10-1-1988

The education and training of senior maritime personnel at World Maritime University

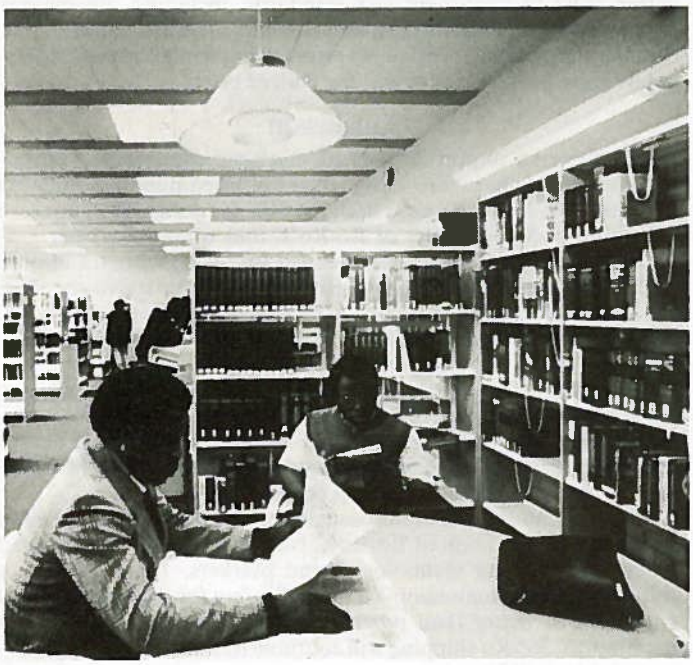
Gunther Zade

The Education and Training of Senior Maritime Personnel at World Maritime University

By Günther Zade, Professor and Vice Rector

Introduction

World Maritime University (WMU) was established under the auspices of the International Maritime Organization (IMO) and inaugurated on 04 July 1983. 284 students have graduated from WMU's two-year postgraduate courses during the first five years and have obtained a Master of Science degree in one of six specializations. The number of students has increased from 68 in the inaugural class to 102 each in the last two annual intakes. With 204 students premises and facilities of WMU at the form Merchant Marine Academy in Malmö, Sweden are now used to their maximum capacity.



Photos: Georg Oddner

Graduates and students come from 97 mainly developing countries. Another 11 countries are represented in the staff so that WMU can claim to be a global institution in which students and staff from 108 countries are involved. Adding countries of visiting professors, which are not contained in the 108, the number of countries would have to be increased to 113.

WMU was created with the main objective to train senior maritime personnel for maritime administrations, maritime training institutions and shipping companies in developing countries who would be capable of assisting in the implementation of IMO Conventions and hereby to the creation of common global maritime safety and pollution prevention standards. Whilst this original objective is still valid and pursued, WMU is now offering courses which satisfy not only the need for the training of such personnel but are more comprehensive and cover a broader range than necessary for the implementation of IMO Conventions. WMU today prepares maritime personnel for positions of high-level responsibility in maritime administrations, maritime safety administrations, maritime training institutions, port organizations, shipping companies and other maritime enterprises. The majority of graduates of WMU have already been promoted shortly after return to their home countries and have been entrusted with senior positions as e.g. heads of divisions or departments in the organizations and institutions mentioned above. Several graduates have reached positions of even higher responsibility as e.g. director of a national maritime safety administration, academic dean of a maritime academy and director general of shipping.

A growing number of graduates becomes visible also outside their countries. They take part in international meetings, above all at IMO. The last IMO Assembly saw 11 graduates participating in their national delegations of whom 3 acted as speakers for their country. One was even elected a Vice President of the Assembly. Recently the first graduate has been appointed representative of his country in the Board of Governors of his former alma mater. The Board consists of eminent personalities from shipping in 45 countries and 14 representatives of organizations which deal with maritime matters. Chairman of the Board is the Chancellor of WMU, H.E. C.P. Srivastava, Secretary-General of IMO.

