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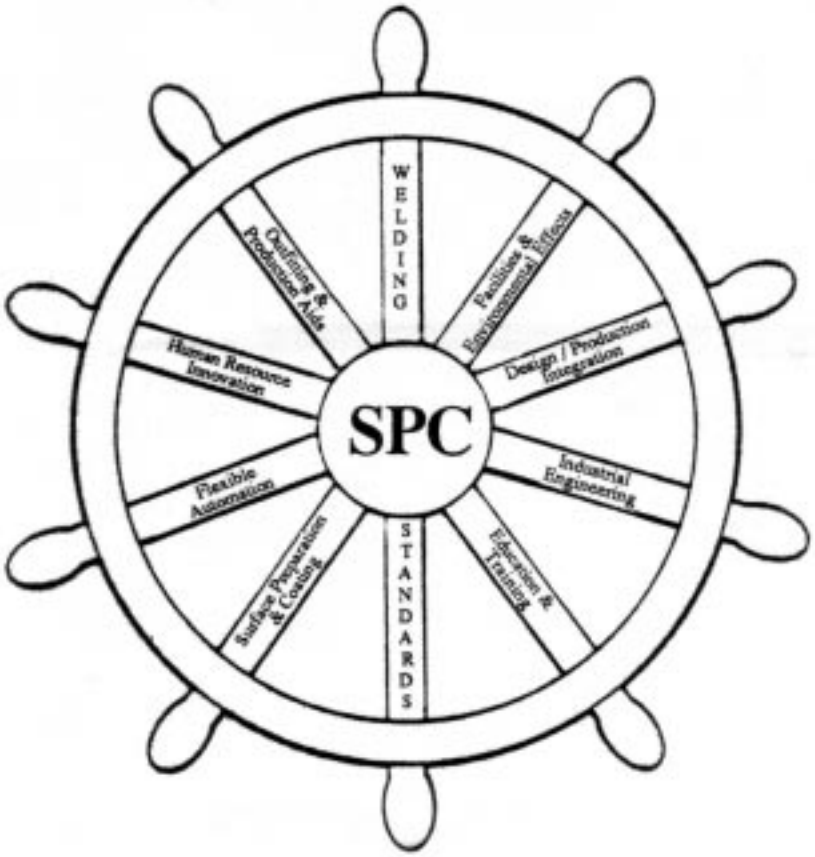

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Political Changes in Eastern Europe and the World Shipbuilding Market

8B-2

Dr. Boris S. Butman, U.S. Merchant Marine Academy

ABSTRACt

The recent political and economic events unfolding in Eastern Europe have brought about changes that are of vital importance to the world shipbuilding community. Following in the footsteps of Yugoslavia, already the No 3 shipbuilding power in the world, these countries view shipbuilding as a source of very needed hard currency, and also as a way of generating employment. The relatively loy cost of ship construction together with an adequately developed level of technology, and comprehensive engineering support, make these communist countries serious competitors. Moreover, the announced reduction of the Soviet military budget might free up substantial capacities for export ship construction, and sharply reduce Soviet orders in their former satellite countries, thus making them available for foreign orders. The following paper addresses shipbuilding organization and capacities in the communist countries, advantages, problems and possible forms of business relations with their shipyards.

contents

1. WORLD SHIPBUILDING MARKET: CURRENT STATUS

During the 1980'S decade of bargain prices resulting from a sharp decline in new ship orders, the combined shipbuilding workforce of Japan, South Korea and Western Europe shrank by over 303,000 workers. By the beginning of 1989 the world shipbuilding capacities have been reduced from 37.5 million gross registered tons (GT) to about 18.0 million [1]. Over 75 shipbuilding and ship repair facilities closed in the U.S. alone. Bv 1990 the world-wide shipbuilding capacity had been reduced sufficiently to give the world shipbuilding community a potentially-manageable control over the market.

According to the published estimates [1], the projected annual demand for new construction in 1990-94 is in the range of about 14-16 million GT or 12-25 % below the estimated shipbuilding capacity, which promises a substantial improvement of the current order book and increased prices. The level of new ship construction for 1995-99 is projected to be 21-24 million GT likely resulting in even larger demand and higher prices. Actually, the orders and prices are already climbing up, but whether this trend will continue into the 1990's depends to a large degree upon the developments in the economic and international marketing postures which arise from the dramatic political changes being experienced in the communist, or for some of them, the former communist countries.

