of the transport cycle the cargo is getting no nearer to its destination. This means that, in addition to the cargo handling costs, there are also the investment costs in the ship, the wages of the crew and other operational costs pro rata.

It is obvious that the search for efficiency was pressed forward urgently. The key to the solution of this problem lay in unification (more uniform products) which would lend itself to mechanised handling.
The ways in which this has been realised so far are (figures 2-6):

— container ships
— pallet ships
— roll-on / roll-off ships
— barge carriers (Kangaroo ships)
— general purpose ships.

But undoubtedly more types and varieties will be evolved.

Figure 2 - Container ship.

Figure 3 - Pallet ship.

Figure 4 - Roll-on / roll-off ship.

Figure 5 - Barge carrier.

Figure 6 - General purpose ship.

3. Specialised types of vessel and classification of goods

Substances, materials and articles are hardly ever suitable for transport in their natural state. Therefore, they are brought together in varying quantities in a particular space, or are packaged; in other words, substances, materials and articles are often proffered for transport encased. Thus goods can also be described as a collection of substances, materials or articles in the form in which they can be transported. This means that the bag of fertiliser, the hogshead of tobacco, the container and the barge are cargo.
Cargo can be divided into general cargo and bulk or mass cargo.
Gases, liquids and powders, grains or lumps should always be encased. In large flows they will be transported as bulk cargo while in small quantities they will be part of general cargo for transportation purpose.
As already mentioned general cargo has its own shape, content and weight. It very often occurs that content plays hardly any role for transportation, in that the wrapping or casing neutralises the content. In the past many substances were made up as portable pieces of general cargo, limited in size. In many areas, usually the less developed ones, where the labour factor of production is not scarce, this is still the case. Gases and liquids, which do not have their own solid shapes, and which lend themselves particularly well to continuous transport by pipeline, are an exception. With gases it was initially not even possible to transport them packaged as general cargo.

As soon as simple equipment such as cranes and hoists appeared on the scene whereby collected loads could also be transhipped, changes were made in a single link of the transport chain but brought about only a limited rise in production. In fact, the tempo was still being determined by the weakest link, the time-consuming stowing and unloading from the holds, a highly labour-intensive activity. Bundled cargo was transported in manloads, the limiting dimensions of which can be set at 1-55 kg weight and 10 cm-60 cm size. See figure 7.
Nowadays, as a result of the introduction of larger and larger handling equipment such as the harbour crane, forklift truck etc., it becomes possible to exceed these limits and so to move larger sizes and weights; thus a scale enlargement of which the barge is the largest example at the moment.
Human labour still plays an important part in this. This drawback can only be resolved by adapting goods and equipment to each other to a far greater extent, which will undoubedly lead to unification and specialisation.
It can be expected that the tendency towards mechanisation and automation will continue. Man will act more as the controler of transport processes, particularly as regards the handling of cargo with large variations in size and weight.

In general the handling of goods can be done in two essentially different ways: using a continuous or a discontinuous transport mode.

a. *Continuous transport*

Large volume flows are not, over a relatively short distance, moved intermittently, but in continuous flows, whereby the goods retain their natural form. This means that the goods do not continually have to be adapted to the means of transportation but that the means are clearly and especially designed for those particular bulk goods. The continuous transport of liquids through pipelines from storage place to storage place will, in larger quantities, be simpler and, often, cheaper than by filling barrels

Figure 7 - Bundled cargo handled as man loads.

with liquids first and then transporting these in a discontinuous fashion. Seen in this light the question is whether powders and grains (semi-bulk) such as meal and fertiliser, will continue to be transported in bags, because here again an increase in flows appears.
With this type of continuous transport, transportation usually takes place in units which are as large as possible, e.g. bulk carriers, tanker and, in the future, perhaps the barge carrier for smaller quantities and the pipeline for shorter distances.

b. *Discontinuous transport*

For those goods which do not lend themselves to continuous transport (steel, wood, tobacco, coffee, tea, etc.) and for relatively small quantities on larger distances, transportation will usually be discontinuous.
This means that the goods must be adapted to the equipment and technique in use.
This inevitably leads, once again, to unification of the goods package e.g. barge, container, pallet, flat, unit load.
The weight of the goods is, within certain limits, no longer important, since the handling equipment can generally adapt to weight, better than it can to the dimensions of the goods packages.

In cargo we can distinguish two large groups: bulk goods and general cargo, the handling of which will lead more and more to unification and specialisation. It is, above all, in the latter group that the development in this direction is taking place in a spectacular manner. In figure 8 the main division of the goods is shown, whereby we bring the goods back to cube form and indicate the relation between size and weight, taking a specific volume of 1,25 m^3 per ton. The scale used is logarithmic.
From this diagram we can see the goods before the transitional phase form the group of bulk goods, the transport of which will be continuous. This implies that the means of transportation are attuned to the goods, e.g. bulk carrier, tankers, gas tankers, pipelines. See figures 9 and 10.

The other group consists of the semi-bulk and general cargo, with sometimes a transitional phase between continuous and discontinuous transport. Larger units

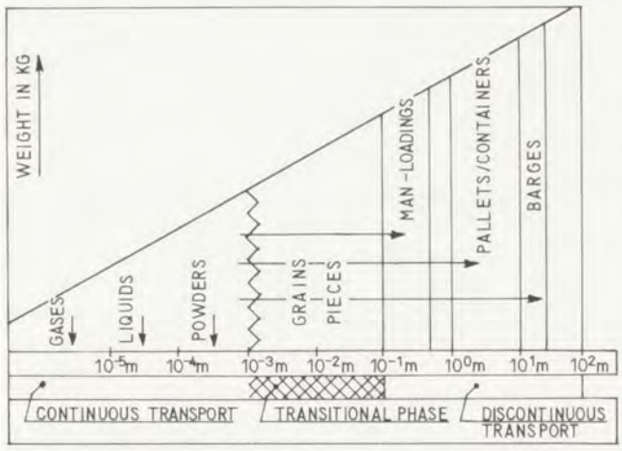


Figure 8 - The main division of cargo and of transport modes.

Figure 9 - Continuous transport: tanker.

Figure 10 - Continuous transport: bulk carrier.

of these goods are formed as indicated in the diagram, and transport will become discontinuous, with the units having to be adapted to the equipment used. This adaptation to the means of transportion takes place in form of pallets, flats, unit loads, containers, roll-on/roll-off and barges. See figures 11 and 12. The barges and their transporting equipment, the barge carrier, hold an intermediate position, in that this system aims particularly at that sector of the cargo transport market which finds itself in the transitional phase between

Figure 11 - Discontinuous transport: containers.

Figure 12 - Discontinuous transport: barges.

Figure 13 - Transitional phase: break-bulk.

continuous and discontinuous transport, i.e. semi-bulk cargo such as forest products, steel, fertiliser, coffee, tobacco. See figure 13. This will be dealt with in further detail in Chapter C.

4. Consequences of this development for transporters, shippers and authorities

The ship and the *modus operandi* of the shipping industry should be adapted to the structure of the transport chain. Through the unification of the units, which is expected, the whole transport chain must begin to form an integrated and mutually attuned series of links. Inland navigation and rail and road transport, are very much a part of this and will have to be attuned to pallets, containers, barges and other forms. As a result of this requirement we see a tendency towards the combined transport operator, integrating the different elements of the transport chain. In many cases, the shipping company is the link in the chain which brings about this integration, in as much as the shipowners in the majority of cases have the most capital.

In the future it looks as if we will not be able to speak of shipping companies any longer or of inland shipping companies, road transport firms etc. but only of one transport firm which will embrace all the elements within the transport services package.
This form of transport has many advantages over the segmented execution of the transport services package, which has been the system to date, viz.:

a. Through unification, the different elements of the transport chain can be mutually attuned under one management,
b. As a result of economies of scale, a more efficient use can often be made of the available production resources.
c. A better appeal can be made to the capital market through the creation of a larger firm. This is a very important point, as investments during the present transport revolution are very large.
d. When the maritime carrier alone commits himself to these investments, the risks become greater, as the other links are not yet geared to this. Adjustment only occurs when a certain period of time has elapsed. This was clearly demonstrated on the introduction of containers.
e. The combined transport operator offers shippers the best services at the lowest possible price, which is a result of the factors summed up above. The services package which the shipper is offered in this manner is very important in view of its role in the physical distribution carried out by the shippers.
   Just how important this lowest possible price can be on the sales market has already been described in 1.
f. The whole transport chain is as strong as the weakest link. This means that if some of the elements are not sufficiently attuned, the whole transport chain is no stronger than this weak link, which is, at the same time, usually the most inefficient. Under one management, investment in this weak link can considerably strengthen the whole transport chain.
g. An important advantage will also arise from the

fact that transport people do not think in terms of shipping company owners, road transporters, stevedores, shipbrokers or shipping agents etc., but in terms of transporters, whereby thinking is more integrated. One does not think in terms of a specific technique of a specific form of transport.

All these advantages of transport integration make it possible to reach the optimum cost level. This would not appear to be possible with segmented transport. By necessity a transport system must be designed as a complete system and not as a series of unrelated elements. However, this does not imply that the most efficient transport system would also mean that all the elements of the transport chain in themselves should be the very best.
In this connection advantage f. above is of much importance.

Against these advantages there are, of course, a number of disadvantages, but in our opinion the latter do not cutweigh the former. One disadvantage of using a combined transport operator is that the shipper sees his alternative transport possibilities diminishing as a result of economic concentration and an oligopolistic form of power. This makes entry into the transport market difficult, if not impossible. Against this background it becomes possible to have a look at the consequences to transporters, shippers and authorities.

Transporters

Through the development outlined above, which is already being carried out at a very rapid pace, it becomes necessary that transporters:

— orient themselves towards this development
— get attuned to one another with a view to unification
— ultimately integrate themselves into one all-encompassing transport system, whereby the combined transport operator can offer all services in the field of transport.

Mutual adaptation of the transport elements is obvious, but in practice this has seldom been the case.
At the introduction of the container, the transporters adapted themselves to the structural change in the maritime field.
The container activated road transport, railways, inland navigation and shippers. There were only a few shippers sufficiently organised to be able continually to deliver unitised elements alongside the ship.

Shippers

This development demands a reorientation in the field of physical distribution, on the part both of shippers and those potential shippers whose appearance on the transport scene has for one reason or another been prevented to date.

Figure 14 - Infrastructure and facilities of the port must be geared to continual adaptation.

By physical distribution we understand the complex of factors which rules the course which a product takes from the moment when production is finished until it reaches the consumer. Naturally, transport is a very important factor in physical distribution, next to other factors such as: stock-pile, financing of stock, loss of interest during transportation, packaging, insurance, invoicing. The sum of the costs of these individual factors determines the cost of the physical distribution which often amounts to 20 to 30% of the total cost price of the product.

It now seems obvious that these costs can be reduced by more efficient methods of transport. This will be dealt with further in Chapter E.

Authorities

Adaptation to transport development in the wider sense encompasses the provision of adapted port facilities such as container terminals and the provision of adequate inlets and outlets, by land as well as by water. In addition, loading terminals and transhipping facilities for bulk goods are required, with a processing capacity sufficient to preclude congestion and the concomittant loss of time.
The infrastructure of the ports must be geared to a continual adaptation and widening of its economic potential. See figure 14.

Cooperation between shippers, transporters and the authorities seems essential, in order to arrive at an adequate infrastructure, which will have to be attuned to the expected development.

A directive, originating from the authorities to the "Economic Office for Road and Water Transport" to look into the infrastructural needs in the coming decade strongly points in this direction.

Chapter B. Description of barge carrier systems

1. Introduction

It was apparent from Chapter A that the development of transport is moving towards a system and not towards a sequence of no or hardly any related elements. We found the solution for discontinuous transport in unification and specialisation, whereby container, flat, pallets and the unit load were created. The latest development in this field is the barge, the largest unit of transport.
It seemed to us to be a good idea to give more attention to this barge system in particular, for the following reasons:

— The very fact of its being the latest development in the field of transport means that it answers to the demand to create a system out of transportation problems.
— The barge carrier, in our opinion, will clearly be geared to serve an important part of the total flow of goods. We shall go into this further in Chapter C.
— The barge carrier is the most suitable system for servicing the developing countries, where the infrastructure and harbour equipment is not yet geared to the assimilation of container ships, pallet ships and unit load ships. This will be examined further in Chapter D.

2. Survey of barge carrier systems

As far as we know there are seven different standard designs for barge carriers at present. They do not differ so much in construction, size or speed as in the ways in which the mother-ships load, discharge and stow their barges.

a. Lash (lighter aboard ship)
designed by Friede and Goldman, U.S.A.
b. Seabee
designed by J. J. Henry and Co., U.S.A.
c. European barge carrier systems
i. designed by Blohm and Voss, Germany
ii. designed by Howaldts Werke Deutsche Werft, Germany.

The remaining three, of English and Australian origin, will not be considered in that their operability is, in our opinion, questionable.

The European barge carrier systems have been set in abeyance for the moment for a variety of reasons, which include certain political considerations.

a. Lash (Lighter aboard ship) (figure 15)

Several of this type of barge carrier are on order in two slightly different versions. These differences are mainly connected with size, as Lash barges are more or less identical in construction.

Barge carriers in service

Type No.	Owner	Dwt	Builder	
Lash 2	A/S Moslash Shipping Co. Norway; vessels under longterm charter to Central Gulf SS.	43,500	Sumitomo Shipbuilding & Machinery Co., Japan	U.S. Gulf/Europe
Lash 1	Prudential-Grace Lines	29,463	Avondale, U.S.A.	U.S. East Coast/ Mediterranean

Barge carriers on order

Type No.	Owner	Dwt	Builder	Schedule for delivery	Trade route
Lash 4	Prudential-Grace Lines	29,463	Avondale, U.S.A.	3/71 6/71 9/72 11/72	U.S. East coast/ Mediterranean
Lash 6	Pacific Far East Lines	29,463	Avondale, U.S.A.	9/71 11/71 2/72 4/72 7/72 2/73	U.S. Gulf/Europe
Lash 2	Holland-America Lines	43,000	Cockerill Yards, Belgium	11/71 5/72	U.S. Gulf/Europe
Seabee 3	Lykes SS*	33,350	General Dynamics' Quincy Division	1/72 4/72 7/72	

* Enters service January 1, 1972

Barge carriers planned

Type No.	Owner	Proposed trade routes
Lash 3	Central Gulf SS	U.S. Gulf Coast/Red Sea, Persian Gulf, India, West & East Pakistan
Lash 3	Delta SS Lines	U.S. Gulf/East Coast of South America
Lash 5	Prudential-Grace Lines	U.S. West Coast/East & West Coasts of South America
Lash 2	State Shipping Service of Western Australia	West Coast of Australia
Lash 12	Waterman SS	World-Wide Service

The Pacific Far East Line and the Prudential Steamship Company have ordered the smallest type, which will not only be able to transport barges but containers as well.

The number of barges and containers can be varied within certain limits, depending on the need at the time; this is done by placing extra guiders in the barge cells. These cells are provided with connections for

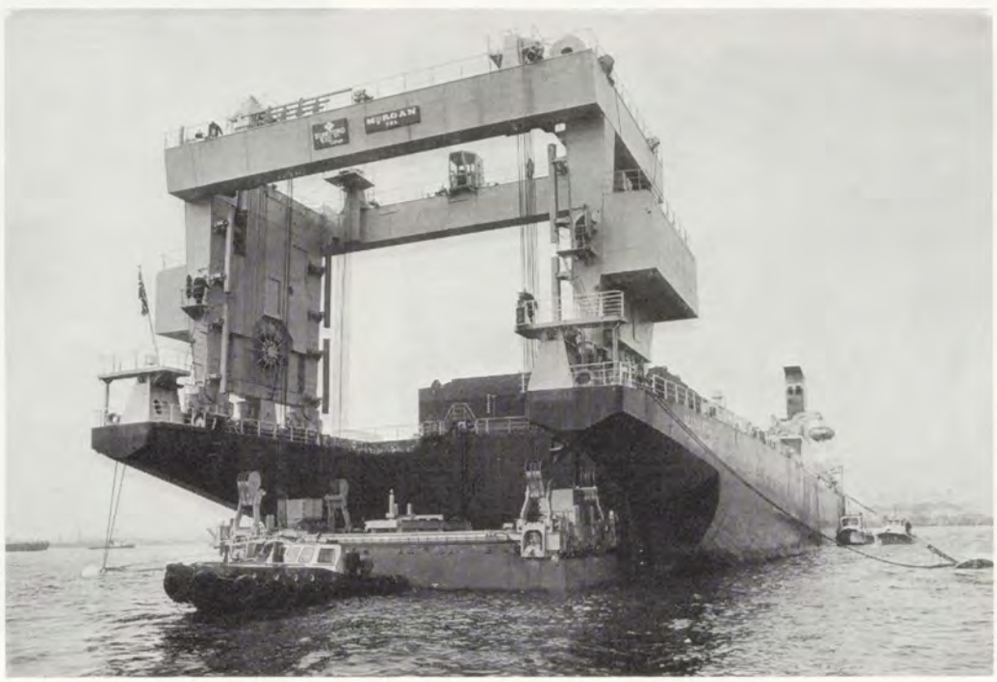


Figure 15 - Lash carrier in operation.

freezing, cooling and ventilation. A 500 ton crane is used for the hoisting and lowering of the barges. It lifts up the barges between the two protruding parts of the U-shaped stern of the ship, and then drives forward along rails fitted onto the upper deck. The barge is then lowered into its cell. The hatches of the barges are so strong that four barges can be stacked one on top of the other. It is also possible to place containers on the hatches of the top barge. These, as are the barges, are stacked athwartships.
There is a 30 ton crane on board ship especially for containers so that the ship is more or less independent of the container terminal facilities. Should the ship not be berthing alongside the quay, the containers can still be unloaded, into empty barges, as the openings under the hatches are so big that containers can be put into them athwartships.

The measurements are as follows:

length overall	235.31 m
length between perpendiculars	220.68 m
beam	30.48 m
depth	18.29 m
maximum draught	10.69 m
power output	32,000 S.H.P.
speed	23 knots
load capacity	61 barges or 54 barges and 204 20′ containers or 49 barges and 324 20′ containers or 34 barges and 700 20′ containers
deadweight	29,600tons

The larger Lash carrier sails under the Norwegian flag, in charter for the Central Gulf Steamship Corporation of New Orleans.
The ship is not fitted for containers as it mainly transports pulp and paper products.
Otherwise the system differs only slightly from the one described above.

The measurements are:

length overall	262.20 m
length between perpendiculars	234.00 m
beam	32.50 m
depth	18.29 m
maximum draught	11.25 m
power output	26,000 H.P.
speed	18 knots
load capacity	73 barges
deadweight	43,000 tons

Figure 16 - Artist's impression of the Pacific Far East barge.

The Lash barge

The Pacific Far East barge has a four part hatch, the parts of which can be folded in pairs using either a manual or pneumatic winch (see figure 16); while Central Gulf barges have a hatch consisting of three parts which can be lifted off (see figure 17).

In addition, the former has double walls. Both types have holes at the four corners for attaching the framework which lifts the barge.

The measurements are:

	Pacific Far East	Central Gulf
length	18.75 m	
breadth	9.50 m	
height overall	3.96 m	
draught	2.61 m	
load capacity	380 tons	
length of hatch	12.80 m	13.41 m
width of hatch	6.40 m	7.92 m
capacity	480 m^3 (general cargo)	564 m^3 (general cargo) 583 m^3 (grain)

b. Seabee (figure 18)

A so-called syncrolift is used with this system, which is fitted to the stern and has a lifting capacity of 2,000 tons at a lifting speed of 1.8 m per minute. The plat-

Figure 17 - A Central Gulf barge in the port of Strasbourg.

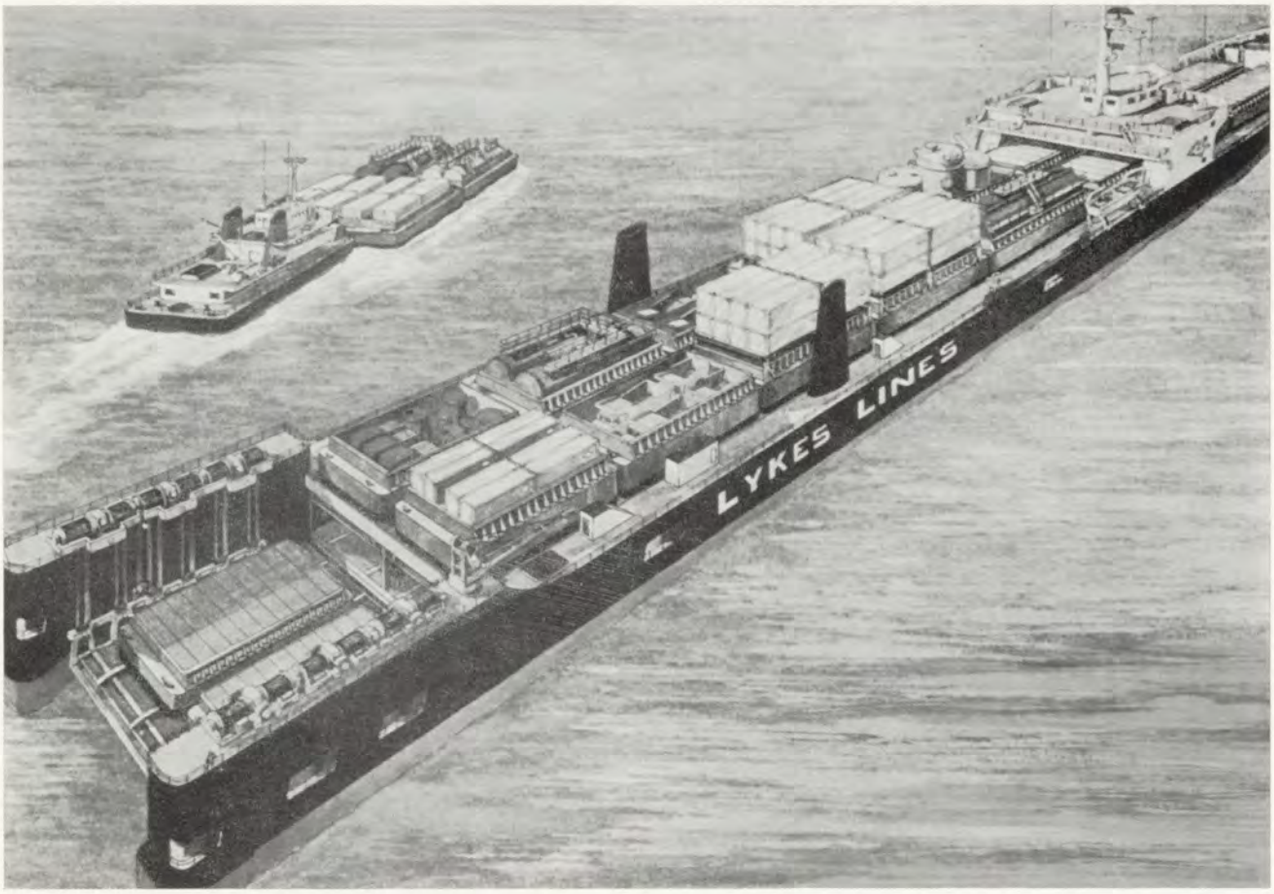


Figure 18 - Artist's impression of the Seabee carrier loaded with barges and containers.

form is lowered into the water so that two barges can be manoeuvred onto it side by side, the barges being held in position by a winch on the ship. On the two lower decks there is room for 2 x 12 barges and room for another 14 on the upper deck. The lift is brought to the level of one of the decks, where a barge transporter lifts the barge from the platform and displaces it horizontally in a fore-and-aft direction at an average speed of 18 m per minute.
(See figure 19).
The lifting capacity of this transporter is 1,000 tons.

There is no cell structure as there is with the Lash system. The barges are pushed into the ship one after another and are not piled. The advantage of this is that it is possible to accept barges of different sizes with a maximum deadweight of 850 tons. Another advantage is that the Seabee ship can be used, without modification, as a roll-on/roll-off system. The lift is then used as a ramp. The usuable deck surface comes to approximately 13,500 m² and there is clearance between the decks of 5.90 m. See figure 20.

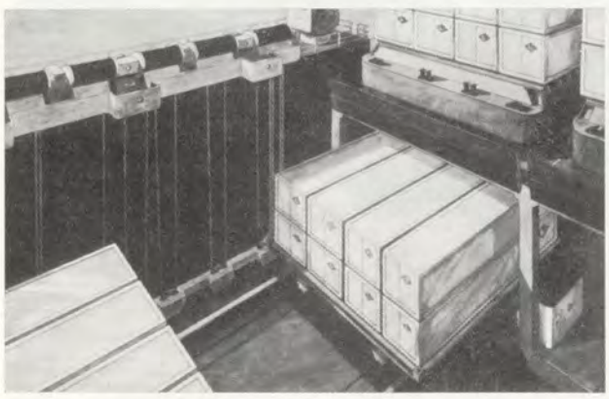


Figure 19 - The lift is brought to the level of a deck and the barge (with containers on its hatch covers) is moved to its place.

The barges stowed upon the upper deck can accomodate containers two deep internally, with a further three layers of containers stacked upon its hatch cover.

The main measurements are:

length overall	266.31 m
length between perpendiculars	219.43 m
beam	32.26 m
depth	22.80 m
maximum draught	11.90 m
power output	36,000 S.H.P.
service speed	20 knots
capacity	38 barges

The Seabee barge (figure 21)

As has already been noted, the Seabee system shows greater flexibility, as regards the dimensions of the barges. However, this does not get away from the fact that the dimensions of the standard Seabee barge are more attuned to the pushing units which navigate American waterways than to European requirements. One example of this is the height of the barge, 4.95 m. As in the unloaded state the barge draws approximate-

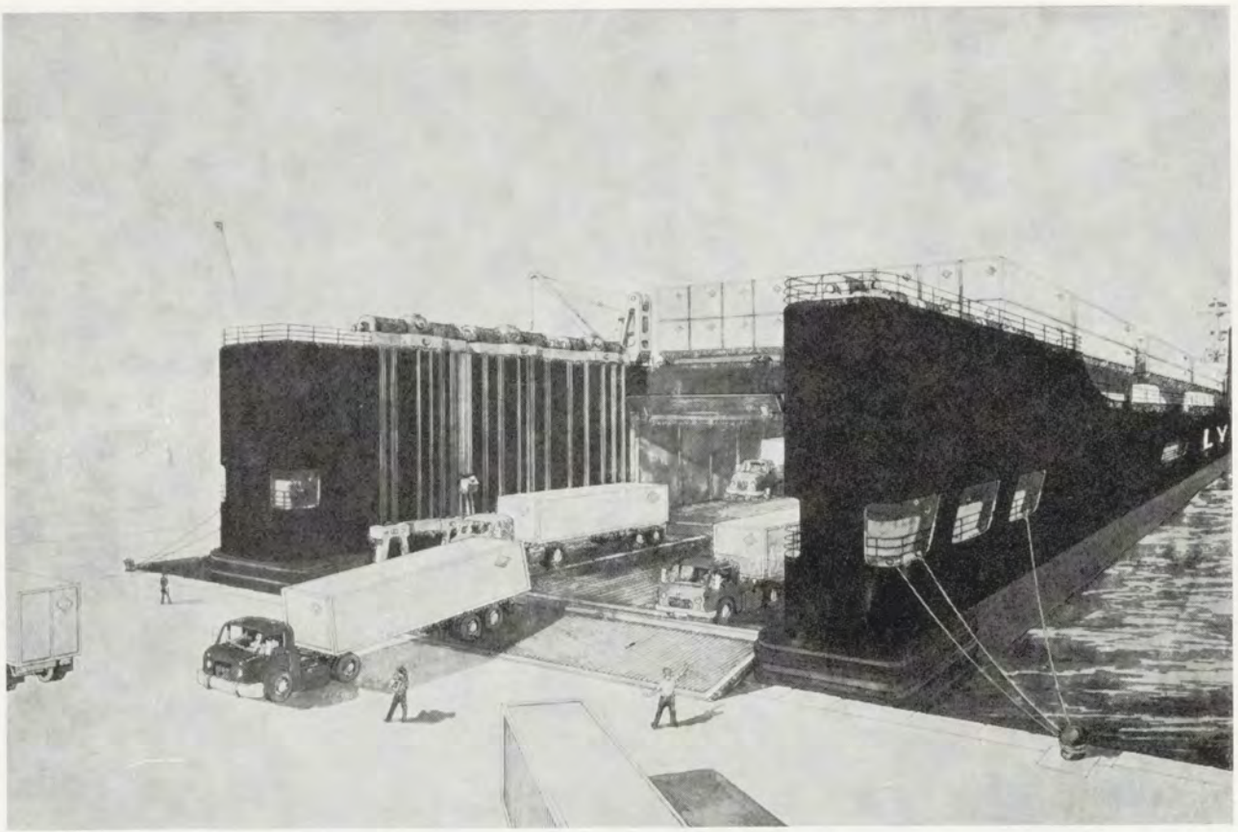
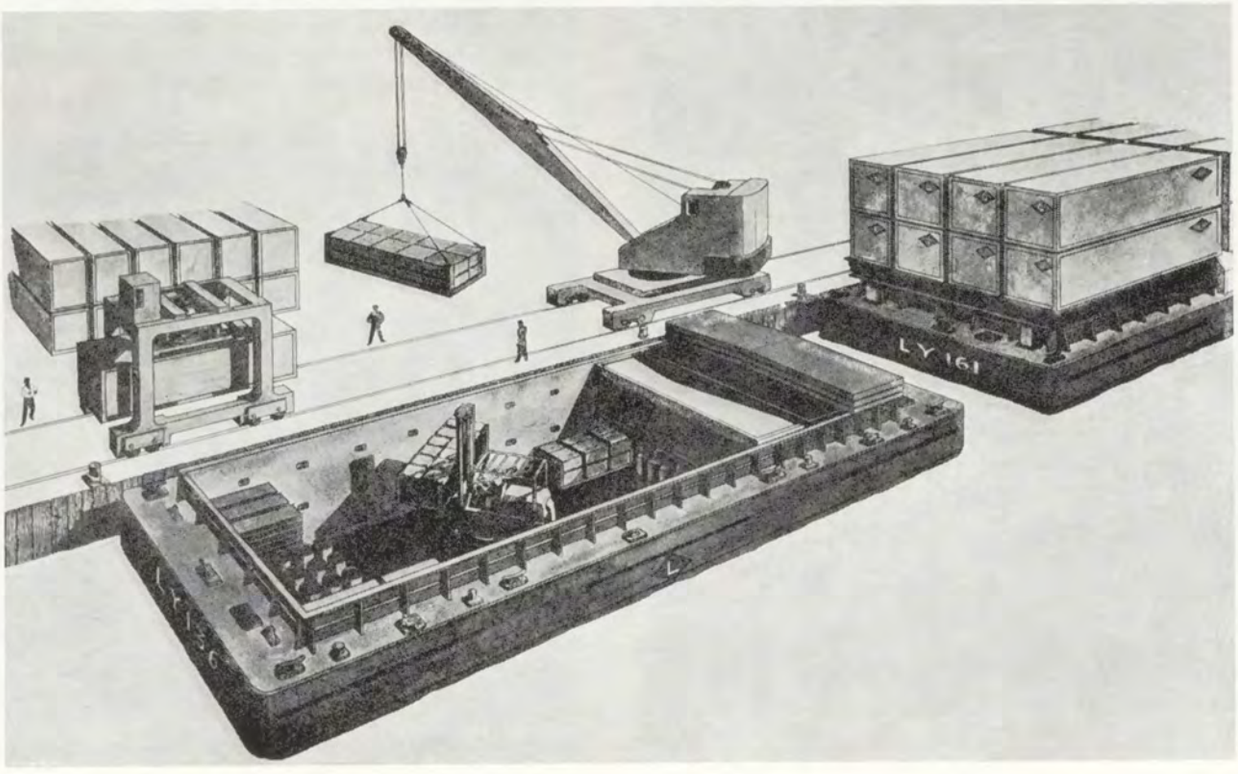


Figure 20 - The Seabee carrier can be used, without modification, as a roll-on/roll-off system.