WMU is the brain-child of the Secretary-General of IMO. It was also he who raised the support and created the prerequisites for the implementation of this ambitious project. WMU could, on the other hand, not have come into being without the support of numerous countries, organizations and personalities. The most important single financial contribution to the founding and continued existence of WMU was made and is being made by the government of Sweden. The hospitality and the generous support by the City of Malmö also plays an important role in the establishing and successful operation of WMU as do the recurrent contributions from many other countries and organizations as e.g. the United Nations Development Programme (UNDP) and Norway.

Students

Students enter WMU with the average age of 35. They hold master

mariner or chief engineer certificates of competency or the academic degree of a Bachelor or another equivalent degree. Most of the students have already gained professional experience in the organizations and institutions, for higher positions in which they are trained at WMU. Students are normally nominated by maritime administrations, maritime safety administrations or maritime academies, by shipping companies, port authorities or other maritime enterprises.

Age, careful selection and nomination are the main reasons for the students' high motivation to work and to profit as much as possible from their two years of postgraduate studies at WMU. Matching these high expectations, syllabi and teaching style at WMU provide for education of adults who bring with them experience in the field of specialization they are trained in.

Students sacrifice two years of their lives, during which many of them are separated from their families for longer periods, to qualify for national positions of higher responsibility. They see themselves as representatives of their countries. Graduates normally return to their nominating organizations or institutions. It is obvious from these circumstances that students are afraid of the ignominy of failure and make greatest efforts to successfully conclude their studies.

Students may occasionally be better qualified at completion of their studies than their previous superiors. Thus they would have to be prepared for such situation. Studies at WMU are therefore not only aiming at imparting up-to-date knowledge and providing corresponding practical experience but also at maintaining the modesty with which students normally join WMU. In addition, students would have to further develop their skills for successfully operating in an organization or institution from a social point of view. The meeting of this objective is a good prerequisite for a successful re-integration and for a graduate's knowledge and experience to be put to optimum use after return to his/her home country.

It is in this context a highly educating experience for the students to have two years of close working and social contacts with their colleagues from all over the world who come from the same field of specialization or other sectors of shipping and who may have different educational and cultural backgrounds. Students respect each other and freely extend mutual assistance. There are numerous indications that such co-operation continues after graduation and that the alumni stay in close contact with each other, over national boundaries and those of responsibilities and operations which may rather separate than bind togheter representatives from administrations, academies and companies. It is the perception of common objectives that unites the alumni despite the variations in interests which they may pursue in their organization or institution.

Courses

WMU offers now the following 7 two-year postgraduate courses:

* General Maritime Administration, GMA
* Ports and Shipping Administration, PSA
* Technical Management of Shipping Companies, TMS
* Maritime Safety Administration (Nautical), MSA(N)
* Maritime Safety Administration (Marine Engineering, MSA(E)
* Maritime Education and Training (Nautical), MET(N)
* Maritime Education and Training (Marine Engineering), MET(E)

The course PSA is for the first time offered under this title for students who will join WMU in 1989. It was run as a specialization within GMA since 1985. The test has been successful so that it was proposed by the faculty of professors, supported by the first academic review of WMU and decided by the Board of Governors to give the course its own identity also officially by a specific name and to separate it from GMA which is offered to maritime administrators for shipping ministries or maritime divisions of transport or communication ministries.

Responsible for each of the 6 courses is a course professor who is assisted by a lecturer. Only for the TMS course 2 professors are responsible. The courses GMA and PSA as well as MSA(N) and MSA(E) are assisted by a programme officer each who provide logistic support for field studies. Under the overall supervision by Rector and Academic Council, the academic programme is co-ordinated by the Vice Rector who acts as Academic Dean. He is also responsible for harmonizing — together with his professor colleagues and the lecturers — basic approaches to and standards between the courses.

All courses have specified entry requirements the meeting of which is supervised by the Admission Board. Candidates for GMA- and PSA-courses are normally accepted if they hold the academic degree of a Bachelor. Students for MSA(N)- and MET(N)-courses can enter with an unlimited master mariner certificate and students for MSA(E)- and MET(E)-courses with an unlimited marine engineer certificate of competency. Students for the TMS-course are eligible with either of the latter two qualifications. Qualifications which are considered equivalent are also accepted since only a limited number of countries uses the term Bachelor for the first academic degree. As certificates of competency normally bear the same title these qualifications may appear more harmonized than entrance qualifications which are related to academic degrees. This is only true for the basic professional contents of studies. Variations lie in the academic qualification of the students who hold certificates of competency.

