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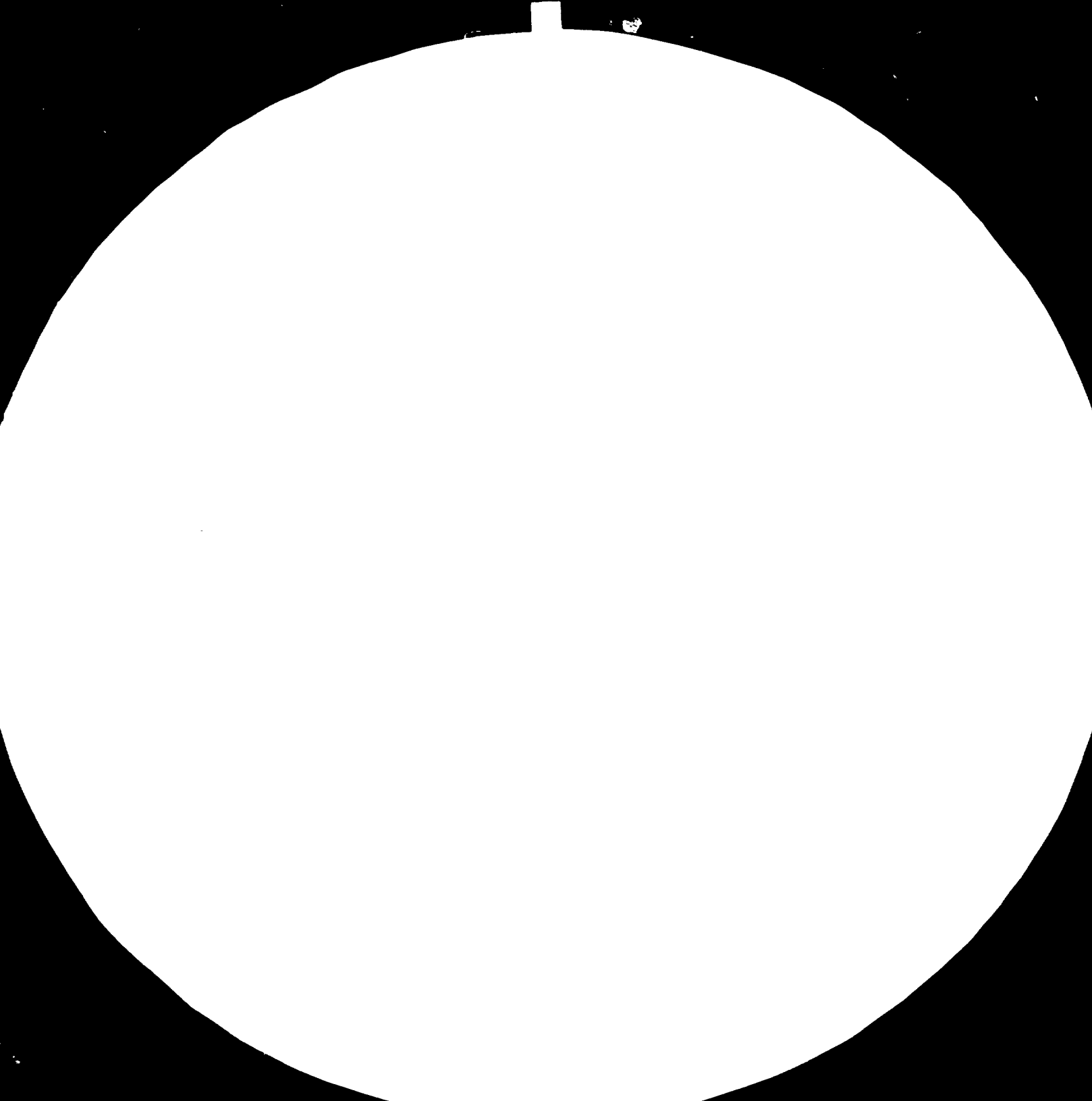

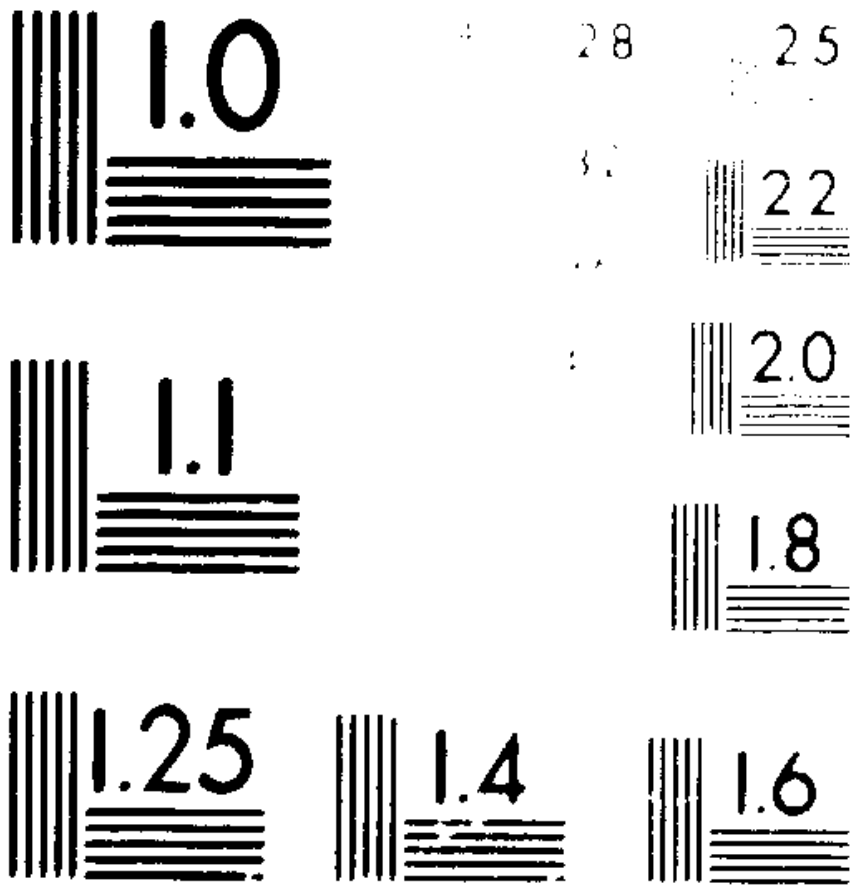

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REPORT

ON POSSIBILITIES OF FUTURE DEVELOPMENT OF WATER TRANSPORT, SHIPBUILDING AND OCEAN ENGINEERING IN THE DEVELOPING COUNTRIES AND NECESSARY TECHNICAL ASSISTANCE VIA UNIDO

Prepared by:

Dr. P.A. Bagdanov

According to the consultation on Special Service Agreement

2708

Vienna

31 August 1984

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Annexes 1

Outline of the global study of technical and economic nature concerning the state and perspectives of the development of shipbuilding, water transport and ocean engineering in the developing countries and the necessary technical assistance for its implementation via UNIDO

Appendix 1

Main fields of the scientific and technical progress, whose application will be actualized at the assessment of the international shipbuilding and marine industry

Appendix 2

List of additional informational sources which are enviaged to be (under initiatives and in accordance with the possibilities creased by BSMC) additionally used for a better realization of the investigation.

