SPECIAL LECTURE

SHIPBUILDING IN TOMORROW'S WORLD*

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ABSTRACT

This paper attempts an educated guess at developments in world-wide needs for ocean commerce. It tries to predict the kinds of new ships that will be needed between now and the year 2000. It considers the requirements for competitive shipbuilding and suggests various steps that Korean shipbuilders may to take in order or capture an enlarged share of the world's shipbuilding business.

INTENT

My friends in Seoul have asked me to prepare these comments of the future of world ships and shipbuilding because they are contemplating an expanded activity in merchant shipbuilding.

I do not claim any supernatural ability to foresee the future; but I agree that we are wise to guess as best we can. Of one thing we can be sure: this experiencing accelerating change in all manner of things, and the needs for oceanborne shipping (and shipyards) are no exception. Change is inevitable and wise political leaders and business managers know well how to cope with it.

There are those who believe that aircraft will supplant ships in ocean commerce before the end of this century [1]+. I find that opinion naive. Displacement-type ships moving at moderate speeds offer the world's most efficient form of transport. Even the best of aircraft have costs per ton-mile about 200 times as high as those of a large tanker. Certainly, we can expect aircraft to carry an increasing share of our most valuable cargos, but the all-important bulk trades (both dry and liquid) are totally unlikely to move by air within our lifetime. In U.S. foreign trade today, ships carry 99.9% of the cargo by weight and 85% by value. By the year 2000, I should guess that the figures will have leveled off to perhaps 99.5% and 75% respectively. Aircraft will not find it easy to make further inroads.

Another important consideration is that world trade is growing rapidly. A recent Litton report [2] predicts a five-fold increase during the final third of this century. The prediction is backed by solid analytical studies of future needs for ocean transport, and is not out of line with forecasts made by other groups. Thus, we may confidently expect that ships and shipbuilding will remain growth industries for at least the next several decades.

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+Numbers in parentheses refer to bibliography

There is every reason why Korea should look upon shipbuilding as a potentially valuable facet of its national economy. Merchant shipbuilding is an art as well as a science. It requires an inexpensive labor market with many skilled workers who take pride in honest work. It also requires a corps of well-educated engineers and managers. All these human resources are either already on hand in Korea or obtainable within reasonable time. The two principal materials required for shipbuilding are steel and propulsion machinery. Again, these components are obtainable at reasonable cost. A third prerequisite is capital, and I can only assume that it too will become available if a carefully thought-out shipbuilding program is developed.

WORLD SHIPPING NEEDS & SHIPS TYPES

The previously-mentioned Litton study [2] presents these figures for past and future oceanborne world trade requirements:

Millions of long tons

Year	Tanker trades	Other trades	Total
1966	935	787	1722
2000	5500	3300	8800
Ratio $\frac{2000}{1966}$	5.9	4.2	5.1

The clear trend toward increased tonnage requirements suggests the probability of further emergence of specialized ships, from orange juice tankers to Volkswagen carriers. The continuing need for tankers is also clearly indicated, although the growth pattern will be blurred by increasing use of combination oil-ore carriers, and slurry carriers.

The Litton report cites these estimates for the sizes of tankers that should be added to the world fleet between 1973 and 1983:

DWT	Number of ships added	Cumulative percent of total
1000		
20	680	28
20—40	227	37
40—60	90	41
60—80	161	47
80—100	503	68
100—125	301	80
125—150	33	82
150—200	129	87
200—300	271	98
400—600	45	100
Total	2440	

These figures indicate that a shipyard with shipways large enough to build a 300,000 DWT tanker would be able to compete for 98 percent of the worldwide tanker construction business, at least for the next decade. A typical tanker of that capacity would have a length overall of about 335 meters (1100 ft.), a beam of 53 meters(174 ft.), a depth of 31 meters (102 ft.) and a shaft horsepower of about 40,000.

Another important segment of the merchant fleet is of course the dry bulk carrier. Whereas the great majority of tankers are engaged in moving a single commodity, namely, crude oil, dry bulk carriers are designed for a great variety of commodities. Some bulk carriers are specialized, others are versatile. Some carry their own cargo handling gear, others do not. Nevertheless, a shipyard that can build one variety of bulk carrier should be able to build any other assuming it has the engineering knowhow.

The Litton report projects these figures for the numbers of dry bulk carriers that should be added to the world fleet before 1983:

DWT	Number of ships added	Cumulative percent of total
1000		
less than 10	30	3
10—20	173	19
20—30	310	48
30—40	138	62
40—50	143	75
50—60	89	83
60—80	116	94
89—100	45	99
More than 100	14	100
Total	1058	

We can conclude from these figures that dry bulk carriers will be small compared to tankers. If Litton's figures are correct, a yard that can build ships of up to 100,000 DWT could compete for nearly all the world's business in dry bulk carrier construction (and two-thirds of the tanker business). Such a ship might have a length overall of 260 meters (850 ft.), a beam of 38 meters (125 ft.), a depth of 21 meters (69 ft.) and a shaft horsepower of about 20,000.