2. SHIPBUILDING FOR EXPORT IN COMMUNIST COUNTRIES

The share of these countries in world shipbuilding is already quite

substantial. Four out of the eleven largest shipbuilding countries in 1989 were Yugoslavia (No 3), China (No 9),, Poland (No 10) and Romania (No 11), and their combined tonnage of ships on order reached 13,5% to the total world order book [3]. Since 1978 these four socialist countries together have more than tripled their share of the world tonnage on order. Yugoslavia and Romania began building ships for foreign,"non Soviet", owners more than 20 years ago, almost immediately after they split with the U.S.S.R. They have managed to maintain, ever since that separation, practically the same number of newbuildings per year, while the average ship's tonnage is gradually increasing.

The People's Republic of China has embarked on the export shipbuilding path only recently, and in a few years has grown to become a substantial shipbuilding power with a share in the world market, reaching over 5% of total number of ships on order.

As per table 1, the other East European countries, currently in the process of severing their traditional ties with the Soviet Union, also possess considerable shipbuilding capacities. As of June 1989, East Germany and Bulgaria had on order all together 71 ships with total tonnage of about one million DWT. At the same time, total tonnage on order in the Communist countries was 7,130 thousand DWT which accounts for over 17% to the world level.

Table 1 Ships on Order in the Communist Countries

Country	'1987		1989	
	Number of ships [Ref. 2]	DWT (000)	Number of ships [Ref. 31]	DWT (000)
Bulgaria		53	39	505
Czechoslov.	6	18	*na*	na.
China	37	834	56	1,165
E. Germany	15	133	**32**	**450**
Poland	94	945	**49**	1,139
Romania	19	339	**38**	1,111
USSR	14	285	18	529
Yugoslavia	52	1,968	51	2,230
Total		**5,085**		7,129

Based on the data in Table 1 the Soviet Union does not appear to be a real shipbuilding power, with only 18 ships of 529,000 DWT on order in 1989. The explanation to this misleading data lies partially in the limitations of the statistical analysis, which apparently does not consider the many large river ships over 2000 DWT and tug/barge trains of 5ooo-10,000 DWT, which are very popular in the Soviet Union. However, the main reason is in the vast naval orders, overloading the Soviet shipbuilding capacities. A recent attempt to create a 6OO-ship Wavy in the U.S. has provided our major yards with a substantial backlog. Eased on various counts, the Soviet Navy is 2.5 to 3 times larger. Considering a corresponding doubled and tripled number of naval auxiliaries, and also the #correspondingly large volume of overhauls and -modernizations, it can be appreciated that required shipbuilding capacities in the Soviet Union exceed those available for the American Navy by at least three times.

The driving forces behind the success of Yugoslav shipbuilding are similar to those found in all other communist countries, especially, now when they are struggling to convert into market economies. First of all; there is the ever present shortage of hard currency needed to repay previous debts to Western banks, to finance future industrial projects, and to pay for *grain* and other food related imports in the case of the USSR and China,

Unable to compete with Western democracies due to the low quality of most of their industrial products, the communist countries are realizing that construction of simple ships like tankers and general cargo carriers is the easiest way to enter the highly competitive world market of industrial products. They also view shipbuilding as a way of maintaining labor employment during the transition period while switching over to the market system.

The recent political events in the East European countries have brought to life various actions affecting world shipbuilding:

1. open-door policies adopted by these countries *when* giant deals like the recent Pepsico agreement become feasible;

2. incredible drive to earn hard currency resulting sometimes in accepting newbuilding sale prices which are far below the actual cost;

3. gradual secession of their economies from the Soviet economy and an end to the barter trade relations.

A reduction by 14.2% of the Soviet military budget and by 19.5% of the

annual production of weapons and military equipment during 1989-90 announced -- michael Gorbachev might have a "snow ball" effect on world shipbuilding. It would:

1. free up substantial Soviet shipbuilding capacities for commercial ship construction for both domestic and foreign owners;

2. sharply decrease Soviet orders placed in their former satellite countries thus making them available for, foreign owners; and

3. further reduce the already limited Soviet orders to West European and Far Eastern shipbuilders, making that share of shipbuilding capacity available for other sales.

The gradual increase in the share of naval shipbuilding at Soviet yards in the 1950-60s was accompanied by the steady diversion of non-military orders placed with foreign yards. Actually, many foreign yards, especially those in the Warsaw Pact countries (East Germany, Poland, Czechoslovakia, Hungary, Bulgaria, and Rumania) have completely replaced the portion of Soviet yard capacities occupied by naval construction.

3. THE YUGOSLAV PHENOMENON

It was the first communist country that broke with the Soviets and decided to explore an independent course of development. Over 30 years ago the country started a program of export oriented shipbuilding. The main driving force was and still is the need for hard currency, In order to win the market, shipyards were forced to match South Korean prices. As a result, prices dropped as far down as $25 million for a 140,000 DWT crude carrier of 1985-90 delivery [4].