1. SUMMARY

One week consultation on shipbuilding industry on special service agreement was carried out at UNIDO headquarters, Vienna, from 27 August 1984 to 1 September 1984. The main conclusions and recommendations are the following:-

1. The development of marine industry and shipbuilding favourably reflects on a number of other sectors of the economy of the developing countries.

2. The stimulating role of marine industry and shipbuilding can be seen in many directions and the development of maritime business would be a legitimate integral part of a long-tenage strategy, with multi-purpose complex approach for overcoming the lag in comparison with industrialized countries in production of capital goods. Through this, a vertical and horizontal integration would be achieved with other sectors of industry and the foreign exchange balances would be considerably improved to assure expanded reproduction.

3. The possibilities of multi-purpose utilization of the shipbuilding capacities and facilities are large and favourable.

4. An effective technical assistance and international cooperation of accelerated development of shipbuilding and marine industry is strongly needed.

5. It is desirable to review and update UNIDO's programme in this field and to give first priority to the activities assuring development of marine industry and shipbuilding in developing countries.

6. Bearing in mind complexity of the problems as well as many other aspects it is desirable to carry out a global study of technical and economic nature concering the perspectives of development of shipbuilding, water transport and ocean engineering in the developing countris and the necessary technical assistance for its implementation via UNIDO. As annex to the report conceptual programme (outline) for possible global study is given.

Finally the author hopes that recommendations given for the most part can be accepted and utilized without much delay.

2. BACKGROUND AND JUSTIFICATION

2.1 For years the developing countries have been showing an increasing interest and many of them has undertaken great efforts to develop national shipbuilding, marine industries, ocean engineering and related industries in order to meet growing basic demands in the national and international scale.

2.2 Majority of developing countries have a coastline and a linkage with maritime activities. Only about 15 developing countries have not coastline (Paraguay and Bolivia in Latin America; Zambia, Zimbabve, Rwanda, Burundi, Uganda, Central African Republic, Niger, Mali and Chad in Africa; Laos, Afghanistan and Nepal in Asia)

2.3 The developing countries are all at various stages of economic and social development, but more than 40 developing countries started with building activities and achieved some progress in the development.

2.4 Shipbuilding in years to come will be increasingly influenced by the struggle for a more evenly balanced distribution of shipping between the developed and developing countries.

2.5 At present, the developing countries have a lot of problems for future development of maritime industry and shipbuilding and an international assistance and cooperation will be very useful.

3. THE CONSULTATION

3.1 The development objective of the consultation is to assist in further development of shipbuilding, marine industry and ocean engineering in the developing countries.

3.2 The immediate objectives of the consultation to review the following aspects:

- The worldwide restructuring of the shipbuilding industry;
- the integrated development of shipbuilding and iron and steel industries;
- the possibilities of multipurpose utilization of shipbuilding facilities

and to write a short report.

The work of the author was performed during his stay in Vienna, after very useful discussions with UNIDO representaitves, namely:

- Mr. G. Latortue, Head, Negotiations Branch, DPC;
- Mr. A. Vassiliev, Director, DIO;
- Mr. M. Delos, Head, IO/ENG;
- Mr. G. Campos-Rademacher, Chief, Basic Industries Unit, PC/NEG;
- Mr. C. Gürkök, Industrial Development Officer, PC/NEG

Representatives of UNIDO mentioned above have made a valuable work and the cooperation with them is herewith gratefully acknowledged.

For the above-mentioned project activities it was necessary in the very short time to prepare a short report and suggest conceptual programme for implementation of necessary global study.

4. STATE AND TENDENCIES IN THE GLOBAL DEVELOPMENT OF THE WORLD SHIPING AND SHIPBUILDING AND THE WORLD-WIDE RESTRUCTURING OF THE SHIPBUILDING INDUSTRY.

4.1 At present about 90% of all transports in the world foreign trade turnover is realized by the sea transport because of which it affects directly the development of the social production. The analysis of the water transport development allows the drawing of the conclusion that its role in the world economy will be decisive for the long-term perspective which is explained with the uneven distribution of the natural resources, the intensive development of the industry, the international division of labour and the constant increase of the population on the earth.

4.2 According to Lloyd's register of shipping data towards 1 July 1982, the world merchant fleet includes 73864 ships with total capacity 420.8 million gross register tons. At that 43% of the tonnage in the structure of the world sea transport is allotted to the tankers, 27% to the carriers, 19% to the general cargo ships, while the container ships and the barges occupy about 3%.[7]

4.3 The data for orders of new ships show that according to types of ships there is an increase in the groups of the container ships, the bulk carriers and tankers below 150,000 TDW.[8]

4.4 The crisis which started in the 70's and has reflected in the shipping and the shipbuilding, can be considered as a typical phenomenon of adapting the world economy towards the period characterized with low rates of development. The crisis state in the shipping, the low transport taxes and the raised fuel prices directed the ship owners towards search for high efficient universal and multipurpose ships, i.e. ships adapted for transport of several types of products and cargos. A number of developed countries and leading companies directed themselves towards accelerated development of the scientific and technical progress and towards production of more complex and science-consuming, expensive, specialized ships and facilities. Gas carriers,

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7/ Statistical data, Lloyd's register of shipping, London, 1 January 1983.

8/ Fairplay International Shipping, List of ordered ships, London, Jan. 1984.

chemical carriers, container ships, ships with horizontal loading and discharging Ro-Ro type, technical means for investigating and adopting the ocean resources, warships, etc. With the purpose of partial compensation of the reduction of the package orders and simultaneously for ensuring possibly highest profits.

4.5 For the period until 2000 the increase of the volume of the sea transports will be realized at the same rate as in the recent 30 years; so that towards 2000 it is expected that 10-15 billion t. various cargos be transported, while their total volume for 1982 amounts to 3.5 billion t. For the same period of time the total dead weight for the world fleet is predicted to be about 1500 million t. in comparison with about 700 million t. in 1983 (Fig.1.2)

