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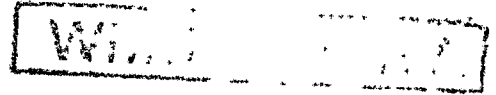
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WORLD MARITIME UNIVERSITY
Malmö, Sweden

PROPOSALS FOR FURTHER DEVELOPMENT
AND IMPROVEMENT OF MARITIME
SAFETY EDUCATION AND TRAINING IN CHINA

by

Fang Quan-Gen

The People's Republic of China

A dissertation submitted to the World
Maritime University in partial fulfilment of
the requirements for the award of the

Degree of Master of Science

in

Maritime Education and Training (Nautical)

Year of Graduation

1991

I certify that all material in this dissertation which is not my own work has been identified and that no material is included for which a degree has been previously conferred upon me.

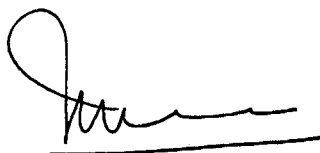
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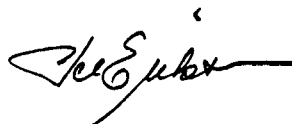
Supervised and assessed by:

J.H. Mulders
Professor
World Maritime University



Co-assessed by:

Mr. Per Eriksson
Visiting Professor
World Maritime University



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TABLE OF CONTENTS

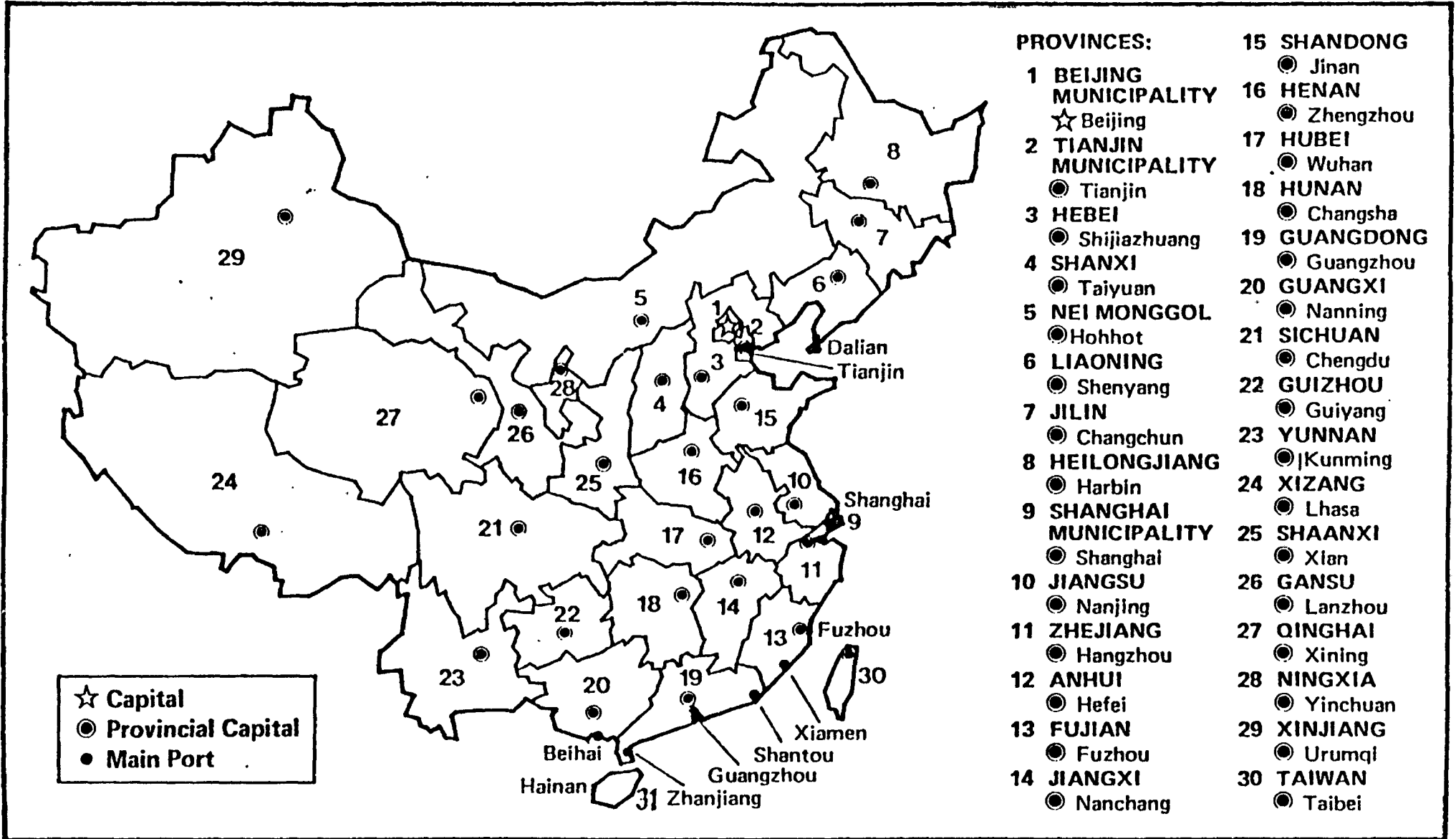
ACKNOWLEDGEMENTS	I-1
TABLE OF CONTENTS	I-2
ABSTRACT	1
CHAPTER ONE: INTRODUCTION	2
1.1 The definition and range of MSET	2
1.2 The objective of MSET	2
1.3 The imperative necessity of improved MSET in China	3
CHAPTER TWO: THE PRESENT MSET SYSTEM IN CHINA	6
2.1 The Ministry of Communications	6
2.2 The Administrative Authorities for MSET	7
2.2.1 The Bureau of Harbour Superintendency	7
2.2.1.1 The Regional and Local Harbour Superintendency Administration	8
2.2.2. The Bureau of Education	9
2.3. The Maritime Institutions	10
2.3.1 Maritime institutions of Higher Education	10
2.3.2 Specialized Maritime institutions of Higher Education	11
2.3.3. Maritime School of Medium Level of Technology	12
2.3.4 Maritime Technical School	13
2.4. The Mariners Training Centers	13
2.4.1 Shanghai Mariners Training Center	14
2.4.2 Local mariners Training Center	15
2.5. National Shipping Companies and the Social Maritime Organizations	16

CHAPTER THREE:	EXISTING MSET COURSES CONDUCTED IN CHINA	19
3.1.	General MSET	19
3.2.	Special MSE course	23
3.3	Specific MST courses	26
3.3.1	Four Sub-certificates Training Course	27
3.3.1.1	Survival At Sea	28
3.3.1.2	Manoeuvring Survival crafts	29
3.3.1.3	Ship's Fire Fighting	30
3.3.1.4	First Aid At sea	32
3.3.2	Three Sub-certificates training Courses	33
3.3.2.1	Radar Observer and Radar Simulator	34
3.3.2.2	Operational Use Of ARPA	36
3.3.2.3	Radio Telephony	37
3.3.3	Safety operation of Tanker and Crude Oil Washing (COW)	38
3.3.3.1	Safety operation of Tanker	38
3.3.3.2	Crude Oil Washing of Tanker	41
3.3.4	Special Training of Ship Carrying Liquefied Gas In Bulk safety Management	42
3.3.4.1	Special Training of Ship Carrying Liquefied Gas In Bulk Safety Management, Part A	42
3.3.4.2	Special Training of Ship Carrying Liquefied Gas In Bulk Safety Management, Part B	44
CHAPTER FOUR:	THE EVALUATION OF THE PRESENT MSET IN CHINA	45
4.1	The Achievements of present MSET in China	45
4.1.1	The MSET System	46
4.1.1.1	The MSET Administration	46
4.1.1.2	Expansion of Maritime Institutions and Mariners Training Center	48
4.1.1.3	MSET in the National Shipping Company	49

4.1.2	The MSET Courses	50
4.1.2.1	The development of MSET Courses	50
4.1.2.2	The Standardization of MSET Course Programs	52
4.1.2.3	The MSET Facilities	52
4.1.2.4	Updating of MSET	54
4.1.2.5	MSET Statistics	55
4.2.	Problems of Present MSET system in China	56
4.2.1	The Structure and Administration of MSET System	56
4.2.1.1	The Authorities of MSET in the Ministry of Communication	56
4.2.1.2	The Regional and Local Harbour Superintendency Administrations	57
4.2.1.3	The Maritime Institutions and Mariners Training Centers	58
4.2.1.4	The Shipping Companies, Social Maritime Organization and the other maritime Bodies	60
4.2.2	The Implementation and Conduct of MSET Courses	62
4.2.2.1	General MSET Course	62
4.2.2.2	MSE Course	63
4.2.2.3	MST Courses	63
4.3	The Training of MSET Staff	64
4.4.	The training Facilities	66
4.5.	Other Maritime Safety Training Courses	67
CHAPTER FIVE: PROPOSALS FOR FURTHER DEVELOPMENT AND IMPROVEMENT OF MSET IN CHINA		69
5.1.	Acknowledging the Need for An Effective MSET System	69
5.1.1	Enhancing the Maritime safety consciousness	69
5.1.2	Training the qualified seafarers	70
5.2	Strengthening the Structure and Administration of MSET System	71