In Yugoslav shipbuilding we see a remarkable example of the competitive capabilities of a communist country. Recent issues of marine related periodicals have devoted a considerable amount of time and attention to the subject [5, 6 and 7]. Yugoslavia has maintained the number 3 spot in the world shipbuilding order book for four consecutive years. Moreover, their market share in terms of ship tonnage has doubled, and while it was achieved, the composition of the shipbuilding output changed from being primarily tankers and bulk carriers to more diverse and advanced designs. In 1989 the five major yards delivered 23 ships totaling over 900,000 DWT.

The present order book includes a number of modern designs ranging from 140,000 DWT tankers, 40,000 DWT product carriers to 1OO- and 40-ton cranes and 2,000 HP harbor tug boats. Among the deliveries of the last three years are two 3,500-car carriers with a high degree level of automation, providing a potential manning level of eight crew, series of eight rail ferries for the Caspian Sea, large multi-purpose reefers; and Baltic cruise ferries.

Twenty years ago, the JADRANBROD Shipbuilding Association was founded to represent and coordinate the efforts of the major shipyards on the Adriatic Coast. Although a government-controlled entity, similar to the Soviet ministry of Shipbuilding, the JADRANBROD, as well as the shipyards themselves, enjoy substantial independence. The four major shipyards are the ULJANIK in Pula, the country's largest shipbuilder, the 3 MAj yard in Rieka, the Brodsplit yard in Split, and the JLM yard in Trogir (See Fig. 1).

The Uljanik yard, with a workforce Of 8,000, with two 173 meter and 135 meter long shipbuilding berths is capable of constructing ships up to 160,000 DWT on the larger berth. It also has a diesel plant to build MAN B&W and Pielstic engines, and an electrical factory with licenses from Siemens and ESAB.

The 3 Maj yard is a combination of a three-berth shipbuilding facility with capacities of up to 150,000 DwT, and a modern diesel plant, building the newest Sulzer design engines under the license agreement. The Split Yard with four building berths and 5,000 employees has a most diverse portfolio and delivery history, including very large crude and bulk carriers, 2,200 passenger/car ferry, reefers, and product carriers.

The forth major shipbuilding yard, the JLM at Trogir, specializes in floating docks, mid-size product carriers, and harbor tugs.

Another large shipyard, the Victor Lenac in Rieka, is the major repair and conversion facility which has floating docks with up to 24,000 tons lifting capacity.

With all its shipbuilding successes, Yugoslavia remains a state run economy, plagued with all of the familiar drawbacks and shortcomings: planning flows and material shortages, lack of incentive on the part of the workforce towards the improvement of productivity, political instability and labor unrest, and high inflation. However, the main lesson to be learnt is

that a11 of the inherited problems have not prevented the government-controlled economy from gaining 'a substantial share of the world shipbuilding market. It should not be forgotten, however, that state run economies do have one advantage, namely, the ability to keep labor cost low. But with the current changes taking place in the world today, it is doubtful how long this will continue.

4 SHIPBUILDING IN EASTERN EUROPE AND CHINA

There exists a substantial body of literature dealing with shipbuilding capacities in the East European Communist Countries and China. The following is a brief summary of the available information.

China

Although only a decade ago it was practically unknown as a shipbuilding power, China today competes today for the No 3 spot in the world order book; From the creation of the People's Republic of China in 1949 up until 1979; the Chinese shipyards built 4.61 million DWT of total tonnage for their own merchant fleet, or about 150,000 DWT per year. They built 3.5 million DWT in the next 7 years, including over one million DWT for foreign shipowners [8, 9].

For many years, China, like the USSR, has set aside a substantial portion of its shipbuilding capacities for naval construction. The naval build-up slowed down a few years ago when China launched its dramatic economic reforms. After adoption of the open-door policy in the mid-eighties, the growth of industry accelerated, especially with regard to the export portion of industrial output. Thus, the shipbuilding industry enjoys a steady annual increase in the order book of over 10%.

The details of the organizational structure of China's shipbuilding industry are very similar to that of the USSR. The industry is managed by the China State Shipbuilding Corporation (CSSC), a Government entity, embracing 26 shipyards, 60 machinery plants and over 70 institutions, factories and shops with a total of almost 300,000 employees. Among the institutions under the CSSC umbrella there are about 35 design and research centers employing over 40,000 personnel [10].

The seven major shipyards capable of building ships of 30,000 DWT and above are located along the East China Sea and Yellow Sea Coasts in Dalian, Shanghai (3 yards), Guangzou, and Chunhua. All of those shipyards are heavily involved in export activities, Among the recent deliveries from these shipyards are two car carriers for 3,700 vehicles each, a 2,700 TEU containership with reefer capacity, two 81,350 DWT Superflex 3 Class multi-purpose ships, and two 118,000 DWT shuttle tankers, [11].