Syllabi

It is therefore of considerable importance in the beginning of studies or even before that students are brought on a common level of knowledge both in the overall context of the academic programme and in their course speciality. As the teaching language of WMU is English, the first steps into this direction are the Intensive English Language Programmes which begin, depending on need, for certain students on 01 November, for others on 07 January. The 18-week and the 10-week programmes end in the middle of March when the two-year courses begin. Nearly or even exactly half of the students come from countries where English is not the or one of the official languages.

The three resident English language lecturers of WMU are supported by up to 4 supernumeraries during the intensive programmes. Although insufficient language proficiency occasionally contributes to poor examination results in the very beginning of the studies, the language factor is normally eliminated in the second semester. The academic performance of the groups of native speakers and non-native speakers shows an equal distribution in grades obtained after two years of studies.

Similar arrangements as for English are e.g. made for students of the maritime lecturer courses MET(N) and MET(E) in mathematics although the upgrading is not preceding studies but is dealt with within the first year of studies after the students' mathematics proficiency has been identified in the very beginning.

An upgrading and harmonization of knowledge in maritime affairs and methodological subjects for students of all courses takes place during the common first semester during which introductions to utilization of the sea, maritime trade and transport economics, maritime law, naval architecture, management, word processors and computers, library use, the work of IMO and international maritime conventions, maritime safety and marine pollution prevention are given which, depending on specialization, are followed up by the various courses in the second, third and fourth semesters. The common first semester also provides for a communication between the representatives of different sectors in maritime affairs. Moreover, it has a considerable educational value. It helps create mutual recognition and tolerance between students and courses.

The second, third and fourth semesters contain programmes which are mostly course-specific. The programmes consist of lectures and related activities and of field studies. Lectures are given by resident and visiting staff. Field studies are divided in field training or on-the-job training and field trips or excursions. These differ from course to course not only in content but also in duration. WMU receives support for its field study programme from most European countries, from North America and Japan. Tuition or information at field study destinations is given free of charge. WMU normally pays travel, accommodation and living costs for the students with the exception of a few countries which even take over all or part of the student's local costs.

Generous support is also given by visiting professors who are eminent experts in their field of specialization from all over the world. WMU pays for their travel, provides free accommodation at the stu-

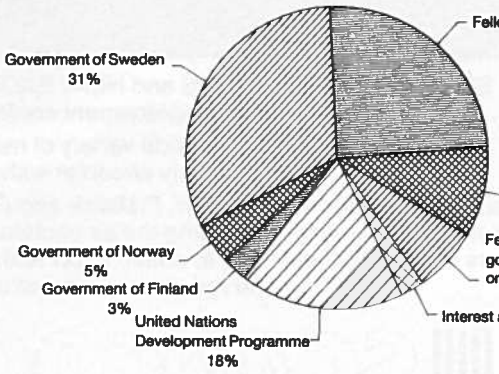
dents' hostel and offers a moderate daily subsistence allowance (DSA). No fee is charged by visiting professors who extend their services to WMU free of cost. About 80 of them come to WMU each year for a week or longer, many of them not only once but for two or three times.

Visiting professors and field studies allow students a.o. to get acquainted with renowned specialists in maritime circles all over the world which, in addition to the close relationship that students develop with their colleagues and WMU staff, helps extend the students' global network of contacts which they can make use of for the benefit of their work in their national organizations and institutions.

The syllabi of all courses contain not only technical subjects by which the students' knowledge and experience in their specializations is enhanced and brought up-to-date. Students also acquire a sound knowledge of how shipping operates and functions. They are also made aware of the contribution they can and are expected to make to the further raising of safety and pollution prevention standards and where it will figure in the maritime field. Last but not least: course syllabi are designed for providing students with capabilities for keeping themselves abreast of future developments so that they can successfully contribute to their national shipping operations not only in the first years after graduation but also for a long period thereafter.