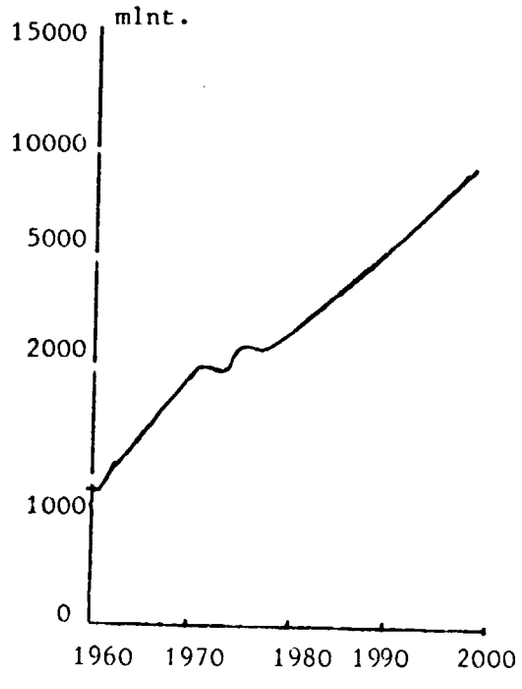


Fig. 1. Dynomics and prognosis of the world cargos sea transports

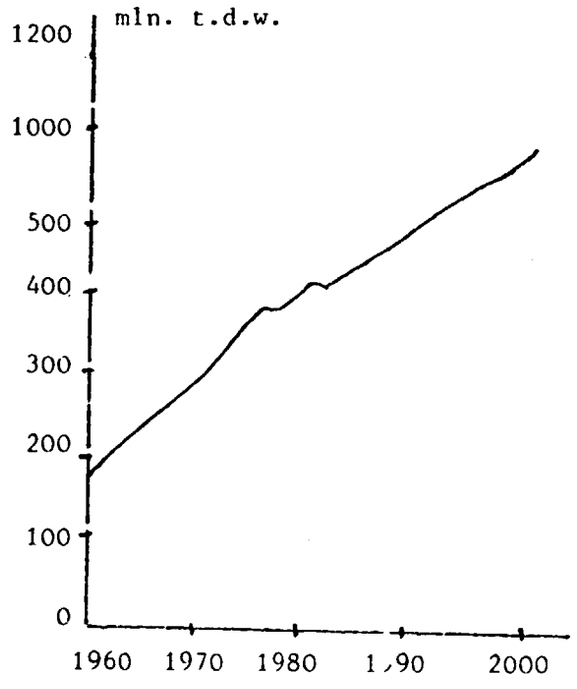


Fig.2 Dynamics and prognosis of development of the world fleet

4.6 The share of the developed countries in the world ship production is threatened very much by the sharp increase in labour costs in these countries. Despite the increase in the degree of automation in the production processes of shipbuilding, the relative share of labour expenses is too high when beginning production. In Fig.3, the correlation between the average international prices and the costs of production for standard ships in the FRG, Japan and the UK are shown, and it can be clearly seen that during the last years, the prices for these ships were approximately half of the

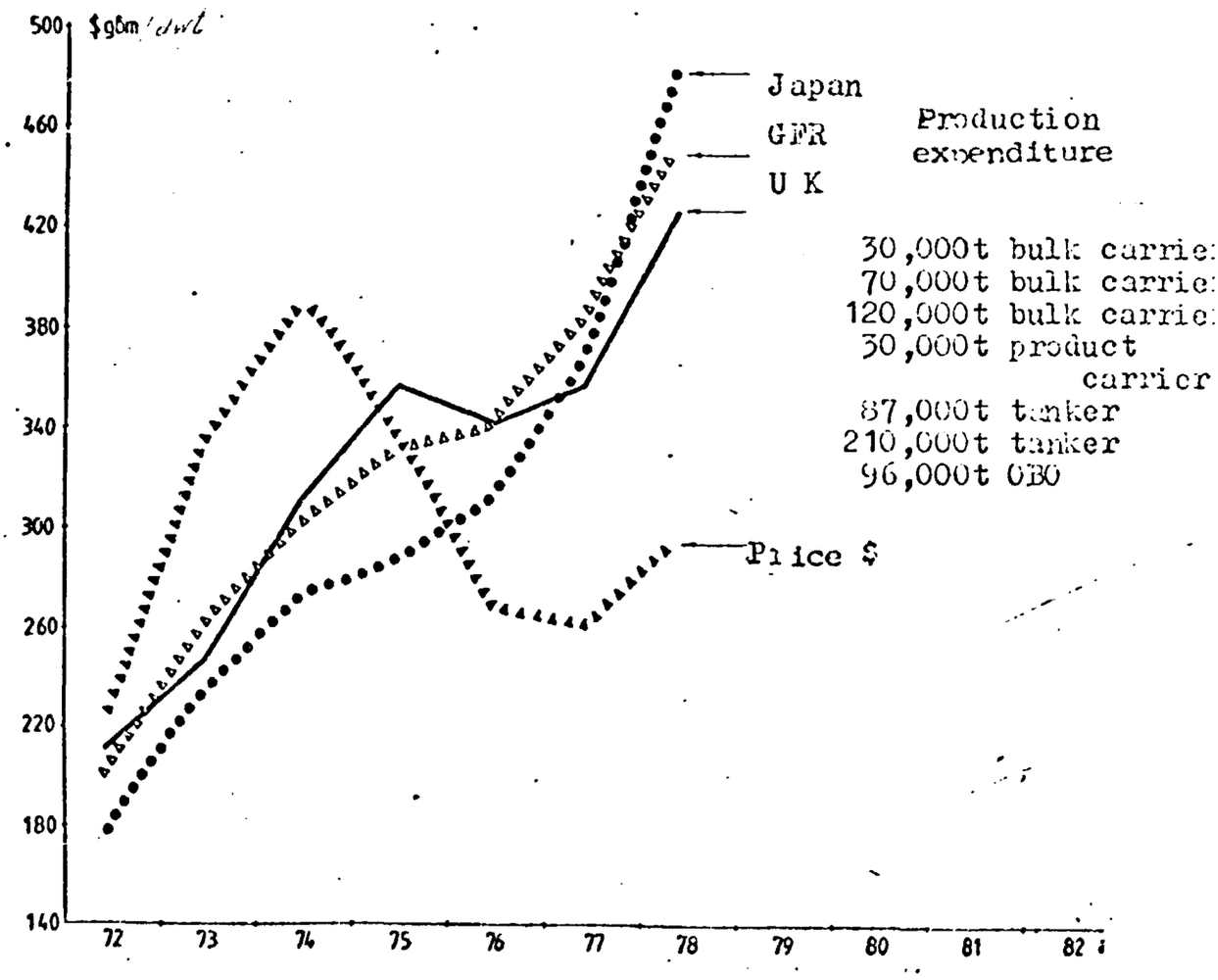


Fig.3. Dynamics of production expenditure for standard ships in the period 1972-1982

production costs. This constant trend explains why the developed countries curtailed the production of standard ships even though such ships are in demand on the world market and such ships are no longer being built even if the industrialized countries have production capacities free of order. Hence, a very good opportunity is created for the developing countries to increase their share in world ship production. This is verified by the fact that from 3 percent of the total world orders in 1978, the Republic of Korea reaches 19 percent in 1983. Throughout the same period, the share (between 1 percent and 2.5 percent of the total world orders) of many other developing countries in shipbuilding greatly increases: for example countries such as Brazil, the People's Republic of China and others.

This restructuring of the ship producing countries is taking place at the expense of Western Europe and the USA, whereby only Japan preserves its relatively high share due mainly to that country's high level of scientific and technological development.

4.7 For the same reason as in para.4.6 and because of the bigger labour consumption of the ship repair and due to the very nature of the work involved therein, the industry is suitable and attrative for the developing countries to expand and develop not only for their own needs, but also for considerable export.

4.8 The adoption of the world ocean resources will be realized in the way of creating complicated projects for scientific research ships, underwater apparatuses and constructions of technical facilities and devices ensuring resources extraction in the continental shelf as well as in the regions with great depths.

4.9 The prognosis for development of the fishing fleet shows that many ocean trowlers and vessels for fabrication and transportation of production will be necessary (Fig.4).

4.10 For the new ships and other floating structures, the accelerated application of the achievements of the scientific and technical progess will be characteristic, as well as the further increase of the rate of automization and the equipping with electronic installations, computers, micro-processor technique, etc.