5.2.1	MSET Authorities in the Ministry of Communications	72
5.2.1.1	Coordinating MSET Work	72
5.2.1.2	Responsibilities of MSET work	72
5.2.2	Harbour Superintendency Administration	73
5.2.2.1	Enhancing Existing Regional and Local Harbour Superintendency Administrations	74
5.2.2.2	Establishing New Regional and Local Harbour Superintendency Administrations	74
5.2.3	Maritime Institutions and Mariners training Centers	75
5.2.3.1.	Further Developing and Improving Chinese Maritime Institutions	75
5.2.3.2	Consolidating Existing Mariners Training Centers and Establishing Chinese Mariners Training Center	76
5.3	Improving Existing MSET Courses	78
5.3.1	General MSET Course	79
5.3.2	Special MSE course	80
5.3.3	Basic Maritime Safety Training Course	80
5.3.4	Advanced and special Maritime Safety Training Courses	81
5.4	Offering New MST Courses	83
5.4.1	Shiphandling Simulator Training Course	83
5.4.2	Marine Environment Protection Course	86
5.4.2.1	MARPOL 73/78 Annex I Training Course	87
5.4.2.2	MARPOL 73/78 Annex II Training Course	89
5.4.3	Integrated Safety Navigation Training Course	91
5.4.3.1	Bridge Team and Procedures Training Course	92
5.4.3.2	Electronic Navigation Aids Training Course	93
5.4.3.3	Radar and ARPA Refreshing Training Course	95
5.4.4	GMDSS Course	97
5.4.5	Transportation and Handling of Dangerous Cargo course	101

5.4.6	Cargo Securing Course	103
5.4.7	Search and Rescue Course	105
5.4.8	VTS Operators Training Course	108
5.4.9	Maritime Accident and Incident Investigation	111
5.4.10	Intensive Maritime Safety English Course	113
5.4.11	Refreshing Course for Four and Three Sub Certificates Training Courses	115
5.5	Establishing A Training System for MSET Instructors	118
5.6	Expanding MSET Academic Activities	120
5.7	Enhancing and Updating MSET Training Facilities	121
CHAPTER SIX: CONCLUSION		125
LIST OF PROPOSALS		128
ABBREVIATIONS		130
REFERENCES		132



☆ Capital
 ● Provincial Capital
 • Main Port

- PROVINCES:**
- | | |
|-------------------------|--------------|
| 1 BEIJING MUNICIPALITY | 15 SHANDONG |
| ☆ Beijing | ● Jinan |
| 2 TIANJIN MUNICIPALITY | 16 HENAN |
| ● Tianjin | ● Zhengzhou |
| 3 HEBEI | 17 HUBEI |
| ● Shijiazhuang | ● Wuhan |
| 4 SHANXI | 18 HUNAN |
| ● Taiyuan | ● Changsha |
| 5 NEI MONGGOL | 19 GUANGDONG |
| ● Hohhot | ● Guangzhou |
| 6 LIAONING | 20 GUANGXI |
| ● Shenyang | ● Nanning |
| 7 JILIN | 21 SICHUAN |
| ● Changchun | ● Chengdu |
| 8 HEILONGJIANG | 22 GUIZHOU |
| ● Harbin | ● Guiyang |
| 9 SHANGHAI MUNICIPALITY | 23 YUNNAN |
| ● Shanghai | ● Kunming |
| 10 JIANGSU | 24 XIZANG |
| ● Nanjing | ● Lhasa |
| 11 ZHEJIANG | 25 SHAANXI |
| ● Hangzhou | ● Xian |
| 12 ANHUI | 26 GANSU |
| ● Hefei | ● Lanzhou |
| 13 FUJIAN | 27 QINGHAI |
| ● Fuzhou | ● Xining |
| 14 JIANGXI | 28 NINGXIA |
| ● Nanchang | ● Yinchuan |
| | 29 XINJIANG |
| | ● Urumqi |
| | 30 TAIWAN |
| | ● Taipei |

PROPOSALS FOR FURTHER DEVELOPMENT AND IMPROVEMENT
OF THE MARITIME SAFETY EDUCATION AND TRAINING IN CHINA

ABSTRACT

According to the international and national regulations and requirements on safety at sea, the maritime institutions and training centers in China have held and offered certain specific education and training courses for seafarers and the students of the maritime institutions in the field of maritime safety. On the basis of the present situation for maritime safety education and training in China and the practical maritime safety training courses conducted in Chinese maritime institutions and training centers, in this dissertation, the author briefly introduces some information about the maritime institutions and training centers in China. Next he describes the teaching and training programs of the relevant courses and the implementation and development of these courses, then evaluates the progress achieved and the problems existing in the field of Chinese maritime safety education and training by the analysis and comparison of the Chinese MSET with the other maritime countries. Finally he puts forward some proposals and suggestions for further development and the improvement of the maritime safety education and training in China with an emphasis on nautical aspects. To meet future requirements and improve the safety of the international and Chinese shipping industry, the author also discusses the importance and imperative necessity of maritime safety education and training, and points out that this is very urgent not only for China, but also for all maritime countries in the world.

CHAPTER ONE: INTRODUCTION

The developments of the world merchant fleet, the application of new technologies in shipbuilding, shiphandling, equipment for navigation, communication and transport of cargo bring forth the necessity for Maritime Safety Education and Training (MSET) to adapt continuously to these changes. The ever increasing demands for safety of ships, crews and the environment thereby put a heavy emphasis on MSET.

1.1. The definition and range of MSET

MSET is a very important part of Maritime Education and Training (MET) dealing with all aspects of maritime safety. It consists of two parts, Maritime Safety Education (MSE) and Maritime Safety Training (MST).

MSE covers not only the education of the maritime safety knowledge, but also the education of maritime safety consciousness and sense of responsibility.

MST deals with training of maritime safety techniques and procedures in navigation and shipping in addition to the specific theoretical knowledge.

1.2. The objective of MSET

The objective of MSET is to enhance the maritime safety consciousness and sense of responsibility of all mariners, raising the level of their knowledge and techniques of maritime operations and management of ships in order to improve the safety maritime traffic, safety of life at sea and prevent the marine pollutions from ships.

1.3. The imperative necessity of improved MSET in China

China has a wide sea area and long coastline which spreads from the north-east down to the south aggregating some 18,000 kilometers, and there are a great number of ports scattered along the coast and the larger rivers.

With the development of the national economy, a great change has taken place in Chinese shipping industry. In early 1989, Chinese national merchant fleet had already increased to 12,276,400 GRT, and become the 8th largest one in the world (see table 1-1). The national shipbuilding capability has developed fast as well, the total production of the shipbuilding in 1989 is up to 607,000 DWT, and this made China the 5th world largest shipbuilding country. To satisfy the requirements for such a great development of the national shipping industry, the number of the mariners in China increased sharply. At this moment, there are about 160,000 mariners working on board sea-going Chinese vessels.

Table 1-1 The Ten Leading Maritime Nations in The World

Rank	Country	Ship Nos	GRT*1000	DWT*1000	NRT*1000	% World
1	Liberia	1399	48062.6	90626.4	33935.5	14.7
2	Panama	3792	44724.0	71741.1	27305.8	11.7
3	Japan	3849	28286.5	43933.3	13977.6	7.1
4	Greece	1458	21309.5	38490.9	14847.9	6.3
5	Cyprus	1283	18637.3	33527.4	12994.8	5.4
6	U.S.A.	800	18180.0	27053.6	11865.5	4.4
7	USSR	2599	18867.0	24971.7	9694.1	4.1
8	China	1412	12276.4	18618.7	6959.3	3.0
9	Norway	346	9591.5	17131.4	6573.3	2.8
10	Bahamas	486	9661.7	1603.5	6300.9	2.6

Source: ISL Shipping Statistics, January 1989. Ships are 300 GRT and over.

On the other hand, the marine accidents and casualties, such as fire on board, the capsizing of ship, loss of life and collisions at sea have not decreased a lot in the last years. For example, a cargo ship capsized in the heavy weather at the Yellow Sea in 1983, and an oil tanker exploded near the same area of the Yellow sea in 1985. These two accidents of total loss all occurred with a serious loss of lives. In 1987, there were about 30 serious casualties happened within the shipping companies directly under the administration of the Ministry of Communications.

In general, the causes for this high loss rate can be identified as follows:

Firstly, because the demand for seafarers has increased very fast followed by the expanding national fleet, a number of mariners have not followed the proper MSET courses or have not had the relevant practical training, and their knowledge of maritime safety is insufficient.

IMO has implemented a lot of conventions and regulations relating to the safety of life at sea, the carriage of dangerous cargoes, the prevention of collision at sea and other maritime safety subjects. The Chinese maritime safety administration authority has formulated and promulgated the relevant national regulations and requirements according to these international conventions and regulations. However these maritime safety rules can only be implemented and carried out by the mariners who have acquired a good understanding of maritime safety by adequate MSET courses.

Secondly, with the introduction of new advanced equipment and new technologies and methodologies on board ship, the older

mariners who were properly educated and trained in their youth often can not meet and satisfy the present needs and requirements for safe procedures. There is an imperative need for those mariners to update their knowledge through certain MST courses. This is especially important for captains, officers and engineers.

For promoting and developing the national economy in China, it is very important to expand its national fleet and develop other aspects of the maritime industry. But all these developments must be on the basis of maritime safety, and the aim of the maritime safety is to further improve and develop the Chinese MSET.

In short, in consideration of the successful development of the national maritime industry, there is an imperative necessity for improved MSET in China.

CHAPTER TWO: THE PRESENT MSET SYSTEM IN CHINA

In order to ensure the successful implementation of the IMO maritime safety conventions and regulations and in consideration of the practical maritime situation in China, the Chinese MSET system has been operating already for several years.

Under the direct authority of the Ministry of Communications in China, the Chinese MSET structure consists of the maritime safety administration authority and maritime education authority, the maritime institutions, the mariners' training centers and the national shipping companies. For the general structure of MSET in China, please refer to the figure 2.1, A detailed description of the Chinese MSET system follows in the next paragraphs.

2.1 The Ministry of Communications

The Ministry of Communications acts as the highest decision-making authority and top administration in the Chinese MSET system. It paid and pays great importance to MSET in general. Apart from setting up the various national rules and regulations such as the "Maritime Traffic Safety Law", the ministry also has made a lot of decisions dealing with MSET and in accordance with the SOLAS, STCW, MARPOL and the other IMO conventions and regulations.