Figure 21 - The Seabee barge.



ly 50 cm, there is a real chance that she will just exceed the height of 4.40 m allowed on European waterways.

The measurements of the standard barge are:

length	29.71 m
breadth	10.67 m
depth	4.95 m
draught	3.25 m
maximum load capacity	850 tons
length of hatch	25.30 m
width of hatch	9.75 m
capacity	1,130 m^3 (general cargo)

c. European barge carrier systems

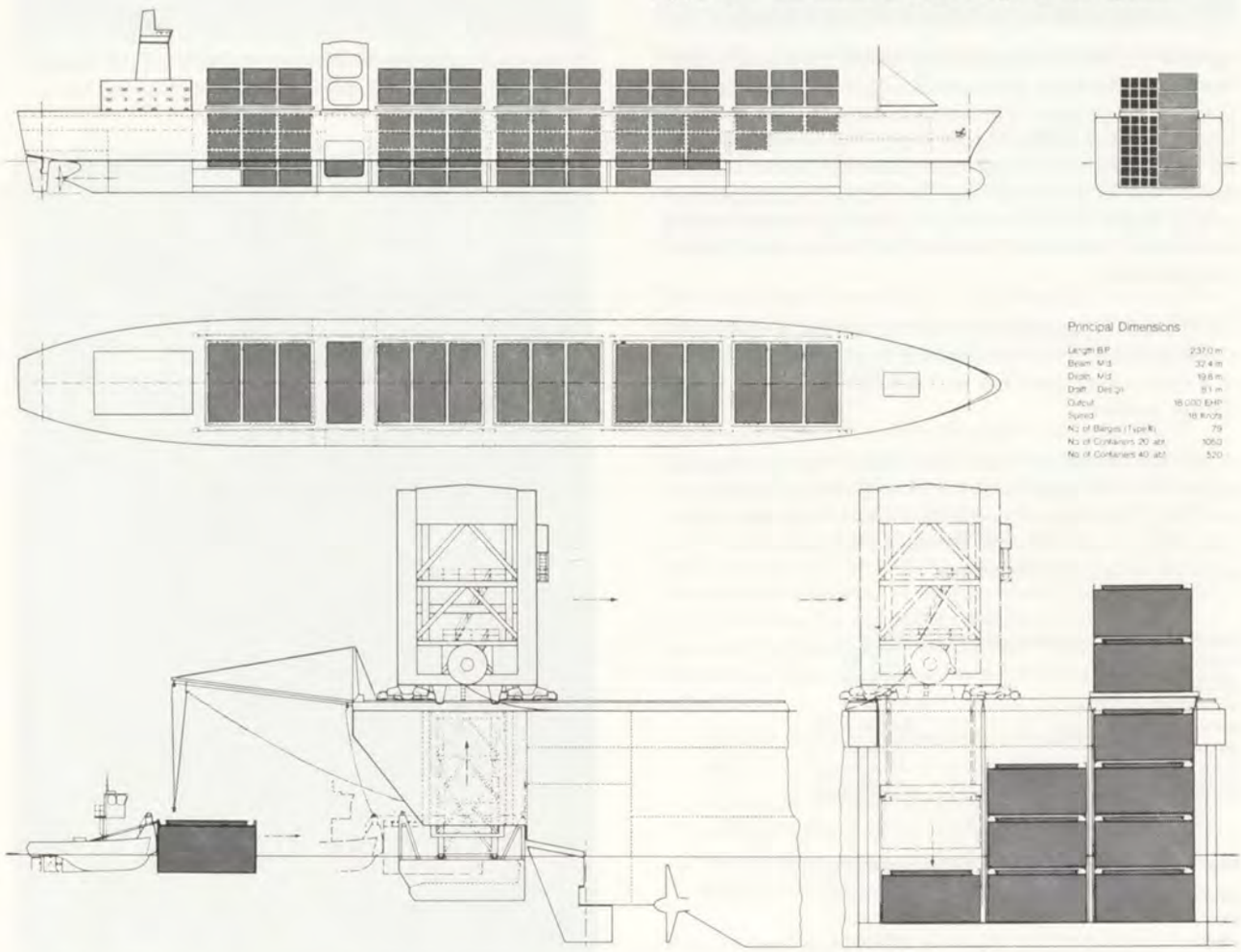
Intensive work on the barge carrier system has been carried out by two German shipyards and has resulted in two quite different designs. Blohm & Voss have devised a type in which the barge lifting device is a crane, and a lifting pontoon without swell compensators. The barges — as in the Lash carrier — are positioned athwartships. The second design was produced by the Howaldtswerke — Deutsche Werft A.G. and has not been given a name, as yet. It is distinguished by having the barges positioned fore-and-aft using a travelling portal crane.
We will now examine these two designs in more detail.

The Blohm & Voss barge carrier (figure 22)

The Blohm & Voss designers have not limited themselves exclusively to locating the barge lifting device in its traditional position on the stern. They have also proposed a version where the stern lift system is replaced by a special floodable section in the midbody of the carrier. The system operates, however, in the same manner. The pontoon is flooded and lowered to a depth sufficient to allow a barge to be moved into position over it with the aid of tugs.

The water is then expelled from the pontoon's tanks by compressed air, making it buoyant and thus forcing the barge upwards. The pontoon's highest position in the seaway is fixed by hydraulic actuators, and this enables the barge, which is no longer moving relative to the carrier, to be picked up by the crane without difficulty. This process is reversed for unloading the barges, the crane placing the barge on the pontoon which is then slowly lowered by the actuators until the barge begins to float. At this point the pontoon is flooded rapidly in order to separate it from the barge. One particular advantage of this method is that it enables the propulsion plant and the accomodation to be sited aft, which is not only cheaper but also benefits the trim situation.

Figure 22 - The Blohm & Voss barge carrier system.



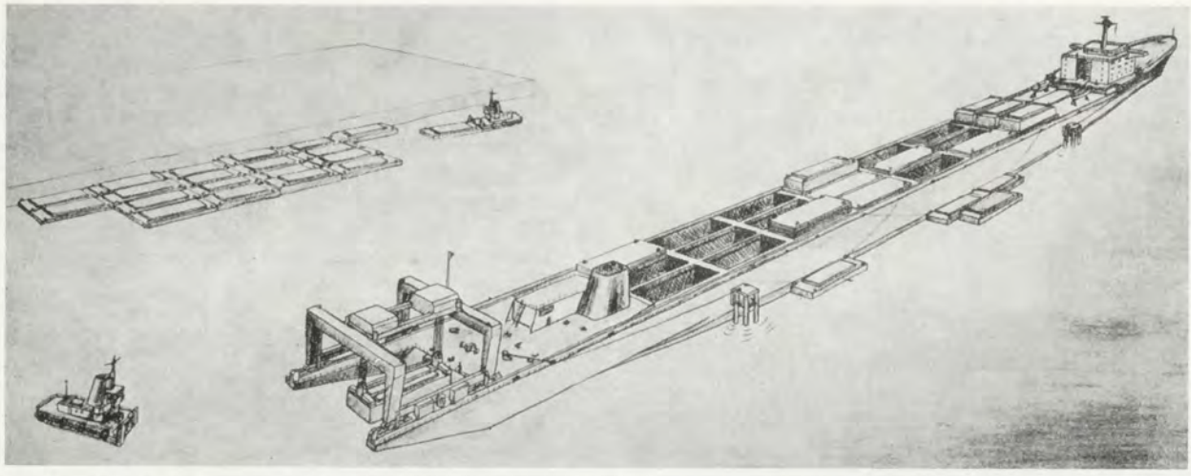


Figure 23 - Artist's impression of the Howaldtswerke barge carrier.

The main measurements of the carrier are:

length overall	237 m
beam	32.4 m
depth	19.8 m
draught	8.1 m
number of barges	79 (20.6 x 8.2 x 3.9)
	or 1,050 20 ft containers
	or 520 40 ft containers

The Howaldtswerke barge carrier (see figure 23)

As this carrier is almost a copy of the Lash carrier we feel that a detailed description would here be superfluous. The only point at which it departs from the Lash carrier is in the positioning of the barges, which lie fore-and-aft. The argument advanced for this is that should the barge carrier be converted into a container ship it would simplify work for dockside cranes to load and unload containers stowed for-and-aft rather than athwartships.

This reasoning appears somewhat specious when one considers that it is also possible to stow containers in a fore-and-aft position with the Blohm & Voss barge carrier system.

A number of designs have been drawn up, envisaging carrier service speeds of 17, 19 or 21 knots, with a carrying capacity ranging from 79 to 116 barges. The following dimensions are those of a barge carrier capable of taking 116 barges.

length between perpendiculars	258 m
beam	32.2 m
depth	19.3 m
maximum draught	10.8 m
power output	31,400 H.P.
service speed	19 knots
load capacity	116 barges
deadweight	47,000 tons

The barge itself has the following dimensions:

length	19.5 m
beam	7.9 m
depth	4.55 m
draught	2.7 m
load carrying capacity	300 tons
capacity	500 m^3 (general cargo)

3. Safety provisions on the Lash barge

Intensive study of the problems surrounding the safety of personnel working on and operating the Lash barge has been carried out by the German Binnenschiffahrts-Berufsgenossenschaft (Inland Navigation Trade Organisation). This has led to the publication, by the BSBG, of a number of regulations and guidelines which are the minimal requirements for barge working. Among other measures, these stipulate that there must be raised rims or angles running around the outside edge of the deck to prevent workers slipping off the barge. The outer edge of the walkway should likewise have

Figure 24 - The barge must be made anti-slip.

Figure 25 - The barge must be made anti-slip.

Figure 27 - Detachable railing along the barge's walkway.

Figure 26 - Accessibility of the barge hold must be improved.

an angle iron or strip at least 3 cm high. It has also been laid down that barges to be built in the future should have the smooth iron of the upper deck and walkway replaced by studded or ridged steel. In brief, the barge must be made anti-slip. See figures 24-25.

The hatch heads must have an upstand of at least 40 cm next to the walkway. The hold must be accessible via ladders or rungs at both the bow and stern of the barge. See figure 26.

Unpowered barges, with a transporting capacity of 250 tons or more, which are not course stable must have a vertical wheel for steering. On the foredeck of barges of 150 ton capacity and over, and on the after-deck of barges of 200 ton capacity and over, there must be a winch for shifting the barge.
Because the majority of barges plying German waters at the moment do not satisfy the requirements contained in the publication BSBG-UVV (VBG 107), the following safety measures have been urgently recommended:

— harbour crews must wear shoes with anti-slip soles.

— walkways should be provided with some form of safety railing, a rope, for example. See figure 27.

— lifejackets or life preservers must be worn for all deck activities.

When incorporated into a convoy all barges must be accessible from the push vessel along a soundly-constructed walkway.

Chapter C. Cost consideration of the barge carrier system

1. Analysis of the barge carrier system

A brief technical description of the barge carrier system and all its variations has already been given in Chapter B. In this analysis the cost factors of sea transport are examined, and the differences in costs (positive and negative) between the barge carrier system and conventional transport analysed. However, it remains a rather rough analysis, as no precise figures for costs can be given, and these anyway vary considerably for each variant, route, cargo, etc.

The total costs for sea transport can be divided into five cost factors which we shall first allow to vary with the size of ship and, in the second place, apply to the particular case of the barge carrier.

These cost factors are:
— costs of the ship at sea
— costs of the ship in port
— port charges
— costs for loading and unloading
— costs of goods storage at the port.

In the curves which follow, all circumstances have been weighted equally.

a. Costs of the ship at sea

These costs comprise many components, the most important of which are:
— Depreciation on the barge carrier + barges. The average number of barges is approximately four times the standard capacity of the barge carrier, depending firstly, on the number of carriers in service, and secondly, on the time taken by the barge to complete its inland roundtrip. We shall come back to these costs in Chapter E.
— Costs of maintenance and survey.
— Wages of the crew.
— Fuel costs.
— General overheads.

Variations in the size of the ship give rise to economies of scale for all cost components, as the costs vary less than linearly with the size. The depreciation costs of ship and barges will be reduced for each extra ton in capacity, as will the maintenance and survey costs. In general, the crew's wages will not increase at all in totality.

The increase in general overheads will also be far less than linear. For the larger ships the increase in fuel costs will be only slightly more than linear, often depending on shape of the hull, stem, rudder, etc. We are now able to draw a typical economies of scale graph showing these costs per ton. See figure 28.

Conclusion: The costs of the ship at sea per ton of cargo will generally lie higher for a barge carrier than for a conventional ship.

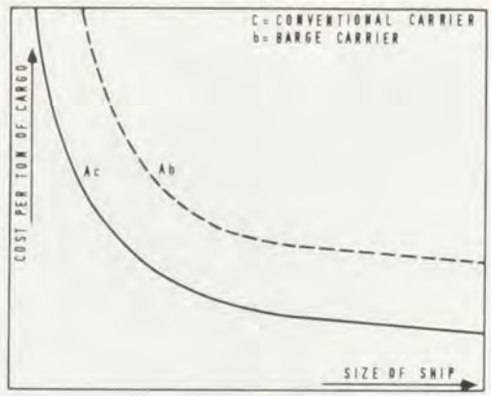


Figure 28 - Costs of the ship at sea relative to its size.
A_c for conventional ships.
A_b for barge carriers.

b. The costs of the ship during its stay in port

We can distinguish three components:

— *The time between the moment of arrival in the harbour and the moment when the ship is moored and ready for loading and/or unloading*

(waiting for pilot, navigation up the river, passing through locks, mooring). This time will generally not vary greatly with the size of the ship. In this respect the barge carrier has the great advantage of being less harbour-dependent, at least in the case of the all-barge carrier; for the combined barge carrier it is quite a different matter again. A barge carrier often does not require a quay and is not dependent on quay cranes, moreover the barge carrier will look for harbours situated close to the open sea thus saving the time required for river navigation.

— *Loss of time due to difficulties regarding organisation and administration*

These comprise waiting for a berth and customs formalities.
In many ports waiting for a berth has been a great problem, varying in time from days (Bremen) to weeks (Calcutta).
Because of its harbour independance costs per ton of cargo will be less for the barge carrier than for more conventional ships, whose schedules can be disrupted by harbour congestion.
This is largely determined by the length of quay made available by ships leaving port, which results in the increase in the costs per ton being dependent upon the size of ship.

— *Time needed for loading and unloading the ship*

With standard equipment for loading and unloading, the number of tons loaded or unloaded per hour will vary only slightly with the size of the ship, if we can take a certain labour supply, work regulations, etc., for granted. The estimate for a conventional ship with five holds is that 5 x 25 ton = 125 ton per hour of general cargo can be loaded and/or unloaded. For the barge carrier, the loading rate would be four barges of 400 tons each = 1,600 tons per hour, provided that the barge is 100% loaded. This represents a large saving in the

time required for loading and unloading, being but 1/12 of the time needed for the conventional ship.

This brings out the most important advantage of the barge carrier, and it is clearly shown in figure 29 by the curves Bb and Bc.
The drop in the left hand part of the curve is caused by a decrease in economic importance of the time needed for entering and leaving the harbour. The rise in the right hand side indicates the increasing economic importance of the time when the ship is lying alongside the quay for loading and unloading.

c. Port charges (see Chapter G, para 6)

Harbour dues, pilotage, quayage, tugboat dues, etc., all come under this heading. Generally these costs are hardly affected by the size of the ship. In the case of the barge carrier they will differ from those for the conventional ship because the barge carrier is less harbour-dependent.
This shows up as a saving on quayage and a reduction in tugboat dues. This saving in costs is represented by the curves Cb and Cc in figure 30.

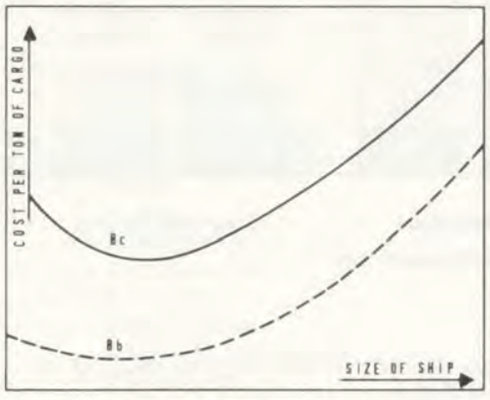


Figure 29 - Costs of the ship in port relative to its size.
B_c for conventional ships.
B_b for barge carriers.

d. The costs for loading and unloading and the terminal costs per ton

The costs for loading and unloading are not influenced so much by the size of the ship, but rather by the type. Even for conventional ships the differences are considerable, and are related to the equipment for loading and unloading, the shape of the hatch-heads, dimensions, free floor area, height of holds, etc.
Apart from the advantage of quicker loading and unloading, the barge carrier also requires less labour, as great numbers of stevedores are no longer needed to handle the cargo.
This also reduces the cost of loading and unloading per ton.
A comparison of these costs for conventional ships and barge carriers is made in curves Dc and Db of figure 30.

e. Costs of goods storage at the port

In most cases the cargo, for longer or shorter periods, is stored in sheds until a ship can be loaded, as it is

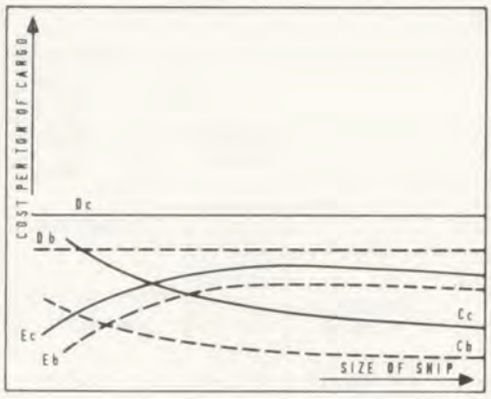


Figure 30 - Comparison between several cost components for conventional ships (drawn line) and barge carriers (broken line).

not an economic proposition to leave a ship waiting alongside the quay for a stream of goods to come in, which was often the case in the past and occasionally still is.
The correct way is to build up a stock of goods in sheds, which will make it possible to load at far greater speeds than when one has to deal with the loading as goods come in. The size of the stock will be pretty well proportional to the size of the ship.

The barge system will hardly differ in this respect. One advantage of the barge system could lie in the time-saving due to the continuous flow of goods in the transport chain, i.e. with conventional transport the goods have first to be placed on the quay before any further transportation can take place, whereas barges can be formed at once into push units to be shipped to the hinterland. For comparison of these costs for conventional ships and for barge carriers, see the curves Ec and Eb in figure 30.
Port costs for break-bulk and unitized ships are given in figure 31.

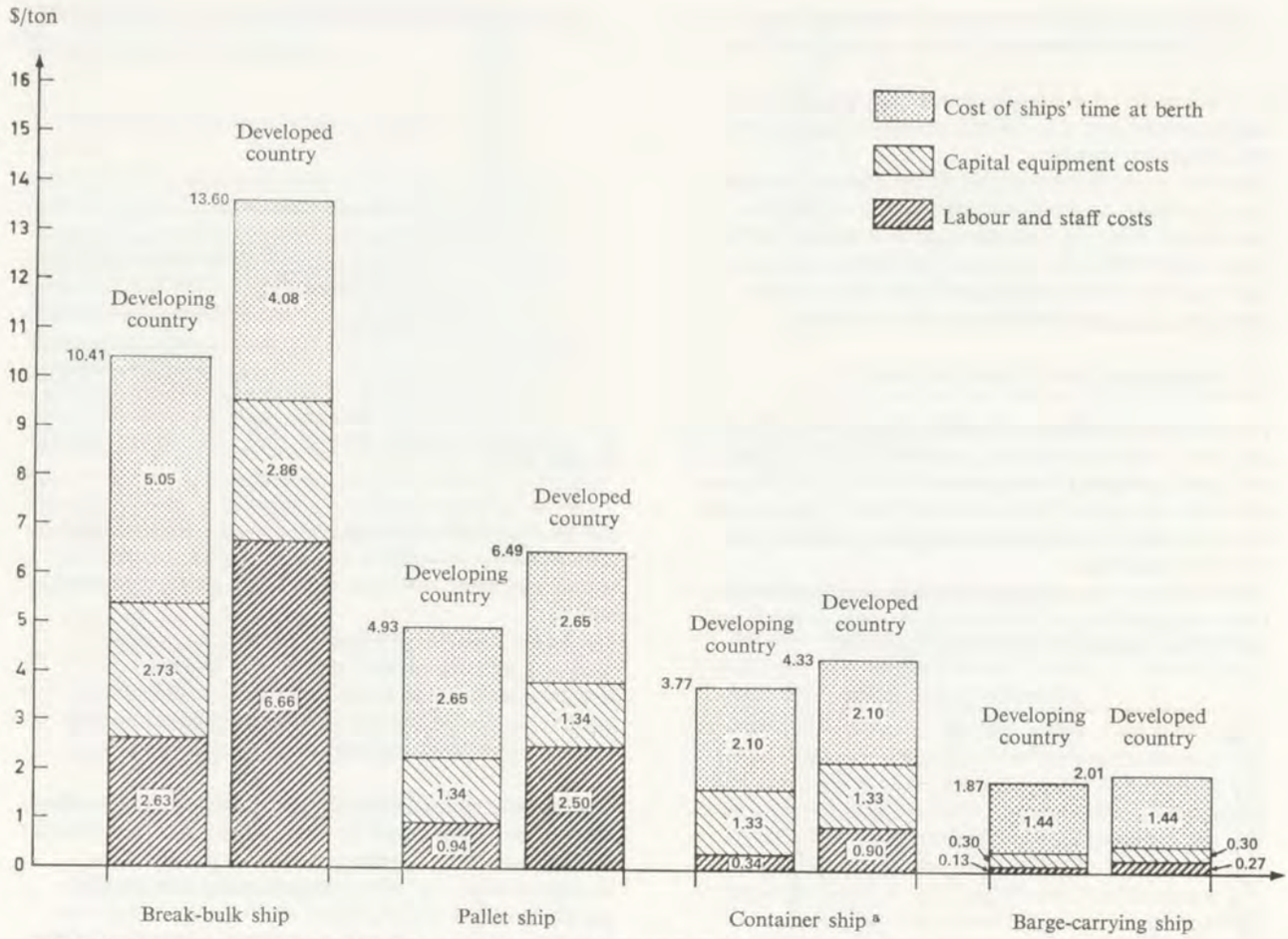
Several important conclusions may be drawn from the graphs in figures 28-30.

— *The relation between the costs per ton of cargo and the size of the ship*

We see that in larger ships the dominant falling cost factor is the curve A, i.e. the cost of the ship at sea, to some extent accentuated by port costs. The principal factor for rising costs is curve B. (Costs of the ship during its stay in port), to which are added the cost of goods storage at the port (curve E).
The relative weight and the slope of the curves are, in this rough analysis, arbitrary.
By means of this analysis, the optimum size for a certain type of ship from the point of view of these costs can be determined. This, however, is abstracted from the cargo supply and the demands made on the ship by a specific type of cargo.

— *The effect of cargo-handling efficiency in the port*

By greater efficiency in handling the cargo, as in the case of barge carriers, we can influence the total costs of transport; this appears from the difference between the curves relating to the con-



a The total port cost per ton for the container ship is that of the combined roll-on/roll-off, lift-on/lift-off container berth.

Figure 31 - Total port cost per ton of cargo for break-bulk and unitized ships.

ventional ship (Bc and Dc) and those relating to the barge carrier (Bb and Db).
The greater efficiency in cargo handling shows itself in two ways:

— The reduction in the time spent by the ship in port (curves B).
— The effort on the costs of loading and unloading (curves D).

The most important of these two is the reduction in the time spent in port, which in many cases would justify a more expensive method of loading and unloading. A closer examination of this factor is therefore useful. This we shall do by means of the total costs of transport curves, given in figure 32.

We find that the minimum point of the curve for total costs has moved.

This movement can be divided into two components:

— Reduction in the total cost of transport from P to P_1;
— Change in the optimum size of ship from G to G_1.

This shows that by means of the rough cost analysis of the barge carrier a considerable reduction in the costs of transport can be found, the importance of which has already been fully explained.
But this has only dealt with the cost aspect. The gains aspect depends on other factors, the most important ones being:

— the type of cargo, as each has its own freight tariff;
— the amount of cargo carried.

2. Profit-yield ratio of the barge carrier system

Following on that highly generalized cost analysis, the prime aim of which was to give an indicative cost comparison between the conventional cargo vessel and the barge carrier, this paragraph will present some more details of the barge carrier system seen as an investment project.

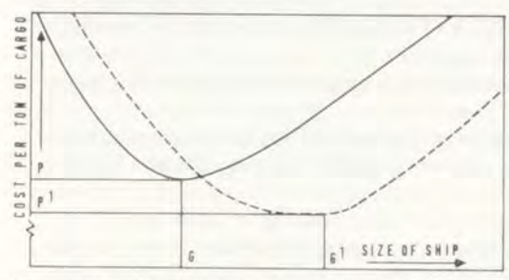


Figure 32 - Comparison of total costs per ton of cargo for conventional ships (drawn line) and barge carriers (broken line) relative to their size.

Firstly, a number of data must be established, partly by means of market research and statistical analysis;
— number of ships to be operated on the route;
— service speed;
— length of voyage in days;
— number of days at sea per voyage;
— number of days spent in port per voyage;
— number of voyages per year;
— number of days at sea per year;
— number of days spent in port per year;
— fuel consumption in port;
— fuel consumption at sea;
— number of barges (sets and units);
— general overheads.

When these data are considered known, a rough profit-yield analysis must be drawn up.
A skeletal framework for this analysis could look like this:

A. Carrier vessel

1. Investment costs
   a. financing
   b. insurance
   c. depreciation
2. Fixed operating costs
   a. crew
   b. maintenance costs
   c. various fixed costs
3. Variable operating costs
   a. fuel and lubricating oil
      — at sea
      — in port
      — at sea per year
      — in port per year
   b. Port charges
      — harbour dues
      — loading and unloading
      — pilotage, etc.

———————— +

Total costs of carrier vessel

B. Barges

1. *Investment costs*
   a. financing
   b. insurance
   c. depreciation
2. *Port charges*

C. General overheads

———————— +

Total costs: carrier vessels + barges + overheads

Receipts

Average degree of loading / Average freight tariff \ average freight yields.

Net pre-tax profit = average freight yield x number of voyages per year — total system costs per year.

Profit yield of the project: $\frac{\text{net profit}}{\text{investments}}$

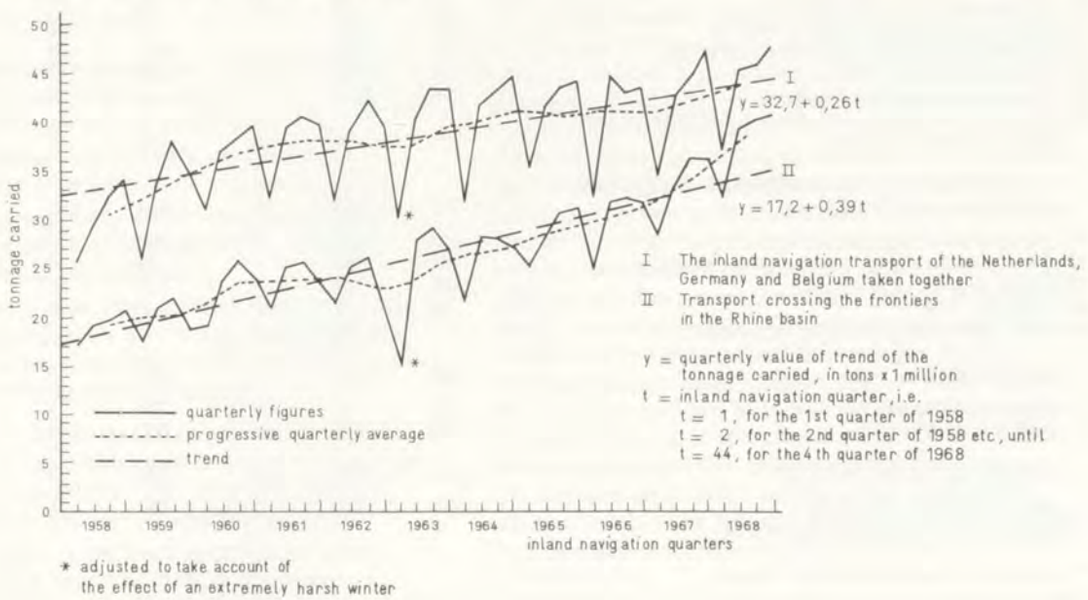
3. What is the market position of the barge carrier?

As we already noted in Chapter A, the barge transporter is interested in those goods lying in the transitional phase between continuous and discontinuous transport (semi-bulk), and in a part of the goods in discontinuous transport (general cargo).

In order to obtain a closer insight into both the qualitative and quantitative aspects of the goods flow which will in the future be transported by barge via the Netherlands, we can make use of the goods flow at present being transported by inland navigation.

The quantitative breakdown of the goods flow for 1969 is given in Table 1.
The following groups of goods, denoted by the code figure shown in the table, are those of relevance for barge transport: 0, 1, 5, 62, 63, 64, 69, 7, 8, 9.

Figure 33 - The development of inland navigation transport.



INLAND WATERBORNE TRANSPORT.

Table 1. Transport via the Netherlands *) according to trading partner per commodity group (Nomenclature pour les statistiques du Transport Révisée).

Weight in tons x 1000

	Discharged in:						
	Belgium		Luxem-bourg	West Germany	France		other countries
	Total	Antwerp			German Frontier	Belgian Frontier	
	TOTAAL						
1969 total	14 531	6 081	38	8 196	569	487	2 091
0 AGRICULTURAL PRODUCTS	122	22	3	1 001	1	27	138
01 Grains	96	13	3	908	1	15	107
04 Textile fabrics and waste	8	5	–	18	–	2	11
05 Wood	8	1	–	52	–	9	16
09 Other vegetable and animal raw materials	8	3	–	21	–	1	3
1 OTHER EDIBLE PRODUCTS	146	74	5	240	3	21	97
11 Sugar	2	1	–	74	0	1	14
12 Potables	5	4	–	9	–	1	2
13 Luxury comestibles and prepared food products not listed elsewhere	1	1	–	5	–	1	19
14 Meat, fish, dairy produce	1	1	–	2	–	0	1
16 Cereal, fruit and vegetable preparations	70	60	–	19	0	1	47
17 Animal feeding stuffs	31	2	5	93	1	14	12
18 Oilseeds, oils and fats	37	5	–	38	1	3	3
2 SOLID FUELS	1 921	22	–	365	85	33	16
21 Coal	1 451	20	–	281	80	15	12
22 Lignite and peat	3	–	–	7	–	–	–
23 Coke	468	2	–	77	5	19	3
3 PETROLEUM AND PETROLEUM PRODUCTS	1 283	397	–	1 460	2	24	657
31 Crude petroleum	0	–	–	40	–	–	–
32 Liquid fuels	1 231	378	–	1 313	2	19	649
33 Fuel gases	25	5	–	35	–	–	–
34 Other petroleum derivatives	27	14	–	73	–	5	7
4 ORES, METAL WASTE, CALCINATED IRON PYRITES	389	14	5	1 094	23	15	14
41 Iron ore	16	–	1	435	1	4	–
45 Other ores and their wastes	62	3	3	138	12	3	9
46 Scrap metal, blast furnace slag, calcinated iron pyrites	310	11	1	522	10	8	5
5 METALS AND SEMI-MANUFACTURED METAL PRODUCTS	3 602	3 136	21	1 666	240	223	553
51 Crude cast iron and steel	162	38	14	99	61	8	26
52 Semi-manufactured steel products	365	318	–	147	28	25	37
53 Bar and structural steel, wire, rails, etc.	1 429	1 303	–	641	30	5	129
54 Sheet and band steel	1 414	1 256	7	626	117	178	306
55 Pipes, other foundry products	220	216	–	4	0	1	22
56 Non-ferrous metals and semi-manufactured non-ferrous metal products	11	6	0	149	4	5	34
6 CRUDE MINERALS AND MINERAL PRODUCTS; BUILDING MATERIALS	3 786	415	4	1 264	135	34	333
61 Sand, gravel, clay and slags	2 943	306	4	1 055	77	22	231
62 Salt, noncalcinated iron pyrites, sulphur	547	59	–	24	4	1	58
63 Other crude minerals	213	26	–	176	50	9	22
64 Cement, lime	34	8	–	0	1	–	0
69 Other processed building materials	47	16	–	9	3	1	22
7 FERTILISERS	1 436	1 093	–	697	45	17	18
71 Natural fertilisers	67	34	–	356	1	4	2
72 Artificial fertilisers	1 369	1 059	–	342	44	13	16
8 CHEMICAL SUBSTANCES	1 667	757	2	342	29	86	225
81 Basic chemical products	751	587	2	260	11	6	142
82 Alumina and aluminium hydroxide	2	2	–	–	–	–	14

*) Compiled from clearances inwards

	Discharged in:						
	Belgium		Luxem-bourg	West Germany	France		other countries
	Total	Antwerp			German Frontier	Belgian Frontier	
(continued)							
83 Coal and petrochemical products	710	21	–	27	16	–	1
84 Cellulose and waste paper	21	12	–	26	2	77	9
89 Other chemical products	182	134	–	30	0	4	59
9 OTHER COMMODITIES	178	152	–	66	6	7	41
91 Transport material	53	53	–	0	–	–	9
93 Electrical and other machines, equipment and motors	47	33	–	6	6	2	12
94 Metal goods	39	38	–	3	0	1	5
95 Glass, glassware, ceramic products	14	10	–	3	–	0	1
96 Leather, textiles and clothing	3	3	–	1	–	–	2
97 Other manufactured and semi-manufactured goods	10	8	–	35	0	2	9
99 Other commodities	11	6	–	18	0	2	2

In 1969 these groups amounted to approximately 54% of the total goods flow.
The development of the goods flow via inland navigation is given by the relationship

$$Y = 17.2 + 0.39t \quad \text{(see figure 33)}$$

where Y = quarterly value of the trend of the tonnage carried, in tons x 1 million
and t = inland navigation quarter.