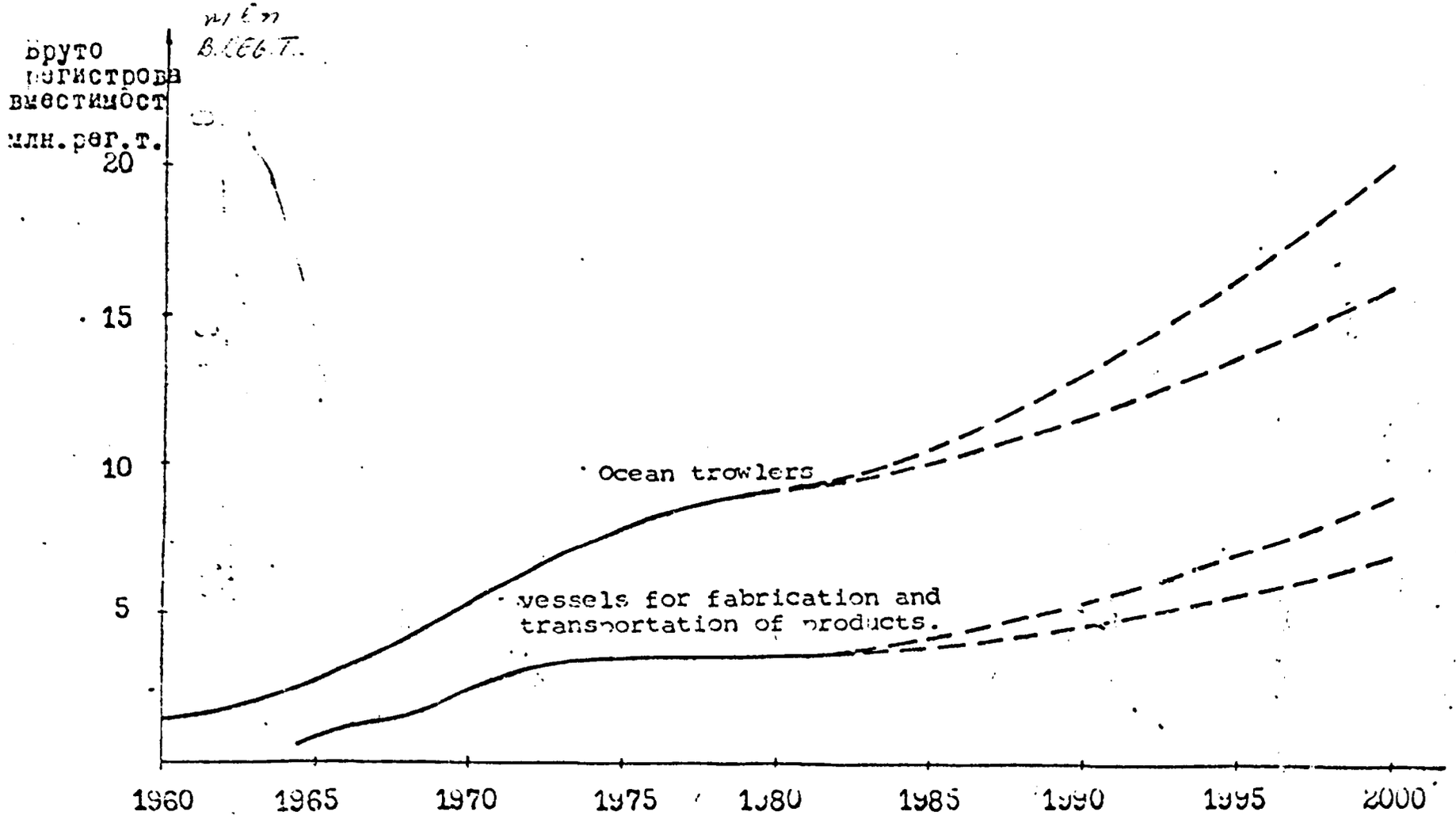


Fig. 4. Prognosis for development of the fishing fleet.

5. BASIC ADVANCED ACHIEVEMENTS IN THE SCIENTIFIC AND TECHNICAL PROGRESS IN MARINE INDUSTRY AND SHIPBUILDING

5.1 Many factors determine the tasks of ship hydrodynamics for increasing the effectiveness of water transport. Among the multitude of factors conditioning the role and importance of ship hydrodynamics, the increase of fuel expenses has an exclusive and determining influence. Their share in the operating expenses structure being 7-8% in 1970 attained about 30% in 1980, and is expected to rise to 30 - 40% towards 1988 (with a confidence interval), as is shown in Fig.5. This figure has been drawn according to calculations of the firm "Zulzer" for 170,000 TDW bulk carrier[10/]. Meanwhile, the calculations data for 1982 show that for a number of ships only the fuel expenses amount to 60%, categorically dominating in the structure of operating expenses. At that, the increase of the fuel expenses share is accompanied by a simultaneous increase of the absolute share of all components, namely: for crew maintenance, docking, insurance, capital expenses, allowance for depreciation, etc.

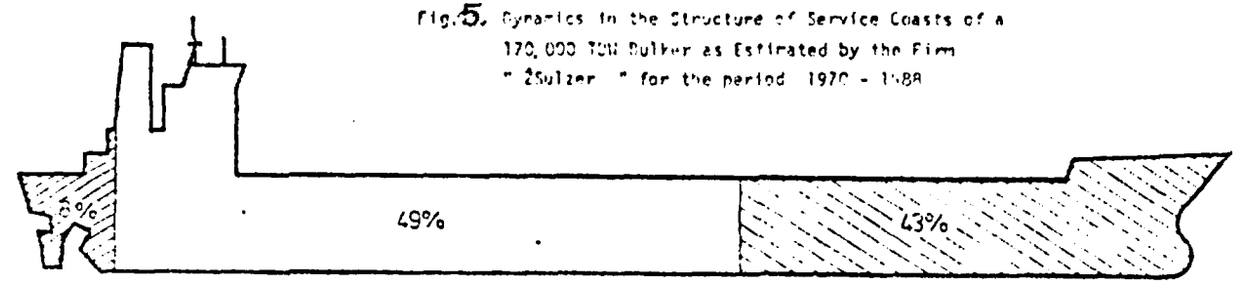
5.2 Since some Japanese and other leading firms realized a number of new approaches connected with the application of new technical solutions, a whide confirmation for their rationality and efficiency was received. This refers to the application of non-conventional propellers, local changes are in the bow and bulb hull contours, realisation of improved propulsive systems etc. leading to lowering of the energy consumption as well as of full expenses of ship. It should be the methods and means ensuring improvement of ship performance and its handling and manoeuvrability in waves, which documinates in real exploitation[11/]

10/ Study and publication of firm "Zulzer", Zurich, 1982.

11/ P. Bogdanov, "The increase in the role of ship hydrodynamics in the Scientific Service of Bulgarian Shipbuilding and National Economy for the Period 1981-2000", BSHC report, Dec. 1982 (updated in July 1984).