Periodically, there are regular maritime safety meetings in the ministry. These meetings are organized four times a year, normally on the 20th of the first month in the four different seasons. It is chaired by the vice-minister, who is in charge of transportation by water. The affairs dealing with national MSET are the main subjects of these meetings. As a result of these meetings, the ministry can

make decisions about MSET and put these into operation through the Bureau of Harbour Superintendency and the Bureau of ducation. These two bureaus are the direct MSET administration authorities which are responsible to the Ministry of Communications.

2.2. The Administrative Authorities for MSET

In China, the MSET administrative authorities are in charge of the implementation of the international and national conventions and regulations dealing with the maritime safety affairs in co-operation with maritime institutions, mariners training centers, national shipping companies and social maritime organizations.

2.2.1 The Bureau of Harbour Superintendency

The Bureau of Harbour Superintendency is responsible for the maritime safety administration in China. It plays a very important role in MSET. It will design the national maritime safety regulations or requirements according to the decisions made by the Ministry of the Communication with reference to the international maritime safety conventions and regulations, such as SOLAS 74; STCW 78 and MARPOL 73/78, and promulgate these national maritime safety rules to national maritime institutions, the shipping industry and other parties involved. It is also responsible for designing the detailed training programs for the different MSET courses according to the decisions and requirements of the Ministry of Communications. It administrates the implementation and conduct of courses offered in the maritime institutions and training centers or other maritime bodies. The Bureau of Harbour Superintendency will supervise the examinations and certification for the MSET courses. These examinations are generally organized by the maritime institutions or other training units under the supervision of regional and local

Harbour Superintendency Administrations, who also will issue the certificates to the trainees who have successfully completed the relevant courses.

The Bureau of Harbour Superintendency has a very close relationship with the Bureau of Education in the fields of the MSET, because the Bureau of Harbour Superintendency will administrate and supervise the MSET courses offered and conducted in the maritime institutions which are under the responsibility of the Bureau of Education.

2.2.1.1 The Regional and Local Harbour Superintendency Administrations

The Bureau of Harbour Superintendency Administration of the Ministry of Communication has its own subordinate bodies at the various ports along the Chinese coasts and the inland waters of the individual provinces, autonomous regions and municipalities.

There are total six regional Harbour Superintendency Administrations which are located in Shanghai, Dalian, Tienjin, Qingdao, Guangzhou, Zhangjiang. There are 8 local Harbour Superintendency Administrations in Yingkou, Yantai, Shijiu, Lianyungang, Ningbo, Shantou and Hainan. These regional and local Harbour Superintendency Administrations are in charge of the maritime safety affairs in the individual areas, MSET is one of the most important task for them. They will administrate and inspect the conduct and the development of the MSET courses in the individual maritime institutions and the mariners training centers within their administrating area. They will also examine and issue relevant training certificates for the mariners who have successfully finished their various MST courses.

The difference of the responsibilities between the Regional

and Local Harbour Superintendency Administrations on the aspect of MSET is, besides the basic MST courses such as Survival At Sea, Manoeuvring of Survival Craft, Ship's Fire Fighting and First Aids for mariners, the Regional Harbour Superintendency Administrations are also in charge of the administration and certification of the advanced or more specialized MST courses such as Radar Observation, Operational use of Automatic Radar Plotting Aids (ARPA), VHF Communication training courses for the officers and captains, and the Tanker Safety Operation, Liquid Cargo Transportation courses for the crew members working on board the tankers. Whereas the Local Harbour Superintendency administrations are only in charge of the above mentioned basic MST courses.

To ensure the training quality of the MST courses, the Regional and Local Harbour Superintendency Administrations inspect whether the training program, textbooks, instructors and the equipment in individual maritime institutions, mariners training centers and other institutes are suitable for conduct the above MST courses. The maritime institutions, mariners training centers and other institutes are only allowed to provide certain MST courses for mariners after getting the confirmation of the specific Regional and Local Harbour Superintendency Administrations.

2.2.2 The Bureau of Education

The Bureau of Education is the authority which is responsible for the operation and management of the maritime education and training in the Chinese maritime institutions and Shanghai Mariners Training Center.

The MSET is a very important part of the maritime education and training, and this Bureau will make the short-term and long-term plans for the Chinese maritime education and training in consideration of the developments and needs of

the maritime industry and the maritime safety in co-operation with the Bureau of Harbour Superintendency. It will design the detailed programs for the maritime safety education and training and the MST courses in the Chinese maritime institutions at the different levels. It also arranges for the different maritime education and training courses among the maritime institutions. The bureau is also in charge of the budget and provides the financial means to the maritime institutions according to the requirements and needs of their maritime education and training courses.

2.3 The Maritime Institutions

Due to the rapid expansion of the national fleet, further development of the maritime education and training is necessary. Presently, there are 16 maritime institutions at the different levels in China. They are the main force for implementing and conducting the necessary MSET courses. According to the individual backgrounds of the students and the functions in the field of the maritime education and training, including the MSET, these maritime institutions can be divided into the following four categories:

2.3.1. Maritime Institutions of Higher Education (University and College Level, Four Years)

There are three maritime institutions of higher education (university and college level) in China. They are Dalian maritime university, Shanghai maritime university and Jimei navigation Institute which are respectively located in the northern, middle-east and southern part of China.

Senior middle school graduates (after 12 years education) after passing the Annual State University Entrance Examination can enter these maritime universities and college.

The duration of study for this kind of maritime institutions is 4 years. After 6 months' practice at sea within the period of four years of study and successful completion of their practice report, the graduates are awarded a Second Officer or Third Engineer or Second Class Radio Officer Certificate on board ship according to their individual learning specialties.

Apart from the general MSET and specific MST courses for the graduates, these three maritime institutions also provide higher level maritime education and training including the relevant MST courses for captains, officers and maritime engineers.

These universities and college mainly offer the advanced MST courses such as Radar Observer, ARPA, VHF Communication courses for the officers and captains, and Tanker Safety Operation and Liquid Cargo Transportation courses for crews. They also provide basic MST courses such as Survival At Sea, Manoeuvring of Survival Craft, Ship's Fire Fighting and First Aid for seafarers. These advanced and basic MST courses are also provided for the graduates in the university and college during their four years of study.

2.3.2. Specialized Maritime Institutions of Higher Education (Technical College Level, Three Years)

There are two specialized maritime institutions of higher education, Qingdao Ocean Shipping Mariners' College and Shanghai Vocational Maritime College, which are operated by the China Ocean Shipping Company (COSCO) and the Shanghai Bureau of Maritime Transportation Administration.

Apart from high school graduates, these maritime technical colleges offer enrollment to seafarers with a high school or

equivalent educational background and 2 years' sea experience as a seaman. The duration of study of in these colleges is 3 years. The graduates will get a Third Officer or Fourth Engineer Certificate after finishing their study and after 12 months of sea practice on board ship.

Similar as the previously mentioned universities and college, not only MSET and MST courses for the maritime graduates of their own colleges, they also offer the advanced and basic specific MST courses for seafarers. The trainees are mostly from COSCO and the Shanghai Bureau of Maritime Transportation Administration.

2.3.3. Maritime School of Medium Level of Technology (Two Years)

This category of the maritime institutions includes 8 institutions, they are Shanghai Marine School, Nanjing Marine School, Guangzhou Marine School Talian marine school, Nantong water transport school, Guangdong Maritime School, Mawei Merchant School and Zhejiang Traffic School. These maritime schools also enroll high school graduates, but the duration of study is only 2 years. They have a close relationship with the shipping companies. Some of them belong to certain shipping companies.

In addition to the general courses for a deck or engine room rating, these marine school also provide the basic theoretical maritime study courses in all aspects of navigation, seamanship, carriage of cargo and other relevant subjects on shipping business. The students will be working firstly on board ship as a deck or engine room rating after their graduation, but after having two years' sea experience, they can get a Third officer or a Fourth Engineer Certificate if they successfully pass the certification examination.

Most of these maritime schools offer the above mentioned basic MST courses for their graduates and seafarers. Dalian Marine School and Nanjing Marine School also provide the higher level or more advanced MST courses such as Radar Observer, ARPA, VHF Communication courses for the officers and captains.

2.3.4. Maritime Technical School (Three Years)

Under this category, there are 3 maritime technical schools named Shanghai Mariner School, Guangzhou Mariner School and Tienjing Mariner School in the different parts along the Chinese coast.

These mariner schools enroll junior middle school graduates. After three years of study, the students are qualified to work on board ship as a deck or engine room rating.

Due to the entrance background and the learning subjects at the school, the graduates of these Maritime Technical Schools can only serve as a deck or engine room rating on board ship after their graduation. If they want to be a marine officer or engineer, they have to continue and finish their further study in the maritime university or college.

Besides the conventional maritime education and training course for the ratings, these institutions also offer the basic MET courses for their graduates and seafarers.

2.4. The Mariners Training Centers

In order to complete the huge task of the specific MST for the seafarers of national fleet in a certain limited period according to the requirements of the international and national maritime safety conventions and regulations, with a

view to the practical situation of the Chinese maritime education and training work, China had to expand facilities for the MST of mariners. In addition to MST courses offered in the maritime institutions both for the graduates and the mariners who have already worked on board ship, there are four special mariners training centers which offer specific MST courses for the mariners.

Apart from the Shanghai Mariner Training Center which belongs to the Ministry of Communications, the other local mariners training centers are generally established and operated by the shipping enterprises and maritime social organizations. These mariners training centers are under the administration of the relevant Regional or Local Harbour Superintendency Administrations, and they are co-operated and assisted by the maritime institutions. According to their differences of administrative authorities, they can be divided into two categories:

2.4.1. Shanghai Mariners Training Center

Shanghai Mariners Training Center was founded in 1984, and established by the Ministry of Communications. It is directly under the administration of the Bureau of Education.

This mariners training center not only offers maritime education and training courses for the examination for the certificates of senior marine officers and engineers (including captain and chief engineer certificates), but also the advanced and specialized MST courses for the captains, officers, and the tanker crews from different shipping companies in China.