The third major type of merchant ship is the general cargo carrier. The trend today, of course, is toward unitized cargo in containers, on pallets, or in lighters. This variety of ship is in a rapidly developing state, but we are probably safe in assuming that there will be no dramatic increases in size. Many general cargo ships are relatively small, serving out-of-the-way ports all over the world. Indeed, the Litton report indicates that nearly half the new general cargo ships to be built before 1983 will be of less than 7000 tons dead-weight capacity.

There is a widespread opinion in the shipping world that there will shortly be an excess of tonnage in container ships. At the same time, many break-bulk cargo ships that are now in the liner trades will be

pushed aside in favor of container ships. Such displaced tonnage will presumably find its way into tramp service. Concurrently, the high-paying cargo now being siphoned off by the freight lines is forcing owners of general cargo ships to increase their freight rates on the less valuable commodities (formerly subsidized by the high-paying goods). As a result, some of the lower class commodities are no longer competitive at delivered prices. The overall conclusion, it would seem to me, would be that general cargo ship construction is going to be less attractive than tanker or bulk carrier construction for the next decade.

An important factor in future shipbuilding is the development of several new types of ships. Notable among these are slurry carriers, OBO's, LNG (liquified natural gas) carriers, and ocean-going pushed barges. A shipyard that can offer superior technological advances in any of these emerging types will be in a strong position to capture plenty of lucrative business. The LNG trade, in particular, seems promising [3], [4]. The future transport demand is apparently assured. Present cryogenic construction methods are extremely expensive, however. The shipyard that can design and produce a cheaper LNG ship will surely prosper.

We have discussed many varieties of merchant ships. One must not conclude that the ideal shipyard should be capable of building any or all of them. Logical divisions of work might be somewhat along these lines: (1) large tankers, (2) tankers and dry bulk carriers up to 100,000 DWT capacity, (3) general cargo ships and larger ferry boats, (4) smaller ferry boats, tugs, fishing craft, and other miscellaneous small craft. Specialization, at least to a moderate degree, is as economically sound in shipyards as it is in ships. This is a policy matter that deserves careful thought and guidance on the part of the Korean government.

One final thing. The conventional displacement ship is quite unlikely to be elbowed aside by hydrofoil craft, air cushion vehicles, submarines, catamarans or any other sort of exotic vehicle. Many such craft will find their uses in ferry services, etc., but the bulk of the world's commerce will long continue to move in ordinary displacement hulls. The shipbuilding industry should not be distracted by the fascinating problems of the newer vehicles.