Fig. 5. Dynamics in the Structure of Service Coasts of a 170,000 TDW Bulker as Estimated by the Firm " Sulzer " for the period 1970 - 1988

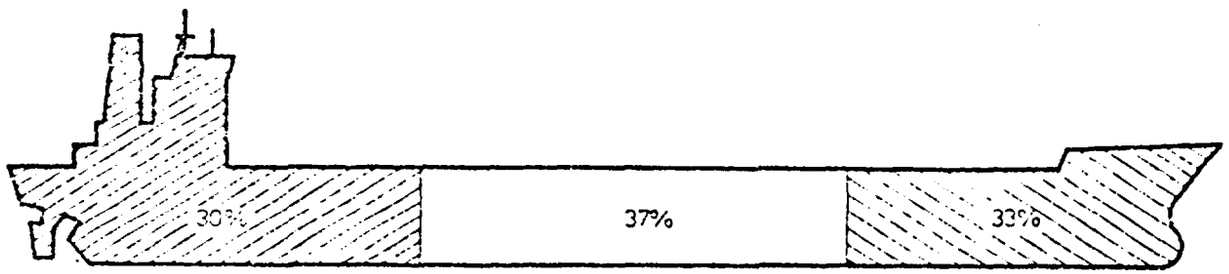
1970



Legend :

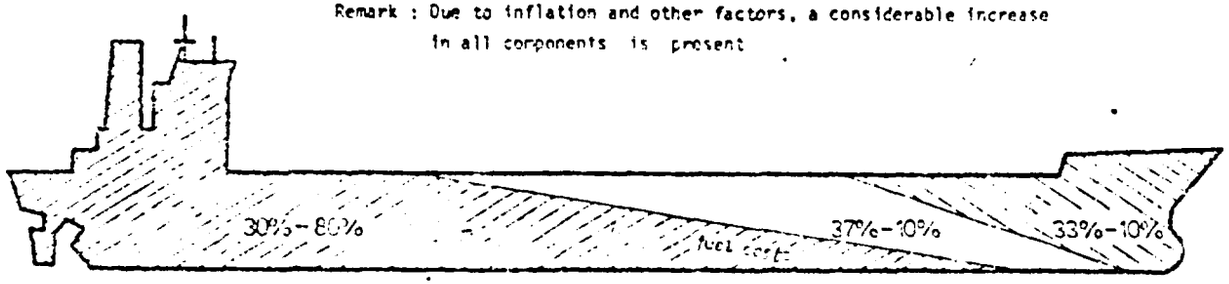
Voyage costs, fuel port and canal fees	Other daily costs, crew maintenance, docking, repairs, insurance, administrative costs.	Capital costs interest, allowances for depreciation

1980



Remark : Due to inflation and other factors, a considerable increase in all components is present

1988



(30 % without change in fuel prices ; 80 % if the tendency for 1970 - 80 ; and in the period 1980 -86 ; is preserved ; for 1988 the results show that only oil expenses amount to about 65 %)

5.3 The considerable economy of these new approaches and solutions (includes qualitative evaluation of their efficiency) predetermines their importance for ensuring competitiveness of ships at their production and at the freight market. In this respect, the hydrodynamic investigations are topical as regards their importance for ensuring multiaspectual technical and economical advantages.

5.4 Most generally, the determining and progressive achievements of the scientific and technical progress in the leading shipbuilding countries, can be characterised as follows:[12/]

- Improvement of the ship forms, optimization of the dimensions, application of self-polishing, antifouling coatings and adoption of methods and devices leasing to decrease in the ship motion resistance and reduction in the energy expenditures (power and fuel) upto 20-30%;

- Alternative application of non-conventional propulsive systems ensuring reduction in the energy expenditures up to 15%;

- Adoption of effective stabilizers and means of handling, ensuring improvement of the manoeuving qualities and considerable decrease in the speed losses in waves and simultaneously increase in the shipping reliability and safety;

- Appearance of ships with new principles of movement (hydrofoil, air-cushion, semi-submerged, catamarans, etc.;

- Improvement of the methods of design and optimization of the ship constructions and mechanisms leading to reduction in the metal consumption and improvement of the production processes technology and organization and adaptation of new materials;

- Improvement of the ship energy installations, devices and systems, ensuring reduction in the operational expenses, increase in the ship reliability and facilitating the labour of the crew;

12/ P. Bogdanov, et al., "Scientific and technical progmosis for the development of shipbuilding and marine industry till 2000"; BSHC report, March 1982 (updated in July 1984).

- Improvement of the methods for protection against noise and vibrations ensuring the ship habitability and comfortability and improvement of the reliability at the same time;

- Adoption of progressive technological methods ensuring repeated increase of the productivity of labour for different processes and reduction of the cycles and considerable improvement of the conditions of labour at the same time including application of complex mechanisation and automization, use of manipulators, robots, etc.;

- Computerization and electronization of the ships and the shipbuilding technology;

- Intellectualization and automization of the scientify experiment, the engineering activities, management, etc.

5.5 The leading achievements realised in the shipbuilding of the advanced countries is explained with the following major preconditions:-

- Complex application of modern theoretical and experimental methods based on the utilization of modern experimental facilities, powerful computer resources, application of the achievements in the scientific instrumetation, etc.

  In this relation it should be pointed out that all developed countries have worked out and are constantly working out solid multipurpose laboratory-experimental complexes and are creating new research centres and laboratories of national importance as well as in the status of separate firms and universities;

- Carrying out systematic research activities and multivariant investigations and model and full scale tests, considerable resources being ensured for the purpose. Thus for instance, for the leading firms in Sweden and Belgium the expenditures for the scientific service for the complex types of ships exceed 9% of the volume of production, with the number of the designers in the Japanese shipbuilding with 10% of the total staff, the expenses for designing vary from 6 to 10% of the ship prime cost, etc.

5.6 Attributing strategic importance to the scientific service the developed countries allow considerable subsidies of the national budget for financing the perspective outpacing and accelerated development of the science and the scientific investigations and creation of science-consuming highly reliable ships.

6. ADDITIONAL FACTORS FAVOURABLE TO THE PROCESS OF BRIDGING THE GAP BETWEEN DEVELOPING AND INDUSTRIALIZED COUNTRIES IN THE PRODUCTION OF CAPITAL GOODS THROUGH DEVELOPMENT OF MARINE INDUSTRY AND SHIPBUILDING.

6.1 Typical for the great majority of developing countries is the limited one-sided nature of their national economies and their great dependence on import. This necessitates considerable participation in international trade; the prevailing activities are the export of raw materials, minerals and agricultural products and the import of industrial goods. In the world shipments prevails the share of marine shipments (80-90%), realized mostly by sea transport.

6.2 For most developing countries a number of profitable conditions and pre-requisites exist for establishment and development of shipbuilding, as well as of other sectors of marine economy. They are predetermined by free human resources, cheap manpower, favourable climate, considerable length of the coast, convenint gulfs and water areas, etc.

6.3 In connection with population feeding and coastal regions suitable for fishing, great is the importance of the development of fishing and fish processing ships and floating facilities.

6.4 Many developing countries have large navigable rivers, which, however, are not sufficiently used for shipments of goods and passangers and for fishing with modern ships.

6.5 Though a number of developing countries possess continental shelf regions rich in oil and gas, due to their economic and technological backwardness they have not yet begun even the preparation for adoption of these large quantities of raw materials (excluding, to a certain extent, Venezuela, Brazil, Mexico, China, West Africa, India, Middle East, South-East Asia, etc.[10/]

6.6 In order to participate more successfully in international exchange of merchandise, and taking account of the above factors and circumstances (3.1-3.5), a whole group of developing countries (though still very small)

10/ The Journal of Ocean Business, October 1983; A Pennwell Publication.

have created their own marine fleets and are exerting efforts for their maintenance and further development; many of them have overcome serious economic and technological difficulties. Some countries have built, and envisage to continue to build in the future, ship repair and ship construction facilities and yards for meeting a large part of their necessities. With small exceptions, these facilities and yards are, however, on a low technical level.