The training center co-operates with Shanghai Maritime University, the Shanghai Branch of China Ocean Shipping Company (COSCO, Shanghai), Shanghai Bureau of Maritime

Transportation Administration. In consideration of the enhancement of management of the training center and its geographical location, Shanghai Harbour Superintendency administration also takes part in the administration of this training center.

2.4.2. Local Mariners Training Centers

In addition to the Shanghai Mariners Training Center, there are three local mariners training centers in China. They are Tienjing Mariners Training Center, Dalian Mariners Training Center and Guangzhou Mariners Training Center.

These training centers are usually established and organized by some large shipping companies or social maritime organizations. They are all under the administration of the regional and local harbour superintendency. For example: the Guangzhou Mariners Training Center is organized by the Guangzhou Branch of COSCO, Guangzhou Bureau of Transportation Administration, Guangzhou Navigation Association and Guangzhou Navy Academy. It is under the administration of the Guangzhou Harbour Superintendency administration.

Compared with the Shanghai Mariners Training Center, the main difference is that these mariners training centers are not directly under the supervision of the Ministry of Communications, they are managed by the individual local shipping companies or other maritime bodies. Some of these mariners training centers offer the same courses which are offered in the Shanghai Mariners Training Center, but most of them only offer the basic MST courses for seafarers.

2.5. National Shipping Companies and Social Maritime Organizations

In the Chinese MSET system, most of the shipping companies have their own sections or offices which deal with maritime safety and MSET.

To enhance the maritime safety and improve the performances of their mariners, the maritime safety sections or offices of the companies are responsible for the arrangement of sending their crews to attend MST courses according to the requirements of the international and national maritime safety conventions and regulations. Some of the shipping companies also offer basic MST courses for seafarers. But these courses have to be approved by the Regional and Local Harbour Superintendency Administrations.

Example of such courses are given next. The Head Office of China Ocean Shipping Company (COSCO, the largest national shipping enterprise) has established a maritime college (Qingdao Ocean Mariners College) for the technical training and knowledge updating to its officers and engineers. The branches of COSCO at Shanghai, Guangzhou, Tienjin, Dalian and Qingdao all have their own maritime academies or institutions for various training and education purposes. The other shipping companies, for instance, Shanghai Bureau of Maritime Transportation Administration has also set up its own Maritime Vocational College and Maritime school to carry out same work as Qingdao Ocean Mariners College. It is undeniable that these maritime institutions also are components of the Chinese MSET system.

Moreover, the Chinese social maritime organizations which are the maritime academic bodies involved in the development maritime technology also play a considerable role in the

field of the MSET and MST in China. For example, the China Navigation Association with its sub-associations in Shanghai, Guangzhou and other regions all are active to organize and offer the basic MST courses including Survival At Sea, Fire Fighting and Manoeuvring of Survival Craft and First Aid training courses for the mariners in their relevant area.

The social maritime organizations are managed and operated by the representatives from the different shipping companies and other social societies. Many of the staff members in such organizations are maritime experts who used to be a captain or chief engineers on board ship.

The organizations keep very close in touch with the various maritime institutions, mariners training centers, shipping companies and social society, and they can get the close co-operation with above maritime bodies in conduct of the basic MST courses.

THE STRUCTURE OF MSET SYSTEM IN CHINA

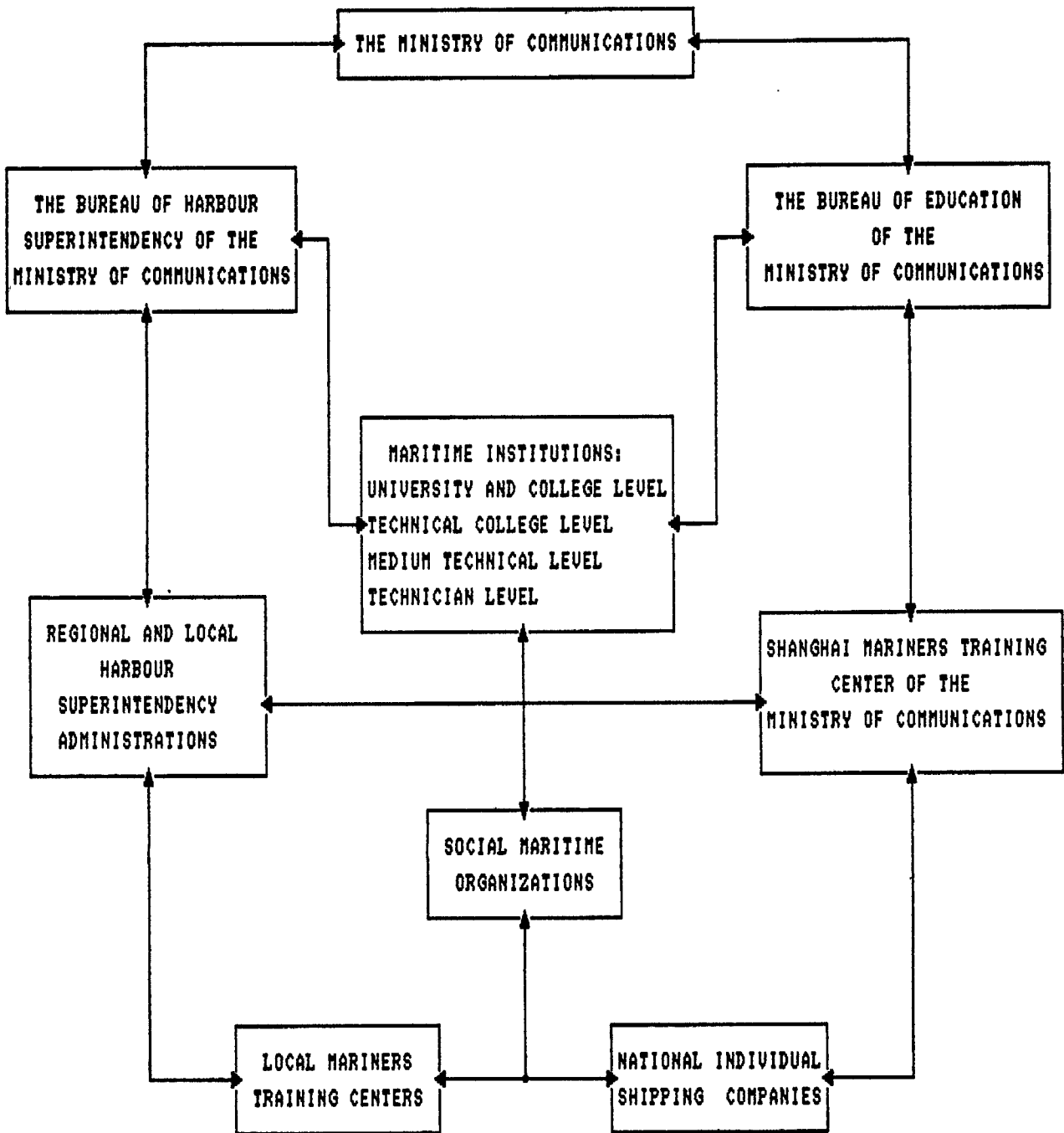


FIGURE 2.1

CHAPTER THREE: EXISTING MSET COURSES CONDUCTED IN CHINA

The existing MSET courses conducted in China are arranged to meet the needs of the requirements for the maritime study in relevant maritime specialties and the international and national maritime safety conventions and regulations. These courses can be classified according to the following three categories:

3.1. General MSET

The general MSET is traditionally a very important component of the conventional MET for the graduates of the maritime institutions. It is contained in the common MET courses which are dealing with the maritime safety aspects in navigation, seamanship, carriage of goods by ship, cargoes, prevention of collision at sea, manoeuvring of ships, maritime transport security and seaman's duties.

The general MSET and its course program is conducted and implemented within the common maritime education and training of the specific individual courses through the classroom lectures and practical training items both at the laboratory or training bases in the maritime institutions and on board ships.

The aim of the general MSET is to help the students to be able to understand the importance of maritime safety, and master the basic safety knowledge and the techniques in the different maritime subjects in order to ensure the safety operation at sea when they are working on board ship in the future.

In consideration of the importance and necessity of the maritime safety, the contents of general MSET will be arranged in different ways among the maritime subjects

accordingly.

Taking the teaching programs of the navigation department in Shanghai Maritime University as example, the arrangement of the courses dealing with the general MSET, their total teaching hours and the practical training items are as follows:

(1). Theoretic Lectures

Subject	Total Teaching Hour
Coastal Navigation	151
Marine Meteorology	60
Celestial Navigation	75
Carriage of good by ship (Ship Stability, cargo handling and transportation)	66
Prevention of Collision at Sea	50
Manoeuvring of ship (including the procedure for man overboard and Search & Rescue)	36
Marine Security and Seaman's Duties (Bridge Procedures and Team)	58
Seamanship	30
Maritime Communication	30
Radar and ARPA	85
Electronic Navigation Instruments (Navigational Aids)	70

(2). Practical Training

Subject	Total Time
Field Work on board Ship	2 Weeks
Boating and Fire-fighting	2 Weeks
Stowage Planning	1 Week
Shipping Route Planning	2 Weeks
Comprehensive Training	2 Weeks
Graduation Practice	23 Weeks

Note:

1. Field Work on board ship is a specific study period arranged for maritime students to familiarize ships' structure, equipment and facilities, routine work and life on board ship.

2. Graduation Practice is a comprehensive practical training on board ship. It is conducted for the graduates in the last semester of the four years of study before their graduation. Most of the graduates will go on board ships of the different shipping companies for this practice, and few of them can have this practice on board the training ship of the maritime institution.

3. Comprehensive training listed above is a short-term intensive and refreshing maritime practical training for the graduates just before they start their graduation practice. It includes the seamanship activities as a sailor, the familiarization of narrow channel of Hwangpu River (on board the university yachts, practical use of radar and ARPA (on the radar and navigation simulator) and VHF communication.