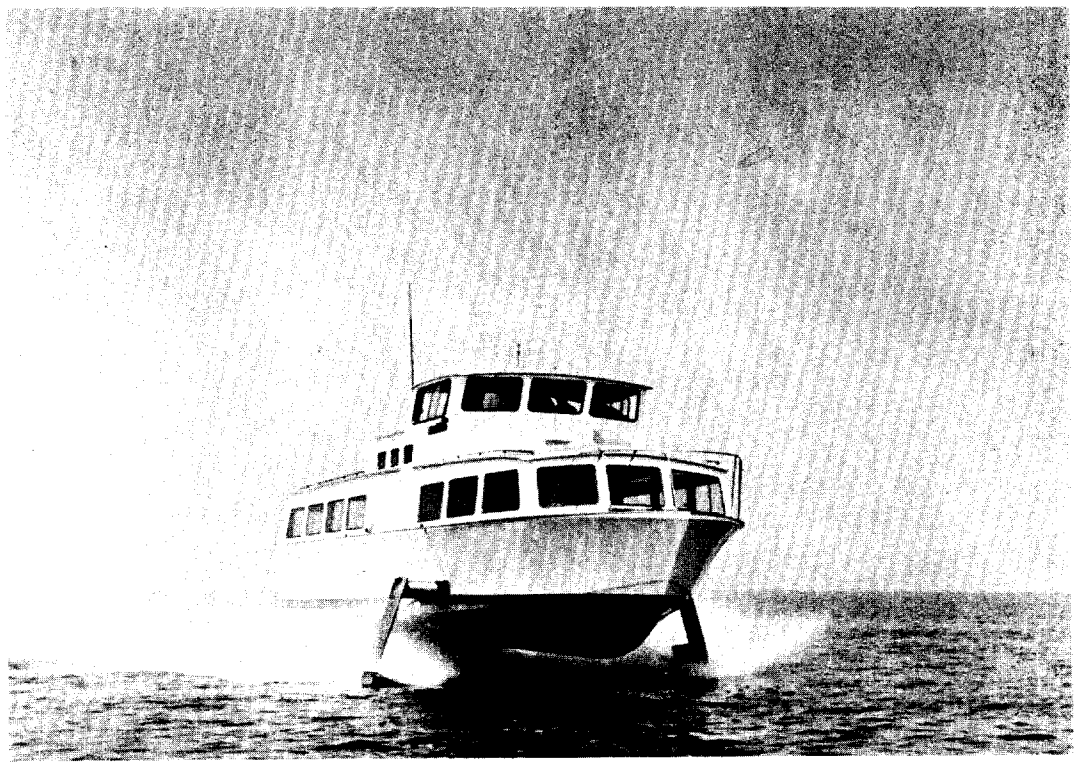
SHIPBUILDING TECHNOLOGY

Aside from Götaverken's famous extrusion-type yard at Arendal, most modern shipyards assemble hulls from relatively few major assemblies. I expect this general method will continue to predominate. I should guess that the big assemblies will eventually be built indoors. Temperature control seems necessary to accurate fitting, and the superior working conditions are also beneficial in attracting high quality workers.

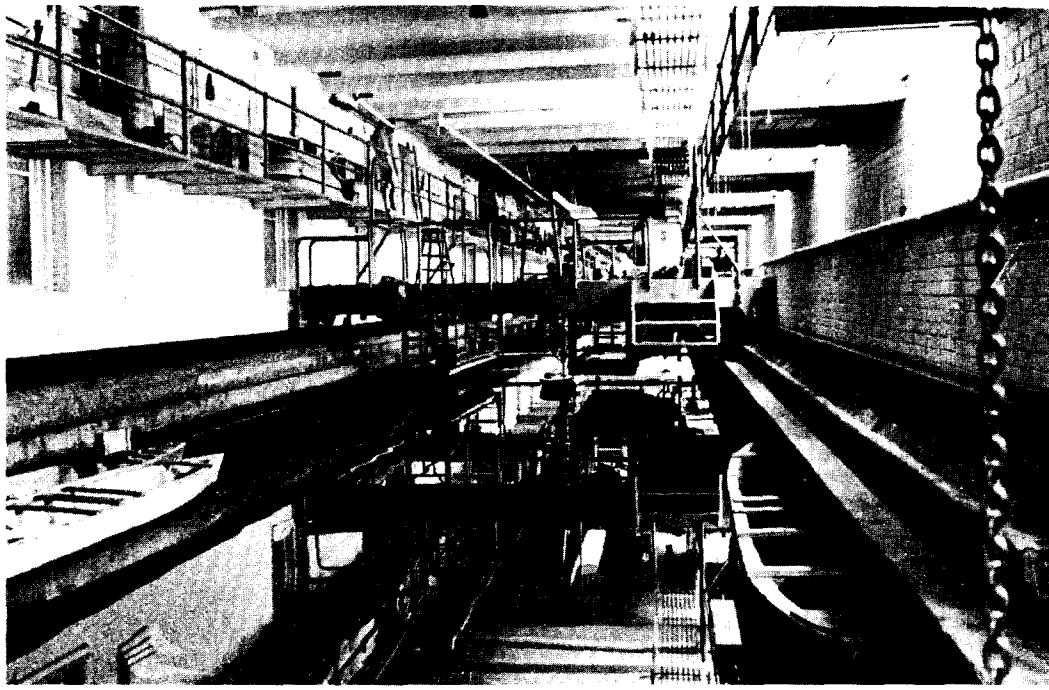
Steel will long remain the predominant hull material, with growing application of special high strenth alloys. Aluminum alloys and, eventually, composite materialsmay become important, too. In steel construction, welding still leaves much to be desired. I predict that it will be replaced by adhesive bonding of some sort.

The truly important developments in ship production will be largely invisible. I refer to better to better management, more careful integration of production and design, better scheduling techniques, better cost

There are those who believe aircraft will supplant ships. (The Boeing Co.)