6.7 In some developing countries the above factors have been taken into account comparatively fully, and considerable investments have been made, as a result of which shipbuilding is turning into a significant export branch (Korea, China, Taiwan, Brazil, Hong-Kong, Singapore, etc.)

6.8 Productioa of ships, which are large and sophisticated complexes, consisting of more than 10,000 various articles in average (as a rule, most of these products are supplied from factories from outside of the shipbuilding i ·stry itself.) This is an industrial sector which has universal connection with and importance for the industrialization of the developing countries. It is difficult to find another sector of production of capital goods which would be relevant for so many developing countries, big and small.

In the process of decrease of the import of completing equipment and materials for the shipbuilding, the role and importance of this sector would increase constantly, since it would give impetus to the overall development of the national economies.

Even if, at the initial stages, the portion of imported equipment and materials in considerable, the shipbuilding could be profitable, due to the considerable part of added value in the overall cost. This has been so even in conditions of much higher costs of labour than in the most of the developing countires.

6.9 The shipbuilding plays a specifically positive role in the payments balances, when the national fleets are being fully equipped with ships then the expenditures in foreign currency for maritime transport by other (foreign) carriers are decreased, as well as those for purchase and repair/maintenance of ships abroad.

When the sector is developed to the extent to permit export of ships, then the shipbuilding becomes a sound currency earner.

6.10 The stimulating role of the shipbuilding can be seen in many other directions. For instance, the considerable requirements of this sector for metals further the rational utilization of existing metallurgical capacities, and/or justify their establishment and increase to the extent to provide optimum conditions of production of iron and steel and non-ferrous metals.

In this way, instread of export of ores and ore concentrates at low international prices as the case is, the developing countries would become to be in position to export, through the ships, processed raw materials and semi-fabricates.

6.11 The development of the shipbuilding favourably reflects on a number of other sectors of the economy, and, specifically, on the machinebuilding and the chemical industry. The systematic gradual development of the shipbuilding is connected with constant increase of the relative percentage of indigenous equipment and products, such as various cast and forged parts, main and auxiliary engines, diesel generators, compressors, pumps, ventilatiors, boilers, air-conditioning systems, electrical and electronic equipment, various plastics, paints and lacqers, household equipment, etc. A great number of these products could be exported and/or could be made subject of specialization and industrial co-operation among developing countries. Through export of ships themselves, which are commodities of a complex nature, a favourable export of national product is ensured.

7. POSSIBILITIES OF MULTI-PURPOSE UTILIZATION OF THE SHIPBUILDING CAPACITIES AND FACILITIES/

7.1 The technological experience and the production capacities for shipbuilding and repair/maintenance of ships, could be widely used in the following areas:-

- Erection of bridges and other welded metal structures, necessary in the industrial and civil construction;

- Production of oil-producing/drilling platforms, and other equipment for industrialization of sea resources (including stations working on the principle of utilization of the energy of the waves and tides;

- Production, repair and maintenance of harbour cranes and other equipment, construction cranes, and other cranes;

- Production of floating, or stationary pumps for irrigation;

- Production and repair/maintenance of fishery equipment;

- Production of tanks, pans and other articles for the chemical industry;

- Production, repair and maintenance of locomotives, railway cars, and other railway equipment.

7.2 Considering the above, and also from what has been said in Parts 4 and 6, one could come to the conclusion that the development of the maritime business, and the shipbuilding in the developing countries would be a legitimate integral part of a long-range strategy, with multi-purpose complex approach for overcoming the lag in comparison with the industrialized countries in production of capital goods. Through this, a vertical and horizontal integration would be achieved with other sectors of industry and the foreign exchange balances would be considerably improved to assure expanded reproduction.

8. SOME CONSIDERATIONS CONNECTED WITH NECESSARY TECHNICAL ASSISTANCE AND UNIDO ACTIVITIES.

8.1 Even for the developing countries, making considerable investments in shipbuilding and marine transport, the effectiveness is significantly lower and the competitiveness insufficient, as compared to the advanced countries, which is due to the impossibility to adequately solve the multitude of scientific and technical problems connected with the production and operation of such complex and with high requirements technological facilities as ships and other floating structures. In the conditions of rapid scientific and technical progress and grown requirements to cheapness and safety of ships (as will be clarified further, when treating the trends determining modern development), these countries are meeting serious difficulties at the stage when their own design and construction potential and scientific research capacity are still not strengthened. For this reason they are spending large funds for delivery of ship projects from the developing countries, for import of technological equipment, know-how, consultant assistance, etc. It suffices to say that the value of consultant assistance for one man/week varies from $ 15,000 to $ 20,000 that the fees for short-term (one week) training of one person in West Europe have reached $ 20,000, etc.

8.2 Compared to what was described in 8.1, the majority of the developing countries are in still more unfavourable condition, because they depend on the industrialized countries totally, not only in separate fields of science and technology. Moreover, as a rule, it is not sufficiently clear to a multitude of countries what is the nature of technical assistance necessary and what are the ways for its effective use. This is predetermined by many reasons; of particular importance are the insufficient funds and the lack of national staff and management, respectively trained and oriented.

8.3 In such as way, from what was said in 4, 5, 6, 7 and 8.1 - 8.2 above, the advisability becomes clear of analyzing the state and necessities for technical assistance to the developing countries in the field of utmost importance being discussed, which would be most favourable, efficiently all-embracing, if realized with the methods and means applied in UNIDO and UNDP practice.

8.4 For immediate action it is recommended as follows:-

- To carry out a global study of technical and economic nature concerning the state and perspectives of development of shipbuilding, water transport and ocean engineering in the developing countries and the necessary technical assistance for its implementation via UNIDO. Some possible concept and outline of this study is given in Annex 1. (The study could be executed in the proposed way by BSHC, having experience in analogous investigations and additional capabilities connected with organized national integrated system for research, design and training of personnel for marine industry, shipbuilding and ocean engineering with participation of 12 scientific and research institutes).

- To give necessary priority of the project "Meeting of Experts on the Problem of Industry-Research Linkage in the Field of Shipbuilding" (Bulgaria, 7-11 October 1985), scheduled start: September 1984 and completion: November 1985.

Annex 1

CONCEPT

O U T L I N E

of the **global study** of technical and economic nature concerning the state and perspectives of development of shipbuilding, water transport and ocean engineering in the developing countries and the necessary technical assistance for its implementation via UNIDO

1. TITLE OF THE GLOBAL STUDY: "State and development of world shipbuilding, marine economy and ocean engineering in the next 5-6 years and in further perspective till 2000 - problems and necessary technical assistance for the developing countries, with a view to increasing their relative share in world economy and accelerated application of the achievements of scientific and technical progress"

2. BASIS OF THE STUDY: Proceeding from the necessity to choose out of the variety of problems the major ones, and particularly taking into account the rather limited information and even the lack of statistical data in a number of fields, it is envisaged to treat as follows:

2.1. Shipbuilding (mostly: necessities and orders for new ships, yards for construction of transport ships and for ship repair, directions for the development and application of the achievements of scientific and technical progress in the creation of transport ships, as well as in the technology and organization of production and partly: development of fishing ships construction, construction and operation of ships for the technical and auxiliary fleet, production of main and auxiliary ship engines and other outfitting ship equipment and basic materials).