4. There are total 2800 teaching hours for the maritime students during the four years of study at the university. Apart from the above listed teaching hours used for maritime safety subjects, the remaining teaching hours will be

distributed for learning the basic theoretical knowledge and other subjects relating to navigation specialty.

Taking another example from the standard teaching program of the Chinese maritime institutions in medium level of technology, the General MSET course which is also conducted in the relevant maritime learning subjects of individual courses, total hours of these courses for teaching and practice are as follows:

Name of Course	Total Teaching Hour
Coastal Navigation	154
Marine Meteorology	84
Celestial Navigation	80
Carriage of good by ship	72
Prevention of Collision	45
Manoeuvring of ship	45
Marine Security and Seamen's Duties	32
Seamanship (including sailors' work)	116
Maritime communication	30
Radar and ARPA	50
Electronic Navigation Aids	50

To achieve the aim of the general MSET course, it is very important to arrange for the maritime graduates to have sufficient time in the safety training for the systematic development of attitudes, knowledge and skills required in their later work on board ship besides enough teaching hours for their basic theoretical learning in the classroom. This has already been showed in the previous arrangements of the general MSET course that the graduates have to join a lot of practical training activities by the field work study, comprehensive training, graduation practice and other

training items.

3.2. Special MSE Course

In consideration of the needs of maritime safety and maritime practical situation in China, during the national safety traffic work conference in the April, 1988, the Ministry of Communications made the decision to offer a special MSE course named " Ship Transportation Security (STS) " for the maritime students during their study at the institutions from 1990.

The aim of the special " STS " course is to help the graduates in the maritime institutions to enhance the their maritime safety consciousness and their responsibility, to raise their technical level of maritime safety and management.

There are three main aspects for this STS course:

- i. The safety consciousness in maritime transportation.
- ii. The technical safety knowledge for maritime transportation.
- iii. The safety management of maritime transportation

The syllabus and the distribution of the teaching hours for this special STS course are as the following:

(1). General introduction (6 teaching hours)

- a. The infrastructure of maritime transportation.
- b. Enhancement of the safety consciousness in maritime transportation.

c. Safety management of maritime transportation.

(2). Casualties and their prevention (10 teaching hours)

a. The definition and classification of maritime casualties.

b. The statistics and analysis of maritime casualties.

c. The existing situation and tendency of maritime casualties.

d. The basic conditions and causes for maritime casualty.

e. The main principles and measures to prevent maritime casualty.

(3). Single ship safety management (13 teaching hours)

a. Enhancing crew members abilities and raising the quality of performance of crew members.

b. Safety organization of single ship transportation.

c. Safety quality management of single ship.

d. Influential factors of safety transportation to a single ship in the carriage of cargo.

(4). Safety administration of ship transportation
(10 teaching hours)

a. Ship's seaworthiness and related requirements.

b. The general significance and effects of rules on maritime safety administration.

- c. The investigation of maritime casualties and its procedures.
 - d. The application of VTS in the safety administration of ship transportation.
- (5). Emergency procedures and safety educational management of crew members (8 teaching hours)
- a. Emergency procedure.
 - b. The contents of safety management education for crew members.
 - c. The evaluation of the results on the safety education for crew members.
- (6). Ship safety management and other relevant affairs (7 teaching hours)
- a. The regulations of search and rescue at sea.
 - b. Ship safety insurance and its function.
 - c. The significance and function of the law for protecting water-born labor.
 - d. The significance of ship survey to the safety ship transportation.
 - e. The ship safety management in the relation to the prevention of marine pollution.

(7). Application of modern ship transportation safety management (6 teaching hours)

- a. The analysis of safety system.
- b. The probability of maritime casualties and decision making in ship transportation safety management.
- c. Maritime safety vessel traffic service.
- d. The management of maritime information.

The total teaching hours for this special STS MSE course is 60. The lectures of this course will be given by the qualified lecturers who have a certain sea experiences. At the end of the course, a written examination will be arranged for the students.

3.3. Specific MST courses

The specific MST courses are specially for the maritime safety training of seafarers according the requirements of the STCW 1978, MARPOL 73/78 and the other conventions and regulations issued by IMO and relevant national maritime safety rules and regulations.

These courses include "Survival At Sea", "Manoeuvring of Survival Craft", Ship's Fire-Fighting" and "First Aids at Sea" which are combined together and called "Four Sub-Certificate Training Course" for all mariners; "Radar Observer and Simulator", "The Operational Use of Automatic Plotting Aids (ARPA)" and "Radio Telephony" which are combined together and called "Three Sub-Certificates Training Course" for captains and officers on board ship; Finally "Tanker Safety Operation", "Crude Oil Washing for Tanker" and "Liquified Gas in Bulk Safety Management" are

special certification training courses for mariners working on board oil tanker and liquified gas ships.

The arrangements and conduct of the training courses are made in according with the Regulations Governing Special Training and Certification for Seafarers issued by the Harbour Superintendency Administration of the Ministry of Communications on 14th, June, 1984.

The programs of the individual MST courses are designed by the Bureau of the Harbour Superintendency Administration of the Ministry of Communications in reference to the IMO maritime safety conventions, regulations and models courses and in consideration of the practical maritime safety situation in China.

The detailed information about these MST courses, their main training subjects and learning objectives are as follows:

3.3.1. Four Sub-certificates Training Course (Survival at Sea, Manoeuvring Survival Craft, Firefighting and First Aid at Sea)

In the Regulations Governing Special Training and certification for Seafarers issued by the Bureau of Harbour Superintendency of the Ministration of Communications in 1984, all Chinese seafarers working on board the ships more then 200 GRT must attend the survival at sea, manoeuvring survival craft, ship's fire fighting and first aid at sea training and certification course. All the students of the maritime institutions of the different levels should also complete these courses during their study at the institutions from 1985 and onwards.

The seafarers and students will attend the four sub-

certification training and certification course in a certain period of time. Generally the duration of these four courses is three weeks. The total training hours is not less than 108 for the ratings and 114 for captains and senior crew members.

During the training, the trainees have to have some theoretical lectures, take part in the practical training activities and subject to the written examinations. The different training programs for survival at sea, manoeuvring survival craft, ship's fire fighting and first aid at sea are briefly as the following:

3.3.1.1. Survival at SEA

The objective of the "Survival at Sea" training course is to help the trainees be able to react in a correct manner during the emergency situation, take the right measures appropriate to his own survival and to the survival of the others, and use survival equipment correctly. The trainees will also acquire the knowledge which in some instances will enable him to identify and correct defects and thereby prevent emergency.

The main subjects and teaching hours for this training course are as follows:

- A. Theoretical Lectures: (not less than 16 teaching hours)
 - a. The categories of the ship's casualty: collision, on-fire, foundering, etc. General knowledge of survival at sea in various distress situations.
 - b. The general kinds of the safety appliances fitted on board ship. Personal responsibilities and specific precautions in emergency situations.

- c. Evacuation from ship after the abandoning order is given. Actions to be taken after boarding liferaft.
- d. The main dangers to survival and the general principle of survival at sea. The knowledge for survival after landing in an uninhabited area.

B. Practical Operation: (not less than 8 hours)

- a. The correct manner for dressing of the lifejacket.
- b. Abandoning ship, getting away from the distress area, Putting an upside-down liferaft into right position. Boarding a lifeboat or liferaft from ship or water.
- c. Keeping the body afloat. helping others to board the lifeboat or raft.

3.3.1.2. Manoeuvring Survival Craft

The objective of the " Manoeuvring Survival Craft " training course is to help the trainees to be able to take charge of the preparation, embarkation and launching of survival craft. They will also be to manage a boat under oars, sail or motor and take charge of an inflatable liferaft. Trainees will know the correct use of all survival equipment and the actions to take to prevent the lives of those in their charge.

The main subjects and teaching hours for this training course are as follows:

A. Theoretical Lectures: (not less than 10 teaching hours)

- a. The kinds, structure, particulars, appliance and fittings of the lifeboats and liferafts on board ship.
- b. The knowledge of the launching, recovering and manoeuvring for the lifeboat and liferaft.
- c. The knowledge of survival in the lifeboat and liferaft (emphasize again the main points of this subjects) .

B. Practical Operation: (not less than 16 teaching hours)

- a. Drills in launching and recovering a lifeboat and liferaft.
- b. Handling of a lifeboat, including sailing, rowing and manoeuvring lifeboats to clear off and berth alongside a ship in normal and rough weather.
- c. Starting and operating the engine of a motor lifeboat, and general techniques to clear off the defection of a motor.
- e. Operating the communication facilities for distress purposes, including the radio equipment and visual signals.

3.3.1.3. Ship's Fire Fighting

The objective of " Ship's Fire Fighting " training course is to help the trainees be able to react in a correct manner in the event of an outbreak of fire, to take appropriate measures for the safety of personnel and of the ship, and to use the fire fighting appliances correctly. The

trainees should also be able to state and demonstrate that they have acquired sufficient knowledge and skills which will enable them to identify and correct defects and prevent fire from occurring.

The main subjects and teaching hours for this training course are as follows:

A. Theoretical Lectures (not less than 20 teaching hours)

- a. Basic knowledge of the condition for occurrence of fire, the properties of flammable materials and categories of fire.
- b. Fire hazards, the causes and prevention of fire on board ship, spreading of fire.
- c. The structure and facilities of ship for fire fighting. The detection of fire and the extinguishing methods for different kinds of fire, the use and maintenance of the fire equipment and personal safety apparatus.
- d. Fire and explosion prevention on board tankers.
- e. Fire fighting organization and drills on board ship.

B. Practical Operation (not less than 14 teaching hours)

- a. Operating the different kinds of portable extinguishers and personal safety apparatus.
- b. Extinguishing the different kinds of fire (electricity, oils and chemicals) by water, foam, dry powder and other chemical materials.
- c. Extinguishing a fire in smoke and fire filled enclosed

space, including an accommodation room and a simulated engine room. Entering and passing through a compartment into which high expansion foam has been injected using a lifeline but without breath apparatus.