SOURCES OF FINANCING*

DIRECT CONTRIBUTIONS TO THE BUDGET — FELLOWSHIP INCOME



For many developing countries, sending students to WMU represents a considerable sacrifice of human resources.

In order not to add financial burdens to those sacrifices, WMU offers conditions to students making it possible for them to come to Malmö to stay there and return home without having incurred any expenses of their own. Travel, board and lodging, a monthly allowance and different cash contributions are all covered by WMU.

*Based on announced contributions in 1988

The current annual running costs for the University are about US $6.5 million.

Staff

The academic personnel of WMU will consist on 15 September 1988 of Rector, Vice Rector and 7 other professors, of 7 lecturers of whom 6 assist course professors and one the Vice Rector, of a librarian and an assistant librarian, 3 English language lecturers and 3 programme officers of whom 2 support courses and one deals with computer training. Excluding the Rector's secretary and assistant they are supported by 5 secretaries. Altogether 29 persons work in academics and 13 in the administration. Rector, Vice Rector, professors and lecturers come from 16 countries.

Professors at WMU are persons with extended experience in the area of the course they are responsible for. They are professionals who have held positions of high responsibility. On the other hand, they need to have an appropriate academic qualification to meet also the requirements in this very important aspect of their work at WMU. The age of the present professors at WMU is between 46 and 64 with an average of 56-57. They have joined WMU from very senior positions in the shipping industry and from academic institutions.

The age of the 7 lecturers is between 33 and 43 with an average of 37-38. They differ from the professors mainly in professional experience but have in general obtained similar academic credentials.

The first academic review of WMU has supported the proposal of the Academic Council to introduce a rank between professor and lecturer so that lecturers could be given some career perspective within WMU. At the same time this intermediate position may perhaps be used for testing candidates for professorships before an eventual appointment.

Resulting from a retirement age of 60, WMU has had some difficulties in keeping staff for a sufficiently long period. The recent extension of the retirement age to 65 as recommended by the academic review and approved by the Board of Governors reduces fluctuation and contributes to continuity in staff.

Professors and later lecturers of whom most joined a few years after inauguration had to implement syllabi for the courses, for which a need was identified in a preparatory phase between 1980 and 1982, on the basis of a draft syllabus. There was no model to follow since all courses at WMU were to meet needs which were not catered for at any other institution. Whilst above all the syllabi for the first class and courses and to a limited extent also the syllabi of the next two classes and courses had occasionally to be amended, the present syllabi are consolidated. Nevertheless, further improvement is always possible and will become necessary with further changes in the maritime industry and environment. A faculty of professors and lecturers with some members who can look back at years of experience at WMU and others who are relatively new is well suited to attend to the continued improvement of syllabi. Similar benefit from extended service applies to the development of the library and other learning resources as well as to the Intensive English Language Programme. WMU has not only been lucky with students but also with the majority of staff that has been recruited for academic work. The students' motivation is reflected in that of the staff and vice versa.

Outlook

WMU is still a young and developing institution. The modesty of the celebration of its 5th anniversary during the last meeting of the Board of Governors at the end of June this year was an indication of how well Chancellor, Board of Governors, Rector, Vice Rector, professors and other WMU staff are aware of this fact. WMU has still some way to go to fully meet the ambitious objectives of its governing body, Chancellor, faculty and staff.

The first academic review of the WMU that was undertaken in early spring 1988 by a 6-man team of maritime experts with global renown under the chairmanship of its member Pierre Bauchet, Professor of Economics and Law at the University of Paris, former president of this University, Deputy Chairman of the French Conseil Supérieur de la Marine Marchande and Director of the Centre Transport et Dévelopement C.N.R.S. concluded that no major changes in the operation and academic offer of WMU would be necessary now but that a survey of maritime training needs in countries where students of WMU come from should be undertaken in order to be able to amend the present offer when it may become necessary for meeting emerging new needs.

The Academic Review Team did however make numerous, mainly minor recommendations for the further improvement of standards which when implemented in their totality will enhance the value from studies at WMU and will at the same time make the study programme even more demanding for carefully selected students to whom entry requirements are stringently applied.