2.2. Marine transport - complete review of the different in destination types of ships (for general cargo, for liquid cargo, for bulk and containerized cargoes, etc.) and partial review of sea ports and inter-islands shipping services.

2.3. Ocean engineering - complete review of oil and gas production from the continental shelf and partial [illegible]

2.4 River transport and construction of river ships - general review.

2.5 Ship repair - general review.

2.6 Coast protection from the abrasive action of the sea-general review.

3. BASIC GOAL OF THE STUDY

3.1 Determination of factors and approaches for increasing of production of capital goods in developing countries through development of marine industry, shipbuilding and ocean engineering.

3.2 Clarification of necessary technical assistance and international cooperation via UNIDO and UNDP.

3.3 Increasing of effectiveness of long-term programme of shipbuilding and shiprepair development.

4. IMMEDIATE OBJECTIVES AND TASKS OF THE INVESTIGATION

4.1. Analysis and generalization of the results from the development of world marine shipments, shipping, shipbuilding, ocean fishing, sea ports and ocean engineering and assessment of the characteristics which predetermine the pattern of the future development.

4.2. Analysis of the achievements of scientific and technical progress up to now and appointment of the factors and prerequisites predetermining their application (See Appendix 1).

4.3. Analysis of the dynamics of world orders for ships in the past 3-4 years and their structural distribution according to types and basic technical characteristics.

4.4. Systematization and classification of the data for the facilities, capacities and other basic production indices of the major world shipbuilding and ship repair yards.

4.5. Generalizing evaluation of the fishing fleet and some other types of ships (technical and auxiliary fleet, patrol ships, etc.).

4.6. Brief review of shipbuilding, ship repair, shipping and ocean engineering in the developing countries.

4.7. Generalization and evaluation of the predictions for world development and necessities for ships and other floating structures.

4.8. Determining and lasting trends in the further perspective development and application of scientific and technical progress acheivements (on the analogy of 5.2 and Appendix 4).

4.9. Some specific aspects and problems related to the state and future development for different groups of developing countries and to the necessary assistance for them in the field discussed.

4.10. Generalizing data for the use in the period 1976-81 and 1982-85 of UNIDO assistance (national, regional and interregional programmes) and funds granted by other international organizations (divided in sectors, structure and immediate objectives).

4.11. [illegible] marine economy.

4.12 The possibilities of worldwide restructuring of shipbuilding [illegible]

4.13 The possibilities of multipurpose utilization of shipbuilding [illegible]

4.14. Considerations as to UNIDO's role, organization and possibilities to aid more effectively the developing countries in the field discussed (by applying some or other forms, including by eventual creation of interregional centre for training, investigations and consultant services in shipbuilding, marine econory and ocean engineering).

5. WAY OF CARRYING OUT THE INVESTIGATION

5.1. The investigation which is of complicated nature could be carried out with success and effectively by drawing (as envisaged) professionally well orientated and informed scientists and experts, having experience in analogous investigations. BSMC and the scientific institutes in collaboration with it from the Bulgarian Academy of Sciences, technical universities and industry (here we could point out the Shipbuilding Institute, the Water Transport and Fish Economy Institute, the Computer Centre of the Bulgarian Shipbuilding Industry) possess such scientists and experts.

5.2. Besides the conventional sources of information, other sources are envisaged to be used as well, as per Appendix 2.

5.3. It is hoped that with UNIDO's assistance possibilities will be used and additional information collected as follows (the rather limited information for the developing countries and other circumstances, as is seen from the nature of references and data given below, is had in mind):

5.3.1. By means of elaboration (additionally and at a later stage and after respective coordination with UNIDO) and sending of a special questionnaire from containing problems concerning the state and plans for development of shipbuilding, ocean engineering and other sectors of marine econory; the necessary technical assistance, which must be rendered via UNIDO and UNDP in the different fields (training, investigations, consultant services, etc.); the possible covering of necessities by realization of an interregional project and by other more elementary or more complex forms for rendering technical assistance and its specification in subject, quantity, duration, period for realization, etc.

5.3.2. For separate selected countries (Appendix 3), besides the inquiry per 5.3.1., holding of interview is also desirable, with a view to [illegible] detailed discussion of the aspects of the questionnaire and [illegible]

5.3.[illegible]. Collection of additional information by using the respective UNIDO funds (including data, which must be provided by UNIDO local agencies in a number of developing countries), by use of UN Library in New York, etc.

6. CHARACTERISTICS OF THE FINAL INVESTIGATION RESULTS

The elaboration could in final form contain, and be presented as follows:

- Abstract (about 15-20 standard pages);
- Main Report (about 130-200 pages including large number of tables, block-diagrams and other suitable illusiartions);
- about 10-12 Appendices (each of them about 50-60 pages in average, or total volume of Appendices about 600 standard pages);
- short review of the state and specific problems and aspects for separate or grouped according to respective principle, developing countries (about 100 pages).

- visualizing material, slides, videocassettes,etc., illustrating the results of the investigation.

7. ADDITIONAL PURPOSES OF THE INVESTIGATION

The elaboration could also serve (in UNIDO's Secretary esteem) for various purposes, namely:

- for submission to be used (to one or other degree of fullness) by the developing countries;
- for accompanying information at discussing the preparation for the possible realization of international project and/or international centre with UNDP assistance, etc.;
- for eventual cooperation of UNIDO and mobilizing the resources of FAO, [illegible] UNCTAD, IMO, ILO, and other international organizations and funds;
- for use as basic information at specifying the activities of UNIDO and upon fixing respective organizational structure;
- upon continuation of future investigations, treating with further details different aspects about the problems and the necessary technical assistance for separate aspects, regions, groups of countries, or a given country taken separately [illegible]
- not last though its place, the study results would facilitate the [illegible] the [illegible] meeting in [illegible], in [illegible] ing of Experts on the Problems of Industry-Research Linkage in the Field of Shipbuilding", in accordance with the protocol of the VII Session of

the Joint Committee). The efficiency of the meeting will enhance, much better results will be obtained, etc.

8. TIME DURATION, EXPENSES RELATED TO SOME OTHER QUESTIONS CONNECTED WITH THE INVESTIGATION

8.1. The total time duration of the elaboration could be cut down, notwithstanding its complex character, informational and other difficulties, to about 12 months, taken from the date of the signing of the contract.

8.2. In order to fulfill the above purposes, the participation of experts is v essential, as follows (tentatively):
- Head of the investigation (sum total of the investigation time duration abou 6 months) and 2 assistants (class P.IV; time duration for each one - up to 4 months);
- 8 Senior Research Scientists (class P.V, with average time duration for each one - 2 months);
- 20 Research Scientists (class P.IV, with average time duration for each one - 2 months).

8.3. Accounting for the fact that BSHC is not a profit-making institution, and the character of the cooperation with UNIDO, will be necessary just actual expenses, as follows:
8.3.1. Fees for the participants in the investigation, as per i. 8.2 above, in compliance with respective final assessment and coordination with UNIDO of the investigation's completeness and scope.