C. Additional training for captains and senior crew members who are in charge of fire fighting work (not less 6 teaching hours)

a. The control of fire on board ship, organizing and training of the crew members for fire fighting and the fire fighting procedures at sea and harbour. The knowledge of first aid including the technology of resuscitation

b. The inspection and maintenance of fire systems and equipment on board ship. The control of ventilation, fuel, electricity and air systems.

c. The precautions and correct measures for prevention of hazards for the ship when using water for fire fighting, the dangers caused by certain fire fighting methods.

d. The precautions and fire fighting in relation to dangerous cargoes.

e. The investigation and reporting on a fire accident.

3.3.1.4. First Aid at Sea

The objective of the " First Aid at Sea " training course is to provide knowledge and skill of first aid, sufficient to take immediate effective actions in the case of accidents or illness.

The main subjects and teaching hours for this training

course are as follows:

A. Theoretical Lectures (not less than 16 teaching hours)

- a. The principle and aim of first aid, the body structure and functions.
- b. The correct use of the first aid box, the precautions and proper treatment in case of drowning, electric shock.
- c. Appropriate first aid measures for burns, scalds, and effects of heat and cold. The prevention and first aid treatment for sunstroke and heat stroke.
- e. The signs, symptoms and first aid measures for fracture, poisoning and shock,

B. Practical Operation (not less than 8 teaching hours)

- a. The operation of artificial respiration and heart compression for resuscitation and the relevant precautions.
- b. The precautions and methods on applying pressure bandage for bleeding.
- c. Applying a sling and cravat bandage.

3.3.2. Three Sub-certificates Training Course (Radar Observer and Radar Simulator, Operational Use of Automatic Plotting Aids, Radio Telephony)

The Three Sub-Certification Training course, including Radar Observer and Radar Simulator, Operational Use of Automatic Plotting Aids (ARPA) and Radio Telephony is specially offered for captains and deck officers.

According to the National Regulations Governing Special Training and certification for Seafarers issued by the Bureau of Harbour Superintendency of the Ministration of Communications in 1984, all the Chinese captains and deck officers working on board a Chinese vessel or foreign vessel which is more than 1,600 GRT, should attend this three sub-certificates training courses and pass the examinations.

Similar with the Four Sub-Certificates Training Course, the trainees have the theoretical lectures, take part in the practical training activities, complete all the training items and participate in the practical operation assessment, oral and written examinations. The different training programs for Radar Observer and Radar Simulator, ARPA and Radio Telephony are briefly as the following:

3.3.2.1. Radar Observer and Radar Simulator

The objective of the "Radar Observer and Radar Simulator" course is to help the trainees to be able to correctly operate radar including the selection of the mode, range setting, getting a optimal radar picture; to be aware of the limitation of the equipment in detecting targets and in terms of accuracy; to be able to compare the radar display with the chart, select conspicuous land targets and use these targets to fix his position; to be aware of the need to maintain a continuous plot of ship targets which pose a potential threat of collision, and derive from the plot the necessary information about the other ship's speed, course and CPA to enable action to be taken in ample time, in accordance with COLREG 1972.

At the same time, through the training on a radar simulator, to help the trainees to be able to make efficient and effective use of radar as a navigation aid in congested,

confined waters, recognize potential threats and make valid navigational and collision-avoidance decision based on the sound radar observation and plotting in compliance with the COLREG 72; will be aware of the time needed to appreciate action, and to ascertain that such action is adequate and does not give rise to further conflicts with other vessels; will also realize that excessive speed in poor visibility reduces the time available to assess a threat and to take appropriate action.

To achieve the foregoing objective, the course will be conducted not only by lectures and practice on real radar equipment, but also through a series of practical and simulated exercises on radar simulator. This course is a combination of radar observation & plotting and radar simulator training courses.

The total teaching hours is 100, and the contents of this training course includes the following:

A. Theoretical Lectures:

- a. Fundamental operating principles of radar, the basic individual components of Radar and their operating principles.
- b. Setting up and maintaining of radar display, the factors affecting radar detection.
- c. The radar plotting and the use of radar in navigation, the relationship of COLREG 1972 to the use of radar.
- d. Brief introduction of radar simulator and its relevant facilities.

B. Practical Operation

- a. Operation of radar, setting up an optimum radar display, measuring the range and bearing of targets. The general maintenance of radar.
- b. Radar plotting on radar simulator, getting the information of the speed, course, CPA and TCPA of targets, and actions to prevent collision.
- c. Taking part in simulated exercises in open sea, in confined and congested waters or near the traffic separation schemes for safe radar navigation.

3.3.2.2. Operational Use of Automatic Plotting Aids (ARPA)

The objective of the " Operational Use of ARPA " course is to train on the ability to choose an appropriate mode display; select plotting and graphics controls suitable to circumstances; make appropriate use of operational alarms; acquire and track those targets which present a potential threat of collision; extract the information needed on course, speed and nearest approach to enable early action to be taken to avoid close-quarter situations; and make use of ARPA to confirm and monitor the outcome of actions.

Total teaching hours is 40, and the contents of this training course includes the following:

A. Theoretical Lectures

- a. The operating principle and functions of an ARPA system, the IMO performance standards for ARPA system.
- b. The reliability, the factors affecting the accuracy and characteristics, tracking abilities and limitations,

processing delays, trial manoeuvres, acquisition of targets and limitations, the selection of display models, identification of dangers, operational warnings and test of ARPA systems.

- c. The errors of an ARPA system and the risks of over-reliance on ARPA.

B. Practical Operation

- a. Operating an RPA, setting up display, selecting display model, acquiring targets.
- b. Identifying dangerous targets, assessing the threat of collision, assessing the suitable actions for avoidance of collision by trial manoeuvres.
- c. Taking part in the simulated exercises in a narrow channel or traffic separation scheme, using other functions of ARPA for safe navigation.

3.3.2.3. Radio Telephony

The objective of the " Radio Telephony " course is to train on the basic knowledge of the operating principles and the operation procedures of modern radio communications equipment.

The participants of this training course are usually the captains and deck officers who have already had a certain level of ability of spoken English knowledge.

Total teaching hours is 30, and the contents of this training course include the following:

A. Theoretical Lectures

- a. The operating principles, operation methods, precautions and relevant communication procedures of satellite, single side band and VHF communications.
- b. The VHF communication procedures of the International Rule of the code for radio communications, includes the communication procedure of general, distress, emergency, safety communication and preventing collision between ships.
- c. The IMO Maritime Standard Vocabulary and its use, the communication procedures of Merchant Ship Position Reporting System and Search & Rescue (SAR) at sea.

B. Practical Operation

- a. Operation of the satellite and VHF communication equipment and practice of general, distress, emergency, safety communication.
- b. Practice of VHF communication in preventing collision between ships and merchant ship position reporting system.

3.3.3 Safety Operation of Tanker and Crude Oil Washing (COW)

According to the requirement of the formal notice issued by the Bureau of Harbour Superintendency of the ministry of communications in 1987, all the crew members working on board oil tankers of more than 150 GRT have to take part in the Safety Operation of Tanker training course. All captains, chief engineers, officers and the crew members dealing with the operation of oil pumps and special pumps working on board the tankers fitted with the crude oil washing equipment must

attend the Crude Oil Washing training course.

These training courses have been formally offered at some maritime institutions and mariners training centers since 1987. The theoretical lectures for these courses are mostly arranged in the classrooms. Because there is no Liquid Cargo Handling Simulator available in China now, the practical operation training are carried out in the laboratories or on board real tankers.

After the trainees have successfully completed the training courses, they can get the specific certificates on these subjects.

3.3.3.1 Safety Operation of Tanker

The objective of the " Safety Operation of Tanker " training course is to train on the basic knowledge of structure, cargo and operation of tankers; to work on oil tankers and perform specific duties and fulfill responsibilities in connection with cargo and cargo equipment.

The total number of teaching hours is 42, and the contents of this training course includes the following:

A. Theoretical Lectures (38 teaching hours)

- a. The types, structures, equipment and terminology on board of tankers. The basic properties of petroleum and its hazards.
- b. Static electricity, the prevention of fire and explosions on board tankers. The protection appliances, measuring facilities and precautions to be taken on board tankers.
- c. General introduction of COW, the prevention of marine

pollution and the international and national rules for marine pollution.

B. Practical Operation (4 teaching hours)

- a. Case study on tanker structures, equipment, types and other particular characteristics.
- b. Operating the cargo equipment, the protection appliances and measuring facilities on board of tankers.

3.3.3.2 Crude Oil Washing

Total teaching hours amounts to 52, and the contents of this training course includes the following:

A. Theoretical Lectures (40 teaching hours)

1. General introduction of tankers and its cargo, the history, the principle of COW system. The facilities and equipment on board tankers with a COW system, and the particular characteristics of such tankers.
2. The international conventions and national regulations about the precautions of marine pollution from ships.
3. Introduction of the Inert Gas System and COW System including the operating principles, structures, equipment, procedures and precautions.
4. The detailed information about the COW application, planning, inspections, and the specific safety requirements, measures and use of emergency appliances of COW system.

B. Practical Operation (12 teaching hours)

1. Use of safety appliances and apparatus on board tankers with COW system, familiarization of the operation panels of control station and relevant equipment.
2. Operation of COW and Inert Gas systems, including the operation of washing machine, measurement meters of oxygen meter and explosive meter.
3. Use of the measurement meter for measuring the amount

of floating oil and demonstration of the operation of monitoring system for discharging.