With a view on future staff fluctuation WMU would also have to continue to develop its syllabi in a way that would reduce the dependence of a certain course on a certain professor. This total identification of the pioneer professors with their courses was necessary in the build-up phase. It provided for maximum motivation and has led to excellent results without affecting the co-ordination between all courses.

The routines which have by now been established at WMU in the implementation of the study programmes should allow the WMU faculty to spend part of their time on research, on attending international maritime meetings more frequently than before and on using

new knowledge and experience gained for the further improvement of the syllabi and for developing an academic programme with a view on the year 2000 and beyond. WMU staff will also give increased attention to the co-operation with its 8 branches, which have been or will be established for regional offering of short specialized courses, and with other maritime training and research centres.

The branches are part of the maritime training institutes in Dalian, Bombay (Shipping Corporation of India), Sharjah, Alexandria, Bou Ismail (Algeria), Abidjan, Tampico and Rio de Janeiro.

In general, the activities of WMU staff will have to be extended and diversified within the range of the academic programme and related relevant areas while the priority of concentrating on the continued improvement of the academic programme for the meeting of students' education and training needs will have to be maintained.

There is a lot to do. Staff and students at WMU are well prepared and committed to assist in meeting the requireements and challenges of the future in the maritime field.

International Composition of the Student Body Admissions 1983-1988

Algeria
Angola
Argentina
Bahrain
Bangladesh
Barbados
Benin
Bolivia
Brazil
Burma
Burundi
Cameroon
Canada
Chile
China
Colombia
Comoros
Congo
Costa Rica
Côte d'Ivoire
Cuba
Cyprus
Democratic People's Republic of Korea
Democratic Yemen
Ecuador
Egypt
Equatorial Guinea
Ethiopia
Fiji
Gabon
Gambia
Ghana
Greece
Guatemala
Guinea
Guinea-Bissau
Guyana
Haiti
Honduras
India
Indonesia
Iran
Jamaica
Jordan
Kenya
Kiribati
Kuwait
Lebanon
Liberia
Libyan Arab Jamahiriya
Madagascar
Malawi
Malaysia
Maldives
Malta
Mauritania
Mauritius
Mexico
Morocco
Mozambique
Namibia
Nicaragua
Niger
Nigeria
Oman
Pakistan
Panama
Papua New Guinea
Peru
Philippines
Portugal
Qatar
Republic of Korea
Samoa
Sao Tome and Principe
Saudi Arabia
Senegal
Seychelles
Sierra Leone
Somalia
Spain
Sri Lanka
Sudan
Sweden
Thailand
Togo
Trinidad and Tobago
Tunisia
Turkey
United Republic of Tanzania
Uruguay
Vanuatu
Venezuela
Yemen Arab Republic
Yugoslavia
Zaire
Zambia
Total: 97 countries

Haverier på fartygs-dieslar, huvudmotorer

Av inspektör Nils Erik Wolff, Assuransföreningen

Under de senaste åren har vi på Assuransföreningen ägnat en del tid och möda åt att analysera haverier på fartygens huvudmotorer och då speciellt uppdelat på medlevarvsmotorer och långslagiga tvärstycksmotorer. Anledningen till detta var, att vi kunde konstatera att kostnaderna för skador på huvudmotorer ökade, både i reella tal och som procent av den totala haverikostnaden.

En analys av kostnaderna för perioden 1981-1986 visade att medelvarvsmotorer svarade för ca 70% av skadekostnaden, långslagsmotorerna för ca 15% och turbinanläggningar för ca 15% av kostnaderna. När vi sedan tittade på antalet anläggningar av de olika typerna visade det sig att antalet medelvarvsmotorer var 25-30% av totala antalet, långslagsmotorerna 65-70% och turbinerna ca 5% av totala antalet. Man kan alltså grovt säga att 1/3 av antalet motorer (medelvarvsmotorerna) svarade för drygt 2/3 av kostnaderna för skadorna.