This relationship has been determined from the actual values since 1958, the variable t being 'time'. Taking this prognosis as a base, the flow of goods transported by inland shipping will increase by 1.46 million tons annually.

This means that the flow of goods for which barges are suitable, assuming that this flow remains equally as large, relatively, within the total goods flow, will

increase by $\frac{54}{100} \times 1.46 = 0.79$ million tons annually.

In summary we can state that:

a. Straightforward bulk goods will continue to be transported in special bulk vessels.
   Possible exceptions to this could arise when:
   — it is a question of extremely valuable bulk goods, which are shipped in smaller quantities;
   — it is a matter of many small lots, the ultimate receiver of which is situated at the waterside (mineral sands, for example);
   — in addition to their transport function the barges would have to serve as storage space (we are thinking of the developing areas, and those factories without storage capacity).

b. Goods which are primarily suitable for the container, will not be transported by barge. Preference will be given to a smaller unit, such as unit load and container. Exceptions to this could arise:
   — when transport time, from both the economic and technical points of view, is irrelevant;
   — when the barge must also serve as storage space for these goods;
   — when the infrastructure definitely favours barges;
   — when the road and rail rates on the one hand, and inland navigation rates on the other show sufficient differences as to overcome the disadvantages.

Barge carrier operators will have to direct their marketing effort towards semi-bulk goods, as it is with these goods that the best use of this particular system can be made.

Chapter D. Application of the barge carrier system to various areas

Before going into this aspect of the matter in any detail we must first ascertain which particular areas are in fact relevant. In order to do this we will make a classification of the areas, and the first distinction we make is whether a particular country is developed or otherwise. That is to say, is it a highly developed country or a developing country? We can further subdivide the areas according to whether they have or do not have a well developed and widely ramified waterway system in the hinterland. For the first classification we take the state of the country's infrastructure as our criterion, i.e. the road network, communications, etc. The reason for this is that, in this examination, we are assuming a combined barge carrier system which can transport both barges and containers. Because good roads and an efficient organisational structure are essential for the operation of a container service, it is necessary that we assess the various areas with this requirement in mind. We do not take the commodity supply as our criterion because this would be beyond the scope of this chapter. Having made our differentiation we arrive at a number of alternatives.

We distinguish successively:

— Two highly developed areas, each with a well developed waterway system.

— Two highly developed areas, one of them with a widely ramified river system.

— Two highly developed areas, both lacking a waterway network.

— One highly developed and one developing area, each with an extensive river system.

— One highly developed and one developing area with a developed waterway system in only one of the areas.

— A highly developed area and a developing area, both lacking waterways.

— Two developing areas.

It is possible to further subdivide the last case into three parts, but this will not be done as this case will be treated as a whole below.
We will now review some of these alternatives.

1. Two highly developed areas, each with a well developed waterway system

This case can perhaps best be illustrated by using a real-life example. We will take two areas between which a barge carrier is already in operation: the Mississippi basin in the United States with New Orleans as its supplying port and, on the other side, the Rhine basin with Rotterdam as its supplying port. In our opinion this situation is absolutely ideal for a barge transporter in that inland waterborne transport in both basins is very highly and intensively developed.

Figure 34 - The Mississippi River System gives access to America's most important industrial areas.

This will mean that his barges, once offloaded, will immediately be incorporated in a push-convoy. Navigating the Mississippi presents few problems. The River System, which includes all the river's tributaries, has length and depth characteristics as shown in table 2.
This waterway network gives access to America's most important industrial areas. (See figure 34).
Taking 9 feet of water as a barge's minimum requirement, we arrive at a figure of around 5,500 miles as the usable length of the Mississippi River System. The Rhine area serves six countries via 6,800 miles of rivers and canals. The navigability of this waterway system will be dealt with in a later section of this report. The criterion for deciding whether or not to initiate a barge service between two areas depends upon the results of a goods flow analysis. This analysis must show whether or not there will be a sufficient average cargo load on both the outward and homeward voyages.

2. Two highly developed areas with a widely ramified river system in one of the areas

The problem presented by this case is that the barges cannot be taken away on one of the two sides, at any rate not by the method we know. It here becomes necessary to cast around for other forms of transportation. One solution could be the coast feeder system. This system operates by taking the barges from various small coastal ports to a mother port, using special vessels, thus forming one large flow. It is not always essential to use special vessels for transportation, push units are also suitable, although the construction of the barges is, for the moment, not such that they can be used at sea.
The advantage of feeding is that the time the barge carrier spends in port is kept to the minimum in that it does not need to go around picking up barges at different points.

One example of an area which does not have a widely ramified waterway system in the hinterland is the San Francisco Bay Area, yet it will have a barge service within the very near future. It is a highly industrialised area embracing San Francisco, Oakland, Alameda and Stockton, all of which lie on the Sacramento River. (See figure 35). The Pacific Far East Line runs a barge carrier service between this area and the Far East.
This is a good example of a situation where a sufficiently large cargo supply can provide a powerful stimulus to the initiation of a barge service, despite more or less disadvantageous circumstances (the lack of a river system). However, it remains to be seen whether the yields from a one-sided barge carrier transport will not be offset by the extra costs incurred by a feeder service. This is very closely inter-

Table 2. Lengths and depths of the Mississippi River System.

less than 6 feet	between 6 and 9 feet	between 9 and 12 feet	between 12 and 14 feet	more than 14 feet	Total length
2,400	684	4,449	732	273	8,538 miles

Figure 35 - Terminal in San Francisco: an area without waterways.

connected with the nature of the goods package to be transported.

3. Two highly developed areas, both lacking a waterway network

As already outlined in the previous case, it is possible to begin the operation of services in areas deprived of inland waters when feeder services are set up. The question of whether or not to initiate such a service will be largely determined by the infrastructures of the areas in question. If, for example, the various industries are concentrated in a number of locations near to the coast and not too far from a large port, then a barge service is possible, always assuming a substantial cargo supply.
Whether or not this is a profitable venture will have to be determined from a closely detailed study.
An example of such a service is the one maintained by the Prudential Grace Lines between the Eastern seaboard of the United States and the Mediterranean Sea area. The barge carrier nips in and out of all the harbours like a grasshopper, needing only a few hours to load and discharge a number of barges.

4. One highly developed and one developing area, each with an extensive river system

In this situation vast opportunities exist for the developing countries to increase their export positions. However, the river systems in many of the developing countries are still seriously underdeveloped, with their navigability leaving a great deal to be desired, and additionally being generally dependent upon climatological fluctuations throughout the year. The accessibility of the ports also tends to be rather poor. If one then further considers that the hinterland in these areas is barely opened up to traffic, if at all, then one can see that the majority of the developing countries are faced with problems which are insoluble in the short term, with the result that the barge will remain limited exclusively to the port.
The only alternative left is the feeder service/grasshopper service. This, however, will often present the developing country with complications and problems as regards organisation and communications.
The port manager in a developing country is, in all probability, very happy with the barge carrier system in that it is a unit load which demands, from the operator's side, minimal investment. In addition, there is a sufficiently large labour potential in the port to enable the barges to be loaded and unloaded in the conventional way.
It is therefore the structural imbalance in the goods traffic between developed and developing countries which will be the most serious impediment to a possible barge carrier service between two such areas.

The other possible situations in developed and developing areas are determined by a combination of factors such as those which came under review in the previous cases.

5. Two developing areas

The origination of a traffic between two developing countries is not to be expected within the near future for the following reasons:

a) the lack of a market for each other's products, thus there is no latent need for transport;
b) the infrastructure is (as yet) inferior;
c) organisational aspects;
d) communications are poor;
e) developing countries would find it difficult to raise the capital necessary for starting up such a service.

Chapter E. The barge carrier system compared to container transport

Many publications have spoken of the competitive battle between the container, the unit load and the barge. It would therefore appear to be useful to make a comparison between the barge and the container in order to demonstrate that:

— The container can exist alongside the barge, that there is a segment of the market for both systems;
— the combined barge/container system is to be preferred on many trade routes above either container or barge transport alone.

In order to come to this conclusion, the advantages and disadvantages of the barge carrier system, as compared with container vessels, will be presented.

1. Advantages of the barge carrier

a. More rapid loading and unloading (approximately 5 times faster than with the container ship) leading to a significant potential reduction in total transport costs. (See Chapter C).
b. Direct investment per cubic foot of bale space in barges is less than the direct investment in cubic

foot of bale space for a container, the ratio being approximately 1 : 1.2.
The barge also shows an advantage from the point of view of investment per ton of load capacity;

c. The economic life of a barge is estimated to be 25 years, while that of the container is estimated to be 10 years.

In the following example we take the last of the above points in order to demonstrate that the annual depreciation costs of barges lie considerably below those for containers.
We start from a required bale space of 800,000 cu.ft. This requires 45 Lash barges of Dfl 100,000 each, or 360 40' containers, of Dfl 10,000 each.
The depreciation costs of the barges over 25 years thus come to $\frac{1}{25}$ (cost price — residual value (nil)) = Dfl. 180,000 per year.
The depreciation costs of the container over 10 years amount to $\frac{1}{10}$ (cost price — residual value (nil)) = Dfl. 360,000 per year.
This shows that costs can, in this respect, be significantly reduced by the use of barges.

d. The barge carrier is harbour-independent, i.e.
   - — it does not, in principle, require to berth alongside a pier but can anchor in the harbour and there lower its barges into the water;
   - — it is independent of the depth of water alongside the quay;
   - — similarly, it avoids the congested conditions obtaining in many ports (e.g. waiting time for a berth), enabling it to speed up its turn-round time;
   - — bad weather and harbour delays can be avoided as a consequence of this harbour-independence.

e. As already noted in Chapter C, the barge commands a larger share in the goods flow as a result of its greater flexibility.

f. One important advantage, which was expounded in Chapter D, would appear to be the possibility of drawing the developing countries into the barge carrier system on purely rational grounds in the they — as an exception to the rule — will be able to profit from this development in transportation technology. Both the container and unit load systems require port installations and an infrastructure adapted to their particular needs.

g. One organisational advantage lies in the fact that the number of barges required will always be significantly less than the number of containers, which results in a simplification in supervising the barges and in an optimalisation in their degree of use.

h. The barge carrier fills a gap in the transport spectrum. The only way that shippers who had a good connection with a port via inland waterways could previously make use of the advance in transportation technology was by going in for container transport by road or rail. But because the inland waterway freight rates per tonkm are lower than the cost of container transport by road or rail they were forced to continue with the conventional inland navigation simply because of these cost considerations.

i. One extremely important advantage attaching to the barge carrier is that it requires less investment in port installations. For example, the unloading of barges does not call for an expensive portal crane.

Opposed to these advantages there are a number of drawbacks to the use of the barge carrier; drawbacks which may, in many cases, determine the choice between the two transportation systems.

2. Disadvantages of the barge carrier system

a. Limitation of distribution. This is an extremely serious disadvantage when one considers that the container can reach practically every shipper.
This accessibility of the shippers comprises two variants — technical and economic:
   - — the barge is restricted to a navigable inland waterway, which must accommodate the barge's draught;
   - — the shipper who has only a limited goods package to transport will generally not avail himself of the barge's load-carrying capacity, unless an inland goods system were to be created.

   The barge system offers no attraction to the small shipper not situated on an inland waterway.

b. The barge system is more dependent upon climatological factors:
   - — ice on the waterways sometimes makes barge transport totally impossible, bringing transportation to a complete halt. Examples of this are the St. Lawrence and its connections to the Great Lakes, and sometimes the Rhine and its connections;
   - — the water level of the navigable waterways is often determined by climatological circumstances and can display large fluctuations, as set out in Chapter G and H. This, naturally enough, determines the barge's draught and thus the degree of loading.

c. Speed is one of the factors — indeed a very important one — which determine the quality of the transport.
Inland waterway transport is relatively slow and this can be a decisive factor for the transportation of certain high value, agricultural or perishable products.

3. The barge has a right to existence alongside the container, and vice-versa

This is borne out by points e, f and h of section 1. and points a, and c of section 2. From these it is clear that when we are considering a particular flow of goods from a particular transmission point to a destination we can — on the basis of these advantages and disadvantages — determine which system is the best and most economic for carrying this out. When this can be done on such a rationalised basis both systems

have an equal right to existence, as one can not be substituted for the other.

4. The combined system is to be preferred on many trade routes

It can not be maintained that, with this combined system, all the advantages attaching to an individual system can be added together and be then taken as applying to the combined system. Because the majority of the advantages are, nevertheless, passed on to the combined system it will suffice to indicate those advantages which are either lost or modified:

a. More rapid loading and unloading will be proportional to the ratio in which barges and containers are transported. This will vary from one voyage to the next.
b. The investments per cubic foot of bale space or per ton of load capacity will lie somewhere between the comparable figures for the all-barge system and the all-container system.
c. Similarly, the depreciations for the combined system will be higher than those for the all-barge system.
d. The most important of the advantages lost is that of harbour-independence. As a consequence of transporting both barges and containers the carrier must berth, and both infrastructure and port equipment must be able to deal with this.

All except the last of the above factors are subordinate to the fact that the goods in question would otherwise be transported by container anyway, for technical or economic reasons. The advantage which does obtain is that it is in fact possible to transport these goods, where it would otherwise mean the cancellation of a certain percentage of the total cargo supply.
The only substantial disadvantage remaining is the harbour-dependence of the system, but this will be amply compensated for by the advantages. Account has been taken of this development within the various systems already evolved (see Chapter B) although no practical use has been made of it on any trade route as yet.

Chapter F. Marketing considerations

1. Transport in marketing

The transition in the industrial process, from product-oriented production to market-oriented production has been going ahead for some time now.
A market-oriented production is first and foremost a policy vision, a preparedness to see the consumer behind the product and to attune both the product and sales policies to this concept. It is a concept in which the consumer occupies the central position and in which the various elements which go to make up the marketing mix can have a decisive influence upon a product's success or failure.

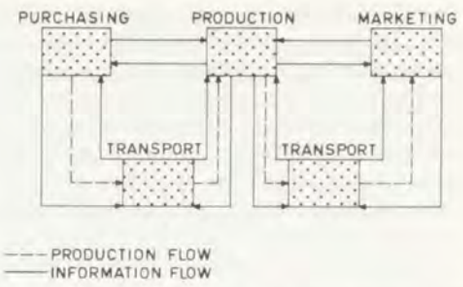


Figure 36 - Physical distribution in a market-oriented business.

This marketing mix is made up of a large number of important elements such as price, product, location, promotion.
The connecting link between production location and market is the physical distribution element, this being a complex of factors which govern the route a product must travel from the moment its production is completed to the moment it reaches the consumer, i.e. the market. (See figure 36).

Transport constitutes a vitally important link in this physical distribution process, alongside other elements such as stock-keeping, stock financing, storage, loss of interest during transportation, packaging, assembly, and invoicing. These factors, taken together, determine the costs of the route between the place of production and the place of consumption. These costs, in their turn, account for a substantial part of the integral cost price, some 20 to 30%. For this reason it is therefore extremely important to aim at a reduction in the costs of physical distribution by endeavouring to find more efficient methods.

Transport constitutes, in the most literal sense, the elements of propulsive force behind physical distribution and for this reason plays an essential role in distributive activities, which are oriented towards fulfilling the demands of the consumer. The effects of the price and quality of transport make themselves felt on various elements within the marketing mix:

— *Price*

The price of the product can be affected by the integral transport price, and may or may not be decisive for success in reaching or creating a market;

— *Location*

Reaching a particular location at a particular moment is a qualitative requirement of transport which can decide success or failure in capturing a market.

Despite the vital importance of transportation in the industrial processes of modern market-oriented enterprises, it is generally farmed-out.
This farming out to specialist service enterprises (transport companies) means that the firm is allowing an important marketing instrument to pass out of its possession, with the concomitant that there is considerable doubt as to whether the transport company is serving the shipper's particular requirements.

The question involuntarily presents itself as to why the majority of enterprises do in fact farm out the transportation of their products. We are in general referring, naturally, to transportation over longer distances, by sea, rail or waterway. The answer is, of course, cost considerations. Only a few enterprises are in such a position as to make the operation of their own transport divisions a paying proposition. Examples of this are the oil companies which run their own tankers, and there are other companies which have their own shipping concerns such as Volkswagen, which built a ship especially equipped for the transportation of cars. These, however, are exceptions, and we must assume that the majority of industrial enterprises will continue to farm out their transportation to transport companies. However, as already mentioned, there is a danger that the quality of transport, and the demands made of it are not always attuned, one to the other.
One important subject for study must therefore be the co-ordination between the supply of and demand for transport.

2. The demand for transport

The demand for transport arises from the fact that the locations of production and consumption are physically separated, which results in a firm needing:

— to ship products in (raw materials, semi-finished goods, auxiliary materials, machinery, etc.);
— to ship products out (end products, waste products, etc.).

Already we see a highly heterogeneous transportation demand within a firm, in that we can further subdivide the products to be transported according to quantity, weight, dimensions, physical condition, frequency, etc. — all of which pose different problems.
A consequence is that the demand for transport is a demand which can be gauged from production.
This heterogeneous demand for transport results in:

a. a situation whereby no single industrial enterprise can operate its own transport division as a paying proposition
   — because of the diversity of the requirements made of transport;
   — because the majority of transport methods have become highly capital-intensive;
b. a situation whereby no single transport company would orient its transport product to such a heterogeneous demand. This leads to unification of the units to be transported, the process which is in full swing at the moment.

It is necessary to work towards co-ordination between a heterogeneous demand and a fairly homogeneous supply of the transport product. Consultation on this point between shippers and transporters is also essential.
The most important points about transportation for the shipper are:

— the integral transport price;
— the quality of the transport.

Previously held beliefs that the shipper had some emotional preference for a particular medium of transport or for a particular port seem to us to belong to the past.

The shipper will choose that transportation cycle which gives him the best of both these factors. The price factor has already been dealt with sufficiently. The quality factor can be further analysed, the following points having a bearing upon it:

— risk of damage;
— economic significance of the regularity;
— frequency of transport;
— reliability of transport;
— transportation time;
— amount of administrative work tied up in transportation;
— packaging necessary for transportation.

The transport offered must, in general, satisfy the demands made of it, these varying from product to product. There is, on the part of the shippers, a definite requirement for door-to-door transport, which implies that they would like to deal with a single transport company which can offer the entire range of transport services and not with a number of fragmented transport firms: Rhine shipping company, transport company, shipping line, and so on.

3. Marketing of transport services

For industrial enterprises the change-over from product orientation to market orientation was achieved some years back. For transport, however, this change in outlook is only now beginning to break through, and even with regard to the container this has only been fragmentary. The technical development in transport has always been rather autonomous and has hardly ever been oriented to the market requirements of the shippers. A good example of this attitude is the container, which was put onto the market without any previous market research having been carried out. The consequences of this are still a point of discussion. Due to rationalisation of transport many firms had already changed over to the pallet, taking the 0.4 x 0.6 metre pallet as their standard, next to the ISO pallets I and II. Many industries, department stores and distributive enterprises were already using these pallets. Strangely enough, the measurements of the container which later appeared on the market were not attuned to this:

— The external dimensions of the ISO container are not in conformity with the actual or future measurements allowed for road and rail transport in all places;
— The internal dimensions of the ISO container are not suitable for the pallet already in use.

It will be difficult to bridge this gap. We see large investments in pallets by industries, department stores and distributive enterprises, but the investments in containers and container ships are equally large. All this could have been prevented by market research!
It is clear that an important section of the shippers has not been taken into consideration, with the consequences noted above. This must be prevented by adapting the means of transport to the demands of

the market. It is necessary that a close co-operation, both on the technical and economic fronts, be developed between transporters and shippers. During the period of product orientation in the transport enterprises, the fragmentation of transport could clearly be seen; shipowners, inland shipping companies, road transport firms, shipbrokers, stevedores, charterers etc.
These enterprises supplied their own product and were hardly aware of the fact that maritime transport, for instance, is only part of the overall transport spectrum. Vertical and horizontal integration took place hardly at all, if ever. Moreover, these fragmentary transport products were not attuned to each other, or if so only slightly, being determined in fact, autonomously by technical developments. The unification which could be observed during the last few years was a great improvement. However, this too was an autonomous result of technological development. Only after the introduction of the container did it appear that in the North Atlantic the best conventional route service would come off second-best to the container services, which are still in their infancy, and this because the market prefers uninterrupted house to house transport to fragmented transport. There was obviously a latent need which is becoming more and more apparent since container services became available.

Next to the necessity of a change-over from fragmented transport to integrated transport another change occurred. The need for mutual adjustment of the various transport links often leads to vertical and horizontal integration and mergers, as adjustment could more easily be achieved when these links came under one management.
Road transport companies, stevedores and railways adapted their services to containers and unit loads. We are now entering the phase of market orientation. Transport concerns should not offer autonomously their means of transportation, but develop after research, those means as an answer to existing and future needs. Only by studying the demands of the market can we achieve the optimum yield, and it should always be borne in mind that the demands of the market are constantly fluctuating.
The barge already occupies a place in the transport world, be it beside the container and the unit load. That another unit should be developed was both understandable and predictable, for two reasons:

a. Of the total general cargo entering and leaving Rotterdam 85% was dealt with by inland navigation, 10% by road transport, and 5% by the railways;
For containers the picture is very different. In 1970 in the Netherlands approx. 55% of the containers were carried by road and approx. 45% by rail. So far inland navigation has had no share in container transport. The reasons for this are of no relevance here, but the conclusion can be drawn that the existing demand of many enterprises for transportation by inland waterways, cannot be met by using present day container transport methods.
This need must be met, the symptoms can be seen in for example, the arrival of the barge carrier, which will inject new life into inland navigation.
This was a case of a gap in the transport spectrum.
The fact that many enterprises give preference to transportation by inland navigation can only be explained by the low costs of transport. Apart from that, large industrial complexes arose in western Europe and the U.S.A. along the existing natural waterways. Both the supply of their raw materials and a great deal of the transportation of their products is done by means of inland navigation.

b. There was also a demand for a means of transportation of those goods which could not be transported by container or unit load.
In Chapter A it has already been stated that a unit had to be created to meet this demand, and that this unit was the barge. Chapter C dealt with the type of goods that can be carried by the barge.

We can see now, that the barge carrier meets both needs:
— to make use of inland navigation;
— to transport goods that cannot be transported by container or unit load and still be able to profit from technical progress in the world of transport.

Finally we must draw the conclusion that rapid progress in the field of market oriented transport enterprise is required, and that more consultation between shippers, transporters and authorities will be needed in order to develop an optimum transport system.

Chapter G. Barge carrier terminals

1. General survey

a. United States (See figure 37)
Terminals specially equipped for the handling of barge carriers and barges are springing up like mushrooms. The United States already has four under construction.

Figure 37 - Barge carrier terminals (under construction) in the U.S.A.

Figure 38 - Lash terminal in India Basin, Port of San Francisco.

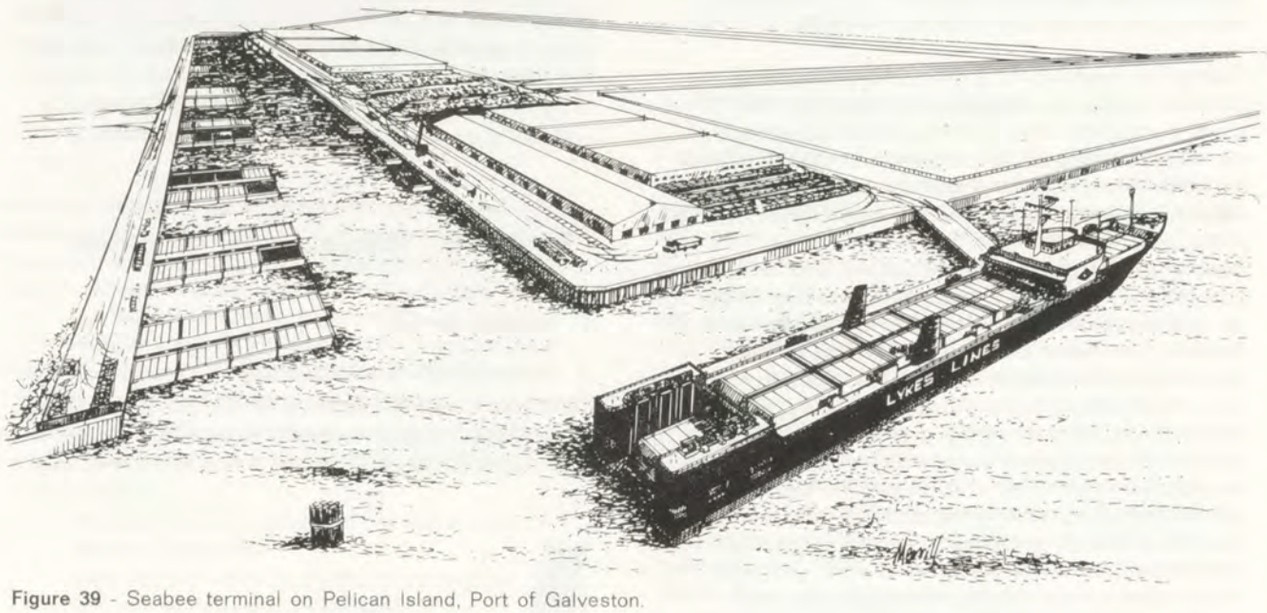


Figure 39 - Seabee terminal on Pelican Island, Port of Galveston.

in San Francisco, Galveston, New Orleans and Savannah.
The San Francisco terminal is being built for the Pacific Far East Line, and received its first Lash carrier alongside at the end of August 1971 prior to her maiden voyage to the Far East. This terminal, which is in the India Basin, has facilities for taking both barges and containers. (See figure 38). The storage space for barges is remarkably small when one considers that five of PFEL's Lash carriers will be using the terminal by 1972. Between 40 and 50 parking spaces is not much, even for combined barge/container carriers (49 barges plus 334 20' containers). The terminal also has two heavy cranes with a capacity of 100 tons each for lifting the barges out of the water for maintenance in the maintenance yard. The goods shed is roofed in for its entire length, enabling loading and unloading to take place independent of the state of the weather. The container yard is equipped with one gantry crane. As can be seen from the accompanying illustration, access to the barge storage basin is fairly constricted; this will present difficulties in the manoeuvring around the stern of the ship, which requires a great deal of space.

Work began at Galveston in June 1971 on a barge terminal on Pelican Island. (See figure 39). For the moment it is only intended that Seabees of the Lykes Line should berth here, the first of which is expected alongside in January 1972.

The New Orleans port — known as Centroport — is also readying itself for the reception of barge carriers. (See figure 40).

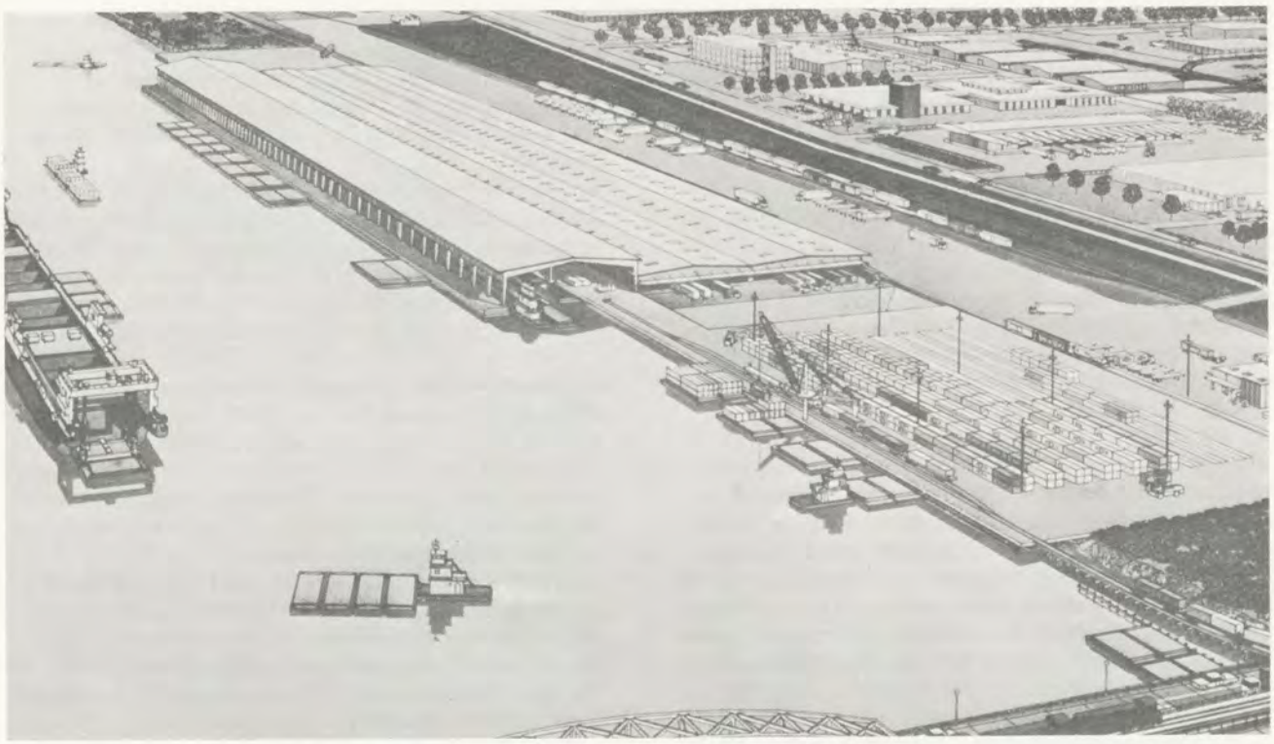


Figure 40 - Jefferson Marine Terminal, Port of New Orleans, as it will look when fully completed by early 1972.

Ambitious expansion plans, stretching as far ahead as the year 2000, have been made for this site at the mouth of the Mississippi (it is, in fact, the site of the original harbour for New Orleans) and even include the provision of four modules, each of which will cover 115,000 m² and have a quay length of 350 metres. Each module must be capable of handling 1.5 million tons annually. The first will be operational in 1972.