The prevailing types of Shipbuilding installations are the traditional inclined end-launching berth and a side-launching berth. Only the Dalian shipyard, the largest in the country with 15,000 employees, has a gravel dock to build ships up to 150,000 DWT. In addition, this yard has three smaller berths - 290, 255 and 185 meters long. A 350 meter long building dock for: ships up to 300,000 DWT is scheduled to be completed in 1991. Dalian shipyard, as well as the Hudong and Shanghai: yards, operate full-scale diesel plants building Sulzer, B&W MAN and Pielstic designs under license agreements.

CSSC also offers 24 drydocks at 17 shipyards around the country, capable of lifting ships up to 60,000 DWT.

Last year's political turmoil in China adversely affected the Shipbuilding industry: number of new orders dropped immediately and delays with new deliveries were reported. However, recent new orders have significantly improved the situation, securing a bright future for the Chinese shipyards.

Poland

The four major Polish shipyards in Gdansk (two yards), Gdynia and Szczecin (fig.1)have been enjoying a very steady market of new building for the USSR for over 40 years. Since 1949, Polish shipyards have finished about 1,OOO ships, and most of them were sold to the USSR. The Warsky shipvard in Szczecin alone has built over 200 ships on Soviet orders.

However, the advantage of this steady and reliable demand has to be weighed against the fact that the transactions are carried out entirely on the barter basis. The Soviet Union pays for ships with raw materials, and the prices for these supplies do not reflect current world level. Moreover, many components for the ships are purchased by Poland from the West for dollars, and are not reimbursed upon ship delivery. At the same time it should be remembered that significant modernization plans also require hard currency. As a result, in spite of the many advantages of dealing with the USSR, including steady

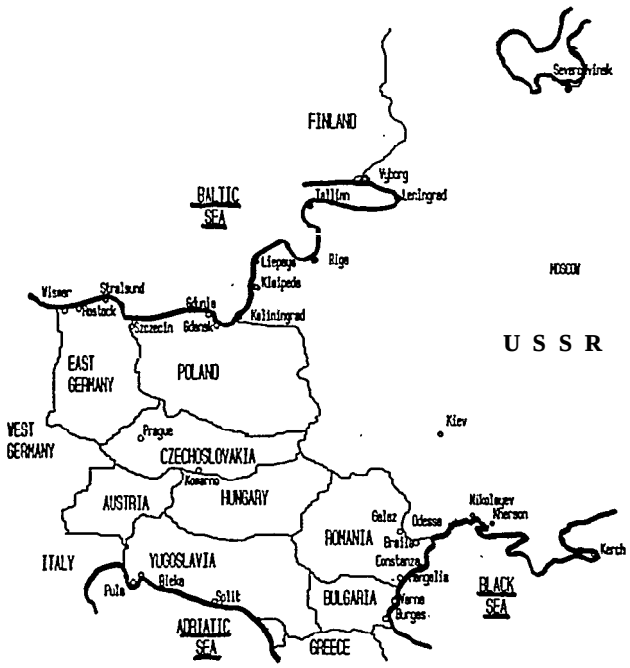


Fig. 1 Geography of Shipbuilding in Eastern Europe

demand and long ship series, Polish shipyards are turning towards western shipowners in search of hard currency.

The recent political and economic changes in Poland support the western orientation of the shipbuilding industry. Shipyards now operate under the umbrella of CENTROMOR, a combined venture of the Government, shipyards and marine equipment plants, which covers all aspects of the export and import of ships and marine equipment [13].

Among the ships built recently by the CENTRONOR group are floating docks, large passenger/car ferries, 85,000 DWT tankers, 150,000 DWT bulk carriers from Gdynia, 29,000 DWT bulk lumber carriers, and fish factory trawlers from Gdansk, car/passenger ferries, 32,000 DWT bulk carriers, and 30,000 DWT product carriers from Szczecin.

There have been, however, a few cases of substantial delays and late deliveries which led to the cancellation of contracts or reduction of the number of ships ordered. The main reason for these failures have been labor shortages and pure personnel discipline. Although the total shipbuilding workforce exceeds 50,000 people, many experienced workers left shipyards during and after the labor unrest of 1980-81, and a significant proportion of the remaining workers are still heavily involved in political activities. The problem is so serious that at one time the very existence of the Polish shipbuilding industry was in doubt.

As of January, 1990 all three major shipyards had the order books filled until 1992-93. The future will show if the industry is able to restructure and operate successfully without Government subsidies [14].

East Germany

The four major East German, shipyards in Wismar, Rostock, Stralsund, and Warnemunde have full order books until 1991-92, largely due to a steady demand from the USSR. Only 15% of the annual output is intended for the western countries. East Germany faces the same problems as Poland when dealing with Soviet orders. Not surprisingly, the yards are actively looking for Western business, and their marketing strategy is changing towards a more aggressive promotion of their products and services.