Efter detta konstaterande fann vi det angeläget att försöka analysera skadorna mera i detalj. Vi startade ett samarbete med CTH, som gick ut på att plöja igenom samtliga maskinhaverier under 1986 för att systematisera materialet och se om man kan upptäcka något mönster eller någon speciell trend. Alltihopa naturligtvis med baktanken att det skulle bli möjligt att i framtiden förhindra vissa skador. För CTH:s del låg en del intresse i att skaffa fram intressanta typfall, som skulle kunna användas i undervisningen.

Dessutom har vi på Assuransföreningen gjort en mera översiktlig analys av 1987 års siffror. Eftersom antalet turbinanläggningar minskar och dessutom dessa skador är av annat slag har vi valt att inte ha dessa med i 1986 och 1987 års siffror.

För vår statistik gäller att den är baserad på kostnader. Kostnaderna innefattar förutom själva reparationskostnaden även kostnaden för t.ex. bärgning och bogsering men är exklusive redarens självrisk. Detta innebär att de verkliga kostnaderna för haveriet är högre än de här redovisade. Eftersom alla skador ännu inte är slutgiltigt reglerade är en viss del av kostnaderna baserade på uppskattning.

För 1986 ser statistiken ut enligt nedan

TYP AV MASKIN	kostnad i % av totala	Ant maskiner i % av totala	Kostnad per skada SEK
Medelvarvs-maskiner	78.2	31.1	750000:-
Långslags-maskiner	21.8	68.9	350000:-

För 1987 ser statistiken ut enligt nedan

TYP AV MASKIN	Kostnad i % av totala	Ant maskiner i % av totala	Kostnad per skada SEK
Medelvarvs-maskiner	80.2	31.3	1000000:-
Långslags-maskiner	19.8	68.7	350000:-

Vi har också undersökt hur skadorna fördelar sig på olika delar av huvudmotorn dels antalsmässigt och dels kostnadsmässigt. Resultaten för 1986 och 1987 redovisas i tabellerna på nästa sida.

SKADOR PÅ HUVUDMOTORER 1986

RUBRIKER	Medelvarsmot.			Långslagiga tvärstycksmot.		
	Antal st	Antal i %	Kost. i %	Antal st	Antal i %	Kost. i %
00 Ingen skada eget fartyg	1	2	0(1)	2	8	9
01 Skada omfattande flera rubriker	19	34	56(3)	3	11	21
06 Cylinderlock	1	2	2(2)			
07 Tappar, lager etc	4	7	13(13)	3	11	20
08 Avgasventiler, stötstänger						
09 Drivanordn. för ventil, bränslepump	2	4	2(6)	1	4	0
10 Cylinderfoder	1	2	0(0)	2	8	1
11 Kolvar, kolvstänger	7	12	4(4)	3	11	2
12 Vevaxel, vevstakar	4	7	10(57)	1	4	4
13 Kamaxel, kopplingar	1	2	0(0)	2	8	5
14 Kylvattensystem	1	2	0(0)			
15 Spolluftsystem med överladdare	4	7	1(2)	7	27	32
16 Avgassystem						
18 Startluftsystem				1	4	6
19 Bränslesystem						
24 Övrigt	2	3	1(1)	1	4	0
31 Reduktionsväxlar	4	7	1(1)			
32 Propelleraxlar, lager	1	2	5(5)			
34 Axelledningar, svängningsdämpare	4	7	5(5)			
	56	100	100(100)	26	100	100

SKADOR PÅ HUVUDMOTORER 1987

RUBRIKER	Medelvarsmot.			Långslagiga tvärstycksmot.		
	Antal st	Antal i %	Kost. i %	Antal st	Antal i %	Kost. i %
00 Ingen skada eget fartyg	6	12	2			
01 Skada omfattande flera rubriker	8	15	34	4	12	36
06 Cylinderlock				4	12	1
07 Tappar, lager etc	4	8	26			
08 Avgasventiler, stötstänger				1	3	0
09 Drivanordn. för ventil, bränslepump				1	3	0
10 Cylinderfoder	3	6	0	5	14	10
11 Kolvar, kolvstänger	5	10	3	4	12	4
12 Vevaxel, vevstakar	3	6	7			
13 Kamaxel, kopplingar	1	2	3			
14 Kylvattensystem						
15 Spolluftsystem med överladdare	14	27	20	8	23	36
16 Avgassystem				1	3	6
18 Startluftsystem						
19 Bränslesystem	1	2	2			
24 Övrigt	1	2	0	3	9	1
31 Reduktionsväxlar	4	8	2	2	6	6
32 Propelleraxlar, lager	1	2	1	1	3	0
34 Axelledningar, svängningsdämpare						
	51	100	100	34	100	100