The port of Savannah lies 18 miles from the sea, and so the Georgia Ports Authority had a number of dolphins placed at the mouth of the Savannah River for the handling of barge carriers. There will be no sheds on land near to this mooring site, with the result that any barges for transhipment will have to be pushed 220 miles upstream to the Augusta barge terminal. The mooring site was ready for use in mid-1971.

b. Europe (See figure 41)

The first European ports to receive a Lash carrier were Rotterdam and Sheerness. Antwerp took over the Rotterdam service for a short time in 1970, as there were certain difficulties at Rotterdam with the unloading of bulk goods from the wing tanks of the barge carrier. Other ports are making every effort to attract a barge carrier service, but without success. Le Havre is well in the forefront here.

The French authorities are organising congresses, publishing articles etc. in a cost what it may effort to lure the barge carriers (navires porte-barges) into a

Figure 41 - Barge carrier terminals (under construction) in Europe.

French port. Both Le Havre and Marseille are in fact without a hinterland accessible by canal or river. The only waterways suitable for a barge push-service are:

— The Dunkirk/Valenciennes canal.
— The rivers Seine and Oise, as far as Corbeil or Compiègne.
— The rivers Rhône and Saône, but not until 1976.

Barges on these routes can not be loaded to their maximum capacity. Le Havre and Marseille are unlikely to be end stations for barge carrier services to and from Europe, but they may well have a use as ports-of-call, as they each have a roadstead where barges can rapidly be taken on board.

Sheerness, in the Thames estuary, was the first port to have a Lash service. In the winter an extra service to the Gulf ports has even been laid on for the goods which normally go via the St. Lawrence but which, at that time of year, have to travel via the Mississippi to reach their destinations in the northwest of the United States. As a result of the sustained growth in outward-bound goods traffic, the Ports Authority has decided to convert the former No. 1 dry dock into a special terminal for handling the barges. Work on the terminal began October 1970 and was completed in the spring of 1971.

As regards barge carrier services, the position of Antwerp vis-à-vis Rotterdam is not, at first glance, so disadvantageous. However, one of its most serious drawbacks is the River Scheldt, leading to the port. Navigation on this river is principally determined by two factors: the draught and the length of the ship.

The depth of water in the river at normal high water ranges between 11 and 12.5 metres, with the result that ships having draught somewhere in this region do not have a clear passage in at all times, but only at the beginning of high water when they are carried in on the tidal swell, as it were.
Fully laden Lash carriers draw between 10 and 11 metres, which means that they will have to take the state of the tide into account and will often be faced with delays.
If the ship is two hours late it is unable to reach the port of Antwerp before the tide falls, and must wait in the Flushing roads for the next high water.

Duration of the flood and ebb tides at a few points on the Scheldt from data gathered over the period 1951—1960:

	duration of flood tide	duration of ebb tide
Flushing	5 hr 56 min	6 hr 29 min
Antwerp	5 hr 16 min	7 hr 06 min

It can be seen that the ebb lasts considerably longer than the flood and that this difference increases up river.

The barge carrier is approximately 265 metres in length. Although ships of this length regularly enter Antwerp it is by no means a simple operation for the captain and pilot because of the many bends in the river and the Scheldt's poor radar coverage.
A bow side-thruster — which is fitted on Seabees — will therefore come in very useful in manoeuvring up this river.
Antwerp harbour is isolated from the Scheldt by locks. Although they cause delays for a ship, these locks are an advantage in that they provide the harbour basin with a constant water level. This does away with the need for expensive floating pontoons for the berthing of the barges such as are used at Rotterdam.

At Antwerp ships can simply make fast alongside, without the worry of rises and falls. The port has enough quays to provide berths for several barge carriers. When the Acadia Forest and the Atlantic Forest put in at Antwerp in 1970/1971 they lay right next to the Hessenatie terminal, which turned out to be a very satisfactory arrangement.
The Antwerp hinterland — the industrial zone around Luik — is connected to the seaport by the Albert Canal. One-bargewidth push units with a maximum draught of 2.7 metres are permitted on this canal.
The other important link with an industrial zone is the canal via Rupelmonde-Brussels (max. draught 2.7 metres) — Louvières to Charleroi (max. draught 2.5 metres).
And — last but not least — there is the Rhine-Scheldt connection, which will be ready for use in 1975 and which will give Antwerp a first-class access route to the industrial heart of Germany.
When we refer to Antwerp as Rotterdam's competitor for barge carrier transport we are talking of the period post-1975. Prior to that year Antwerp will not be able to play a role of any significance.
Unfortunately for her, it is the intervening period which will be critical for the development of the barge system in Europe. She thus stands a good chance of missing the barge!

Figures 42 and 43 clearly illustrate the effect which the opening of the Rhine-Scheldt link will have on the predicted flows of shipping from and to the Scheldt and along the canal from Ghent to Terneuzen in 1975 (taken from De Ingenieur Feb. 5, 1971).

The Rhine, the artery for the entire European inland shipping fleet, flows into the North Sea near Rotterdam.

Figure 42 - Shipping flows between the West Scheldt basin and the Hollandsch Diep (in 1975, before the opening of the Scheldt-Rhine link).

Figure 43 - Shipping flows between the West Scheldt basin and the Hollandsch Diep (in 1975, after opening of the Scheldt-Rhine link).

The industrial concentration around the Rhine and its tributaries import and export their goods from and to the four corners of the world. The Delta Ports, and Rotterdam in particular, are engaged in the forwarding and unloading of raw materials and finished goods.
In 1969 52.5 million tons of goods passed through Rotterdam to and from Germany along the Rhine, while only 9.2 million tons went through Antwerp. The picture was slightly distorted by the fact that the 52.5 million tons consisted, in the main, of bulk goods; general cargo accounted for only some 15 million tons, while the goods transport through Antwerp in that year was mainly in the form of general cargo.
Amsterdam, with a goods transit figure of 6.9 million tons in 1969, played only a subordinate role.
Rotterdam will, because of her present position in the transport of general cargo via the Rhine, almost undoubtedly be **the** port to which barge carriers will come to collect or deliver their barges. The Port of Rotterdam is an open connection between the North Sea and the Rhine and is therefore pre-eminently **the** location for the establishment of a barge carrier terminal. We will therefore deal with this port in more detail later on (see G.2).

The locks at IJmuiden serve to discourage shipping companies in advance, as they consider the delays occasioned by passing the ships through the locks to be quite unacceptable. Thus Amsterdam will only begin to play a part in this kind of transport once the outer port has been constructed. The Amsterdam-Rhine Canal will, when widening operations have been completed, be highly suitable for barge push-transport, so there will be no problem concerning the connection with the hinterland.

Bremen and Hamburg are virtually outsiders in the race for the barge carrier. Neither is in a particularly convenient position; they both lie quite far to the north for one thing, and their links with the hinterland via the Elbe and the Weser do not penetrate far enough into Germany.
In spite of these facts, Bremen has been port-of-call from the start of the first Lash-service in Europe.

To improve Hamburg's connection with the West German and East European inland waterways, the 116 km long Elbe Lateral Canal is at present under construction between Lauenburg (Upper Elbe) and Fallersleben (Mittelland Canal). It is scheduled for completion in 1975. The canal will be navigable for the 1.350-ton European barge. With it, Hamburg will have a waterway connection with its hinterland (West-Germany, the German Democratic Republic, Czechoslovakia, the Balkans) navigable over its entire length throughout the year. In view of the goods traffic already existing, which is partly being carried over the road, it may be expected that additional volumes of cargo will be transported between Hamburg and Czechoslovakia, the northern industrial area of the German Democratic Republic, the eastern industrial area in Lower Saxony, and also the Rhine/Ruhr region, when the Canal is finished. By that time the port of Hamburg will, without doubt, become of interest to a barge carrier operator.

c. *The Far East* (See figure 44)
In this part of the world, where the Pacific Far East Line operates, "barge carrier fever" has also claimed a number of victims. Special barge carrier terminals are being built at Nagoya and Yokohama in Japan, at Chilung in Taiwan, and at Manila in the Philippines.
The two great centres of distribution in the Far East, Hong Kong and Singapore, will also be coming up with similar plans in the near future.

2. The siting of the terminal at Rotterdam

The opportunities for a barge carrier service at Rotterdam are manifold, as was described in the preceding paragraphs. We shall here simply analyse the motivations for the siting of the barge carrier terminal.
The selection of a site for a barge carrier terminal is determined by the following considerations:

— the terminal should not be far from the sea, so that the ship's docking time can be cut to a minimum;

— a good connection with inland navigation should be available;

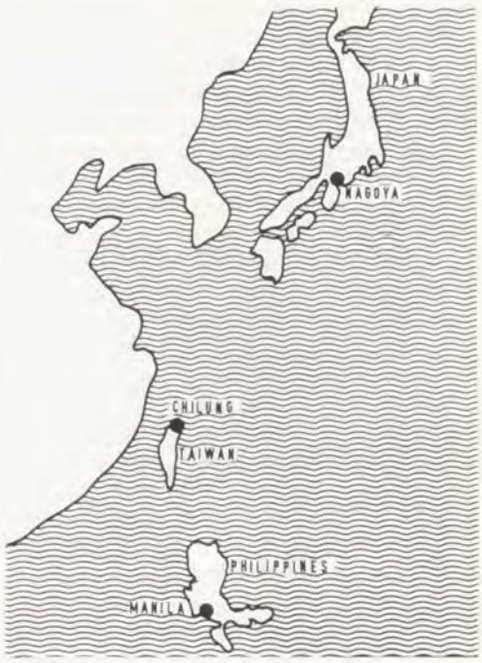


Figure 44 - Barge carrier terminals (under construction) in the Far East.

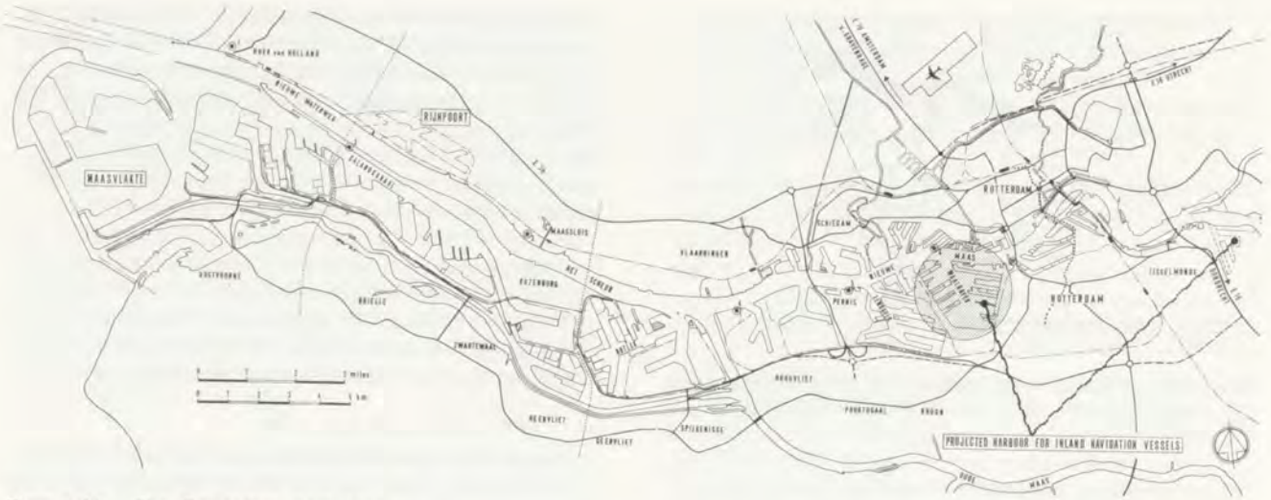


Figure 45 - The Rotterdam port area.

— a large harbour basin is essential for storing the barges.

These are the three main points. There are, of course, many other considerations but these we regard as being subordinate to the above three.

In the Rotterdam port area there are several suitable places but no one of them satisfies all three requirements. The following are possible sites for a terminal (see figure 45):

a) Maasvlakte I

b) Rijnpoorthaven

c) Waalhaven

Other locations must be considered highly improbable. We shall now make a more detailed analysis of these three alternatives:

a) The lay-out of Maasvlakte I had already taken on its definitive shape by the end of 1970, but as a result of the difficulties surrounding the establishment of the Hoogovens steelworks the lay-out decided on at that time has been abandoned. The requirements laid down by Rotterdam for any enterprise wishing to establish itself on the Maasvlakte is that the enterprise be absolutely dependent upon deep water. This the barge carrier is not, of course, and there is an abundance of harbours with a depth of 11 metres within the Rotterdam port area. In addition to this, the ground rent on the Maasvlakte is relatively high. A terminal on this site would be ideal from the navigational point of view, in that ships can be unmoored within half an hour.
The entry and departure of barges is by means of push units, travelling to the Rhine via the Beerkanaal, Hartelkanaal, Oude Maas and Nieuwe Waterweg. The locks in these canals, with their breadth of 24 metres and length of 220 metres, present no problem to push towing.

b) *Rijnpoorthaven*
Around this harbour there will be container/passenger terminals. The harbour lies in a favourable position relative to the sea. The great number of barges that have to be brought in and out and the phase difference between the times when this takes place, could easily lead to congestion in the harbour. Quite apart from this, the push-convoys bringing the barges in and out will tremendously increase the traffic in the busiest part of the Nieuwe Waterweg, so that this canal will even more rapidly reach its capacity limit, with all the consequences that that entails. A further drawback is that the harbour will not be ready until 1977, if matters even get that far.

c) *Waalhaven* (See figure 46)
The third alternative is the Waalhaven. The disadvantage of this basin is that it lies a good way from the sea (approx. 2 hours sailing). But this does not outweigh the advantages of a relatively large water area and good connections with the inland waterways. One of the Waalhaven piers can, at low cost, be converted into a barge terminal. The only pier suitable for this purpose is pier 3, which has so far only been used for inland navigation. These inland ships will have to be given a mooring place somewhere else, a special harbour such as the Puntzakhaven being one solution. It is really quite odd that this expensive basin should be used for inland ships which are more or less laid up.

Upon making a comparison between the three alternatives it turns out that Waalhaven is the only harbour where a terminal can be realised within the short term.

In the longer term Maasvlakte is a viable proposition, although whether Rotterdam City Council is actually prepared to hand out land for a barge carrier terminal is a moot point.

For these reasons the terminal elaborated in the following part of this publication is Waalhaven. This elaboration consists, in the first place, of the determination of the number of berths required for barge carriers, at the same time bearing in mind the often conflicting demands of shipowner and port administrator on the one hand, and the various uncertain quantities on the other. This is followed by a short description of the terminal lay-out.

Figure 46 - Existing barge carrier terminal in the Waalhaven, Port of Rotterdam.

3. The application of queuing theory to the barge carrier terminal at Rotterdam

The first question a reader of this report would naturally ask is: why is a terminal for these ships necessary? The answer being, that barge carriers can and will also carry containers (not in barges), which will be loaded and unloaded in the conventional way, for which a terminal is necessary.
When we apply the queuing theory we shall have to accept certain premises which are, to a certain extent, arbitrary. We shall therefore first try to be as objective as possible about the variables which determine this problem.

These variables are:

T_s = the average time spent in the berth ($\mu = 1/T_s$)

T_a = the average arrival interval ($\lambda = 1/T_a$)

T_w = the average waiting time

ψ = the traffic intensity factor ($\psi = \lambda/\mu$)

n = the number of berths

a. The average time spent in the berth T_s

Not all barge carriers are built according to the same principle, (see figure 47), and the time needed for loading and unloading is therefore not uniform. We shall therefore take the average of two values which are known to us: the Seabee and the Lash carrier.

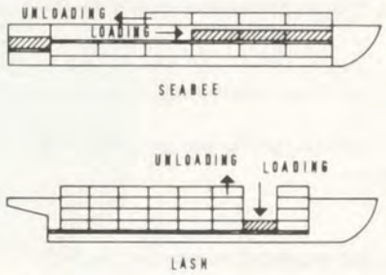


Figure 47 - Loading and unloading of Seabee and Lash.

— Seabee

The shipping company states that a Seabee can theoretically be loaded and unloaded in 13 hours; this is based on the premise that on **all** the lift cycles two barges will be loaded as well as unloaded. But this is not possible as, due to the structure of the ship (three horizontal decks) one deck must first be cleared completely before new barges can be loaded so that, taking other factors into consideration, a Seabee needs at least 18 hours for loading and unloading.

— Lash carrier

A full Lash carrier contains 73 barges and the loading and unloading of one barge takes an average of 15 minutes, which brings us to a theoretical time of 18 hours.
But here again we have the same difficulty, first one cell must be emptied before loading can begin,

and we therefore estimate that a Lash carrier needs 24 hours for loading and unloading.

In order to determine the correct value for T_s one needs to know the ratio between Seabees and Lash carriers. According to the present trend the number of Lash carriers will exceed that of Seabee, and so the respective times for loading and unloading (18 and 24 hours) cannot simply be averaged, but instead will lie somewhat closer to those for the Lash carrier. We therefore fix T_s at 23 hours.

b. The average arrival interval T_a

The initial premise is that the frequency distribution of T_a is a negative exponential function. The theory does not otherwise hold true.

At present it is difficult to quantify this point as only three shipping companies have published the schedules and the frequencies for the ships they are going to run to and from Rotterdam. The three companies are:

Lykes Lines: This shipping company is going to run a 10-days' service with three Seabees between the Gulf Coast and the Continent/United Kingdom.

Central Gulf: A 14-days' departure with two Lash carriers between the Gulf Coast (New Orleans, Panama City) and Rotterdam, Bremerhaven, Sheerness.

H.A.L./Hapag Lloyd: A 17 days' departure with two Lash carriers between Savannah, New Orleans, Galveston/Houston and Rotterdam, Bremerhaven, Sheerness.

This gives approximately 80 ships per year.

c. The average waiting time T_w

In general the object will be to reduce the waiting time to a minimum as it is an expensive business for a shipowner.

We assume that $\frac{T_w}{T_s}$ is a measure of the degree of inconvenience experienced by the shipowner due to harbour congestion.

4. Determining the required number of berths

The average arrival interval T_a is as yet difficult to determine, as was shown in b. We therefore apply the formula:

$$\frac{T_w}{T_s} = \frac{\psi^n}{(n-1)!\,(n-\psi)^2\left(1+\frac{\psi}{1!}+\frac{\psi^2}{2!}+\ldots+\frac{\psi^n}{n!}\cdot\frac{n}{n-\psi}\right)}$$

T_s is considered a fixed datum (23 hours). By varying T_w, ψ and n we find real values for the quotient T_w/T_s. The result of some calculations has been worked out in the accompanying graph. (figure 48)

For n = 1, 2, 3, and 4 berths it appears that for values of the average waiting time $T_w > 5$ hours the average interval T_a moves asymptotically towards definite values, that is to say for:

n = 1 T_a = 100 hours (n = 1 has been omitted from the graph)

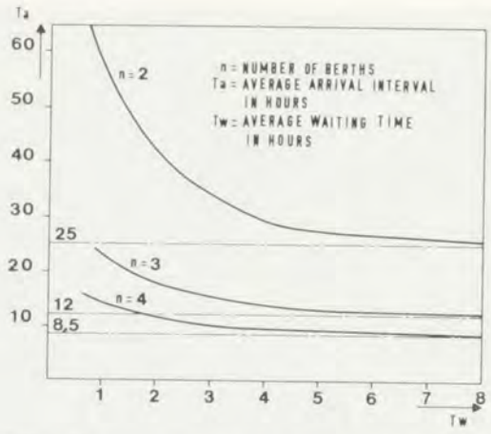


Figure 48 - Average waiting time T_w in relation to average arrival interval T_a as a function of the number of berths.

n = 2 T_a = 25 hours
n = 3 T_a = 12 hours
n = 4 T_a = 8.5 hours

From this we see that for waiting times in excess of 5 hours, it makes little difference whether we create 3 berths or 4.

The average arrival interval corresponding to n = 3 and $T_w > 5$ hours is T_a = 12 hours.

We reckon that a year has 365 days, not deducting Sundays and public holidays, as on these days the barge carriers will be loaded and unloaded as usual.

The annual capacity of a terminal with three berths is then $\frac{365 \times 24}{12}$ = 700 ships, which will be a very high number for the future.

If, however, we make higher demands upon the average waiting time, for example T_w = 1 hour, then the average arrival interval T_a becomes 24 hours. The annual capacity will then be approximately 365 ships, which is one ship per day. This will definitely be sufficient for the near future but probably not in the very long run.

5. A short description of the terminal lay-out

The lay-out of a terminal will on the one hand be determined by the type of ship and the system for loading and unloading related to it, and on the other hand by the requirements as regards storage and the bringing in and out of goods. (See figure 49).

These facets will be discussed point by point.

a) The loading and unloading of barge carriers

For this we must distinguish between two types of ship, the barge carrier **with,** and the barge carrier **without** containers on board.

The loading and unloading of the barge carriers should be done as indicated in figure 50.

The barges are manoeuvred alongside the ship, thus forming a stack. This will make the crane activities more or less independent of the supplying of barges by the tugs.

While one barge is being loaded, the next barge is brought under the stern. This method requires a

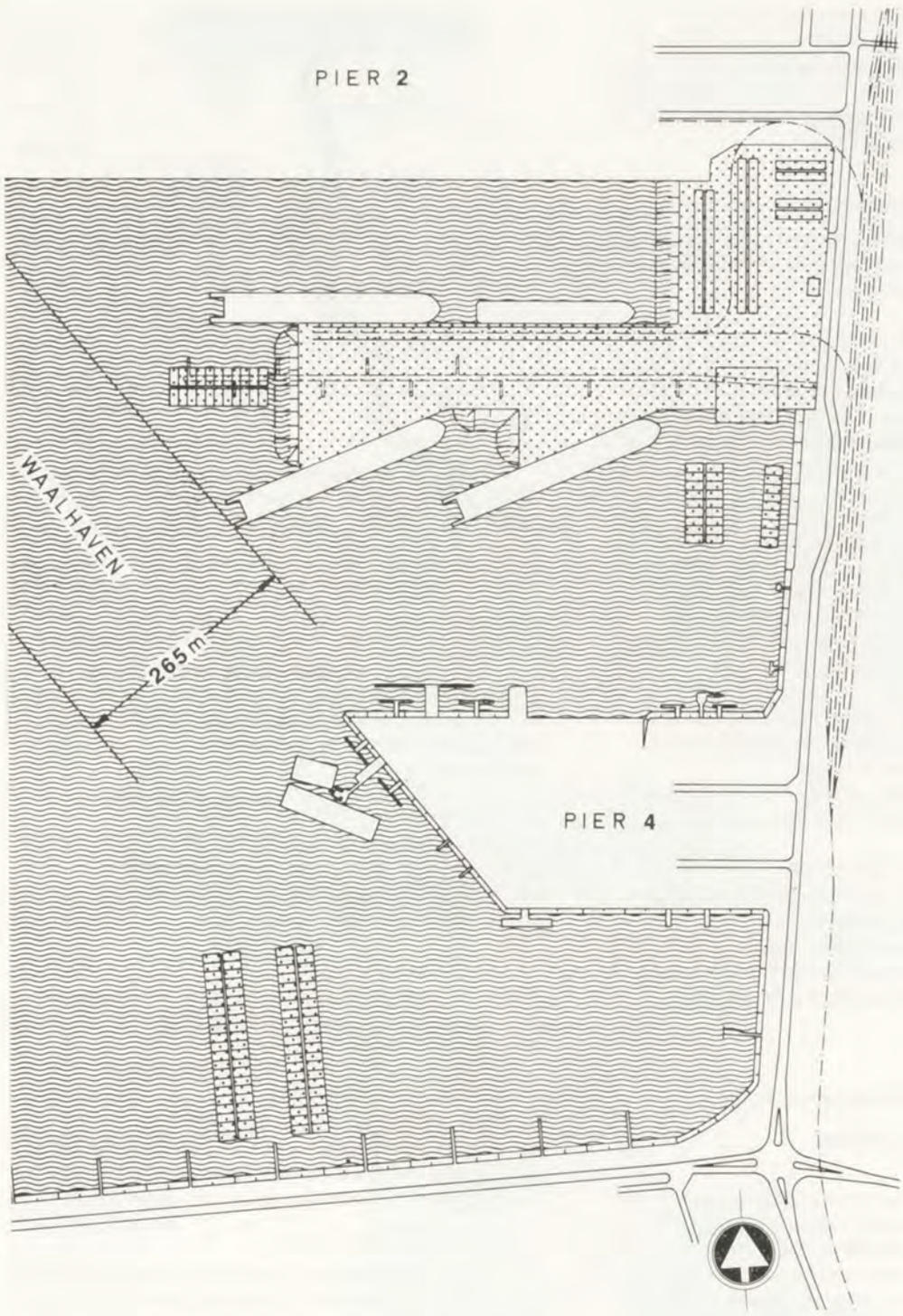


Figure 49 - Barge carrier terminal in the Waalhaven, Port of Rotterdam.

large free water area around the stern of the ship. This is absolutely essential!

If the ship also carries containers, these containers will be taken off by means of a shore crane, as a deck crane operates less efficiently and could cause a bottleneck in the loading and unloading.
As not all barge carriers will operate the combined system, not every berth need be accessible to a container crane.
The containers will also be carried by conventional container ships, so that one berth ought to be reserved for a container ship.

b) Loading and unloading of the barges

Not all the barges have destinations outside Rotterdam, with the result that it will be necessary to create a place where these barges can be loaded and unloaded. The barges are unloaded conventionally alongside a quay with room for 6 to 7 barges.

c) Storing the barges

The unloaded barges are usually formed at once into push-convoys, and therefore the mooring space for these barges need not be large. Near to the terminal the stacking place offers room for barges, and there

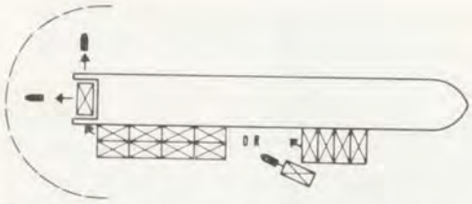


Figure 50 - Loading and unloading of a barge carrier.

is reserve space in the southern part of Waalhaven, which could be adapted to this end.

d) Storage of containers

The quantity of containers brought in by barge carriers will be so small that a relatively small stack will be adequate, particularly as a large percentage of the containers will immediately be taken away by train or truck.

e) The bringing in and out of the barges

This is done by means of push-units which will bring the barges straight to the ship for loading, with no mooring necessary. The barges which come in incidentally are moored, and sorted out according to destination in so far as this is possible. They are then brought to the ship one by one.

f) Bringing in and out of containers

A large proportion of the containers come by road. The remainder are brought in by rail.
The site is connected to the railway network by two tracks, which makes a continuous flow possible.

g) Storing and sorting of the goods at the terminal

At the terminal the goods are taken out of the barges partly in the open air and partly under cover.
The cover over the repacking shed makes it possible to carry on with work during bad weather. As not all goods are sensitive to rain there are only three covered areas.

6. Port charges at Rotterdam (see figure 51)

Explanation of these port charges

a. State pilotage

State pilotage is subdivided into two categories: a sea pilotage tariff (Z tariff) and an inland pilotage tariff (B tariff). The sea pilotage tariff is levied for pilotage of ships bound from the open sea to the port, or vice versa. The criterion for the amount payable is dependent upon the draught "D". The inland pilotage tariff is levied on piloted voyages between seaports and inland ports. The criteria for this tariff are:
1. the distance in km's "A"
2. the draught of the ship "D"

b. Municipal pilot service

Port pilotage (municipal) is levied for the piloting of the barge carrier from the river to its berth. The sum payable per piloted voyage is dependent upon the ship's length overall "L".

c. Tugs

The tug services are provided by private concerns. Rates are dependent upon the ship's length overall.

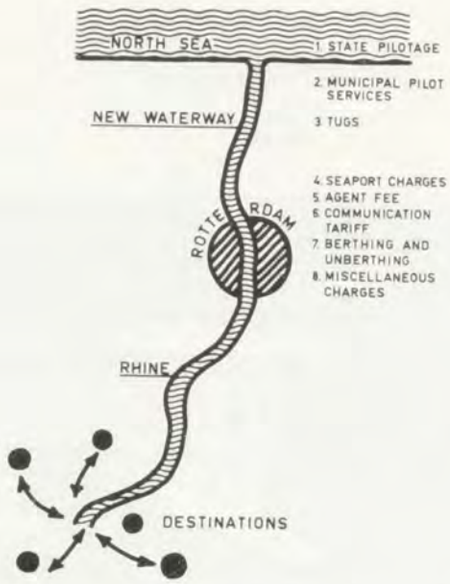


Figure 51 - Port charges at Rotterdam (shown schematically).

d. Seaport charges

If sea-going vessels make use of ports, dolphins or buoys, they are liable for a charge for such services. The barge carrier will generally come under a tariff which is determined by the criterion of gross capacity in cubic metres "C". (1 B.R.T. = 2.83 m^3).

e. Port agent fee

The port agent fee is a standard tariff determined by the size of the ship in B.R.T. — up to 35,000 tons. A barge carrier therefore has a fixed sum as its standard tariff "T_1".

f. Communication tariff

Notification of ships entering is made to Dirkzwager, Maassluis. The charge for this notification is calculated from the ship's draught.

g. Berthing and unberthing

Berthing and unberthing is dealt with by a private concern. Mooring to buoys, which will concern the barge carrier, also requires the provision of this service. The tariff applied is dependent upon the length overall.

h. Miscellaneous charges

There are miscellaneous charges to be paid per visit to the Port of Rotterdam. These include the lifeboat service, seaman's hostels etc., the charge taking the form of a fixed sum "T_2" per visit.

The charges incurred by a visit to the Port of Rotterdam can be summarized as shown in the following formula:

$$K = B(A) + (b + c + g).L + d(C) + (T_1 + T_2) + (Z + B + f).D$$

where

Z = sea pilotage tariff; B = inland pilotage tariff; b = municipal pilotage tariff; c = tug services tariff; d = seaport charge tariff; f = communication tariff; g = berthing tariff; T_1 = port agent fee; T_2 = fixed miscellaneous charges.

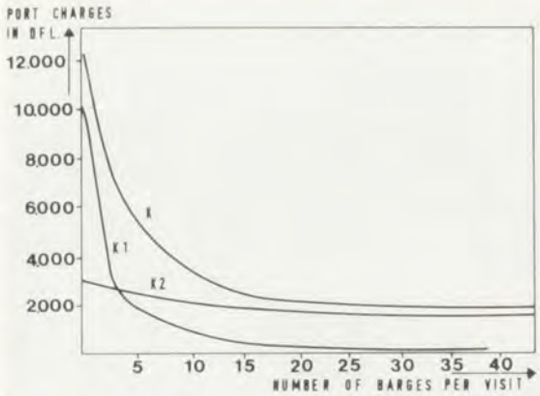


Figure 52 - Progression in port charges per number of barges unloaded.

The port charges are made up of a sum, K_1, which is independent of the load state at the moment of entry:

$K_1 = B(A) + (b + c + g).L + d(C) + T_1 + T_2$

and a sum, K_2, which is dependent upon the load state and, often, upon the number of barges to be unloaded/loaded:

$K_2 = (Z + B + f).D$

The charges K_1 are to be regarded as the fixed portion of the port charges, and the charges K_2 as variable charges depending upon the degree of loading.

The cost progression per number of barges unloaded per visit is shown in figure 52. It can be seen from this graph that the cost of unloading one barge remains practically the same as long as the total number of barges unloaded exceeds or is equal to 15.