One of the main selling points for East Germany has been to emphasize their notable domestic designs: various fishing and fish-factory ships, a 18,000 DWT multipurpose container ship with a Sulzer engine manufactured in East Germany, a 1,200 TEU container ship with a MAN engine also built domestically, and a two-deck rail ferries for Baltic Sea. Recent deliveries include many high technology ships like icebreaking ro/ro's, sea-going and river -sea passenger liners [15].

East German shipyards have full, order books until 1992, but these came largely from the USSR, and there is a significant probability that most of them will not materialize. In the very near future, East German yards will be incorporated into the mighty West German shipbuilding system, and wi11 become much less attractive for the USSR as they loose the opportunity for bartered payments, and for Western shipowners who will no longer be able to take advantage of low wage rates.

Other East European Countries

Recent political developments have created a confusing and unclear situation in Bulgaria and Romania, which both have their major shipbuilding facilities on the east coast of the Black Sea (Fig. 1). The three large Bulgarian yards in Varna and Burgas, and the five shipyards in Romania (Constanza, Galatz, Braila, Mangalia,

and Turnu Severin) enjoy a steady flow of orders from the USSR, China and the Comecon countries. The political changes will diminish the traditional ties with other Communist countries, and the need for hard currency will become a major factor. These countries can offer facilities and expertise to build primarily bulk carriers and tankers of all sizes, from small river-sea types up to 160,000 DWT (Constanza).

The two shipyards in Czechoslovakia (in Prague and Komarno), build mainly specialty river ships: self-propelled dredges, floating pump stations of passenger ships, and river-sea cargo carriers.

5. SOVIET SHIPBUILDING SYSTEM

The Soviet Union has not just imposed its own political system upon the East European countries; it also forced upon them the principles of Soviet style central planning and management. The Soviet Union brought these countries under the umbrella of Comecon (Council for Mutual Economic. Assistance), where the Soviet management system is prevalent. The Soviet Union used its colleges and universities to educate and train the leading engineers and managers of these countries. Therefore, the organizational structure of shipbuilding in most of East Europe and even in China, closely resembles that of the Soviet Union. The following is a short description of the Soviet shipbuilding organization [see also 16].

Shipbuilding Production Associations - one of the latest inventions of the Soviet economy management think tank. It is aimed at a reduction in administrative personnel improvement of planning, and also represents an attempt to ease the excessively tight strings which are imposed by the central planning system. A shipbuilding association is normally formed by merging a major shipyard with one or several smaller yards and assigning additional manufacturing facilities to them, such as a foundry, 'a machine shop, an electrical factory, other factories and shops, and engineering institutions.

The eight major shipyards have already been typical full service enterprises capable of fabricating and building not only ship's hull, piping and foundations, but also various fittings, some auxiliary and even propulsion machinery, including steam boilers. The ship production association has substantially expanded capacities to produce more ship components, clearly an advantage under the Soviet material distribution system. Examples of ship-building associations include the one in Kherson, the Admiralty Association in Leningrad, and the Astrakhan Shipbuilding Association.

From the standpoint of assignment and production structure, there are three major types of shipyards in the Soviet Union: 1) naval, 2) commercial, and 3) mixed production. For a majority of shipyards, their assignments are generally unchanged for a long period of time. For example, the Admiralty Association is mainly a naval yard with occasional orders for special commercial vessels, like the first nuclear icebreaker, Lenin, while the Leninskaya Kuznya in Kiev is mainly a fishing vessel yard with limited involvement in naval construction. The largest mixed production yards, which appear to be the backbone of both naval and commercial shipbuilding in the Soviet Union, have been gradually moving toward deeper involvement into the naval area during the last two decades.

Based on the variety of shipyards available, and on the steady demand for new ships, narrow shipyard specialization has become an important feature of Soviet shipbuilding. Series construction creates the optimum condition for those yards. Among other advantages it allows them to reduce the negative impact of centralized planning on construction time, and reduces the cost of subcontracted works.