8.3.2. The travel and per diem expenses for the study-tours, connected with visits to some developing countries and the UN Library in New York, as proposed in Appendix 3, and as will be finally settled with UNIDO.

Remark: Some other study-tours, participation in international conferences, etc., in accordance with the BSHC programme, as stated in Appendix 2, will be gratuitously used for the investigation's purposes.

8.3.3. The travel and per diem expenses, connected with the visits to Vienna of the Head of the investigation and the other participants, for briefing and some intermediate clarifications and coordinations of problems, as well as for the final presentation of the elaboration.

8.3.4. For the participation of assisting personnel, primarily connected with the considerable volume of activities as to intermediate and final typings, for translations from English into Bulgarian and vice versa, and other accessory activities. These expenses derive from the very scope of the investigation, which is liable to specification with UNIDO, and the eventual UNIDO participation in the editing and the final typing and copying of the materials.

8.3.5. For correspondence (letters, telexes, telegrams, etc. inclusive, with a view to obtaining additional information from firms and other institutes, etc.

8.3.6. For certain project expenses, like expendable materials, stationery, and photographic materials, videocassettes and the like administrative expenses and services.

Remark: The expenses per i.i. 8.3.5 and 8.3.6, in case it is acceptable not to be specified, at this stage could be covered by means interstitial payments, and at the end of the final implementation of the elaboration, by BSMC documents certifying their actual amount.

APPENDIX 1.

MAIN FIELDS OF THE SCIENTIFIC AND TECHNICAL PROGRESS, WHOSE APPLICATION WILL BE ACTUALIZED AT THE ASSESSMENT OF THE INTERNATIONAL SHIPBUILDING AND MARINE INDUSTRY

(to 4.2)

- contemporary design methods of more complex science-consuming, expensive with high consumer qualities and perspective ship types and other floating structures;

- reduction of energy resources and exploitational expenses;

- reduction of resistance during ship performance;

- development of ships' screw propellers and other ship propellers (including non-conventional ship screw propellers);

- improvement of cavitation characteristics and reduction of noise and vibration level;

- improvement of the performance characteristics of ships and other floating structures;

- hydrodynamics of the fishing facilities and vessels;

- movement in restricted waters of ships and other floating structures;

- physical modelling of coast protecting facilities and other objects of the marine hydrotechnical construction;

- dynamics of the drilling platforms and other facilities for adopting the world ocean;

- development of experimental methods, facilities, devices and systems;

- application of mini, micro and maxi-mini computers and processors for automation of the scientific experiment;

- automation and computerization of the scientific experiment and application of numerical methods for improvement of the technical solutions in the field of ship hydrodynamics and the technical and economical and exploitational ship characteristics;

- improvement of modelling for the hydrodynamic investigations and tests;

- construction, strength and dynamics of hull;

- improvement of the main power devices, their automation and utilization of ener

- automation, electronization and computerization of ships;

- improvement of ship devices, systems, and the major ship equipment;

- unification and standardization in shipbuilding;

- application of the module, multi-module, unite and other progressive principles and methods of ship construction;

- struggle against ship noise and vibration;

- complex mechanization and automation of the production process in shipbuilding (and of the welding operations in particular);

- improvement of the installation, piping and other completing operations;

- automation of design, technical preparation, management, planning and further computerization of shipbuilding;

- application of flexible automated systems, manipulators and robots;

- improvement of concentration, specialization in shipbuilding, etc.;

- reducing the design, adoption and ship production cycles and expenses for labour, etc.;

Remerks: 1. The above-mentioned fields will be rightfully treated in technical and economical aspect, as at stating the results connected with respective achievements, the factors predetermining them will be specified.

2. On the background of the achievements of the developed countries, a fuller and more generalized comparison with the developing countries' status will be made.

APPENDIX 2.

LIST

of Additional Informational Sources which are Envisaged to be (under initiatives and in accordance with the possibilities created by BSHC) Additionally Used for a Better Realization of the Investigation

- Proceedings of authoritative International Symposia and Conferences (including the XVth Symposium on ship hydrodynamics and the XVIIth ITTC, coming consecutively in the first half of this year in Hamburg and Göteborg), which are actively attended by BSHC representatives;

- results of missions for rendering expert consultations or visits on other occasions in different developing and using UNDP assistance countries, at which the details concerning the state and perspectives for future development in this field are clarified - (e.g. India, North and South Korea, Malta, Greece, Turkey, Cuba, Romania, Yugoslavia, Vietnam, etc.);

- results of repeated study-tours in the developed countries (in particular - Japan, USSR, Western Europe, USA, etc.), which continue in the period 1984-85;

- firm literature, descriptions, technical specifications, etc. (available and to be additionally received for the aims and aspects of the investigation), respectively processed for use under assignment;

- Proceedings of the Scientific and Methodological BSHC Seminar with wide international participation (the last 5-6 sessions in particular, including the forthcoming XIIth session dedicated to the problems of application of numerical methods, computers, the achievements of the scientific instrumentation, to be held in the beginning of October 1984, where more than 200 reports and written contributions by participants - eminent scolars and experts of world-wide rank in the discussed area will be presented);

- information concerning the received assistance from UNDP and the implemented Projects for the developing countries (available in the Economics Department of the Ministry of Foreign Affairs, Sofia, here should be added that for the processing and analysis of the information in this sphere, we count on UNIDO's assistance and capabilities for enriching and supplementing this substantial part of the investigation informational ensurance), etc.;

[illegible]

tion of the elaboration, on the other.

APPENDIX 3

LIST

of Some Characteristic Developing Countries for which besides the Inquiry as per Item 5.3.1, an Interview Is Desirable, as well as Specifying the Local Conditions by Study-Tours

1. North Africa 1.1. Algeria.1.2. Morocco. 1.3. Tunisia. 1.4. Lebanon. 1.5. The Sudan. 1.6. Egypt and 1.7. Cyprus.

2. West and East Africa: 2.1. Liberia. 2.2. Nigeria. 2.3. Congo(Kinshasa). 2.4. Angola. 2.5. Mozambique. 2.6. Tanzania. 2.7. Kenya. 2.8. Ethiopia.

3. Latin America. 3.1. Mexico. 3.2. Panama. 3.3. Venezuela. 3.4. Peru. 3.5. Brazil. 3.6. Argentina.

4. South and South-East Asia: 4.1. Pakistan. 4.2. Malaysia. 4.3. Singapore. 4.4. Indonesia 4.5. The Philippines. 4.6. Hong Kong.4.7. The PR of China. 4.8. Taiwan.

Remarks: 1. It is desirable that the study-tours include, besides the respective 3-4 investigation participants, UNIDO representatives as well.

2. The time duration is expected, in case the study-tour is well-prepared, to be about 3-4 weeks for each of the above 4 regions. The visits can be realized consequtively, or some of them - parallelly.

3. At the meetings, BSHC representatives could demonstrate (using their portable video equipment) several films about the progressive trends of the scientific and technical progress, this way stimulating the discussions and could fill with material for processing during the investigation and demonstration before representatives of UNIDO Secretariat as well, for status and open problems' visualization, etc.

4. Before and after visiting the Latin America region, a one-week visit to New York could be realized, for work in the UN Library.