Chapter H. Barge navigation on the Rhine

1. Push towing on the Rhine

The large inland, maritime shipping companies in the Netherlands are, without exception, operating in the international transport market. They maintain routes between the North Sea ports of Rotterdam, Amsterdam and Antwerp on the one hand and the European hinterland on the other. (See figure 53). The most important areas of this hinterland are:

— the Ruhr area, with its iron and steel industry and coal mines;

— the environs of Cologne, Hoechst/Frankfurt and Mannheim/Ludwigshafen with their extensive chemical and petrochemical industries;

— Strasbourg as the central supply port for France;

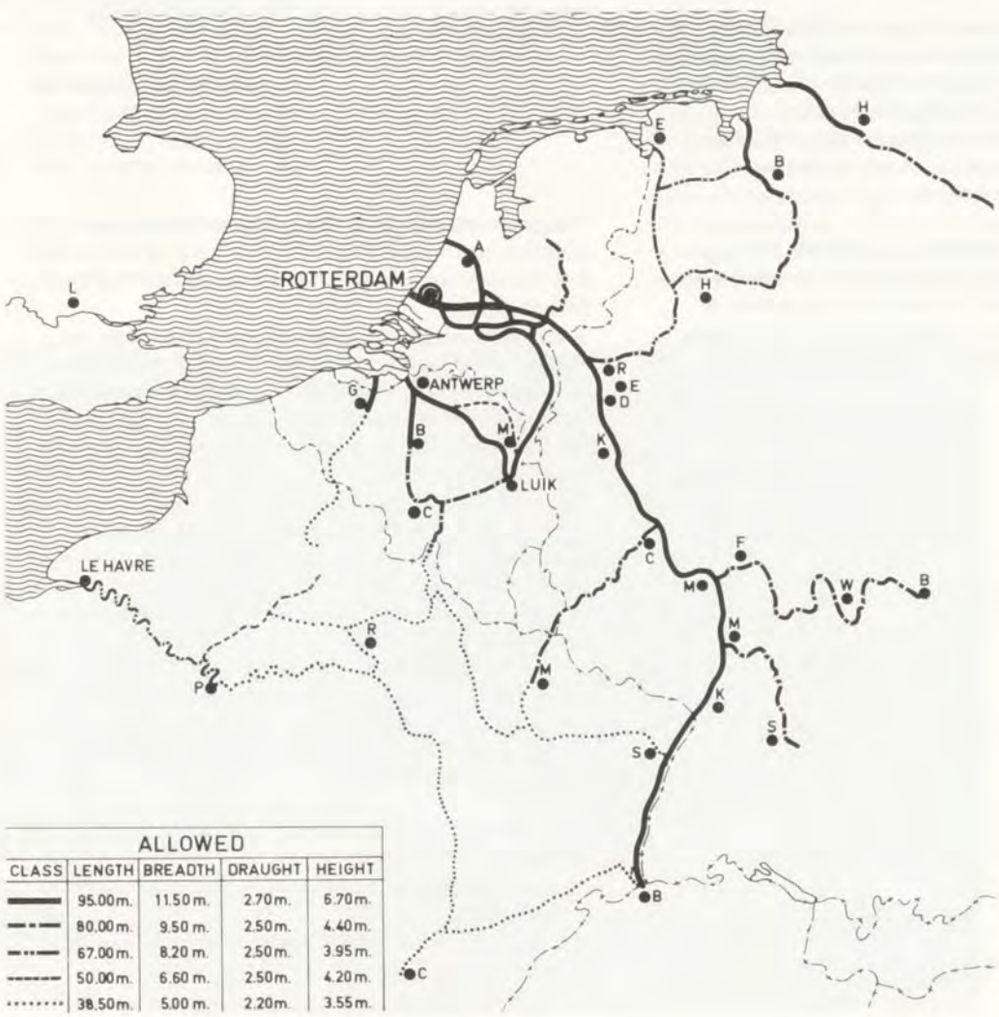


Figure 53 - International transport between Rotterdam, Amsterdam, Antwerp and the European hinterland.

— Basle as the central supply port for Switzerland and as transit port for Italy.

In addition to these hinterlands, which lie on the Rhine itself, there are a number of other areas which are connected to the Rhine by tributaries:

— the entire southern region of Germany via the Main and Neckar;
— the steel industries of Elzas and Lotharingen via the Moselle;
— the German industrial region enclosed by the canal network between Ruhrort and Dortmund;
— the entire area within the range of the Danube, as soon as the Main-Danube connection is completed around 1980. The stretch as far as Nurenberg, however, will be operational in 1971.

In view of the requirements of the hinterland the most important goods to be transported upstream are: ores, phosphates, general cargo and mineral oils.
The goods caming downstream are primarily: coal, sand, gravel and coal tailings. In 1969 219,000 vessels crossed the frontier at Emmerich (i.e. some 600 per day) of which 58 % were travelling upstream, and 42 % downstream. In addition to its dependence upon the cargo supply, Rhine transport is to a large degree determined by the height of the river. If the winter produces only a slight snowfall in Switzerland the result can be extended periods of low water levels (see para 2).
Therefore, transportation contracts take this into account. If the water falls below a certain level (which naturally varies from one location to the other) the transporter is given a low water allowance.
The transporter can only load to a certain draught, and consequently a voyage at times of extreme low water becomes more expensive.

In view of the Rhine's limitations as regards navigability, the Central Rhine Navigation Commission at Strasbourg has laid down the maximum dimensions for push-convoys as 185 x 22.40 metres. Within these limits the following combinations are possible (see figure 54):

one prime mover with — four standard barges type I (see figure 55)
— four standard barges type II
— eight Lash barges + two barges type I (statutory because the Lash barges do not come up to shipping requirements) (See figure 56).

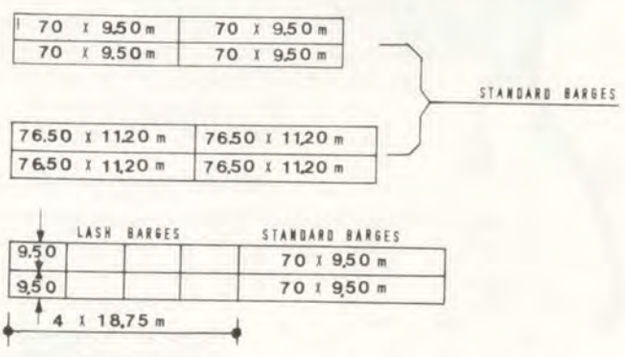


Figure 54 - Possible configurations of push-convoys within the maximum dimensions allowed by the Central Rhine Navigation Commission.

Figure 55 - Push convoy with four standard barges.

The great advantage of push towing lies in the rapid coupling and uncoupling of the barges which means that the pushing vessels need only remain a short time in port.
In the days when supplies from overseas took the form of small quantities, direct transhipment to the inland vessel was a workable and efficient method. Cargo arrived at reasonably-spaced intervals, and inland shipping was quite capable of dealing with the pace. (See figure 57).
Nowadays, however, the situation is radically different. Larger and larger ships arrive, bringing more and more cargo. With the vessels remaining only a very short time in port, push transport offers a solution to a problem which was quite insoluble using traditional inland shipping methods.
Where a motor vessel was sometimes forced to keep space free for an expected arrival from overseas, a push-unit's barges can lie waiting to be loaded while the push tug makes a journey with another set of barges.

Push towing has the following advantages and disadvantages, compared to traditional inland shipping:

— crew savings or, alternatively, higher labour productivity;
— barge construction costs are lower, as are maintenance costs;
— loading and unloading is simpler and thus faster;

Figure 56 - Push convoy with eight Lash barges and two standard barges.

— possibility of unbroken journeys as a result of radar and shift working;
— relatively higher construction costs for the push tug as a result of more engine power and more complicated steering-gear;
— extra labour costs as a result of the working gang required in port to help with the loading and unloading of the barges.

2. Push towing costs

The push tug operator has the following types of cost
— labour costs
— depreciation
— interest losses
— repair costs
— insurance costs
— operating expenses of the vessel itself.

Of these categories, depreciation and interest losses represent the pure fixed costs, while the vessel operating costs are completely variable. The remaining categories are partly fixed and partly variable.
A push tug's productivity depends upon its round-trip time, which is in turn made up of aggregate time on voyage and time spent in port. The aggregate time on voyage is the product of the average speed on voyage and the transportation distance. Time spent in port is determined by the formation of push convoys.

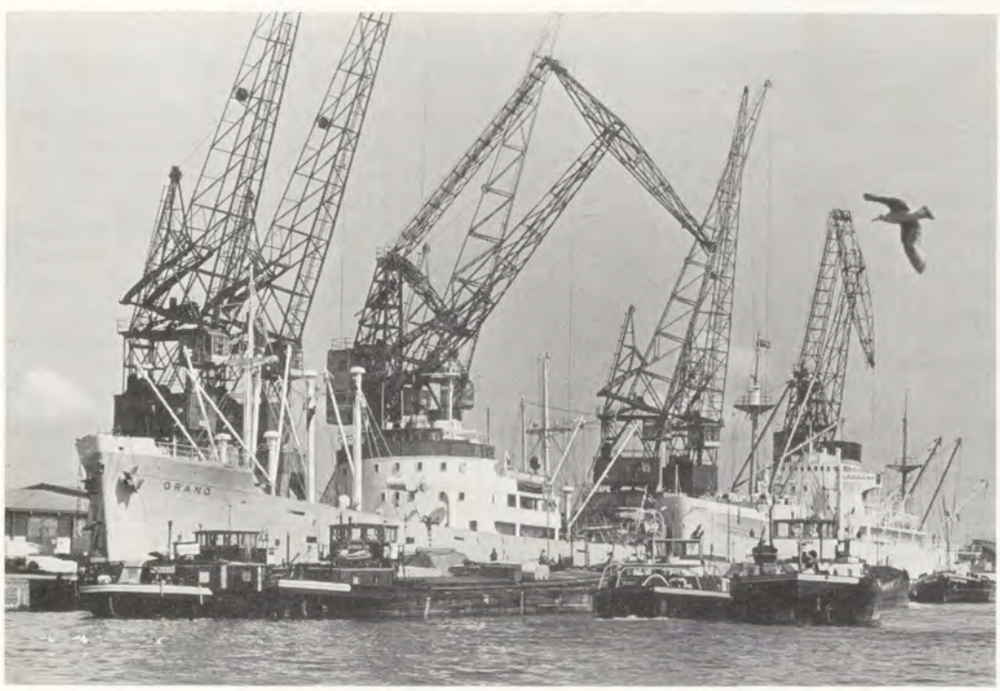


Figure 57 - Conventional direct transhipment.

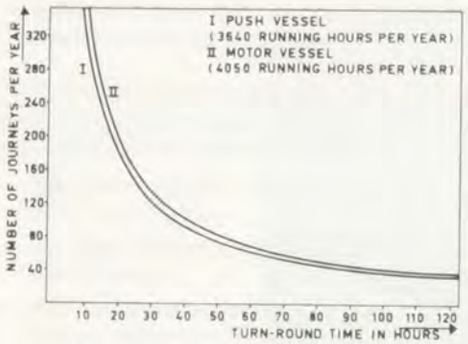


Figure 58 - The relation between round-trip time and number of trips per year for one specific push configuration (curve I) and for a conventional motor vessel (curve II).

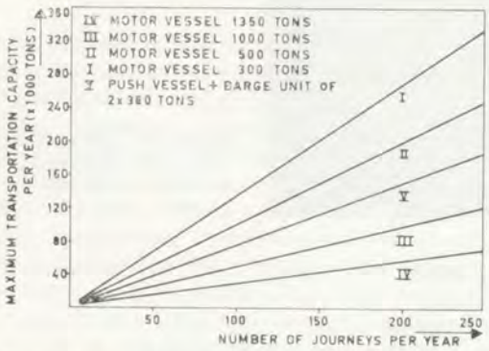


Figure 59 - Maximum transportation capacity and number of journeys per year for several ship configurations.

Figure 58 shows the connection between round-trip time (in hours) and the number of journeys per year. This relationship is only valid for a particular push tug with a particular number of barges!
A shipping company operating a push towing service receives its income from the weight transported, i.e. the number of tonkilometres. An important factor is the maximum transportation capacity taken together with the number of journeys per year.

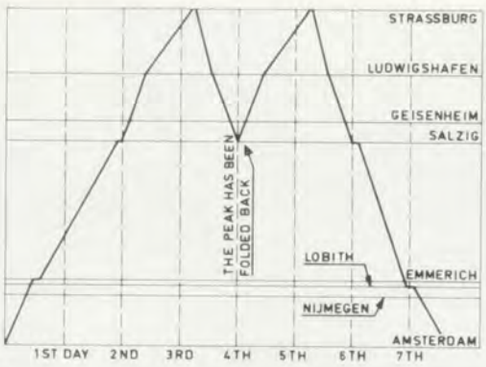


Figure 60 - Voyage schedule of a push tug operating on the Rhine (Amsterdam-Basle vice versa).

This is shown in curve I of figure 58 for one specific combination, but it should be borne in mind that it is an indicative curve. (See also figure 59).

The voyage schedule (figure 60) of a push tug operating on the Netherlands (Amsterdam) — Upper Rhine run (both outward and homeward bound), is meant to give an idea of the scale of the round-trip time. As the diagram shows, the round journey from Amsterdam to Basle and back takes approximately seven days.

3. The navigability of the Rhine in connection with the draught of the barges

One point which tends to be glossed over as regards developing the barge carrier system for the Rhine is the navigability of this river and its tributaries. One definitely cannot take it for granted that a fully loaded barge can reach any destination on the Rhine at any time. (See figure 61). This will also appear from figure 62 in which, in a length profile of the Rhine, the maximum and the minimum average water levels have been plotted for the various towns. In reality the sketched

WATERDEPTHS ON THE RHINE 1951 - 1967

1 MAXIMUM LEVEL
2 MINIMUM LEVEL
3 AVERAGE LEVEL
(in cm.)

SECTIONS	CITY	1951 / 1250	1961	1962	1963	1964	1965	1966	1967
SWISS SECTION km 1664 - 170 3 km 380	RHEINFELDEN	256	376 162 240	436 137 233	382 132 246	411 151 217	585 187 281	486 193 288	427 166 268
BASEL-STRASSBURG km 170 - 294 124 km	OTTENHEIM	336	482 191 313	529 152 298	484 153 312	508 165 269	600 199 367	546 224 336	484 189 306
STRASSBURG - LAUTERBOURG km 294-352 58 km	STRASSBURG	270	406 134 255	498 94 244	418 105 258	484 122 213	562 150 321	580 185 318	480 160 288
LAUTERBOURG - BINGEN km 352 - 530 178 km	MAXAU	453	598 382 438	669 285 428	581 289 437	620 311 394	757 345 516	727 369 511	651 354 477
	MANNHEIM	311	484 137 285	541 93 270	500 89 277	456 188 228	589 178 361	640 197 378	533 176 328
	MAINZ	300	470 166 293	508 117 271	446 118 266	390 143 219	587 184 365	585 203 360	576 200 320
	BINGEN	210	374 95 206	399 50 186	358 53 181	298 75 144	465 117 278	472 134 268	417 132 230
BINGEN - ST. GOAR km 530 556 26 km	KAUB	233	454 100 260	484 53 207	424 55 205	344 70 151	582 115 313	596 137 305	510 135 257
ST GOAR ROLANDSECK km 556 - 642 86 km	KOBLENZ	248	540 108 252	566 57 225	560 57 210	386 73 165	701 143 332	686 142 326	653 170 280
ROLANDSECK - DUTCH BORDER km 642-804 228 km	COLOGNE	228	580 48 837	598 4 200	599 3 179	373 22 122	745 100 333	739 84 325	691 132 267
	RUHRORT	435	814 224 442	824 164 400	803 158 356	582 177 293	953 283 530	953 258 524	898 307 457
RHINE-WAAL km 858 - 952 94 km	LOBITH	1048	1415 821 1063	1428 767 1006	1391 762 955	1169 779 913	1509 877 1163	1522 868 1162	1472 906 1073
	NIJMEGEN	823	1169 807 843	1174 807 786	1154 552 776	948 569 698	1241 864 927	1252 649 836	1210 693 857

Figure 61 - Water depths on the Rhine 1951-1967.

Figure 62 - Maximum and minimum average water depths on the Rhine 1951-1967.

graphs are naturally not quite as angular, but this is due to the small number of measuring points. In this graph we can now draw a line showing the minimum water needed for a barge. This minimum water depth is fixed at 2.40 m for the following reasons:

— a fully loaded Lash barge has a maximum draught of 2.50 m in fresh water;

— a barge is usually not loaded to full capacity, partly due to the specific volume of the goods; therefore the maximum draught will seldom be reached.

We reckon the average draught to be 75 % of the maximum draught. This produces a draught of 1.90 m, leaving the 0.50 m clearance required for nautical reasons, when we assume an average stowage factor of 2 m^3/ton (a Lash barge disposing of 380 ton carrying capacity and 480 m^3 content).

All this together gives us the minimum water depth required of 2.40 m.

From the graph it can be seen that the average water level between Coblenz and Mainz is below this, and we can expect difficulties for the barge push-service on this stretch, particularly as many of the destinations for goods lie upstream from here.
Information on the navigability of the tributaries of the Rhine is available but has not been further elaborated here as barge traffic will initially be concentrated on the Rhine itself.

What are the consequences of all this for shippers and transporters?

— *Shippers*

If we take as an example the trade route New-Orleans—Rotterdam, then a shipper on the Mississippi ought already to be very well informed about the water levels on the Rhine. This facet must not be underestimated, for when the load is too great the shipper runs the risk that part of his goods will have to be taken off the barge in Rotterdam and loaded on to an inland ship, which is very costly and can be charged to the transporter's account.

— *Transporters*

In a year when Rhine water levels are particularly low there will be the chance that the transporter will have to load his ship with half-filled barges, which cannot be calculated in the freight charge, resulting in him possibly suffering a considerable loss.
This is another point which is not generally recognised but which could nevertheless play an important part in the future of a barge service on the Rhine.

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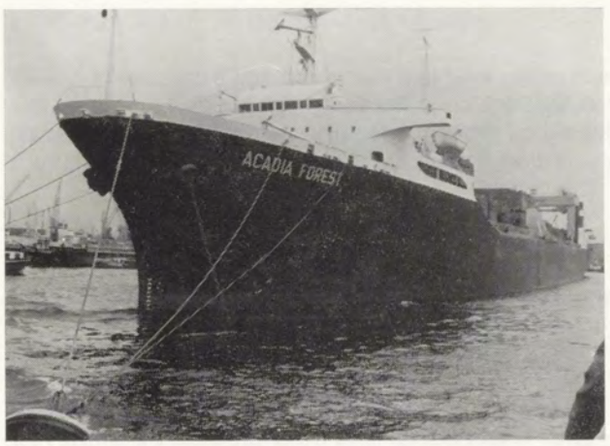
Some legal aspects of the kangaroo ship

by **G. J. W. de Vries**



The first barge carrier in the world.

"**9.285 The kangaroo, or barge-carrier**

This is a seagoing vessel which carries on board not containers of the kind just described, but a number (say, 70) of complete lighters — inland vessels of a couple of hundred tons which come laden over inland waters to the seagoing vessel that carries them across the ocean, after which they are unloaded and travel inland to discharge their cargoes elsewhere. It is this kind of transport most of all that throws up spine-chilling legal problems.„

T. J. Dorhout Mees

"Kort begrip van het Nederlands Handelsrecht en Faillissementsrecht„ 5th edition, 1971.

".... and when you see drawings of the kangaroo-ship, the ‚lighter-aboard-ship' and other gruesome horrors, you can indeed talk in terms of a revolution. But a revolution in legal terms? This extravagant sort of language does not really fit the lawyer.„

H. Schadee

Paper read to the Nederlandse Vereniging voor Zeerecht !Dutch Maritime Law Association) on 18 November 1967 at Amsterdam.

SOME LEGAL ASPECTS OF THE KANGAROO SHIP

I A LIST OF THE PROBLEMS

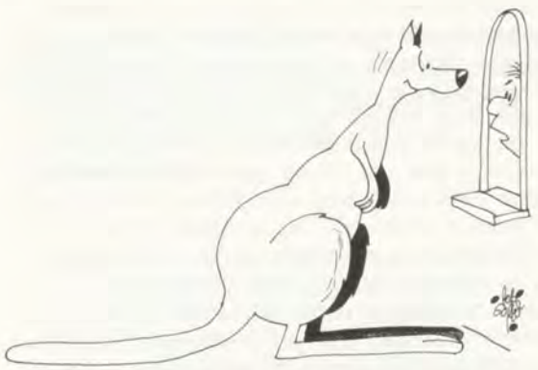
Chapter A. What is the position of the lighter under the law of property?

It would probably be difficult, if not impossible, to discover who first coined the name 'kangaroo-ship' for the type of vessel that is also variously known as a LASH (Lighter Aboard Ship) ship, a BOB (Barge On Board) ship and a barge-carrier. But it seems that what he had in mind was the analogy that exists between the type of ship we shall be discussing here and a mammal found in Australia, Tasmania and New Guinea; this animal has short forelegs and long, powerful hind legs together with a very large tail, and is known generally by its Australian name of 'kangaroo'. The kangaroo, or to give it its more scientific name the Macropodina, has a well-developed pouch opening to the front of its body in which the one young animal is carried each year. It could be said that the 'kangaroo-ship' carries lighters in its holds in more or less the same way. However, the pouch is not restricted to the kangaroo alone, but is a characteristic feature of a much larger order of animals, the Marsupialia, of which the kangaroo is one example. It might be better, therefore, to use the term 'marsupial ships' instead. In the meantime it must be said that the analogy outlined above is, at least for a lawyer, a very incomplete one. While one can always safely assume that the kangaroo will invariably carry only small kangaroos in its pouch — animals which are, moreover, members of its own species — it is still very much in dispute whether the kangaroo-ship is carrying small ships (lighters). And we cannot reasonably expect that the lighters will ever grow into full-size kangaroo-ships in the way the young kangaroos grow up to become adult animals. It is quite conceivable to regard the lighter not as a ship, but as a thing in its own right [1]).

How should the lighter be regarded? The answer to this question has an important bearing on the answers to the questions we shall be discussing later.

1. Does the lighter have to be registered?

If the lighter is a ship, then the question remains of what kind of ship it is — a seagoing vessel or an inland water vessel? There is *no* legal obligation to register a sea-going ship, though if a seagoing vessel has a capacity of 20 m³ gross or above (= approx. 70 GRT) it does become a practical necessity for the owner to register it. Registration is required in order to obtain a certificate of registry (art. 6 of the Zeebrievenwet (Certificates of Registry Act)), and without a certificate of registry a ship will not be cleared into or out of a port (art. 14 of the Zeebrievenwet); it is thus impossible to navigate as a seagoing vessel without one. There is, here, an indirect compulsion to place the ship on the register referred to under art. 314.[2])
Only Dutch seagoing ships are registered in the Netherlands Registry of Shipping.
By law inland water vessels do have to be entered in a separate inland vessels register (art. 749), provided that they fulfil certain conditions. They must either be tugs or have a capacity of 20 m³ gross (approx. 70 GRT) or above. In addition to this, they must be more than 50% owned by Dutch nationals having their normal domicile in the Netherlands, or by companies, associations, institutions or other corporate bodies established in this country the seat of whose water transport business is situated in the Netherlands.



"Does the lighter have to be registered?"

Non-observance of this obligation lays an offender open to a fine of up to 2,000 guilders (art. 477 bis Sr. (Penal Code)). Although there, accordingly, has to be a certain connection between the owners of an inland vessel and the Netherlands for the purpose of entering it in the Netherlands Register, the inland vessel itself has *no* nationality (see art. 4 para. 4 of the Geneva Convention, Trb. 1966 No. 228, and M. v. A

[1]) Whenever in this work the term "thing in its own right" is used in relation to the lighter, this is intended in the sense of an independent, non-ship thing.

[2]) Wherever, throughout this paper, articles are mentioned without any specifications, these are articles of the Wetboek van Koophandel (Commercial Code).

at art. 775). If inland vessels do not satisfy the above conditions there is no obligation to register, although registration is still permitted.
From the legal viewpoint, a component part of a ship and the ship itself are looked upon as forming a single whole. If, therefore, the lighter is a component part of the ship, this means that it does not require to be registered separately. The registration of the mother ship includes the lighter. The ligther has the nationality of the mother ship.

From the viewpoint of the law of property, it is in this case inconceivable that the lighter and the mother ship should belong to different owners, at least while the lighter is aboard the mother ship. Ownership of the mother includes ownership of the lighter. Supporters of this view are found in France [1]).

If the lighter is an appurtenance to the ship the foregoing applies, in principle, to an equal extent. The legal connection between ship and appurtenances can however — unlike the connection between component part and ship — be severed by legal provisions (art. 770) or even by a contractual agreement (art. 309 para 2). Under such a contractual agreement the lighter could become a thing in its own right, or in other words lose its nature as an auxiliary object (cf. art. 563 B.W.). It is noteworthy that such an agreement also has effect in relation to third parties. It would therefore be advisable, in such a case, to add a note to the entry in the Register of Shipping relating to the mother ship. The frustrating effect of art. 1910 B.W. (Civil Code), as construed by the Netherlands Supreme Court in its judgment of 9.2.1940 (N. J. 1940, 302), would thereby be eliminated.
If the lighter is a thing in its own right, then registration would appear, at least under presentday law, to be unnecessary.
It might be commented, incidentally, that the register often does service as a sort of Register of Births, Deaths and Marriages for ships. The register is used to discover who the owner of a ship is, and where its home port is. In many circumstances, such as collisions, damage to goods carried [2]), the exercise of preferential rights, etc., these items of information are, from their nature, indispensable. Where other things than ships are concerned, too, a register of the kind is a possible and even extremely useful measure. One thinks, for instance, of motorcars, which are also registered to varying extents, and of aircraft (art. 2 of the Wet teboekgestelde Luchtvaartuigen (Registered Aircraft Act) of 6 March 1957, Stb. 72).

2. How must ownership of the lighter be transferred?

Ships are movable property (art. 566 B.W.). Despite this, they are to an important extent treated as if they were immovables. It has already been seen from the foregoing that a ship can be registered property, and indeed usually is so. The registered ship therefore has to be transferred as registered property, i.e. the transfer can legally take place only by entry of the instrument of transfer (given under hand or notarized) in the Register of Shipping (art. 318 para. 1 for seagoing vessels and art. 757 para. 1 for inland vessels). Unlike the position with immovables, real execution is possible in the case of ships (art. 318 para. 2 and art. 757 para.2). This real execution can even have retrospective effect to the time at which a note of the demand for transfer was entered in the register (art. 318 a). If the lighter is not a ship, or if the transfer of the mother ship does not extend to the lighter, then the transfer will take place entirely according to the rules governing movable property.

3. Do preferential rights attaching to the ship and its cargo extend to the lighter and its cargo?

Although a ship can, par excellence, be reckoned to come under the 'certain and stated goods' of art. 1185 B.W. (Civil Code) the regulation of the preferential rights of that article does not apply to ships (see art. 318 c para. 2 for seagoing vessels and art. 758 para. 2 for inland vessels).
Instead of this the seagoing vessel comes under the preferential rights of art. 318 c para. 1, which rank before the mortgage, and those of art. 318 q which rank after the mortgage. The preferential rights of art. 318 c para. 1 are particularly strong ones: like the mortgage they follow the ship (art. 318 o para. 1) and can in principle be exercised even if the debtor is not the owner of the ship (art. 318 r). There are similar rules for the inland vessel (arts. 758 para. 1, 777, 763 and 764). Therefore, if the lighter is to be regarded as a component part of the mother ship, or as an appurtenance to the mother ship without there having been any contractual agreement made as referred to under art. 309 para. 2, then the rights mentioned will also extend to the lighter.
If the lighter is to be regarded as a ship, or as a thing in its own right, then it is in any case temporarily an item of cargo of the mother ship. If the lighter is looked upon as being an inland vessel, then the rules covering rights on the cargo (of the mother ship) under maritime law in art. 318 h will apply *in addition* to the rules covering rights in art. 758 para. 1. In that case, two kinds of rights can attach simultaneously to the lighter, viz:

a. The preferential rights on the cargo under art. 318 h para. 1, since the lighter is cargo of the mother ship.
b. The preferential rights on the ship under art. 758, since the lighter is an inland vessel.

There are even three kinds of preferential rights that could attach simultaneously to the lighter's cargo, viz:

1. The rights on cargo under art. 318 h para. 1, since the lighter's cargo is also cargo of the mother ship.
2. The rights on cargo under art. 766.
3. The rights under art. 1185 B.W.

Conflict could easily arise here with regard to the order of precedence of these groups of rights. Where

[1]) E. de Pontavice "Le droit et les navires porte-barges" in D.M.F. 1970, p. 707 et seq.
[2]) cf. Verhoeve p. 40: "The law of inland water transport does not have the concept of an operator of ships, but substitutes for this the owner as the centre point in the system of rights and obligations arising from the business of shipping." (art. 780).
The barge-master is authorized to sign bills of lading (art. 841) the owner or user, as the case may be, as well as the charterer undertakes liability (art. 793, para. 2).

the coincidence of rights under art. 318 h para. 1 and art. 766 on the one hand, and rights under art. 1185 B.W. on the other are concerned, the Act itself provides the solution under art. 318 h para. 2 and art. 767; the rights of art. 1185 B.W. give way to those of art. 318 h para. 1 and art. 766. The law does not, however, provide a solution to any conflict between rights under art. 318 h para. 1 and art. 758.
What is the order of precedence in this case?
If the lighter is regarded as a seagoing vessel, then there is a similar problem to be considered.
If the lighter is not regarded as a ship, then no difficulties will arise in this respect.

4. Is mortgaging of the lighter possible?

If the lighter is registered, either as a seagoing vessel or as an inland vessel, then under arts. 318 k and 776 it may be mortgaged. Provisions with respect to pledging do not apply in these cases (arts. 318 u and 756). With regard to these mortgages on ships, vessels are as far as possible put on the same footing as immovable property (arts. 318 p and 775). All this would appear amply clear from the provisions of art. 318 b and art. 756, which state that art. 2014 B.W. does not apply to registered ships.
If the lighter is a component part or appurtenance, then a mortgage on the mother ship will extend to the lighter. This will fail to be so only if, in the later instance, the condition has been made that the mother ship shall not include the lighter even though this belong to the ship's appurtenances (art. 309 para. 2).
If the lighter is a non-registered ship (which for seagoing vessels must in practice be regarded as out of the question, following on what has been said under para. 1. above), or a thing in its own right, then it will by its nature not come into consideration for mortgage but will do so for pledging.
Coupled with this goes the requirement that this lighter may then not be under the control of the pledger. This requirement can be satisfied by handing over of the bill of lading (art. 517 a) if and in so far as the lighter too is embodied in that bill of lading. If ownership of the lighter belongs to the charterer and the mother ship to the shipowner (which is, inter alia, the case with the m.s. 'Acadia Forest', owned by the A. S. Moslash Shipping Company of Norway; charterer Central Gulf Steamship Corp.), one can wonder whether in the case of pledging of lighters by the charterer the shipowner may have the quality of third pledgee. If this can be established, the use of the system will not suffer stagnation due to pledging: the lighters are no longer under the control of the pledger (the charterer) but under that of a third party (the shipowner).
One has to give careful thought, however, to the fact that the preferential rights on cargo of art. 318 h para. 1 attach to a lighter in its quality as cargo of the mother ship. These shall rank before pledges and before preferential rights under art. 1185 B.W. (art. 318 h para. 2).

5. How is arrest of the lighter to be governed?

If the lighter is a component part of a ship, then arrest of the mother ship extends quite straightforwardly to the lighter. This arrest has legal effect only when the procès verbal has been entered in the register. Similarly, it will also extend to the lighter when this is reckoned as being part of the ship's appurtenances. In both cases, however, the lighter will have to be described, or at least mentioned, in the procès verbal the bailiff has to prepare when carrying out the arrest. According to the letter of art. 565 Rv. sub 7, the bailiff must mention it even if the lighter is not to be regarded as part of the mother ship at all. Art. 565 Rv. also refers to things in their own right, such as stores. It must be borne in mind here that during the amendment of the Act in 1924, when art. 309 (with the exception of para. 4) was adopted in its presentday form, the earlier-dating art. 565 Rv. was not brought into line. It is not entirely clear what the significance of the obligation in art. 565 Rv., to include in the procès verbal of arrest the inventory mentioned in that article, now is; but at all events it does not mean that all the items mentioned in it are also ship's appurtenances. This is not however saying that arrest of the lighter, where it does not belong to the mother ship, is ruled out. In these cases arrest will indeed be possible, but then has to be carried out separately, either as attachment of a ship according to the provisions of title 4 of Book II Rv. if the lighter counts as a ship (registration does not apply as a condition here), or as ordinary seizure of movable property under the provisions of title 2 of Book II Rv. if the lighter is to be regarded as a movable, non-ship thing in its own right.