Western naval experts are familiar with most fixed assignments of the Leningrad and Nikolayev yards for the construction of large combatant vessels (cruisers, aircraft carriers, large destroyers), Severodvinsk and Komsomolsk for submarines, Tallinn for destroyers, and Liepava and Kaliningrad for smaller combatants. In the same way, commercial construction is assigned to various yards according to their capacities and experience (see Fig. 1):

- large tankers:- Kerch' (after 1975), Admiralty and Baltic yards in Leningrad (before 1970);
- midsize tankers - Kherson;
- small sea-going, sea-river, and river tankers - Volgograd, Gorky, Astrakhan', Tumen' and some other inland yards;
- large dry cargo carriers - Vyborg, Baltic and Zhdanov (Leningrad), Ocean and Black Sea (Nikolayev), Kherson;
- midsize and small dry cargo carriers - Gorky, Navashino, Astrakhan', krasnoyarsk,

Petrokrepost', Gorokhovets, Konsomol'sk Khabarovsk, etc.;

- ore and bulk carriers - Ocean (Nikolayev) ;

- reefer carriers - Baltic (Leningrad), Ocean (Nikolayev);

- fish travlers - Black Sea *and* Ocean (Nikolayev), Leninskaya Kuznya (Kiev), Klaipeda;

- fishing factories - Admiralty (leningrad), Black Sea [illegible] (Nikolayev);

- passenger vessels and ferries - Zhdanov (Leningrad), *Gorky:*

- drilling rigs - Vyborg.

Actually, the eight largest yards (Kerch, Kherson, and three each in Leningrad and Nikolayev) are capable of building any type of ships, with very limited prior preparation. Therefore, whenever it is required to construct a unique or very complicated ship or to start a new series, one of these yards usually receives the order. *For* example, the unique fishing factory, Vostok, was built at the Admiralty yard; the largest surveillance vessel, Yury Gagarin, and the second generation of nuclear-powered icebreakers - at Baltic yard; and giant whale factories - at the Black *Sea* yard. Similarly, these sane yards are usually used for starting a new series of large naval vessels.

6 SOVIET MARITIME EXPANSION And SHIPBUILDING

The USSR came out of WWII with a very small fleet of two million DWT total tonnage consisting mainly of very old, or second hand lend-lease and reparation vessels. By the late fifties the overall tonnage had increased to about three million DWT. But during the next 10 years the fleet grew almost live-fold to the level of 15 Million DWT to occupy the 6th spot in the world ranking [17].

Growth has continued up to the present, although at a slower rate. While in the 60s they added primarily general cargo ships of simple design, in the eighties their growth was of a selective type: most of the new orders were either to replace older vessels, or to satisfy special needs. The latter were mainly ships capable of carrying out certain auxiliary naval functions (ro/ro, ferries, oil product carriers, research and hydrographic ships). Another special assignment of a new ship was, and still remains, the aggressive participation in the world ocean trade and competition with the traditional carriers on the major profitable lines. Most of these special ships were ordered from *the* European communist countries, while more sophisticated ships like icebreakers, reefers, and certain container carriers, were built for the USSR in Western Europe.

As of 1986, the number of Soviet ships- on-order exceeded 150. It *grew* to 189 in 1988. and to 210 as of January 1990. While number of Soviet ships on order constituted over 15% of the total' world order book, their share by tonnage was only 3% According to various Soviet publications and official interviews, there is no further substantial planned *growth* of their Merchant Marine for the near future.

The analysis shows that *the* Soviet fleet (currently holding the fifth spot in the World Maritine ranking with its almost 25 million DWT) is capable of meeting most of the water transportation needs of the Soviet economy. Therefore, the decision regarding a further increase of the fleet *size* depends on the evaluation of the three other functions of the Soviet merchant fleet: to earn hard currency; to support the Navy, serving actually as the Navy's {auxiliaries; and to provide transportation of cargoes to and from so-called "friendly nations".

The scope of the first function should be determined by a comparative economic analysis of profitability of shipbuilding for foreign owners versus ship acquisition from foreign and domestic yards for international trade. The odds appear to favor shipbuilding for the foreign owners. The Pepsico-Soviet deal supports this conclusion. As apart of the agreement Soviet shipyards will build for Pepsico at least ten commercial ships, ranging in *size* from 28,600 DWT to 65,000 DWT, with the total value in excess of U.S. $ 300 million, that will later be sold or leased in the international markets [18].

The size of the merchant fleet required to support the Navy's operations can only be determined after the final points of the Soviet commitment regarding the military budget reduction are set. However, due to the severe economic conditions of the country, a decision to limit the Naval assignment of the merchant fleet night be taken independently and much earlier.

The urgent need *for* hard currency might accelerate this move. The latest political events as well as statements of the Soviet leaders suggest that their attitude to the "friendly nations" is gradually changing. There is much less

tonnage needed to support sharply reduced Soviet aid deliveries to Nicaragua, Angola and Vietnam. There are also indications of revaluation of the Soviet-Cuban economic relations which might free up many of the 163 ships that are used on the route to and from Cuba through a substantial period of the entire year [19].