3.3.4 Special Training for Ships Carrying Liquefied Gas In Bulk Safety Management

A special Training for Ships Carrying Liquefied Gas In Bulk Safety Management has been just started for crew members working on board liquefied gas tankers in China. In April 1990, the Bureau of Harbour Superintendency of the Ministry of the Communications held a special seminar to discuss the implementation and standardization of the training and certification of this course. The training program was divided into A and B parts. Part A is for all crew members working on board liquefied gas tankers, and Part B is special for the officers and engineers who are in charge of safety management of a liquefied gas tankers. This training course is conducted on board liquefied gas tanker.

3.3.4.1 Special Training of Ship Carrying Liquefied Gas In Bulk Safety Management, Part A

The objective of "Special Training of Ship carrying Liquefied Gas In Bulk Safety Management, Part A" training course is to provide basic knowledge of structure, cargo and operation of liquefied gas tankers; to serve on such a ship and perform specific duties and responsibilities in connection with cargo and cargo equipment.

Due to the limited number of the ships carrying liquefied gas in bulk in Chinese national fleet and just a few of crew members working on board these ships, this training course is carried out on board ships carrying liquefied gas in bulk. The instructors give the lectures and demonstrations on this kind of ships and the trainees can have the practical operation training there as well. After trainees successfully

complete the training course, they can get the special certificates for this subject.

The total teaching hours is 76, and the contents of this training course includes the following:

A. Theoretical Lectures (60 teaching hours)

1. General introduction of the characteristics of a liquefied gas carrier; its structure, construction materials, equipment and other special instruments both on board and ashore.
2. The physical and chemical characteristics of liquefied gas and relevant technical terms.
3. The hazards of liquefied gas, the emergency procedures for prevention of fire and explosion of a liquefied carrier.
4. The handling, management and shipping business of liquefied gas.

B. Practical Operation (16 teaching hours)

1. Operating the instruments for prevention of fire and explosion on board a liquefied carrier.
2. Exercising the fire fight drill and first aid on board a liquefied gas carrier.
3. Practical operation of loading and discharging of a liquefied gas carrier.

3.3.4.2 Special Training of Ship carrying Liquefied Gas In Bulk Safety Management, Part B

The participants who join the part B training course are officers and engineers in charge of the safety management of liquefied gas tankers, they have to attend the Part B training after finishing part A training course.

The objective of "Special Training of Ship carrying Liquefied Gas In Bulk Safety Management, Part B " course is to train the officers and engineers in charge of loading, discharging and other safety management on board a liquefied gas carrier.

The total teaching hours is 24 (16 teaching hour for lectures and 8 teaching hour for practical operation). The contents of this training course deals with the same subjects as the training part A, but they are all more deeper and wider concerned with the following:

1. The characteristics of liquefied gas, the special equipment and instruments on board liquefied gas carrier.
2. The emergency procedures for prevention of fire and explosion on board liquefied gas carrier.
3. Practical cargo handling, management and relevant business for liquefied gas shipping.

In consideration of the introduction and increased number of the chemical tankers, the Bureau of Harbour Superintendency of the Ministry of Communications is preparing a new training program for "Safety Operation of Chemical Tankers". This training course will be offered at the end of 1991.

CHAPTER FOUR: THE EVALUATION OF PRESENT MSET IN CHINA

From the previous chapters 2 and 3 in this dissertation, it is seen that China has paid a lot of attention to its national MSET. Following the establishment of the national MSET system, various MSET courses have been offered and conducted by various maritime institutions, mariners training centers and other maritime bodies according the requirements of the international and national maritime safety conventions and regulations.

In the recent years, the Chinese MSET system has already played a very important role in the national maritime industry, and achieved progress not only in the implementation and conduct of the international and national maritime safety conventions and regulation, but also in the promotion and development of national maritime industry.

Due to the dramatic development of the national maritime industry and rapid increased demand for seafarers, the present MSET can not fully satisfy the need of this new situation. At the same time, there are a lot of problems which are still existing in the present MSET system and need to be solved.

4.1 The Achievements of Present MSET in China

It is generally acknowledged that China has a long navigation history, in fact, the national modern maritime industry in China developed very slowly before 1970s. The Ocean going shipping fleet was formally established in 1961, consisting of only one shipping company COSCO with 25 ships of 220,000 DWT. By the end of 1960s, the DWT of the national fleet increased to 1,000,000. Because of some historical and political factors in China, such as the great cultural revolution, the organization and structure of maritime safety

administration and the MSET system was delayed. After the beginning of seventies, especially following the end of the great cultural revolution, a great change took place in the Chinese national maritime industry. The national fleet increased to 645 ships and 9,370,000 DWT in 1979 and there were 1,412 ships with 18,000,000 DWT (300 GRT and over) by the end of 1989. In order to follow up such a rapid development of the national maritime industry, the Chinese maritime safety administration and MSET system have to be well adapted.

4.1.1 The MSET System

As it is mentioned above, the Chinese MSET system has been already established for some years. Nowadays there is a need to further develop this very important part of national maritime industry.

4.1.1.1 The MSET Administration

Proper administration and management is the key point in the development and improvement of every organization and also the national MSET system. The Ministry of Communication of China has enhanced the MSET administration and management through its two sub-bodies, the Bureau of Harbour Superintendency and the Bureau of Education.

These two sub-bodies of the Ministry of Communications are responsible for setting the national MSET plan for the insurance and promotion of the safety in the maritime industry according to the national economical development in China. They regularly, sometimes irregularly, send their representatives to the Regional or Local Harbour Superintendency Administrations, the maritime institutions, mariners training centers and the national main shipping companies for inspecting the practical situation of the

quality and results of the MSET.

Due to the Chinese new policy of "Opening to the Outside of the World", and the rapid development of national shipping companies, there are a lot of local ports opened to foreign vessels and many local shipping companies are founded. In order to ensure the maritime safety administration and the conduct of the MSET, various new Local Harbour Superintendency Administrations have been set up. Up to now, there are 14 Harbour Superintendency administrations which have been established and a lot of maritime safety experts have been selected to support the work of the Harbour Superintendency Administrations.

To update and standardize the MSET course programs and ensure the quality of the MSET, the Bureau of Harbour Superintendency and the Bureau of Education have issued detailed standard teaching and training programs for the MSE and MST courses.

Under the supervision and administration of the Bureau of Harbour Superintendency, the Regional and Local Harbour Superintendency Administrations are responsible for the sufficient qualification of the teaching staff, the facilities and teaching aids for MSET in the maritime institutions, Mariners training centers and other relevant maritime bodies. The maritime institutions, mariners training centers and other maritime bodies can only start the relevant MST courses after the specific approval from the Harbour Superintendency Administrations.

At the same time, these Regional or Local Harbour Superintendency Administrations, the maritime institutions, mariners training centers and other maritime bodies involved in the MSET have to provide the regular MSET-reports to the supervising authorities.

4.1.1.2 Expansion and Establishment of Maritime Institutions and Mariner Training Centers

Because of the great change in the Chinese maritime industry, MSET has a huge task for the maritime education and training bodies. The expansion of the national fleet and changes in shipping practices demand a large number of qualified mariners and maritime safety management personnel. The development of the maritime institutions and the mariners training centers were inevitably necessary.

Before 1960s, there were only three maritime institutions, Dalian Maritime College, Shanghai Maritime Institute and Jimei navigation School.

Between 1960 to 1980, four maritime institutions of medium technical level and one maritime institute of the higher technical level (Dalian, Shanghai, Guangzhou Maritime Schools, Nanjing Mariners School and Shanghai Maritime Adult Technical College) were in operation.

In 1980, Qingdao Ocean Mariners College was opened for maritime higher education, in this period several maritime technical schools such as Shanghai Maritime Technician school, Tienjin Mariners School began to enroll their graduates.

To establish more maritime institutions of higher education, the former Jimei Navigation School was changed into "Jimei Navigation Academy" in 1978 and finally became the "Jimei Navigation Institute" in 1989.

In the middle of 1980s, Shanghai Mariners Training Center was founded. It is directly under the administration of the Ministry of Communication. by the end of 1980s, the other

three mariners training centers, Tienjin Mariners Training Center, Dalian Mariners Training Center and Quangzhou Mariners Training Center were established. They are all under the administration of the individual regional or local Harbour Superintendency Administrations, organized by some main shipping companies and supported by the maritime institutions in the relevant areas.

In order to speed up the training of the basic MST courses for crews, some social maritime organizations also joined the Chinese MSET system and have taken part in the MST activities.

All expansion and establishment of maritime institutions, mariners training centers and social maritime organizations have enhanced the Chinese MSET system, and effectively ensured the conduct of the MSET throughout whole country.

4.1.1.3 MSET in The National Shipping Companies

As China is a socialist country, its maritime industry is very different from the other non-socialist system countries, especially the European countries. The Chinese shipping companies have two particular characteristics. One is that most of them are owned by the central government and the other is that they all have a large numbers of ships and personnel.

For example, the largest national shipping company COSCO has 629 ships with 15,000,000 DWT, there are 56,000 staff members working for COSCO of which 35,000 are crew members. One of the regional shipping companies, Shanghai Bureau of Maritime Transportation Administration has 187 ships with 22,780,000 DWT and 14,000 crew members. Therefore a lot of work for the MSET has to be done in the individual shipping companies for their crew and staff. Consequently, it is very important to

have systematical management of MSET in such companies. According to relevant requirements of the Ministry of Communications, all shipping companies must set up a maritime safety section in charge of the MSET of the crew and other maritime safety affairs in their companies.

For instance, there are two specific departments in COSCO, the educational and maritime safety superintendency departments which are responsible for the MSET of the crew and staff of COSCO. Each of the branch companies of COSCO have also set up these two divisions. One of the vice presidents or managing directors of the companies must take special care of these two divisions and is responsible for the maritime safety affairs of the company. These divisions are responsible for the education and inspection of routine safety work on board ship and the arrangement of seafarers to attend MST courses.

In fact, all these above mentioned measures have effectively promoted the development of the Chinese MSET system.

4.1.2 The MSET Courses

The present MSET courses conducted in China have already been introduced in the Chapter No.3 of this dissertation. The characteristics of these courses, the courses programs and the relevant facilities are described in the following subchapters.