Finally, it is clear that it is extremely important to know what the position of the lighter is under the laws of property whenever the mother ship and/or lighter is or are the subject of an agreement.

Chapter B. What law applies to the contract between shipper and carrier for carriage from the lighter's port of loading to the lighter's port of discharge?

It seems desirable, in connection with the trend towards integration in the transport business, to look on the entire route covered by the kangaroo system as forming a single whole. Our starting-point, therefore, is that the shipper enters into a contract with the carrier for carriage over the whole route. This route extends from the point at which the goods are loaded into the lighter, via the place where the lighters are taken aboard the mother ship and the place where they are relaunched from the mother ship, to the point where the goods are discharged from the lighter. Part of such a route, either before the sea voyage, or after the sea voyage, or both, will be over inland waters.

If we now leave aside the problems which fall under the heading of Private International Law, we shall nevertheless have to make a choice between legal rules belonging to various branches of the law which might be considered to apply to the contract between shipper and carrier.

"What law applies?"

These are:

a) maritime law

b) inland water transport law

c) a separate international convention.

It should in fact be said, at once, that we neither have such a thing as maritime law as such, nor such a thing as inland water transport law as such. (See, on this point, C. C. Gischler in N. J. B. 1930, p. 233). For convenience, I shall nevertheless talk of maritime law, indicating the rules which lay down, in binding form or otherwise, the liability of the maritime carrier towards his partner in the contract (the same applies, mutatis mutandis, to the use of the term inland water transport law).
In making the choice mentioned above, we can first of al turn to art. 466: maritime law applies to carriage wholly or partly over the sea. The corresponding article 809 from inland water transport law, in para. 2, gives this provision a more precise content: maritime law applies to carriage partly over the sea and partly over inland waters, provided that no transhipment takes places. The legislator must here have had in mind the case where a seagoing vessel covers the whole of the route, i.e. travels on inland waters as well. However, one can usually go much less far over inland waters with a ship of 39,000 GRT and a draught of 38 feet than one can with a lighter drawing 8½ feet. This provision includes the case where carriage takes place with a lighter before or after the sea voyage as part of the loading or unloading, when the seagoing ship cannot come alongside the quay and when, moreover, this carriage by lighter is at the carrier's expense [1]).

However difficult it may be to draw a sharp line between carriage by lighter as such and carriage by lighter as part of loading and/or unloading, it is most improbable that carriage by lighter forming such a major, integral part of transport by the kangaroo system, in the form this is now taking, must be looked upon as part of loading and unloading.
When the kangaroo system of transport is used in trade with the 'Third World', and this type of transport is chosen with the express purpose of overcoming difficulties connected with inadequate harbour installations, or with congestion, then a different viewpoint is, of course, not ruled out.
In all this it is immaterial whether the carrier undertakes the whole of the transport himself, or has part of it carried out by someone else.

[1]) cf. Dorhout Mees Nos. 1602 and 1774 (4th edition), 9.197 and 9.381 (5th edition).

1. Is maritime law applicable?

The question that now arises is this: does the taking on board of a lighter by the mother ship, and the later relaunching of the lighter, constitute 'transhipment' within the meaning of art. 809 para. 2?
If the answer to this is in the negative, then we can conclude that maritime law applies over the whole of the route. Yet this conclusion, again, is not without its exceptions. If the carrier is an operator of a regular line where the sea stage is concerned and has the inland stage dealt with by someone else, then there is through-carriage. On the subject of through-carriage that is or has been undertaken by a line carrier, art. 517 v lays down that this line carrier is liable for the whole of the carriage, although in accordance with the law governing each part of the carriage. Moreover, he may limit his liability to that part of the carriage performed by himself. The carriage must be agreed as being by *liner*, this being apparent from the issuing of liner bills of lading (H.R. 14.5.1940 N.J. 1940, 932).

2. Are maritime law + inland water transport law applicable?

If, however, the question we asked a moment ago can be answered in the affirmative, then it follows that maritime law is applicable only to the seaborne section of the route, while inland water transport law applies to the inland section. From the legal viewpoint the carrier would in this case be in a more favourable position, for the law of inland water transport leaves a greater freedom of contract than does maritime law. The carrier over inland water, when drafting exception clauses, has only to be guided by the principle of art. 14 A.B. in conjunction with arts. 1371 and 1373 B.W., and in the application of such clauses by the principle of art. 1374 para. 3 B.W. (see, on this point, H.R. 19.5.1967 A.A.XVI 214 with note P.A.S.).
With this latter system of applying different sets of laws (known as the chameleon system, or network system) one has to bear in mind that it will not always be simple to determine where the damage to the goods being carried has occurred. Here, art. 517 x helps, at least in part, the receiver of goods that have been transported by liner, by providing that the receiver can recover his damages from the freight he is due to pay or can claim against the carrier who is collecting or has collected the freight, after which this carrier may have a right of recovery.

3. Is an international convention applicable?

Finally, it is possible that in the future the carrier and merchant will observe not maritime law nor inland water transport law directly, but will state in their contract that an international convention on combined transport shall apply (the Convention relative au contrat de transport international combiné de marchandises, known by the abbrevation TCM).
These future international regulations, which are still at the draft stage, are the outcome of co-operation between the International Institute for the Unification of Private Law (Unidroit) in Rome and the International Maritime Committee (IMC). The last of a series

of drafts on the subject prepared by these very hardworking organizations is known as the 'Rome Rules', and dates from January 1970.
It will be possible to apply these regulations to any carriage between two countries that is undertaken by *one* party to a contract and is carried out consecutively by two or more differing *types* of transport (art. 1 para. 2). The connection with the problems mentioned under Section I is obvious.
The regulations as proposed in the draft are unique in that parties are free to state whether or not the regulations shall apply, by opting to issue a Combined Transport Document or not. If, however, this document is issued, then the convention has binding effect [1]).

Where the liability of the carrier for damage is concerned, the convention adopts a modified chameleon system: if it can be shown where the damage occurred, then the carrier is liable in accordance with the law governing that part of the route (art. 11). If it cannot be shown where the damage occurred, there is a special, separate set of rules (cf. the Uniform Liability System).

Chapter C. What is the effect of economic planning legislation?

Although transport has been subject to never-ending State interference since the Middle Ages, it became clear especially during the present century that the working of a free market mechanism in which, up to then, there had been such firm belief, was not as faultless as had always been thought. The disastrous consequences of the merciless competition of the 1930s — the result of overcapacity — tottered the economic liberalism of the previous century.
As a consequence there was a need for State intervention aimed at restoring economic equilibrium (if such a thing in fact ever existed). Although at the beginning it was felt that it would be possible to stop at temporary intervention, the legal measures taken to bring about a balance today have a more or less permanent character.
In striving to achieve harmony between supply and demand in the transport field, the authorities are pursuing a number of objectives. These measures have, for example, to fit into a *general* economic policy; they have to ensure healthy relations within the transport sector which will protect the welfare of workers in this field; and they have to ensure a good supply of transport services to those who need them. A further aspect is that the very heavy investment in roads and waterways demands that the most effective use possible shall be made of them.
The expression 'economic planning legislation' used in the heading to this section will, in what follows, be used to mean the legal framework within which the State can take measures to regulate supply and demand (in our case, in the transport sector). We shall be relating this solely to the carriage of goods over inland waters.
It is quite true that there is also a certain amount of regulation of the carriage of goods on the high seas, but this is often based on agreements between the carriers concerned in the form of cartel agreements (conferences and pools). Furthermore there is no reason here to make any distinction between kangaroo-ship transport and any other kind of transport.
Economic planning legislation can be either national or international in origin.

1. Economic planning legislation originating from the Dutch national legislator

The framework within which the Dutch government can take a hand in matters in inland water transport carried on by its own nationals is provided by the Wet Goederenvervoer Binnenscheepvaart (W.G.B.) (Carriage of Goods by Inland Water Act) of 1 November 1951, Stb. 472, which came into force on 15 February 1954. To this Act belongs the Uitvoeringsbesluit Goederenvervoer Binnenscheepvaart (U.G.B. = Regulations on the Carriage of Goods by Inland Water) of 16.1.1954, Stb. 7, and the Richtlijnen Goederenvervoer (Directives on the Carriage of Goods) of 30.1.1954, Stb. 24. The Act attempts to match supply and demand by intervening on the supply side, and also has an influence on the fixing of prices.

The supply of services is subjected to control by stipulating that all enterprises engaged in inland water transport in the Netherlands (art. 2 W.G.B.) shall have a licence to which certain conditions can be attached. The Act provides for three types of licence:

a. regular barge services
   art. 1 para. 1 sub-para. f W.G.B
b. collection and delivery services
   art. 1 para. 1 sub-para. g W.G.B.
c. tramp transport
   art. 1 para. 1 sub-para. h W.G.B.

Additionally, registration is required (art. 9 para. 2 W.G.B.) for 'own transport' (which, according to art. 1 para. 1 sub-para. i of the W.G.B., is transport by inland vessel of goods exclusively destined for or coming from the company's own undertaking or business). For tramp transport there is still today an obligation to go through an exchange, as a relic of the Wet Evenredige Vrachtverdeling (Proportional Distribution of Freight Act) — a measure which was intended to be temporary. This obligation to go through an exchange means, in essence, that affreightment contracts (still, for the time being) have to be concluded through the mediation or with the approval of the Rijksinspecteur voor het Verkeer (Government Inspector for Traffic) (art. 65 para. 2 W.G.B.). The intention of the Act was that these contracts should ultimately be concluded via a shipping-exchange run by the industry (art. 45 W.G.B.), but this has not come about so far. A Bill amending the content of the W.G.B. in such a way that the system of Proportional Distribution of Freight is abandoned, and the principle of the shipping-exchange disappears (art. 45), is now in an advanced stage of preparation, and a Memorie

[1]) Although the C.I.M., for rail transport, has regulations which in this respect are very similar to the T.C.M., I believe that the two sets regulations do show differences.
Cf. Béla de Nánássy: "Le droit international des transports par chemins de fer".

van Antwoord (Memorandum in Reply) on this subject appeared not long ago (Hand. 10429, Item No. 6). The current regulations are developed in detail in the Reglement op het sluiten van overeenkomsten van ongeregeld vervoer (Rules for the Conclusion of Agreements on Tramp Transport), Ministerial Order of 8.2.1954 No. A-4/052251.
There are exemptions from this obligation (to go through an exchange), in special cases, where the mediation of the Government Inspector would constitute a greater obstacle to the efficient provision of transport services than would be consistent (art. 34 W.G.B.) with the general interests of transport (art. 1 para. 1 sub-para. j W.G.B.). In such cases a separate licence is issued on application, which renders the mediation or approval of the Government Inspector unnecessary. Such a licence is however always limited, either to the carriage of one or more *specified* types of goods, or to carriages for one or more specified customers, or for carriage in certain parts of the country. This separate licence may not be issued for a ship together with the 'ordinary' licence.
The licence issued for tramp transport states both the ship or ships and the cargo carrying capacity.
A further limitation for the firm offering tramp services is that it may not undertake carriage for more than two shippers at the same time with a single inland vessel (art. 36 W.G.B.). Exemption can be applied for in special cases.
The Act intervenes in the fixing of prices by laying down a tariff of maximum rates for regular barge services and collection and delivery services, and by making compulsory the use of a waybill approved by the Minister (A.V.C. 1950). A tariff of margins is applicable to tramp transport, as well as the compulsory use of an approved charter-party (Bevrachtingsvoorwaarden (Affreightment Conditions) 1952) if the Government Inspector has acted as mediator.
The licences mentioned above are issued by the Commissie Vergunningen Goederenvervoer (Carriage of Goods Licensing Board) or, if temporary licences are involved, by its Chairman. 'Own-Transport' registrations are recorded by the Inspector on application.
It may be of interest to note that as a result of the high level of activity the system of Proportional Distribution of Freight does not operate in practice. Firms prefer to make their chartering contracts outside the shipping-exchange.
Arts. 23 et seq. of the Rules for the Conclusion of Agreements on Tramp Transport allow this when the demand for shipping space exceeds the supply.
Finally it must be commented that the regulations outlined here do not apply to carriage within the port areas of Rotterdam and Amsterdam, nor to carriage in inland vessels not belonging to Dutch nationals, on those specific waterways where the Convention of Mannheim (art. 2 W.G.B.) applies.
The Wet Goederenvervoer Binnenscheepvaart (Carriage of Goods by Inland Water Act) is not intended as a measure to put things back on a sound basis by overcoming any excess capacity there happens to be (art. 46 W.G.B.).

When, in time, the system of Proportional Distribution of Freight disappears from the W.G.B., the result for a number of 'marginal' companies will be that they will not find it profitable to remain in business.

To soften the blow of this, there are government measures designed to provide those who want to (or perhaps better, have to) wind up their businesses with financial compensation from the Stichting Ontwikkeling en Sanering voor het Midden- en Kleinbedrijf (Corporation for the Development and Reorganization of Medium and Small Businesses). These measures are embodied in a directive on the policy for this public corporation drawn up by the Secretary of State for Economic Affairs (Stscrt. 28.5.1968 No. 102) and in a decree of the Secretary of State for Transport and Watercontrol dated 15.8.1968 No. V-3/049 084 (Stscrt. 21.8.1968 No. 162), known under the title of the Sloopregeling Binnenvaart 1968 (Inland Water Transport Breaking-up Regulations).

These measures, which are already in force, are by design of a temporary nature. The costs that such a scheme involves will be borne entirely by the authorities.
This is not so in the Bill for the Wet Sloopregeling Binnenvaart (Inland Water Transport Breaking-up Act) (1970-1971 session — 11029 No. 2). The tenor of this Bill is that an attempt will be made over a 4-year period to bring about an improvement in the structure of inland water transport by encouraging the breaking-up of unprofitable tonnage by means of a 'breaking-up premium'. The costs that such a scheme incurs will, under the Bill, be borne mainly by the industry. To this end, owners of inland vessels of more than 20 tons must register their ships and are (over a period of four years) required to contribute annually, towards the financing of the breaking-up scheme.

For completeness it must be added here that in the Commission of the European Communities at Brussels there are serious objections to the fact that the Secretary of State for Transport and Watercontrol intends also to pay a breaking-up premium when this will be used for reinvestment in more modern vessels (Recommendation of the Commission dated 31.7.1968). This intention is in fact so essential for the industry that the Commission's recommendation is regarded as unacceptable [1]).

A laying-up scheme is being prepared to cope with the more transient circumstances linked to the economic climate that can result in a temporary excess of cargo capacity. Here again the industry will have to bear the greater part of the financial costs; this can hence result in a not inconsiderable extension of the shipping companies' obligation to make contributions.

2. Economic planning legislation originating from an international legislator: the Convention of Mannheim (Trb. 1955 No. 161)

Under a Convention signed at Mannheim in 1868 between the countries bordering the Rhine, navigation on the Rhine is freely open to all vessels. Under art. 1 of this convention and art. 356 of the Versailles Peace Treaty of 1919, this freedom applies to 'navires de

[1]) Letter from the Central Consultative Committee for inland Water Transport to the members of the Permanent Committee on Transport and Watercontrol of the Second Chamber of the Netherlands States-General.

toutes les nations' [1]) on the Rhine from Basle to the sea, for the carriage of goods and/or passengers, both upstream and downstream. The geographical term Rhine must here be interpreted broadly; it embraces the River itself with its two Dutch arms Lek and Waal, the connecting waterways between the Rhine and the open sea and Belgium, and the tributaries where these flow through the territory of the contracting parties. There is agreement that the 'free navigation' mentioned in art. 1 undoubtedly also refers to freedom to exercise navigation in the economic sense, i.e. to take on, carry and discharge goods and passengers, to conclude the contracts required for this, and so on (cf. v. d. Hoeven 'De Rijnvaartakten en de Cabotage'). Under art. 2 of the convention the levying of navigation dues is expressly prohibited: a former barge rota system for the Rhine was also dismantled. It was found so self-evident that the carrier and shipper should be able to arrive at a freight figure in complete freedom that the relevant provision of art. 48 of the Rhine Navigation Act of Mayence (the forerunner of the Convention of Mannheim) was discarded as superfluous.
Restrictions may be placed on free navigation only if they appear in the convention itself (or arise directly from it) and if they relate to general safety on the Rhine. The main restrictions of this kind are:

a) the rule that every master of a vessel navigating on the Rhine (only very small vessels are excepted from this rule) must be in possession of a certificate of professional competency, known as a barge-master's licence.
b) the rule that all Rhine vessels belonging to nationals of the riparian States must have a certificate of riverworthiness (art. 22 of the Convention of Mannheim in conjunction with art. 356 of the Treaty of Versailles).

The Convention of Mannheim also set up a body known as the Central Commission for the Navigation of the Rhine, assigned the task of investigating complaints resulting from application of the Convention and from the implementary measures undertaken by the riparian States after mutual consultation, of advising on proposals from the governments of the riparian States bearing on the prosperity of Rhine navigation, and of delivering judgments in cases of appeal lodged against sentences of the Rhine Shipping Courts of the first instance (art. 45). Other powers of this Commission, together with its composition, are set out in the Treaty of Versailles of 28 June 1919.
Finally we should mention the special jurisdiction that applies to Rhine shipping. This is laid down in arts. 33-40 of the Convention of Mannheim. When signing the convention, each riparian State undertook to appoint Rhine Shipping Judges. The Netherlands did this in the Act of 16 July 1869 (Stb. 139) by making the cantonal judges, and the district courts through whose area of jurisdiction the conventional Rhine flows, into Rhine Shipping Judges. The losing side in a lawsuit connected with Rhine shipping has the option of lodging an appeal with either the Courts of Justice or the Central Commission for Rhine Navigation. For a more detailed account of this special legal system, the reader should consult the articles of the Convention quoted above, and the Act of 16 July 1869 just mentioned.
One might perhaps protest here that all this has nothing to do with economic planning legislation. The convention does, indeed, stipulate that the governments should refrain from economic planning measures. Yet the current system of Rhine navigation provides the point of departure for proposals now being prepared by the Central Commission for Rhine Navigation which definitely do have an economic planning effect.

Since the discrepancy between supply and demand in Rhine shipping led to a highly undesirable state of affairs which could not be altered as things stood, the Central Commission asked the governments, on 12 May 1951, to appoint their own delegates, together with representatives of individual bargemasters and shipowners (6 per country), to an Economic Conference on Rhine Navigation that would examine measures to bring about a balance between supply and demand at times when demand was insufficient.

2.a. *The IRU plan* [2])

At the meeting of 5 November 1963 the Economic Conference on Rhine Navigation proved, by a majority, to be in favour of the drafting of the constitution for an International Rhine Union (IRU) which would in particular be concerned with taking steps to regulate capacity. For our purposes here, this plan comprises in short the following points:

1. All owners of one or more vessels normally used on the Rhine and its tributaries for the carriage of goods shall be obliged to become members of an association having a corporate legal identity and known as the 'International Rhine Union'. The vessels just referred to must be entered in a fleet register. Members of the IRU shall be required to pay:
   a) an entrance fee
   b) an annual subscription based on the cargo carrying capacity of the vessels registered
   c) a compensation contribution, for every vessel registered, towards the financing of an equilization fund.

2. The aim of the association shall be to match the supply of shipping capacity to the demand in such a way as to ensure optimum activity in the shipping business. It can attain this objective by taking its measures of intervention autonomously:
   a) *short-term*

      Members of the IRU may of their own accord decide to lay up vessels temporarily, or may be obliged to do so, when an excess of tonnage that will adversely affect the freight market is

[1]) It has already been shown, under I.A.1., that inland vessels do not have a nationality. Probably the link between the ship and its owner mentioned in art. 4 para. 4 of the Geneva Convention is intended here.

[2]) Communications from the Commission to the Council (of Europe) relating to the regulation of capacity in inland water transport: Document VII/SEC (66) 1963 of 22.6.1966.

expected. In both cases laying-up compensation is paid, this coming from the equalization fund.

b) *long-term*

Members can voluntarily agree among themselves to limit investment in ships, or to take unprofitable or excess tonnage permanently out of use.

3. There is a first draft of a convention between the States that are at present parties to the Convention of Mannheim. Under this convention the constitution of the IRU is ratified by the member States and provisions made that will remove the incompatibility between the measures proposed and the present Convention of Mannheim (i.e. the principle of free navigation).

For the kangaroo carrier it is in this connection of interest to know that the constitution of the IRU provides for the possibility of what is termed an 'obligation certificate'. Owners of inland vessels which operate on the Rhine and its tributaries irregularly, at intervals or during only part of the year can be exempted from compulsory membership of the IRU and from the associated compulsory contributions mentioned under 1a) and 1b) above. The compensation contribution 1c), however, still has to be paid. There can also be compulsory laying-up for these vessels, although their owners are not eligible for laying-up compensation.

2.b. *The Draft E E C Order relating to access to the market in the carriage of goods over inland waterways* [1])

There has, in the mean time, been severe criticism of the IRU plan from the EEC. The objections, which are of both an economic and a legal nature, are directed principally towards the fact that transport policy for the Rhine is dissociated from general transport policy within the EEC which, under the Treaty of Rome, is one of the Community's objectives (art. 3 (e) of the EEC Treaty).
It is even feared that this general policy for transport could be harmed by this dissociation. Collaborating in the implementation of the IRU plan and thereby in bringing about these harmful effects, might be prohibited by art. 5 para. 2 of the Rome Treaty.
Furthermore, there is serious objection to the fact that the measures of intervention proposed by the IRU plan are outside the control of the public authorities; the authorities alone should be able to take such measures, to ensure the necessary impartiality. The agreements between undertakings proposed as long-term measures under the IRU plan would moreover be incompatible with the rules of competition set out in art. 85 of the Rome Treaty. Because of these objections, the European Commission has prepared a scheme to submit proposals to the Council of Ministers for a Community regulation on access to the occupation of carrier and on the fixing of methods for controlling capacity.
These proposals provide for a laying-up scheme to neutralize a temporary excess capacity (e.g. resulting from a long period of high water levels) and a scheme for overcoming a 'structural' excess of capacity (which is found to exist when the laying-up scheme does not have sufficient effect).
To make it possible to achieve these ends, the European waterways network is divided up into a number of different areas; the shipping fleet is divided into various categories. This makes graduated action possible. The regulations apply to the carriage of goods undertaken wholly or partly over the waterways of the member States of the European Economic Community by persons who are nationals of a member State and by corporate bodies or undertakings of which the main offices, management, an agency, a branch or any other establishment is set up on the territory of a member State (art. 2 para. 1). Carriage by persons or bodies other than those named is forbidden under art. 49. The regulations do not apply to seagoing vessels carrying out exclusively 'transports fluvie-maritimes' (art. 2 para. 2 of the Proposition d'amendement à la proposition d'un règlement du Conseil relatif à l'accès au marché des transports de marchandises par voie navigable — COM (69) 311 final).
Inland vessels engaged in the carriage of goods wholly or partly within the EEC must be entered in a register. At the time of registering a 'certificate of registration' is issued against payment of a fee calculated according to the vessel's tonnage. This certificate is valid for one year only, and a further registration fee is required for renewal. The monies collected in this way go into an equalization fund from which, as in the IRU plan, compensation is paid to owners who undertake purely voluntarily (in contradistinction to the IRU plan) to take tonnage temporarily out of circulation in the event of a temporary excess of capacity. The European Commission rules whether there is in fact a temporary excess of capacity, after taking advice from the industry.
A licence is required for carriage with an inland vessel that is not registered in a member State, and this is as a general rule issued without restriction or charge (art. 12).
A programme for developing and modernizing the inland fleet is drawn up every five years. If the capacity remains greater than that set out in this programme, even after application of the laying-up scheme described, then there is a 'structural excess of capacity'. To combat this, the issuing of the licences referred to in art. 12 can be accompanied by the levying of a compulsory fee, and if this does not have the required effect then the issuing of these licences can be entirely suspended. The funds accruing through the payment of any compulsory fees attached to the issuing of these licences will be used to finance 'breaking-up' premiums. These premiums will be paid to owners who undertake to have one or more vessels in sound condition broken up without replacing them. If the fees just mentioned prove insufficient to cover the breaking-up premiums, then the annual registration fee may be increased.

This scheme differs most from the IRU plan in that it applies to all water transport within the EEC; shipping on the Rhine is integrated into an overall transport policy. The EEC plan, like the IRU plan, involves the need for modifications to the Convention of Mannheim.

[1]) see COM (67) 720 def. 23.12.1967
COM (69) 311 final 25.4.1969

Further details will not be examined here.
This would seem to rule out the IRU plan described earlier.
In drawing up the regulations we have been discussing, the legislator (national and international) has the protection of a variety of interests in mind; and protecting the welfare of the owner of inland vessels plays an important part.
It should be remembered that master-owners of a single vessel form a large proportion of the shipowners engaged in inland water transport (in the Netherlands the figure is 86%) [1]. A system which is intended to provide these owners with guarantees must have as few loopholes as possible. This means that Lash transport must — unless one takes the view that this kind of transport will constitute only a negligible proportion of transport within the EEC — fit into the system of economic planning legislation.
The barge-masters themselves feel their position to be seriously threatened by kangaroo transport.
Does kangaroo transport fit into the systems we have just outlined, and if so, how?

Chapter D. What harbour dues can be levied on the kangaroo ship in the Port of Rotterdam?

The local authority levies harbour dues for the use of facilities in the port area that are under this authority's management.
Apart from pilotage dues and other charges that do not concern us here, there are two types of harbour due — seaport dues and inland harbour dues.
Seaport dues are levied as payment for the use by seagoing vessels of the docks, quays, dolphins, mooring-buoys and other facilities provided by the municipality. The level of these dues is decided by various tariffs, based on the following considerations:

i) the gross tonnage of the vessel, in metric tons;
ii) the number of tons (of 1,000 kg) of goods loaded and/or discharged;
iii) whether the port is used in regular, liner service.

Use of a port on a liner basis may be a ground for granting a reduction in harbour dues.
Inland harbour dues are levied for the use of the port facilities, as described above, with inland vessels. The basis for fixing the level of these dues is the cargo carrying capacity of the inland vessel in tons of 1,000 kg.

Finally, there are buoyage dues, for the time during which the seagoing vessel lies moored to buoys on the river without loading, unloading, ballasting or bunkering. If the vessel loads, unloads, ballasts or bunkers while moored to a buoy, then the seaport dues are chargeable in addition to the buoyage dues.
Buoyage dues are calculated per cubic metre gross capacity, per 24-hour period or part thereof.

Chapter E. What papers are needed to navigate with the lighter (in Europe)?

1. What papers does the seagoing vessel need?

The following ship's papers are needed for navigating with a seagoing vessel that is not a fishing-boat (art. 374) and measures more than 20 tons:

— a certificate of registry, as referred to in the Zeebrievenwet (Certificates of Registry Act) of 1926, Stb. 178 (art. 347 para. 1);
— a certificate of tonnage, as referred to in the Meetbrievenwet (Certificates of Tonnage Act) of 1948, Stb. I 492 (art. 347 para. 1);
— an extract from the register showing whether the ship is encumbered by a mortgage (art. 347 para. 1);

[1] Provisional Report on the Inland Water Transport Breaking-up Act (1970-1971 session, 11029 No. 4).

The kangaroo ship moored to a buoy in the Waalhaven, Rotterdam.

— certificates referred to in the Schepenwet (Ships Act) of 1909, (art. 9 para. 1 sub-para. i in conjunction with art. 5 para. 3 Schepenwet). These certificates, which deal with the seaworthiness and safety of the vessel, are required if the seagoing vessel is also a ship in the meaning of the Act. The Ships Act makes use of a concept of a 'ship' which differs in some respects from the meaning given to 'ship' under arts. 309, 310 and 748. The description appearing in the Ships Act runs 'vessel, barge, dock and other similar floating object which is towed over the sea to its destination (art. 1)'. According to this definition, the lighter which is once towed over the sea falls under the Ships Act, even though its construction and equipment do not show the intention that it should be used for navigation on the seas. If this intention is however shown, then it is still possible for the lighter not to be a ship within the meaning of the Ships Act, namely if the lighter is not towed over the sea to its destination.

Other paper which have to be carried on board are:

— a list of the ship's crew, as referred to in art. 451 (art. 347 para. 1);
— a punishment register, in which the captain records the fines he has imposed in any cases that have arisen, as referred to in art. 424 (art. 347 para. 1);
— a register of overtime worked, as referred to in art. 419 (art. 347 para. 1).

The ship's papers enumerated here all relate to the crew. A lighter has no crew.

Finally, the seagoing vessel has to carry:

— the cargo manifest, where there is a cargo (art. 347 para. 1);
— the charter-party if the ship or any part of it has been chartered (art. 347 para. 1);
— the bills of lading, or copies thereof, where there is a cargo (art. 347 para. 1);
— the logs (ship's log, engine log and radio log); (art. 348 in conjunction with art. 9 para. 1 sub-para. h Schepenwet);
— a clearance certificate in the meaning of art. 4 of the Zeeongevallenwet (Accidents at Sea Act) of 1919, as proof that any payments due after an accident are adequately guaranteed;
— the necessary charts and sailing instructions (art. 4 sub-para. c Schepenwet);
— the Dutch Acts and Regulations which are applicable to the voyage (art. 347 para. 1).

It has already been commented that the lighter does not have a crew; nor does it have an engine or radio.

2. What papers does the inland vessel need?

An inland vessel within the meaning of art. 748 must, by virtue of art. 782, be furnished with a tonnage certificate, the certificate of entry in the register and, if the vessel undertakes carriage across frontiers, a document to show whether it is encumbered by a mortgage.

If the vessel navigates on waterways where the revised Rhine Navigation Convention applies, then there also has to be a certificate of riverworthiness or ship's licence showing that the vessel satisfies the safety regulations laid down by the Central Commission for Navigation of the Rhine. To obtain this the vessel must first be inspected by a committee of Rhine navigation experts.
The way in which this inspection is to be carried out is laid down in a K.B. (Royal Decree) of 28 June 1948 Stb. I 259, which is based on the Rhine Police Regulations which in turn derive from the provisions of art. 22 of the Convention of Mannheim and from art. 356 of the Versailles Peace Treaty. This K.B. does not make any provision for pusher units, but does allow for the possibility of promulgating temporary provisions.
Use has been made of this opportunity, pending a more final set of regulations on the inspection of pusher barges and pusher tugs, and has resulted in the Tijdelijke Bepalingen Onderzoek Duweenheden Rijn (Temporary Provisions for the Inspection of Rhine Pusher Units), 1969.
Finally, the inland vessel carrying out inland water transport must have a licence as laid down in the Wet Goederenvervoer Binnenscheepvaart (Carriage of Goods by Inland Water Transport Act) — see I.C. above.
So does the lighter, too, have to have ship's papers for the journey to its port of destination, and if so, what papers?

Chapter F. Where does the carrier's liability for damage to and/or loss of goods being carried begin and end?

In asking this question we must first examine what the contract between the merchant and carrier(s) actually says. Without wishing to make an exhaustive survey, I shall distinguish the following possibilities:

a. the carrier undertakes to carry out only the seaborne section of the route;
b. the carrier undertakes to carry out only an inland section of the route;
c. the carrier undertakes to carry out both the seaborne section and the inland sections of the route.

In I.B. we took the last-named possibility as our starting-point, since this will probably most often be the case; the other cases cannot, however, be left out of the discussion.
A further distinction runs across that just made, viz. between the case where the carrier performs the transport with his own lighters and the case where the lighters are provided by the shipper or are made available by a third party at the shipper's expense. Both of these situations may apply to each of the possibilities listed above.

Cases other than those listed, in particular that of the carrier acting partly as such and partly as a forwarding agent, are beyond the scope of this work; we are concerned here primarily with the carrier's liability.