7. ADVANTAGES OF BUSINESS, Relations information WITH COMMUNIST COUNTRIES

The low price of newly built ships is the main attraction for the shipowner t0 enter a business relation with a shipyards in a communist country. These countries manage to underbid their Western or Japanase competition because their production cost is much lower. Moreover, the Government ownership of all shipyards and policy of subsidization, at times, even allows them to set prices below production cost, as long as the sale is for hard currency. However, it is extremely difficult to carry out a decent cost analysis of Soviet shipbuilding because they still censor all the vital data related to ships and shipyards in spite of all changes inspired by the "perestroika". Hence, the limited information presented below is a result' of the author's analysis, evaluation and sorting of the data obtained from various Soviet official and unofficial Sources and publications [20, 21 and 22].

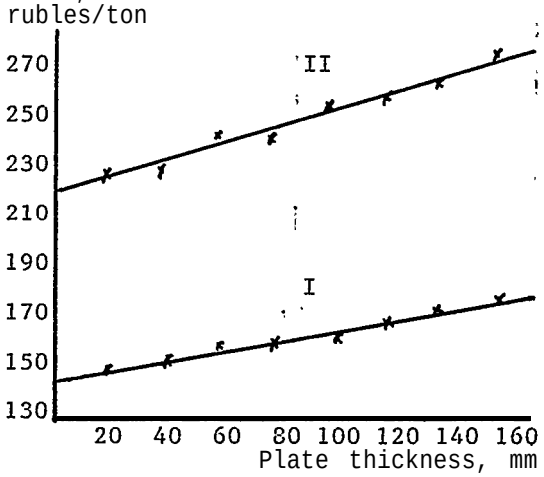
The share of major components of production costs for the representatives of various types of ships built at Soviet shipyards is presented in the Table 2.

Table 2 Production Cost Structure

Ship Types	Material %	Labor Cost %	General Exp. %	Subcontr. %	Others %
'General Cargo	22	9	20	43	6
Tanker	36	9	20	28	7
Ro/ro	20	8	21	44	7
Barge Carrier '(Nuclear)	13	8	22	47	10

Material costs are composed of steel, propulsion plant, auxiliaries, and other materials. The USSR is the largest producer of steel in the world, and their prices are the lowest by far Fig. 2 shows list prices for steel plates in rubles per ton, which vary depending on steel quality and plate thickness.

The official Government exchange rate is one ruble for U.S.$l.5 which is artificial and not based on purchasing power parity. Moreover, the Soviet Government has recently announced a special business exchange rate of one U.S. dollar for six rubles, although, it is not clear if they intend to use it in all commercial transactions. Even based on the official rate, the average cost of U.S.$300/ton appears extremely low. A reasonable assumption would be an additional premium of at least 50% applied for special brands of high tensile steel. And it is also obvious that the price for steel, as well as for any other materials and components



I - Regular shipbuilding steel
II - High-tensile steel

Fig. 2 List Prices for Steel Plates

intended for use on foreign orders, would substantially differ from those used on the internal market. It has been for years a practice of strict separation of the internal market from the export activities in pricing and financing area, as well as, in material supply system.

The general policy of the shipbuilding industry in Communist countries is to buy as little as possible from the foreign vendors in order to save hard currency to maintain lower production costs. The Soviet industry itself is capable of producing practically any component of a ship, including diesels, turbines, all auxiliaries and electronics. Low labor rates and low costs of basic materials contribute to a very competitive cost of production.

Major diesel factories in Poland, East Germany, Czechoslovakia, and several plants in the USSR including those in Leningrad and Bryansk manufacture the entire range of marine engine types and sizes. In general, quality is the main problem of the industry, and of diesel manufacturing, in particular. The recent production and technology improvements combined with licensing the best designs from Sulzer and MAN/B&W might help them. to become competitive in the world diesel market. The decisive advantage of Soviet and Cast European diesels, as well as other marine machinery, is the fact that their price is below world market level.

The main variable in construction expenses is labor cost, which in turn is dependent on labor rates and consumption. A rough estimate of total labor consumption for the construction of a cargo carrier, 160 m long and 12,000 ton of light weight, at a typical Soviet shipyard, is equal to about one million man-hours, or about U.S.$1.5 million for total direct labor cost. Another interesting price parameter is production cost per one man-hour of labor consumed. The average value for this parameter is 13 rubles, however, it sets just an approximate value, because real cost depends on vessel class, yard particulars, etc.

Cost of production labor is a function of labor rates, fringe benefits, insurance and other related charges, and labor productivity. The Soviet labor rates are among the lowest in the world: one man-hour of average skilled labor costs in the range of .60 - 1.25 rubles. Using the official rate of exchange, it equals to approximately U.S.$l.50: with the more practical rate U.S.$1.00 for six rubles the average labor cost is estimated as U.S.$0.20 per one man-hour.