00 Kostnader i samband med bogsering 01 Här förs kostnader när man inte kan fastlägga primärskada
() anger försök att dela upp rubrik 01 på primärskador

De procentuella kostnaderna för medelvarvsmotorerna har för år 1986 redovisats på två sätt. Siffran inom parentes är fördelningen när de skador som omfattar flera rubriker (01) har delats upp i görligaste mån på de underrubriker där den ursprungliga skadan uppstått. Motsvarade korrigering för antalet skador har dock ej gjorts.

Siffrorna talar för sig själva men man ser att vevstakar, vevlager och vevtappar är en kritisk konstruktion på medelvarvsmotorerna. Ofta innebär ett haveri på dessa delar att även vevaxeln får förnyas.

På de långslagiga tvärstycksmotorerna är spolluftsystemet inklusive överladdningsaggregaten en svag punkt men även på medelvarvsmotorerna kommer denna rubrik högt.

The Danish Projekt Skib .... Continued from page 17

Such a system integrate navigation, alarm systems, communication, administration etc. So that all functioncs can be done from one work station.

A Danish Navy-project has solved a similar problem in newly developed Navy ships. Therefore a group of specialists partly from the Navy were assembled to write a specification for soft- and hardware to such a system. It was emphasized that standard components, standard interfaces should be used and that software should be general (easy adaptable to the ships) and flexible for future expansion.

The system would be based on a EDP network with main stations on the bridge, in the engine room and in the ships office. All interfaces to the system should be of standard type, in order to enable suppliers of various components, to be connected without problem.

After negotiations with interested companies the Danish company Søren T. Lyngsø A/S was awarded a contract to develop the hard- and software for ISC and Krupp Atlas agreed to make their existing navigation system able to communicate with ISC.

Through the ISC and a risk analysis, it is the intention to prove to the authorities, that it will be perfectly safe to operate the vessels while at sea and during the loading and discharging.

As the vessels have to enter and leave port with one man on the bridge it was decided to add extended control facilities in the bridge wings.

In order to convince the authorities that mooring and unmooring could be done it was decided to dimension stern and bow thruster to keep the vessel along the pier in winds up to 12 sec/m. There would then be plenty of time to moor. Further a special arrangement for control of mooring winches was designed. In order to prove the feasibility, a computer manouvre simulation model of the vessel was built, so that all forces could be tested. This worked out so satisfactory that untrained people after a few trials were albe to navigate in and out of even difficult ports.

These test we finalized in November/December 87.

Expected costs and benefits for the owner. It is a relevant question, will this become a white elephant? It is estimated, that the total costs for the ISC system will be around 500.000 pounds. And the total extra costs compared to a "normal" specification would be around 1 mio. ponds including new painting systems. This should be compared with a reduction in manning level for such a vessel size from 15 to 6 and around a 10% reduction in fuel consumption.

One should not forget that many of the principles of manning used in this project are universal and naturally will have a spinn off effect for the whole industry.

Did we achieve our goals? This remains to be seen in some areas. We did design not one but four ships. We did put up solutions to the problems we have found essential. We did not, however, finish until the end of 1987. But we foresee at present that all outstanding problems will be solved, and could be approved within a few months. We have kept expenses within the budget, so that total costs will not exceed 2.5 mio pounds. Will there be built any such vessels? This we will know within the coming six months. There is a lot of interest and the Ministry of Indutry will assist by supporting owners, who wish to joint forces, to finance and build such ships.

Finally a new incentive from the government, which may contribute to the confidence of owners, is the Danish International Registry, which may be the actual trigger to the first contract.