Moreover, we are dealing only with the liability that exists between the shipper and the carrier who has entered into a contract with him. The liability of persons used by the carrier in carrying out this obligation can be a totally separate one; but it does not concern us here.
It should be realized, in all this, that the period of liability does not necessarily coincide with the period over which a certain set of rules apply, since certain rules offer the possibility contracting-out for a shorter or longer period.

Chapter G. What consequences does Lash transport have on the bill of lading?

The shipper who sends goods by sea normally asks the carrier who has contracted with him to undertake the carriage for a bill of lading. He is entitled to do so by art. 504. A bill of lading is a document signed by the carrier in which he declares that he has taken receipt of certain goods, that he will transport these goods to a particular place and will there deliver them to the proper holder of the bill of lading (art. 506).
The bill of lading is neither an essential condition for the contract of carriage nor required evidence of this contract; it is however of great importance, since its quality as a declaration of delivery of the goods makes it a security.

1. The bill of lading as a declaration of receipt of certain goods

In order properly to fulfil its function as proof of receipt of the goods offered for carriage, the bill of lading has to incorporate a number of items of information in order adequately to identify the goods received. Some of these details (the leading marks, the quantity or weight of the goods, their apparent order and condition) are required by law; they must appear on every bill of lading.
Under certain circumstances the carrier may omit details of marks and quantity or weight. For example, he does not have to mention the marks when these do not meet the minimum legal requirements on legibility and permanence (art. 504); nor does he have to note the marks, quantity or weight of the goods if he has reasonable grounds to suspect that the information given to him does not agree with the facts.

Finally, the carrier may omit these details when he has had no opportunity to check the stated facts on quantity or weight. It is presumed that he will in any case not have had this opportunity with a bulk or pumped cargo. On the question of apparent order and condition of the goods, however, the law allows the carrier no reservations whatsoever. If he should nevertheless omit to state the apparent condition, then he becomes liable to the sanctions laid down in art. 514; unless there is proof to the contrary, the goods are taken to have been in sound condition at the time of receipt.

Now it is most likely that the shipper will deal with the loading of the lighter, when he has at least sufficient cargo for a whole lighter. But this means the carrier will be taking receipt, for carriage, of a fully-laden lighter which will often already have been closed up.

It must be remembered here that the lighter has no master or other crew who can supervise the loading. The opening-up, in the mother ship's port, of a lighter which has already been sealed by the Customs seems most unlikely.

In these circumstances it seems that the carrier is being called upon to state as facts things he is not in a position to know, at least from his own observation, and to do so vis-a-vis a partner in the contract who *is* in a position to provide these details. At first sight this is an extremely precarious situation for the carrier to be in — he can be held to the stated facts by the holder of the bill of lading, without even being able to offer evidence to the contrary (for indeed how could he?) [1].
How is the carrier to be rescued from his plight?

2. The bill of lading as a declaration by the carrier that he will transport the goods offered for carriage to a particular destination

Although, as we have said, the bill of lading is not required evidence of the contract of carriage, it will often serve, alongside the charter-party if there is one, as a source from which the content of the contract of carriage in concreto can be learned. It is in most cases precisely from the bill of lading that one learns of the existence of any contractual exceptions allowed and of any supplementary conditions, and these can be brought up against parties other than the shipper only if they are apparent from the bill of lading. Elsewhere in this work attention has been given to the Lash carrier in general.

Here, therefore, I will point to only one circumstance that arises with this form of transport and that, in my view, ought to be dealt with in more detail in the bill of lading. It has already been mentioned that in most instances the loading of the lighter will have been done by the shipper. The same is true of the unloading, except that there it is of course the receiver who removes the goods from the lighter. It will be in the carrier's interests for this loading and unloading to be carried out as speedily as possible, for if it takes too long he will suffer through not being able to use the lighter in good time for serving other shippers. In an extreme case this might lead to the mother ship having to leave again part-empty. The time available to the shipper for loading, and to the receiver for unloading, ought therefore to be stated in the bill of lading. The receiver is, in fact, often not the party with whom the carrier has entered into the contract of carriage. In addition to a simple indication of the time permitted for loading and unloading, the bill of lading will need to include rules to cover the case of these times being exceeded.

[1]) cf. Dorhout Mees No. 1739.

3. The bill of lading as a declaration by the carrier that he will deliver up the goods to the holder of the bill of lading

The above declaration in the bill of lading, together with its quality as a receipt, make it a security: surrender of the document is equivalent to surrendering the goods (art. 517 a). The value of the goods is decided to a not inconsiderable extent by the transport of the goods, from their place of production to the place of consumption. It is thus not surprising that the purchaser, who has bought the goods including transport (c.i.f., c. & f.) takes interest in the transport, the certainty that the goods will in fact be transported, the rapidity and quality of the transport and the solvency of the carrier being important factors to him.
The certainty that the goods will be transported, and the rapidity and quality of the transport, can be apparent from the issuing of a 'shipped' bill of lading or a 'received for shipment' bill. Naturally enough it is the shipped bill of lading which has the buyers' preference. When the name of the ship carrying the goods and the date of loading are given, he can form an idea of the rapidity and quality of the carriage. The mention of 'shipped' in the bill gives him the certainty that the goods are in fact being carried.
If the shipper asks for a bill of lading only after the loading of the seagoing vessel has been completed, then he may suffer the disadvantage of his goods remaining unmarketable for quite some time (after delivery to the carrier, but before loading). So he asks for a 'received for shipment' bill of lading, although this is less appealing to the buyer (and hence also to the latter's bank, which is financing the transaction) and again detracts from the marketability of the goods. Such a 'received for shipment' bill can take on the nature of a 'shipped' bill if the carrier, after loading the goods, enters on it the ship's name and date of sailing. Until this happens the carrier's promise, in such a bill of lading, to carry the goods to a given destination is no more than 'an expression of intent (which) is as good as the reputation and liability of the party making it' [1]. For the shipper's sake carriers therefore try to issue a bill of lading, before the goods are loaded aboard a seagoing ship, that offers more certainty than the usual 'received for shipment' bill. Can the carrier engaged in Lash transport go so far as to issue a 'shipped' bill of lading when the goods are loaded into the lighter?

Chapter H. Should the lighter on the deck of the mother ship be looked upon as deck cargo of the mother ship?

Art. 470 entitles the carrier to contract out of liability for damage to or loss of cargo loaded on deck, when certain conditions are met with respect to this cargo. He can, of course, also limit this liability without excluding it entirely. In the first place, the goods must actually be carried on deck; so it is insufficient in this respect for the carrier to make it a condition that he has the right to carry them on deck, without in fact making use of this right. Next, the goods must be stated to be deck cargo in the contract of carriage. This statement should be made by the carrier, and if this exception is to have effect with respect to the consignee and holder of the bill of lading, who is not also the shipper, then this statement, and the fact that the goods have actually been stowed on deck, must be apparent from the 'shipped' bill of lading [2].
If the carrier stows goods on deck without telling the shipper and without his agreement, this counts in tramping and chartering as faulty handling of the cargo (arts. 518 n and 520 i). Without the Act expressly saying so, the same usually applies in the other forms of transport as well.
With particular trades or with specific articles it cannot however always be said that stowage on deck invariably constitutes faulty handling of the goods. The views of the trade are important here, and can provide guidance on this point.
The rationale of the carrier's right to contract out of liability for damage to deck cargo — a right that has its origin in the Baltic timber trade [3] — is that deck cargo runs a greater risk of damage through water coming over the side, or through wide variations in temperature. The danger of cargo falling overboard, or being dropped overboard by the crew is not an imaginary one in the case of conventional goods (so-called 'naked goods'). With this greater risk, it would not be reasonable to oblige the carrier to assume the same liability as applies to cargo carried below decks. If the carrier exercises his right to limit or exclude his liability for deck cargo, this is offset by the fact that he will usually be able to offer a reduction on the freight, so that the shipper will be able to insure his greater risk at a higher premium.
Must lighters carried above the main deck, on parts of the mother ship that are not decked over, be looked upon as deck cargo in the sense that the carrier can (if he informs the shipper beforehand of this method of stowage) limit or exclude his liability for damage or loss of these lighters?

II AN ATTEMPT TO ANSWER THE QUESTIONS ASKED IN PART I

Chapter A. The position of the lighter

1. The lighter is a ship

According to art. 309, 'ships are all vessels however named and of whatever nature'. This description of what a ship is tells us precious little, since the Act does not define a vessel. Like many authors Cleveringa gives the term 'vessel' the wide meaning of an object intended for navigation, this intention needing by no means to be the primary one. This intention must, moreover, be an objective one in the sense that it must be apparent from the construction or

[1]) Knauth, p. 142.

[2]) Rb. Rotterdam 26.6.1956 S. & S. 1957, 73 "Vrouwepolder", "Svenska Traktor vs Maritime Agencies" L.L.L.R. 1952, 124.
[3]) Royer p. 99, Knauth p. 237.

"Ships are all vessels however named and of whatever nature".

equipment. The courts, too, appear to agree with this wide interpretation of the term 'vessel', this being expressed inter alia in a judgment of the Hoge Raad (Supreme Court) of 8 June 1956 (N.J. 1957, 67). In this judgment vessels are described as 'all objects *equipped* to stay on the water and to move (to navigate) thereon, irrespective of whether they incorporate the motive power within themselves or whether this comes from without, the intention to navigate not necessarily being the primary intention'. Even better, perhaps, would be the wording 'all objects intended by their equipment to . . . etc.' (cf. Rb. Amsterdam 22.1. 1937 N.J. 1938, 523). In the opinion of many authors a ship under construction is still a ship, even though it is not yet equipped for navigation (arts. 312 and 748)[1]). If we now look critically at a kangaroo lighter we must come to the conclusion that this barge — with a load capacity of 370 tons and of about 80 tons deadweight, a length of 18.74 m (61½ ft), a beam of 9.50 m (31' 2") and a fresh-water draught of 2.61 m (8'7"), and which after being unloaded from the mother ship is put together with 5, 7 or 9 other lighters to form a pusher unit, and then travels to its port of destination over inland waters with the help of motive power supplied from without, or at least stays on the water after unloading — is a ship in the meaning of art. 309 as interpreted by the courts.

2. The Lash lighter is (still) an inland vessel

After this outcome, it still has to be decided what kind of ship we are dealing with — a seagoing ship or an inland vessel. All vessels which are ships according to art. 309 and are not seagoing ships in the meaning of art. 310 are inland vessels in the meaning of art. 748. There is no common view in the literature as to what is a seagoing ship. According to the Act, two alternative criteria must be applied in deciding whether or not a seagoing ship is involved. In the first place, seagoing ships are those ships which are in fact used for navigation on the seas, irrespective of whether they are intended for this (M.v.T. (Explanatory Memo) to art 310 p. 13).

[1]) In agreement are: Dorhout Mees No. 1416, Cleveringa p. 45, Verhoeve p. 40.
Dissenting: Van Opstall.

Disregarding the actual use made of it, a vessel must also be considered to be a seagoing ship if it is intended for such use; this intention must be apparent from its construction and equipment.
There is disagreement about the first criterion. In the view of some authors, the fact that actual use has once been made of a ship for navigation on the seas makes that ship a seagoing ship [2]). Others consider that use for sea navigation on a single occasion is insufficient, and that more than occasional use at sea must be involved [3]).
The requirement of regular occurrence has appeared in recent times in the courts [4]).

Meanwhile, the second criterion when applied to the Lash lighter, which is not clearly intended through its construction or equipment for sea navigation, leads to the legally far from elegant result that one lighter which is regularly used at sea is a seagoing ship, while another must — even though in every way identical to its fellow-lighter — be classified as an inland vessel if it has not (yet) navigated on the sea. Where this intention is present, which would seem probable in lighters belonging to the Seabee system, they can be looked upon as seagoing ships without any difficulty. With Lash-system lighters, in particular those belonging to the A. S. Moslash Shipping Company of Norway mentioned earlier, this intention is not, in my opinion, sufficiently clearly present.
Companies will probably appear in the future dealing exclusively with the leasing to shippers of lighters belonging to the company, as already happens on quite a large scale with containers (e.g. Container Transport International, Integrated Container Service and Contrans). In this situation those actually performing the carriage, and the lighter owner, will thus not be one and the same person.
The first-mentioned view of the actual-use criterion could now easily lead to the carrier being able, even against the owner's wishes, to make the lighter into a seagoing ship by having it once navigate at sea.
This consequence is unacceptable. If one supports the second view, then the person leasing the lighter will not become the unwilling owner of a seagoing vessel so easily, since the necessary regular use (or at least more than occasional use) will take up quite some time, time during which the owner can take steps to bring about a change in the situation he finds undesirable.

On the grounds of the arguments put forward by Schadee in his binding opinion of 22.2.1967 (S. & S. 1967 No. 45), as well, the first view therefore seems to me to be the less well-founded.
The second view on the actual-use criterion however does not (as explained above) lead to an identical decision for all Lash lighters.

[2]) Cleveringa, p. 54, Van Opstall p. 30, Dorhout Mees No. 1420, Molengraaff, p. 21, Verhoeve p. 45-48.
[3]) Mulderije, p. 32, Van Elden W.P.N.R. 3528 and 3529.
[4]) Schadee, Bindend Advies (Binding Opinion) 22.2.1967 S. & S. 1967 No. 45.
The Court of The Hague 22.3.1968 N.J. 1969, 219.
The Court of The Hague 19.1.1968 S. & S. 1968, 58.
The District Court of Alkmaar 25.6.1970 S. & S. 1970, 93 Aran/Marsdiep.
The Court of the Hague 7.10.1970 S. & S. 1971, 29 Leba III.

Conclusion:
Under the law as it stands we must come to the conclusion (an unsatisfactory one, in my opinion) that some Lash lighters, depending on the use at sea made of them, are seagoing vessels while other Lash lighters, although completely identical, are inland vessels.
So far as I can discover, the Lash lighters which operate on the European waterways network via the Port of Rotterdam are so far nowhere used for navigation at sea. It follows from this that these lighters, since they are ships in the meaning of art. 309 and no seagoing ships in the meaning of art. 310 (they do not have the objective intention of navigation at sea), are inland vessels in the meaning of art. 748. In what follows I shall therefore work from the premise that the lighter is an inland vessel.

Limited liability
An important consequence of the above conclusion that the lighter is an inland vessel is that in the event of collision or other damage caused by a ship the owner or user of the lighter can, except where there is intent or gross negligence, call on the limitation of liability under art. 944 for damage caused by the collision. See here the Royal Decree of 7 February 1952, Stb. 64.

3. The lighter is not a component part of the ship

Those objects that form a single whole with the ship ('so that they together formed only one object') in the sense that they are regarded in law as a substantial component, are component parts of the ship and are by accession the property of the owner of the ship. In its judgment of 26.3.1936 (N. J. 1936, No. 757) from which I quote here, the Netherlands Supreme Court does *not* set the condition that the material solidity with which the component is joined to the main object should be such that it cannot be separated without damage. When there is doubt as to whether a component part of a ship is in fact involved, one should have regard above all to 'the concepts held by general opinion of this type of movable property' without heeding any contrary intention by one of the parties. Unfortunately the phenomenon of the kangaroo-ship is such a new one that it is impossible as yet to talk of there being concepts held by general opinion. One can however read from this judgment that the component must be used permanently together with the main object.
This is an argument for not looking upon the lighter as a component part of the ship. It is, indeed, an essential aspect of the kangaroo-ship system of transport that the lighters are interchangeable, so that they do not have to belong to one particular mother ship, but can be used with a whole series of mother ships serving a particular route or particular linked routes.

A contrary view (that the lighter is in fact a component part) would moreover place serious obstacles in the way of the expected practice of lighter-leasing companies; for as soon as one of these leased lighters was loaded aboard the mother ship it would, by the rule of acquirement-by-accession of art. 643 B.W., become the property of the owner of the mother ship. The lighter would then without more ado remain the property of the owner of the mother ship, even after it had been unloaded.
Our law surely does not recognize the unloading of a lighter from a seagoing ship as a means of acquiring property.

Conclusion:
The lighter is not a component part of the mother ship [1].

4. The lighter is not an appurtenance to a ship

Appurtenances are all objects which while not forming part of a ship are intended permanently to be used with the ship (art. 309 para. 3). It has already been pointed out above that the lighter is not intended to be used permanently with one particular mother ship, but with a number of mother ships. This militates against the lighter being regarded as an appurtenance to a ship. Ship's appurtenances are auxiliary objects as mentioned under art. 563 B.W. and belong to the ship, but the Act and a condition to a contract may determine otherwise (Dorhout Mees No. 1418). This means that the purpose of the ship's appurtenance as such must be given to it by the person who owns both the mother ship and the lighter. We have already said above that the lighter and the mother ship may have different owners, so that when this is the case we cannot talk in terms of a ship's appurtenance. If one seeks to talk of ship's appurtenances in the remaining cases, then this leads to the unacceptable result that one lighter belongs to a ship and another entirely identical lighter does not.
For the rest, it must be commented that the fact of being a ship does not entirely rule out that of being a ship's appurtenance. A ship's (life) 'boats' are themselves ships in the meaning of art. 309 para. 1, but at the same time they are, according to the Memorie van Antwoord (Explanatory Memorandum), p. 11, ship's appurtenances within the meaning of art. 309 para. 3.

Conclusion:
The lighter is not a ship's appurtenance.

5. The lighter is packing(?)

The matter of whether a lighter should be looked upon as packing or not is of interest not so much from the viewpoint of the law of property, which is what we are dealing with in the present chapter, as from that of the law of contract. Designating the lighter as packing can, indeed, have further consequences, but it is better to come back to this later. I would, however, make the following point here: in N. J. B. 1970 p. 24 Th. H. J. Dorrestein describes packing, as used in a transport context, as the whole of the physical measures whereby the goods are protected as far as possible from the likely risks peculiar to the transport. Dorrestein does not say whether this meaning of

[1]) The same conclusion was reached by M. Mercadel (Professor at the Rouen Faculty of Law and Economic Sciences) in his paper at the Rouen Symposium on 16 October 1970.

packing as used in a transport context coincides with its meaning in transport law; but as this is being said by a lawyer in an essentially legal journal, I cannot consider this possibility as entirely ruled out. But it is then at once evident that the lighter readily comes within this description. In my opinion, the lighter does indeed have the twofold quality of ship and packing, at one and the same time. The 'packing' aspect of the lighter will predominate over the 'ship' aspect while the lighter is loaded aboard the mother ship, and will recede into the background when the lighter is navigating on inland waters.

6. Registration

Apart from any registration requirement connected with measures of an economic planning legislation kind, the lighter has to be registered as an inland vessel in the register referred to in art. 749. For details of this registration, see I.A.1.

7. Transfer

The lighter has to be transferred as a registered inland vessel, i.e. an instrument, given under hand or notarized, must be drawn up and has to be entered in the appropriate registers of shipping (art. 757).

8. Preferential rights

The preferential rights on the seagoing ship under art. 318 c do not extend to the lighter. This is not however true of the preferential rights under art. 318 h para. 1 on the mother ship's cargo.
When the lighter is aboard, it is at the same time cargo of the mother ship. These preferential rights may however coincide with those of art. 758 without the law having provided for a full order of precedence. Of prime importance in this connection is the Convention and Protocols regarding the registration of inland vessels; Geneva, 25 January, 1965 (Convention relative à l'immatriculation des bateaux de navigation intérieure) — Trb. 1966 nr. 228.
As the results of the Commercial Code are, to a large extent, in agreement with this Convention the rules of the Commercial Code will be used in the following where possible.

The preferential right listed as the first under art. 318 h (selling-up costs) coincides with the preferential right of art. 777, which is seen to have the same priority: it comes before all other claims. The prior claims of salvage under art. 318 h, too, are seen to coincide with the prior debts of art. 758 para. 1 under (3) on account of salvage. It is in my opinion irrelevant here whether the object of the claim referred to in art. 318 h is the cargo while that in art. 758 para. 1 is the ship, since in this instance both qualities are combined in the lighter. It is further important to note that with both these rights the rule applies that the most recent shall have precedence over he earlier.

The preferential claims resulting from contracts of service between master and crew and the social security premiums, referred to in art. 758 para. 1 under (2), are likewise irrelevant, since the lighter does not have a crew. Finally, the claims on account of bodily injuries to passengers and damage to their luggage can also be set aside, since there are to date no passenger lighters.
We still have to decide the order of precedence of, on the one hand, the preferential claims arising from general average and from the contract of carriage, and on the other preferential claims arising from damage caused by the ship or any other shipping accident and those resulting from the business carried on with the lighter.

As far as general average is concerned, art. 11 of Protocol nr. 1 of the Convention mentioned above stipulates that the claims arising from the amount to which the vessel has contributed to the general average have the same priority as the claims of salvage. Also in this respect the rules for preferential rights on inland vessels and their order of precedence coincide with those of art. 318 h, so that no problems can arise from this any more.

As far as the coincidence is concerned of preferential debts arising from the contract of carriage on the one hand, of preferential debts arising from damage caused by the ship or any other shipping accident and those resulting from the business carried on with the lighter on the other hand, it seems reasonable to me to give preference to the former over the latter. In fact, if one bears in mind that the creditors who seek to recover the last-mentioned rights against the lighter are able to do so only by reason of the fact that others (creditors for the carriage) have incurred costs to preserve the lighter and bring it to the place where these creditors are seeking recovery, then it is in my view justifiable to give preference to the preferential rights of art. 318 h para. 1 sub 3°.

In all the foregoing one must make the reservation that this applies only if the claims referred to in art. 318 h are more recent in date than those referred to in art. 758. If this is not so, then the reasoning outlined above could be reversed, in the sense that it may be that the creditor of art. 318 h can recover his claims only because others (the creditors of art. 758) have seen to it that the lighter could be preserved and taken aboard the mother ship.

A reasoning along similar lines to the above can be followed for the relationship between the preferential rights of art. 318 h and those of art. 766.

9. Mortgage

Mortgaging of the lighter is possible provided that the lighter is properly entered in the register. For further details, see I. A. 4

10. Arrest

Arrest of the mother ship does not extend to the lighter. Arrest of the lighter must be carried out in accordance with the provisions of Title 4 of Book II Rv., i.e. as attachment of a ship.

Chapter B. Law applicable to the contract between merchant and carrier for carriage from the lighter's port of loading to the lighter's port of unloading

Here we start from the premise that the carriage mentioned above is contracted with a carrier as a single whole. If this carrier operates a liner service, then he is himself liable for the whole of the carriage (arts. 517 v, 871 para. 1 and 37 Wet Luchtvervoer (Air Transport Act)). Even without the Act saying so, I consider that the contracting carrier should be liable for the entire carriage. Making use of the services of others in carrying out a contract is after all not uncommon, and certainly does not constitute a reason for a change of the person liable. It should be borne in mind here that the carrier has taken on an obligation to achieve a certain result. The principle that the carrier is liable for the whole of the carriage that he has undertaken in his quality as carrier should therefore be extended to all carriages. Indeed, the case discussed here will occur in most cases with a regular line.

1. The chameleon system

Once we know who carries the liability, we have to say what law shall govern that liability. If we look at transport law as a whole, we see that a separate set of laws of carriage has grown up for practically every means of transport. This is true of both national and international regulations.
The various types of transport, and the typical risks associated with them, were quite clearly such that they each needed their own rules of liability which differed from those in other fields. If we compare an ocean voyage by ship with, say, a train journey across country, the differences in the risks involved in the carriage are immediately obvious. The train (with the exception of the 'boat-train') will encounter few 'perils of the sea' on its journey, so it has been given a different set of liability rules from the ship (the C.I.M.). Both forms of transport do, of course, have certain risks in common (e.g. strikes, defects inherent in the goods, inadequate packing, etc.). One therefore to some extent finds the same provisions in various sets of regulations with regard to legal rights to contract out or to exemptions from liability [1]).

The technique of combined transport, in particular transport by the kangaroo-ship system, does not remove these differences in transport risks. Seen from this standpoint there is hence no reason to throw overboard the system of differing rules on liability. Nor does the Act oblige us to do so by laying down in arts. 466 and 809 that maritime law applies to carriage partly by sea and partly over inland waters, provided that no transhipment takes place. There is of course nothing against calling the operation of putting the lighters back on the water 'transhipment' within the meaning of arts. 466 and 809. The essence of this is a change in the means of transport, and this does occur. After this occurrence, therefore, the law of inland water transport will govern the liability for that part of the route still to be covered [2]). All this applies insofar as carriage by lighter is not a part of the unloading or loading and insofar as the lighter is an inland vessel.
One might offer, as an objection to application of the chameleon system, that it is often impossible to investigate where the damage occurred, all the more so since in this form of transport the lighter is opened up again only when it has reached the port of destination, so that only then can any damage be discovered. Because of this it will remain undecided which regulations are applicable, so that one cannot say whether the carrier is liable or whether he may qualify for the protection of a legal or contractual exception. It would therefore be better to apply maritime law, or at least one single kind of law, to the whole of the route.
This argument, again, is not entirely convincing. The engagement to carry is a commitment to achieve a certain result [3]). Nevertheless, the law relieves the carrier of liability for damage which has arisen through certain, and named, causes. The carrier who wishes to enjoy this protection must however himself show the specified causes, if necessary with evidence to prove them. The same applies, in my opinion, to the contractual exceptions, which still predominate in inland navigation law.
If it is unknown where the damage has occurred, it will usually also be unknown how the damage has occurred. In such a case the carrier will not be able to show and prove circumstances relieving him of his liability, so that he must be regarded as liable. This does not alter if, in place of maritime law for the whole route, one applies inland water transport law for part of it; the uniform liability system will in this case have effects no different from the chameleon system.
It may also happen that the cause of the damage is known, but it is not known when it occurred. This situation will arise when it is a question of risks resulting from the nature of the goods, or of damage suffered in one way or another through the fault of the shipper. These risks are not characteristic of a certain type of transport, or of a particular route, but are rather inherent in particular kinds of cargo and their packing. For this reason they are treated in the same way in the various sets of regulations, so that it makes no difference which system of regulations is applied. It would, certainly, be desirable to try to achieve greater uniformity in the various ways a carrier can limit the extent of his liability.

2. The TCM Convention

The following are some of the considerations that have led to the drafting of the TCM Convention [4]):

[1]) Compare, for example, art. 17 para. 4 C.M.R. with arts. 469 and 470.

[2]) cf. Prof. Plinio Manca in Europees Vervoersrecht 1968, p. 520, where he holds that it would be contrary to all logical principles, for instance, to submit maritime carriage to the regulations for land transport or, vice versa, to submit the latter to the regulations for the former.
[3]) Royer, p. 165 et seq.
H.R. 21.3.1947, N.J. 1947, 383, Flensburg
District Court of Amsterdam 13.11.1953, N.J. 1954, 306 Pericles.
[4]) B. S. Wheble "Combined Transport 'Rome Draft' TCM Convention", in Europees Vervoersrecht, December 1970.

(1) the merchant wants a single transport document, relating to the whole carriage from the first place of loading to the final place of unloading;

(2) the document in question could best be issued by the person dealing directly with the merchant, by which he would be liable for the whole of the carriage;

(3) it must be possible for the merchant's partner in the contract (the Combined Transport Operator) not necessarily himself to be a carrier in the strict sence of the word (one may think, for example, of the forwarding agent);

(4) the transport document must be issued at the moment that the goods are handed over to the Combined Transport Operator.

Apart from (3), however, these desiderata can be satisfied quite easily within the existing system, without there being any need for a separate treaty. As this is so, such a solution is far preferable. Quite apart from the fact that the laborious negotiations and a great deal of preparatory work for a treaty could be avoided, the rigidity that is an inescapable concomitant of agreements in treaty from, and which can easily place obstacles in the way of a flexible adaptation of present circumstances to fresh technological developments, would be unnecessary.
It would also be difficult to accept it if this convention were simply to sweep aside the conventions on transport by rail (C.I.M.), road (C.M.R.) and sea (Hague Rules) that have themselves come into being after a great deal of hard work.
Besides, it is still highly questionable whether it is so desirable, from the viewpoint of society, that a non-carrier should be able to issue a Combined Transport document. Such a document is, after all, a security as well as evidence of a contract of carriage. As such it earns the continuing respect of bankers, who are used to allowing credit against the document. For them it is an important assurance to know that this security has been issued by a carrier who, by reason of his business, is satisfactorily creditworthy. If this issuing authority is now to be extended to the shipping agent and forwarding agent, who can run their businesses without the very costly capital equipment usually possessed by the carrier in the strict sense of the term (and which for the banker offers a solid possibility of recovery), then it is doubtful whether these bankers would be so ready to provide credit against these documents on the same scale.

Conclusion:
Application of the Chameleon system to combined transport in general, and in the case of transport by kangaroo-ship system in particular, is preferable to application of the Uniform Liability System. This means, therefore, that the liability of the carrier during the seaborne phase must be governed by maritime law, while inland water transport law will apply during the parts of the carriage over inland waters.
The arrangement proposed here leaves unaffected the rights of the main carrier, who bears the liability, to recovery from his sub-carriers. Where liability is to be based on the circumstance that it is impossible to discover where and how the damage occurred, then it seems reasonable to adopt the American system (as the Sea-Land shipping company was kind enough to explain it to me) and to have all the carriers involved on the route bear the cost of the damage pound-for-pound, in proportion to the distance for which each has been responsible.
Since existing law appears to provide adequate opportunities for meeting the needs, or at least most of the needs, of combined transport it is in my view unnecessary, and thus indeed undesirable, to have a special international set of rules laid down in a treaty text. Combined transport may, perhaps, provide an extra stimulus to looking at and improving the whole of the law relating to transport, in the near future. It gives the imminent appearance of Book 8 of the N.B.W., already very interesting, an extra dimension. See, in this connection, the 2nd section of the second Title of Book 8 of the draft B.W.

Chapter C. The effect of economic planning legislation

1. Dutch economic planning legislation

The Dutch Minister of Transport & Watercontrol takes the standpoint that carriage inland with Lash lighters directly following on the unloading of these lighters from the mother ship is not inland water transport within the meaning of art. 2 W.G.B., since this carriage begins not in the port of discharge of the mother ship but in the port of loading of the lighter, and therefore counts as international transport. A similar reasoning is applied to the transport of the Lash lighters to the seaport where the mother ship is lying, when these lighters are loaded aboard the mother ship immediately afterwards. As a result of this view no licence is required for these two kinds of inland carriage. A licence or registration will however be required if the Lash lighter undertakes carriage within the Netherlands in order to avoid temporarily running empty, i.e. without a seaborne phase directly preceding or following. In any case, there will be no question of a licence for regular liner transport; occasional carriage by Lash lighter to overcome any running empty is inconsistent with the nature of liner operation.
Apart from the case where the cargo has its own Lash lighters (when 'own-use' registration is involved) a licence will be needed for tramp operation.
Meanwhile the standpoint taken by the Minister seems to me to be difficult to sustain when a substantial proportion of the demand for carriage is met with Lash transport. That this will in fact come to be the case in the near future is by no means improbable.
If we are trying to match the supply of transport to the demand, then we must take account of the *whole* of the supply, including Lash lighters. This means that the kangaroo system as a whole needs to be made subject to the same conditions as the remaining forms of carriage. One difficulty here is that licences [1]) as

[1]) The normal licence for tramp carriage, as referred to in art. 1 para. 1 sub-para. h W.G.B. and the separate licence for tramp operation that may be issued in connection with art. 34 W.G.B.

we know them today are coupled to a particular vessel. This is not reconcilable with the kangaroo-ship system, since this can operate at optimum efficiency only by reason of the interchangeability of the lighters.

From this viewpoint it is therefore desirable that the present system should be modified so that a licence can be issued for a given Lash lighter tonnage which may be present on the inland waterways network at one and the same time, irrespective of which lighters are actually carrying goods.

As regards the national laying-up scheme now in preparation, as well as the national breaking-up regulations, it is only fair that the owners of Lash lighters should contribute towards the costs incurred by these schemes. They will, after all, profit just as much as other carriers from the beneficial effects these schemes are expected to have.