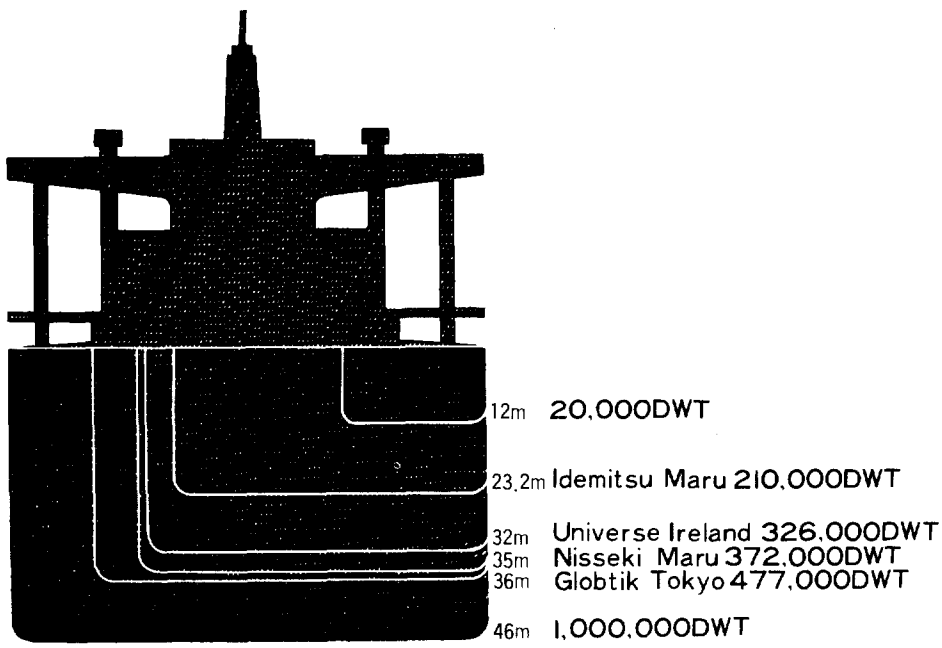
Hydrofoil craft are unlikely to play a major role in overseas transport.



Research is an important ingredient to successful shipbuilding. (University of Michigan)

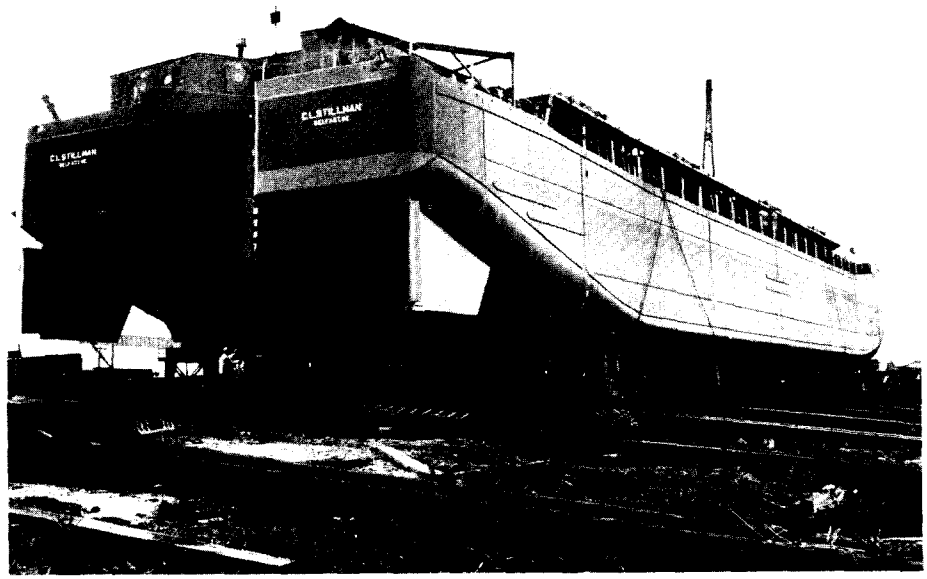
Merchant Shipbuilding requires a corps of well-educated engineers and managers.
(Bethlehem Steel Corp.)

Ships and shipbuilding will remain growth industries for at least the next several decades.
(Newport News Shipbuilding and Dry Dock Co.)



Tankers may grow to one millon tons deadweight capacity,
but average sizes should be much smaller. (Caltex)

Merchant Shipbuilding is an art as well as a science. (Newport News Shipbuilding and Dry Dock Co.)



Ocean-going pushed barges will become common. (Dravo Corp.)

estimating methods, fewer mistakes and wasted material, fewer delays, and shorter construction times. All of this, obviously, will require a large number of well-educated engineers and business managers with ready access to sophisticated computers.

Another result of better management will be the eventual capability (using numerically controlled machinery) of building custom-designed ships almost as efficiently as we now build standard ships.

These are changing times. The successful shipyard will be the one that welcomes and stimulates change both in ships and in shipbuilding. Such a shipyard requires plenty of brainpower. Therefore, the first step in expanding a national shipbuiliding program is to attact the necessary personnel and to push actively a meaninful program in shipbuilding research and development. Quoting Peter F. Drucker (1):

Economic theory needs to be restructured on a brand-new postulate: knowledge creates productivity.

I shall close by borrowing from the above to suggest a motto for Korean shipbuilding: KNOWLEDGE CREATES PRODUCTIVITY.

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