The cost of design and production engineering support comprises substantial portion of the overall production cost. Communist countries, and especially the Soviet Union, are capable of providing quite adequate service for the lowest price. The Soviet Union, for instance, has created a huge multi-tiered educational system which contributes a great deal to the shipbuilding industry.

More than twenty schools - universities, colleges and academies - offer 5-6 year engineering programs in marine related fields including marine, electrical, radio and electronic engineering, as well as naval architecture. Several thousand engineers join the shipbuilding and repair enterprises every year. Therefore, it is not unusual to find that 5-10% of the overall workforce at a given yard are specialists with engineering, certificates or diplomas. Their salaries, however, are very close to those of the production workers in the area of 150-200 rubles or $225-300 per month [18].

The development of an efficient shipbuilding organization is one of the principal areas of engineering and scientific studies in the Communist countries. The following essential factors have contributed significantly to the success of these studies: high level of standardization; extensive experience in employing various management methods based on detailed planning of all activities; constantly growing demand for products of shipbuilding; and strong support by a vast engineering and scientific community.

For instance, the modular system of ship construction is seen in the USSR as one of the most significant break-throughs in the organization and management of ship construction. The modular system is based on standardization, group technology principles, zone outfitting, vast experience in the block/section method of vessel hull forming, and on the process lane concept. One of the first practical applications of modular principles appears to be the highly publicized construction of a series of KRYM-class super tankers of 150,000t DWT in Kerch' and the subsequent POBEDA-class series.

3. PROBLEMS AND DEFICIENCIES

The product quality is an Achilles tendon of shipbuilding production in Communist countries, especially in the Soviet Union. It is reflected in poor

workmanship, inadequate appearance of compartments and accommodations, a high level of machinery and equipiment wear, more frequent failures, and excessive warranty claims.

The quality of products is the major concern of their research and engineering institutions, and also of special quality service departments of the shipyards. For instance, to the individual Soviet shipyard a unique RITM Engineering and Production Association has been created in the USSR: a combination of the midsize Petrozavod shipyard in Leningrad with the Leningrad Engineering Institute for Shipbuilding Technology. This government financed association employing hundreds of engineers and production workers has been given the task of developing and manufacturing new ship production equipment and tooling for use in Soviet shipyards. The goal of this effort is productivity and quality increases.

To the advantage of the Soviet, East European and Chinese shipbuilders, many shipowners are still maintaining :a "built cheaper" approach without proper regard for future operational and maintenance expenses. While crew reduction and fuel saving considerations are normally a part of an evaluation of a proposed shipbuilding project, the maintenance and repair costs and the corresponding losses of operational time are not yet taken properly into account.

The absence of thorough studies on the subject is the main reason that whole life cycle evaluations are not done on a regular basis It would have been very interesting to carry out a comparative study on maintenance and repair costs for comparable ships built in different countries, as was done in a very informative study conducted by Prof. H. Bunch regarding ship construction costs in the U.S., Japan and China [12].

The time needed to construct the ship affects general production expenses, expected profits of the shipowner, and also the amount of interest payments to the mortgage holder. The Soviet and East European yards are at obvious disadvantage compared with their Western or Japanese counterparts. Due in large part to inefficiencies of central planning in the USSR, and its legacv in Poland, Bulgaria, Romania and Yugoslavia, the construction time significantly exceeds that of, for instance, Japan.

9. Conclusion

Low cost of shipbuilding, a decent technology level, and comprehensive engineering support suggest that some kind of a business involvenent with a shipyard in a communist country might prove profitable for an American Shipowner. The question for this audience is whether American shipbuilder can benefit from business relations with Communist countries. In the opinion of this author, there are a few avenues to follow:

1. A management agreement might be welcomed by a certain Soviet, East European or Chinese shipyard that is struggling to gain needed experience in how to operate in a free market world, how to incorporate the modern computer based management methods, and how to deal with quality problems.
2. Subcontracting a shipyard in a communist country to fabricate hull structural modules (cheap steel and high expertise in welding at Soviet shipyards), various auxiliary machinery units and installations.
3. Subcontracting a shipyard for a partial or even complete construction of a ship under the condition that all managerial (ship management., project management, scheduling, etc.), certain material and equipment procurement, quality control and some engineering functions are carried out by an on-site team of the general contractor.
4. Hiring or subcontracting an engineering institution in a communist country, for instance, in the Soviet Union, to carry out certain studies (naval architectural, marine and electrical engineering, etc.), prepare a proposal, conceptual or/and detailed design. Incidentally, the Krylov Scientific Research Institute, a Soviet counterpart of the David Taylor R&D Center, offers foreign shipbuilding companies the opportunity to study the hydrodynamic properties of new designs in their 625 and 218 meters long towing basins.
5. Various types of joint ventures including a partial ownership of shipyards and machinery shops in the Communist countries.

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