It can besides be commented that it is precisely inland transport capacity in the form of Lash lighters that can contribute to the temporary or permanent excess of cargo carrying capacity that may lead to application of the laying-up and/or breaking-up regulations. Whether this will in fact be the case is, however, primarily an economic problem and not a legal one.

Although it is not apparent from the draft regulations on breaking-up that it is indeed the intention that owners of Lash lighters should be liable to contribute, it does appear from the provisional report on this draft (1970-1971 Session, 11029 No. 4) that the Second Chamber's Permanent Committee for Traffic & Watercontrol sees this as desirable. Here again the obligation to make a contribution, and the registration, should preferably be related to a certain tonnage, irrespective of which lighters represent this tonnage.

2. Draft EEC legislation

What has been said above for the Lash lighter in domestic legislation is also valid, in broad terms, for the Lash lighter in the EEC draft legislation. One notices, in this draft, that although no fully-developed rules for Lash lighters have as yet been incorporated account has been taken of this new technique by stating, in art. 50 bis of the Draft EEC regulations on access to the market for the carriage of goods on inland waterways, that:
'Le Conseil, sur proposition de la Commission, procède aux aménagements des dispositions du présent règlement qui s'avéreront nécessaires pour tenir compte de l'évolution de la technique en matière de transport de marchandises par voie navigable et notamment de la mise en service de bateaux rendus aptes par leur équipement à être utilisés comme conteneurs.' [1])

If this draft legislation is in fact enacted, it seems likely that there will be such regulations, in particular on the application of obligatory registration and contributions to transport by the kangaroo system.

[1]) COM (69) 311 final.

The Rotterdam Port Authority levies harbour dues . . .

Chapter D. Harbour dues

Since the Port Authority of Rotterdam takes the standpoint that the lighter must be regarded as an inland vessel, both seaport dues (as cargo of the seagoing vessel before unloading) and inland harbour dues (as an inland vessel after unloading) have to be paid on the lighter. Besides this, the ordinary seaport dues are payable for the mother ship, based on the gross tonnage in metric tons. This levy may be increased further by buoyage, depending on where the ship is lying.
I have this information through the kindness of the Deputy Harbourmaster.
This standpoint adopted by the Municipality fits in well with the view that under commercial law, too, the lighter is an inland vessel (see II A. 2)
In other areas of administrative law, too, it seems desirable that the lighter should be regarded as an inland vessel. This view is accordingly taken in economic planning legislation (see II. C.).
From the point of view of the ship's papers we mentioned earlier, and the associated safety requirements for the lighter, it appears again to be regarded as an inland vessel (albeit a non-steerable one) (see II. E.).

An inland vessel (albeit a non-steerable one).

According to a letter dated 11.4.1969 from the Directeur des Ports Maritimes to the Directeur Général des Douanes, the French harbour services likewise tend to look on the lighter as an inland vessel. The French Customs, however, consider that the lighter is a seagoing vessel (internal memorandum of 25.2.1969). I do not, unfortunately, know what arguments led to this viewpoint.

Chapter E. Papers needed by the lighter in order to navigate in Europe

In II. A. 2 above I came to the conclusion that the lighter must be regarded as an inland vessel. One consequence of this is that the lighter must be provided with the ship's papers required of an inland vessel.
These are, under art. 782, the certificate of tonnage, the certificate of entry in the register and evidence of whether the ship is encumbered by a mortgage. With regard to the last, one may surely assume that the lighter will be engaged in carriage across a national frontier. In addition, in the case of a lighter for Rhine navigation there will have to be a certificate issued after an expert inspection of the vessel's riverworthiness and safety.

Now, the lighter is not fitted with a rudder or with anchors; nor does it have navigation lights of any kind. Consequently it does not satisfy the requirements on pusher barges laid down in the Tijdelijke Bepalingen Onderzoek Duweenheden Rijn (Temporary Provisions for the Inspection of Rhine Pusher Unit) 1969.
The consequence of this is that a certificate of riverworthiness will be issued for the lighter, but that this will be subject to the condition that lighters may not be made up into pusher units comprised solely of Lash lighters. A pusher unit in which Lash lighters are incorporated must in every case include other pusher barges that do carry proper anchors and lights. The make-up of the pusher units must be such that the unit as a whole satisfies the requirements laid down by these Temporary Provisions.
This means, too, that the lighter may not be towed as a towed barge (cf. the English canal term 'butty-boat') in the strict sense. Towing must be done as for any other non-steerable object, i.e. by at least two tugs [1]).

An inspection is not required for each Lash lighter. After a thorough examination of a particular type of lighter, a certificate of riverworthiness will be issued against the certificate of tonnage of other lighters belonging to the same type and thus having the same construction and equipment.
Finally, the carrier carrying out transport by Lash lighters must comply with the provisions of the economic planning laws, as evidence of which he will have to have the necessary documents (see II. B. on this point).

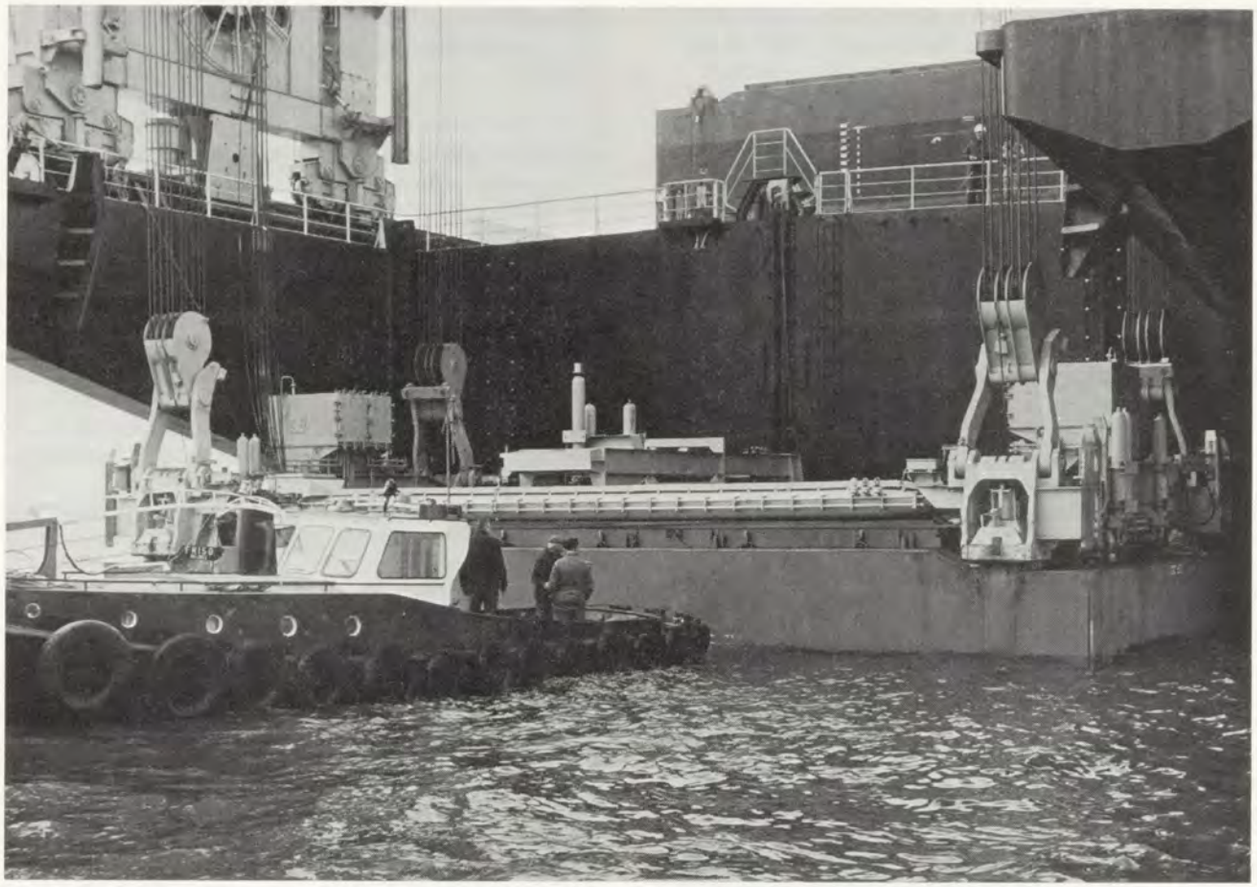
[1]) These facts came to me from the Rotterdam Deputy Harbourmaster, who was kind enough to provide me with various items of information.

Chapter F. Beginning and end of the carrier's liability

1. a. The carrier undertakes only to perform all or part of the seaborne stage: the lighters belong to him

The starting premise here is that the carrier accepts goods for sea carriage making use of a lighter loaded by others and conveyed by them to the place where the mother ship will take the lighter on board.
The carrier's liability is covered by maritime law from the time he takes over the lighters until the time he delivers them. During this period Dutch maritime law coincides with the Hague Rules; it should be noted that after loading onto and before unloading from the mother ship the carrier is, where his liability is concerned, bound by arts. 468 and 469.
Before the start of loading and after the completion of unloading the carrier may, however, absolve himself entirely from liability for any damage, provided this does not occur through intent or gross negligence on his part.
The loading must be regarded as having begun at the moment the lighter is hooked to the crane of the mother ship. Likewise, unloading must be regarded as completed when the lighter is unhooked from this crane [2]).
The correctness of the view taken by Royer, that lighter carriage directly preceding and immediately following the sea voyage does not fall within the sphere of the Hague Rules, is clearly illustrated by this method of transport. It can surely not have been the intention of the draftsmen of the treaty that this should also cover the whole of the inland stage. This is, however, the inevitable consequence of the view that the loading mentioned in art. 470 begins at the time when loading of the lighter is begun, since this loading is done before the inland stage begins. This is more than clear from what was said by Sir Henry Duke, the chairman of the I.M.C. conference held in 1922, and is quoted by Royer. Sir Henry described the purpose of the Hague Rules as '. . . to deal with the transactions upon the universal highway and not with the incidental transactions which lead to the bringing of goods to the ship, and which follow from the unloading of goods from the ship. The committee has interpreted its duty as being to deal with transit upon the sea . . .'.
Without the carrier contracting out, his liability will in this case start from the moment at which he takes over the lighters. In my view this is the moment at which the inland carrier moors the lighters in a 'parking area' which is under the supervision of the sea carrier. Similarly, his liability will end when he hands over the lighters from a similar parking area to the inland carrier.
Alongside this, there is the liability on the carrier from the agreement under which he makes the lighter available to the other party in order to undertake the inland stage of the carriage with it. Where this agreement (bare boat chartering or leasing) is concerned there is complete freedom of contract. Since this does not involve true carrier's liability, we can leave it out of consideration here.

[2]) Royer p. 74; see the jurisprudence quoted there.



The loading begins at the moment the lighter is hooked to the crane of the mother ship.

1. b. The carrier undertakes only to perform all or part of the seaborne stage: the lighters do not belong to him

The period during which the carrier as such is liable in this case coincides entirely with that described in the preceding case.
There is now, however, another feature which though it relates to the extent of the liability and not the period of liability must, in my view, be mentioned. I have already said, in II. A. 5., that besides being a means of transport the lighter is also a packing. Since the carrier now has nothing to do with the carriage over inland waters, not even as the owner of the lighter, the means-of-transport aspect recedes so far into the background that for him it becomes irrelevant. There remains the packing aspect. This means that if the lighter has defects as a result of which there is damage to the goods inside it, the carrier can call on the exception provided by art. 469 para. 2 sub-para. n (inadequate packing), so that he does not bear the liability for this damage. The carrier is not simply relieved of liability for damage that occurs to lighters, or their cargoes, other than the defective one. His liability for these will end only if such damage occurs despite proper treatment of the cargo on his part [1]).

2. a. The carrier undertakes only to perform an inland stage of the route, with his own lighters

In this case the carrier's liability will, unless there are conditions to the contrary, begin when he takes over the goods. If the carriage takes place under a voyage charter, then this taking over of the goods will coincide with the loading of the lighter, which will be at the expense and risk of the charterer (art. 877). In inland water transport the loading is of course virtually always done by the shipper, so that the carrier's liability nearly always begins with the loading.
It is, besides, very questionable whether chartering is applicable in this case. Art. 788 para. 1 does stipulate that the ship must be used for the benefit of the charterer by the first disponent owner [2]). The first disponent owner can do this, according to my premise (i.e. that he undertakes only an inland stage of the transport), only up to the time when he delivers the lighter to the mother ship. He knows nothing of the use made of the lighter from that time on.
According to art. 799, a time charter runs up to and including the day on which the ship, after discharging, is again placed at the disposal of the shipowner, while it can in my opinion be inferred from art. 899 that a voyage charter ends at the time when the goods are delivered from the ship at the port of destination.
But if the carrier undertakes no more than to perform an inland stage of the route, then the ship cannot be placed at his disposal when this stage is completed, since the seaborne stage and the subsequent inland stage are still to follow. In my opinion, therefore, time chartering under arts. 797 et seq. cannot apply in this case. After completion of the first inland stage of the

[1]) Royer pp. 607 and 608.
[2]) Verhoeve p. 117.

route there is, for the same reason, no intention of delivering up the goods from ship; so voyage chartering under arts. 874 et seq. is likewise inapplicable. Since the parties nevertheless enjoy freedom of contract they can, of course, come to an agreement as to the start and finish of the charter which differs from that laid down by the Act. But the character of a charter is then affected to such an extent (there is no promise that the ship will be used for the whole of the route) that it becomes difficult still to talk in terms of a charter.
In a case like this the term 'leasing' seems better suited, at least for the period after the lighter has been taken over by the sea carrier [1]). The liability of the lighter owner as carrier also lasts up to that time, unless an earlier time or exception is provided for in the contract. From that moment on, his liability is as a hirer; but that will not be considered here.

2. b. The carrier undertakes only to perform an inland stage of the route, with lighters made available to him by the shipper

In principle, the carrier's liability applies over the same period as in the preceding case. There can, however, be an important difference with respect to extent of the liability.
Since in inland water transport the loading of the goods is always done by the shipper, there remains for the carrier only the obligation to bring the lighter from its port of loading to the point of rendezvous with the seagoing ship. He does this by means of a pusher tug or at least two towing tugs (see II. E). According to the judgment of the Breda District Court of 2 April 1968, S. & S. 1969, 41 this operation by the carrier comes under the term 'towing' so that — with this towing taking place under a contract — arts. 925 et seq. apply. It can be inferred from art. 930 para. 2 that this contract lays on the carrier an obligation to perform an action [2]), at least where liability for damage to or loss of the goods carried is concerned. The obligation undertaken by the carrier can no longer be seen as carriage per se, since this implies an obligation to achieve a result. The carrier is not liable if he has done his best and damage nevertheless occurs. A great deal will naturally depend on the intentions of the parties to the contract. If they wish to regard the contract as a contract for carriage, with the rules of liability attaching to this, then they are entirely free to do so.

3. The carrier undertakes to carry out both the seaborne stages and the inland stages

It may be seen from the foregoing that the carrier's liability begins with the taking over of the goods before the start of the voyage and continues until they are delivered up at the end of the voyage. During the seaborne stage this liability is regulated, compulsorily by arts. 468 et seq., which are a translation of the Hague Rules (Brussels Bills of Lading Convention of 1924), while up to the moment of hooking the lighter onto the ship's crane and after it has been unhooked the carrier may enjoy a complete freedom of contract, so that it does not make much difference whether inland or maritime law is regarded as applying if the carrier has in fact completely contracted out. The choice does however again take on importance when situations arise that have not been foreseen in the contract of carriage.
In this case it is difficult to draw a dividing line between maritime and inland water transport law. In art. 468 the Act mentions the moment at which the goods are taken over by the sea carrier as being the moment at which the applicability of inland water transport law ceases and that of maritime law begins. Since the sea carrier and the inland carrier are, however, one and the same person this moment in time loses its significance in this respect. As the borderline between inland water transport law and maritime law one might now point to the moment when the pusher unit or barge-train in which the lighter has travelled to its place of rendezvous with the mother ship is split up. A similar line of reasoning can be followed to determine the moment at which the applicability of maritime law ends and that of inland water transport law begins.
The content of the liability of the carrier who services the route with his own lighters is here again (unless there are contractual exceptions) greater than that of carriers using lighters supplied by the shipper. In the first case the carrier will have to take care that the lighter is clean and dry and is in all respects suited to the cargo (art. 811 para. 3) [3]), while in the second case such a duty cannot reasonably be shifted onto the carrier. Moreover, the care that the carrier must exercise towards another's lighters will be directed more towards the exterior of the lighters, since the carrier has no influence on the loading or unloading: he receives a sealed lighter for carriage, and is unable to exert any influence on the goods themselves.
What is now evident about this of transport is that an important part of the traditional principal responsibilities of the sea carrier (for a seaworthy ship in the broad sense and for careful and correct handling of the goods being carried) is shifted onto the shipper's shoulders, especially in a case where the latter himself supplies the lighters. Seaworthiness, in the broad sense, includes the sound state of the holds and all other parts of the ship in which the goods are carried. But these holds of the mother ship now accommodate not the goods themselves directly, but the lighters, and can consequently be much simpler. The function of the conventional ship's hold is to a substantial extent taken over by the lighter, which has the quality of a separate ship and of packing, but is not in any event included under the seaworthiness of the mother ship.
The proper handling of the goods being carried is centred mainly on the operations of loading and unloading, i.e. bringing the goods into the vessel, stowing them there in such a way as to be proof against a normal sea voyage, and removing them from the vessel again. As loading and unloading of an inland vessel is normally done by the shipper all that remains for the sea carrier to do is to take the lighters aboard

[1]) The situation might be described as "bare boat chartering". This term is however unknown in our legal code, and is not mentioned in the jurisprudence.
[2]) Agreeing: Verhoeve p. 264.
Dissenting: Dorhout Mees No. 1812.

[3]) District Court of Amsterdam 20.4.1960 S. & S. 1960, 66.

and to relaunch them, his liability then being compulsorily regulated only while there is physical contact between the mother ship and the lighter: there is very little cargo 'handling' left to the sea carrier. It should be kept in mind here that by far the greatest number of risks of damage to the goods in transit will arise during loading and unloading. Since both operations are carried out by the shipper himself, then he — or at least not the sea carrier (art. 469 para. 2 sub-para. i) — carries the liability for them.
The liability of the sea carrier is considerably lessened. I will not argue that this is unreasonable; to set against it, there is the advantage of very rapid transport, to a great extent independent of local circumstances.

Chapter G. The Lash bill of lading

1. The bill of lading as proof of receipt

In view of the requirement that the bill of lading should be negotiable, this will usually contain more information than the minimum prescribed by law under art. 504. The consignee, who is buying the goods with the bill of lading, is reliant on this document for details of the goods. But the identification of the goods plays, in the first place, an important role in the contractual relations between the buyer/consignee and the seller, who may be the shipper but can also be the latter's successor. The carrier will undoubtedly not welcome being bound by statements made about the goods: he wants to be able on the one hand to accommodate the shipper by including in the bill of lading the details the latter wants to see mentioned, and on the other not to be bound by these statements.
The law offers him this opportunity in art. 513: by including a 'weight, contents, etc. unknown' clause, the carrier is not bound by the statements he makes in the bill of lading, at least where these are not the items required by law under art. 504. As a basic rule, the 'weight, contents, etc. unknown' clause must be regarded as void where these obligatory statements are concerned (art. 517 c) [1].
With respect to the obligatory statement of the leading marks and the weight or quantity of the goods, the proviso that the carrier has not had any opportunity to check these facts does offer relief: these circumstances remove the obligation to include these details. If the bill of lading does nevertheless include these items, it is safe to assume that this has been done at the request of the shipper. There is no reason to assume that the 'weight, contents, etc. unknown' clause will be voided in this case as well.
The carrier is however still, in every case, bound by law to state the apparent order and condition of the goods. From the finding of the courts on art. 504, however, it has emerged that this apparent order and condition of the goods have to be stated only insofar as they are observable by superficial inspection [2]. As a rule this inspection may even be limited to the packing of the goods [3]. In para. 1 e of this Chapter. I have already stated that besides being a ship the lighter is also a packing. It will be clear from what has just been said that the statement of the apparent condition of the goods can, in my opinion, be limited to the apparent order and condition of the lighter [4].
Endorsing the bill of lading to the effect that the apparent condition of the goods left something to be desired is, seen from this viewpoint, really conceivable only when the lighters have been supplied by the shipper. If they have not, then the carrier must in principle be regarded as standing warranty for the soundness of his own lighters. Endorsing the bill of lading in this way would for him be, as it were, admitting guilt in advance.
If the carrier omits to make a note of the poor condition of a lighter supplied by the shipper, at the latter's request and in exchange for a letter of indemnity, then he (the carrier) should be alive to the risk he is running — that not only the cargo in the defective lighter, but that in other lighters as well, may suffer damage.
With regard to damage to this other cargo, it is very doubtful whether the carrier can recover from the shipper of the defective lighter. The taking-aboard of a lighter in spite of evident defects could quite easily be seen as faulty handling of the remaining cargo, for which the carrier himself is liable.

2. The bill of lading as evidence of the contract of carriage

Although there may be objections, with this form of transport, to dealing with the contract of carriage partly as a chartering of an inland vessel (see II. A. 2. a), the recommendation about providing rules for loading and unloading time does merit consideration when arranging the relevant conditions of a charter. The interest that the Lash carrier has in seeing the lighters loaded early and unloaded speedily basically matches that of a disponent owner in this respect. Art. 880, together with the associated general administrative order (K.B. of 7.2.1952 Stb. 63 'Besluit laad- en lostijden' (Order on Loading and Unloading Times)) seems to provide adequate rules to cover this. Under these rules, the shipper/consignee has a maximum of 3 days (assuming a cargo carrying capacity of 380 tons for the lighter) to load or unload (art. 2 Besluit Laad - en Lostijden). If this period of three days is exceeded, then the shipper/consignee becomes liable to pay demurrage, calculated on the displacement of the lighter. Without prejudice to the rules, the carrier ought perhaps to be able to shorten the period allowed for loading and unloading, or to increase the amount payable if the period is exceeded.

Art. 491 lays down that in principle the consignee is liable for the freight and any other charges after delivery of the goods. Although this is already stipu-

[1] cf. Dorhout Mees No. 1722.
[2] Rotterdam District Court 18.12.1962 S. & S. 1963, 26 Rijnkerk.
Court of The Hague 8.1.1965 S. & S. 1965, 30.

[3] District Court of Amsterdam 31.12.1958 S. & S. 1959, 44.
District Court of Rotterdam 13.11.1962 S. & S. 1963, 12 Nordstjernan.
[4] This will naturally not apply if the loading of the lighter has been done by the carrier himself (filling-up, consolidating, groupage, stuffing).

lated by art. 491, art. 511 para. 2 reiterates that the obligation to pay the further charges mentioned here must appear on the bill of lading itself.
If this is not the case, then one must, in my view, come to the conclusion that the shipper, as the original party to the contract, is liable for paying the carrier these sums.

3. The bill of lading as a security

As I have explained in I. G. 3 the question here is whether the carrier can issue a 'shipped' bill of lading once the loading of the lighter has been completed, or whether he has to give a 'received for shipment' bill on which he can later enter the name of the ship and the sailing date. The text of art. 506 para. 4 does not provide an answer to this problem, since it is not clear from this text what should be understood by 'shipped'.

The wording of art. 3 para. 7 of the Brussels Bills of Lading Convention of 1924, which provides the basis for our art. 506, also leaves us in doubt. Yet one can get, from this convention, an indication that the loading of the lighter does not count as loading in the meaning of art. 3 para. 7 of the Hague Rules, and thus equally not as loading in the meaning of art. 506. The scope of this convention is limited, according to art. 1 sub-para. e, to the period during which the goods are aboard the ship, the term 'navire' used in the text being defined as 'tout bâtiment employé pour le transport des marchandises en mer (any craft used for the carrying of goods at sea) [1]). Since, in the case of Lash lighters, we have to work from the premise that they are inland vessels, they certainly do not come under this use of 'navire'. The provision of art. 3 para. 7, which also speaks of 'navires sur lesquels les marchandises ont été embarquées' (ships on which the goods have been loaded), thus also cannot refer to the loading of a lighter. Logically, the same can be said for art. 506 para. 4.

It is moreover apparent from the words of Sir Henry Duke, quoted earlier (II F. 1 a), that the convention was intended to cover only sea voyages: its scope thus certainly did not extend to a moment which — from the point of view of both time and place — may long precede the start of the sea voyage, or may follow it.

I believe it is possible to conclude, from what has just been said, that the loading of the Lash lighter is by itself insufficient to allow the issuing of a 'shipped' bill of lading. It must be commented, however, that the bill of lading that can be issued after goods have been loaded into the lighter (with a statement, on the bill, that this has taken place) will provide the recipient of this document with a great deal more assurance than the forms of 'received for shipment' bill available to date. The fact of the goods having been loaded into the lighter does mean that carriage has actually begun.

The difference between this 'received for shipment' bill and the 'shipped' bill has undoubtedly become smaller.

[1]) Royer, p. 82.

Chapter H. The lighter on deck: deck cargo

From the linguistic viewpoint, the term deck cargo means quite simply cargo loaded on deck, so that the lighter on deck will certainly come under this heading. The legal consequences of this terminological question are not so straightforward, however. From the legal aspect we can consider two separate problems:

a) Is loading the lighters on deck without previously informing and obtaining the approval of the shipper in accordance with the requirement on correct and careful handling of the goods being carried, within the meaning of art. 468 para. 2, or does this already once constitute faulty handling?

b) Is the carrier entitled to exclude or limit his liability for damage to or loss of lighters carried on deck, if he has satisfied the conditions of art. 470?

1. Loading lighters on deck without previously informing the shipper is not always negligent handling of the goods

Although loading goods on deck without the agreement of the shipper does usually constitute faulty handling, this is not so when loading as deck cargo has become a 'custom of the trade' [2]).
It is perhaps still too early, in the case of Lash transport, to speak of a sufficiently recognized and established custom, but such a custom has, in fact, become established in recent years in the closely-related field of container transport. If it is now accepted that loading containers as deck cargo without informing the shipper beforehand and obtaining his approval does not necessarily constitute faulty handling of these containers, then this must apply a fortiori to the far more sturdily constructed Lash lighters. One must bear in mind that for economic use to be made of a kangaroo ship, one requirement is that a substantial proportion of the lighters should be carried on deck; and these vessels are, moreover, specially constructed for this.

2. The carrier can exclude or limit his liability for damage to or loss of lighters carried on deck if he satisfies the requirements of art. 470

The presentday legal provisions allow the carrier to exclude or limit his liability for deck cargo if before the sea voyage he informs the shipper — and states in the bill of lading — that the goods will be loaded as deck cargo, and this is then in fact done. He has expressly to exclude this liability, since the Hague Rules do apply in principle to such a case but are not compulsorily effective.
Lighters stowed above deck do indeed run a greater risk of damage than those below deck. Particular risks to which they are exposed include loss or damage through seas coming over the side, damage caused by heat from long periods of sunshine, and

[2]) cf. Eugene Spitz "Cargo Risk Problems – Container Operator's Dilemma".

sweating damage through inadequate ventilation. On the other hand it must be said that this deck cargo (the mother ship and the lighter are specially designed for this method of stowage) does run less risk than the conventional deck cargo that was in the minds of the draftsmen of art. 1 sub-para. c of the Bills of Lading Convention of 1924 when they included this provision, with the particular purpose of making the convention applicable to the Baltic timber trade. So it is very questionable whether it is all that reasonable that the carrier should be able totally to exclude his liability. It is besides not at all certain that the carrier will make use of this right. For technical reasons it will be very difficult for him to tell beforehand which lighters are going to be stowed on deck and which are not; one must remember the great speed at which kangaroo-ships are unloaded and loaded.

If the carrier's liability in this respect should however be removed or reduced, then the unacceptable result would be that the shipper would never know for certain whether his goods were to be loaded on deck or not, and consequently would not know whether he needed to insure for an extra risk. A cautious shipper will assume the worst, and insure against this possible extra risk in every instance. Lash transport will however then become more expensive for him, and hence less attractive. For commercial reasons, therefore, the Lash carrier will probably waive his right to exclude his liability for damage to deck cargo.

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[1]) Unfortunately I have, in general, been unable to take the 5th edition of this book into account.

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A. A.	Ars Aequi	(Journal of law students)
A. B.	Wet Algemene Bepalingen	General Provisions Act
A. V. C. 1950	Algemene Vervoerscondities 1950	General Transport Conditions
B. R. T.	Bruto Register Ton	Gross register tons (GRT)
B. W.	Burgerlijk Wetboek	Civil Code
c. & f.		cost and freight
c. i. f.		cost, insurance, freight
Cleveringa	R. P. Cleveringa Jzn. 'Zeerecht' 4e druk 1961	R. P. Cleveringa Jzn. 'Zeerecht' 4th edition 1961
C. M. R.	Convention relative au contrat de transport international de Marchandises en Route	Convention on the Contract for International Carriage of Goods by Road
C. I. M.	Convention Internationale concernant le transport de Marchandise par chemin de fer	International Convention on the Carriage of Goods by Rail
Dorhout Mees	T. J. Dorhout Mees 'Kort begrip van het Nederlands Handelsrecht' 4e druk 1964	T. J. Dorhout Mees 'Kort begrip van het Nederlands Handelsrecht' 4th edition 1964
Hand.	Handelingen	Proceedings
v. d. Hoeven	Henk van der Hoeven 'De Rijnvaartakten en de Cabotage' 1956	Henk van der Hoeven 'De Rijnvaartakten en de Cabotage' 1956
H. R.	Hoge Raad	Supreme Court
I. R. U.	Internationale Rijnvaart Unie	International Rhine Union
K	Wetboek van Koophandel	Commercial Code
K. B.	Koninklijk Besluit	Royal Decree
Knauth	Arnold W. Knauth 'The American Law of Ocean Bills of Lading' 4e druk 1953	Arnold W. Knauth 'The American Law of Ocean Bills of Lading' 4th edition 1953
Lash		Lighter Aboard Ship
Molengraaff	W. L. P. A. Molengraaff 'Kort begrip van het nieuwe Nederlandsche zeerecht' 1928	W. L. P. A. Molengraaff 'Kort begrip van het nieuwe Nederlandsche zeerecht' 1928
Mulderije	H. Mulderije 'Aanvaring, aanrijding en hulploon' 1931	H. Mulderije 'Aanvaring, aanrijding en hulploon' 1931
M. v. A.	Memorie van Antwoord	Memorandum in Reply
M. v. T.	Memorie van Toelichting	Explanatory Memorandum
N. B. W.	Nieuw Burgerlijk Wetboek	New Civil Code
N. J.	Nederlandse Jurisprudentie	Netherlands Jurisprudence
N. J. B.	Nederlands Juristen Blad	Dutch Jurists' Journal
v. Opstall	S. N. van Opstall 'Scheepshypotheek' 1932	S. N. van Opstall 'Scheepshypotheek' 1932
Rb	Rechtbank	District Court
Royer	S. Royer 'Hoofdzaken der vervoerdersaansprakelijkheid in het Zeerecht' 1959	S. Royer 'Hoofdzaken der vervoerdersaansprakelijkheid in het Zeerecht' 1959
Rv.	Wetboek van Burgerlijke Rechtsvorderingen	Code of Civil Procedure
S. R.	Wetboek van Strafrecht	Penal Code
S. & S.	Schip & Schade	'Ship & Damage'
Stb.	Staatsblad	(Government gazette)
Stscrt.	Staatscourant	(Official gazette = London Gazette)

T. C. M.	Convention relative au Contrat de transport international combiné de Marchandises	Convention on the Contract for Combined International Carriage of Goods
Trb.	Tractatenblad	(gazette of treaties)
U. G. B.	Uitvoeringsbesluit Goederenvervoer Binnenscheepvaart	Regulations on the Carriage of Goods by Inland Water Transport
Verhoeve	J. Verhoeve 'Het nieuwe binnenvaartrecht' 1954	J. Verhoeve 'Het nieuwe binnenvaartrecht' 1954
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