4.1.2.1 The Development of MSET Courses

The only MSET course conducted in China before 1980s was a general maritime safety course commonly offered in the maritime institutions. This was a traditional course which was a mixture of some maritime safety subjects.

China became a member of IMO in 1978, and it has taken an active role in this international organization since that time. Following the development and issuing of various maritime safety conventions and regulations, China also made a lot of national maritime safety regulations and roles accordingly.

To meet the requirements of these international and national maritime safety conventions, regulations and rules, Some of the maritime institutions began to offer specific MSET courses in the early 1980s. For example, Dalian Maritime University began to offer the Radar Observation and Radar Simulator Training course in 1982 after it had provided a Radar Simulator from Norway at the end of 1980.

Most of the present MST courses, such as the "Four Sub-Certificates Training Course" (including Survival At Sea, Manoeuvring Survival Craft, Ship's Fire Fighting and First Aid At Sea) for all crew member working on board a ship more than 200 GRT and the "Three Sub-Certificates Training Course" (including Radar Observer and Radar Simulator, Operational Use of ARPA and Radio Telephony) for captains and officers working on board a ship more than 1,600 GRT, have been offered since the 1984 after the relevant national MST regulation was issued on 14th, June 1984.

Other specific MST courses, such as "Safety Operation of Tanker and Crude Oil Washing" have been offered since 1987 after the relevant national regulation was issued in the August 1987.

In 1988, in consideration of the practical need of maritime safety and in order to enhance the maritime safety consciousness and improve maritime operations and management levels, the Ministry of Communications decided to offer a special MSE course at a national safety traffic work

conference. This special MSE course starts in 1990.

4.1.2.2 The Standardization of The Course Programs of MSET

The course programs are the key of the MSET courses, to ensure the quality of these courses. Therefore the Bureau of Harbour Superintendency and the Bureau of Education designed the standard course programs for various MSET courses.

The course programs of the general MSET and special MSE were fully discussed at the meetings organized by the Bureau of the Education and with the co-operation of the Bureau of Harbour Superintendency, and finally made by the Bureau of the Education. All the course programs of the individual MST courses are directly made by the Bureau of Harbour Superintendency.

These standardized course programs, including the training objective, participants, contents and time arrangement (the detailed information see Chapter 3), for the individual MSET courses are made according to the relevant IMO maritime safety conventions, regulations and model courses, and also the national maritime safety regulation and rules.

4.1.2.3 The MSET Facilities

To fully meet the requirements of the MSET courses and ensure the quality of these courses, in addition to the common needed facilities and equipment, China has introduced advanced MST facilities aboard for the maritime institutions which offer MSET courses.

In 1980, the first Radar & Navigation Simulator was introduced from Norway (Norcontrol NMS-80) and installed in the Dalian Maritime University. The FURUNO F/GT-32A Radar Simulator from Japan and the Racal Decca MRNS-9000 Radar &

Navigation Simulator were fitted in the Shanghai Maritime University in 1985, and another Norcontrol NMS-90 Radar & Navigation Simulator was installed in Jimei Navigation Institute in 1987. Except the FURUNO radar simulator which has two own ships, the other Radar & Navigation Simulators all have four own ships and are fitted with ARPA facilities.

In 1986, COSCO provided a large sum of money to its maritime institutions; it spent 410,000 USD to get Qingdao Ocean Mariners College equipped with a NMS-80 Radar & Navigation Simulators, a SEAGULL-300 Nocturnal Manoeuvring Simulator and other facilities, and spent near 120,000 USD to help the Dalian, Tienjin and Nanjing Maritime Schools to be equipped with AVIMAR Radar Injectors for MST training during the period of 1987-1989.

Up till now, there are seven British AVIMAR Radar Target Injectors with ARPAs fitted in the Nanjing Maritime School, Dalian Maritime School, Tienjin Mariner School, Dalian Maritime University and Jimei navigation Institute.

At the same time, the Chinese Maritime Research Institutions have made a lot of effort to provide more MSET facilities for the maritime institutions and training centers. For example, the Nanjing Simulation Institute and the Guangzhou Navy Academy successfully developed several types of the maritime simulators for the MSET courses carried out in Guangzhou Mariner Training Center and other maritime bodies.

Some of the maritime institutions in China have made efforts to enhance the functions of their existing maritime simulators and produce a new simulator, for example, Shanghai Maritime University improved the display system of MRNS-9000 Radar & Navigation Simulator and fitted a 100 inch projector for the graphic display. Also the maritime research division of the Navigation Department of this university has already

produced a prototype of a PC controlled shiphandling simulator.

4.1.2.4 Updating of MSET

For gaining more experience from international developments and promote the national MSET, the Ministry of Communication selected some instructors and representatives from the Chinese maritime institutions to attend relevant international maritime seminars. For example, there were 4 representatives from Dalian and Shanghai Maritime University and Qingdao Ocean Ocean Mariner College participating the 5th International Radar and Navigation Simulator Lecturers Conference (IRN SLC) held in Australia, 1988. Some of the lecturers had also joined the radar simulator instructor training course organized by IMO in the World Maritime University (WMU) branch in Dalian.

On the initiative of the four maritime institutions of higher education, the Chinese Maritime Simulator Teachers' Workshops have been organized annually since 1988 in Dalian, Qingdao and Jimei. These national academic Workshops have contributed a lot to the Three Sub-Certification Training Course, such as the improvement of the training course program, the validation of exercises, the methodology of training on the simulator, the development of the functions and proper maintenance of the simulator.

Apart from these academic activities, some of the foreign experts who are in charge of the MET and MSET have been invited to China. The Chairman of the IRN SLC and Vice Rector of WMU, Professor Gunther Zade and the Principal Lecturer of Hong Kong Polytechnic Professor Samar Singh, have been to China to visit and give lectures about the MSET at some maritime institutions and at the national Maritime Simulator Teachers' Workshops.

4.1.2.5 MSET Statistics

Through efforts at various levels of the MSET system in China, thousands of the seafarers have been trained in the different specified courses during these years.

According to the statistics of COSCO, 32,000 crews had attended the Four Sub-Certificates Training Courses and 2,900 Captains and Officers had joined the Three Sub-Certificates Training Courses by the end of 1989. This means that 89% of the crews and 73% of the Captain and Officers had finished their relevant required MST course at that time.

The latest statistics shows that the huge task of the basic specific MST (Four Sub-Certification Training Courses) for the seafarers who are working in the national fleet has been completed by the 31st, September 1990. This means that almost 160,000 seafarers had joined this kind of training.

By the end of 1990, there were about 3,500 captains and deck officers in Dalian area, about 3,000 and 1700 captains and officers in Shanghai and Qingdao areas who had attended the Three Sub-Certificates Training Courses. At the end of 1991, near all the existing captains and officers will have attended the Three Sub-Certificates Training Course.

Maritime safety in China has improved in the last years. In 1987 for instance there were considerable improvement in maritime with respect to 1986. The number of total ship losses reduced to 50%, the number of lives lost at sea shrank to 12% and the maritime accident financial costs dropped to 15.6%. Compared with 1983, the previous percentages in 1987 amounted to 27.8%, 21.9% and 22.5%. The above figures and information shows that the Chinese MSET has achieved progress in maritime safety.

4.2 Problems of Present MSET SYSTEM in China

Although the various levels of the maritime safety administration and MSET system have done a lot for maritime safety in recent years and some progress has been achieved, there are still many problems present in the structure and administration of MSET system, the implementation and conduct of MSET courses, the training of the MSET staff and the training facilities.

4.2.1 The Structure and Administration of The MSET system

From the previous chapters and paragraphs, it is very easy to learn that the structure of the MSET system in China consists of many sub-bodies and that it is a very complicated system. The administration of the Chinese MSET therefore has a lot of difficulties to be well organized and managed.

4.2.1.1 The Authorities of MSET in The Ministry of Communications

The Bureau of Harbour Superintendency and the Bureau of Education of the Ministry of Communications are the direct authorities in the MSET System. Because these Bureaus are separated and independent sub-bodies of the ministry, there are problems with the responsibilities and co-operation between the two bureaus.

In the MSET field, the Bureau of Harbour Superintendency is mainly in charge of the training and certification of the MST for the seafarers and the graduates of the maritime institutions, and the Bureau of Education is mainly in charge of general MSET and MST for the graduates of the maritime institutions. Although regular maritime safety meetings are held in the Ministry of Communication, there is still no

direct relationship and definite co-ordinating person of the MSET between these two Bureaus, so MSET can not be thoroughly planned and guided as by one relevant authority.

For example, in making of the MSET programs, the Bureau of Education is only responsible for the general MSET and MSE programs for the maritime students, while the Bureau of Harbour Superintendency is responsible for the MST program. In practice, the Bureau of Education is not involved in the conduct of the MST courses for the seafarers, and the Bureau is not deeply involved in the conduct of the MST courses for the graduates of the maritime institutions except the issue of the MST certificates for the graduates.

4.2.1.2 The Regional and Local Harbour Superintendency Administration

With the further development of the Chinese economy, a lot of collective and private shipping companies have been founded, not only in the provinces and cities along the coast, but also in the inland provinces and cities which are connected with the sea.

before 1980, there were only three shipping companies involved in ocean shipping business, but recent statistics information show that there are already more than 130 shipping companies dealing with foreign trade in China. Most of these newly founded companies in general still lack qualified crews and the experience in the maritime safety affairs, especially in safety management and relevant procedures dealing with MSET.

To enhance the supervision of the maritime safety administration and make MSET available for these shipping companies, the maritime safety administration has to extend its attention.

There are already 14 Regional and Local Harbour Superintendency Administrations which are listed in the previous Chapter. They are still not sufficient to meet the needs for the further development of the national maritime safety supervision and administration, especially in the areas of the inland province and cities.

Huge numbers of crew in China have to be trained in the relevant MST courses within a certain period of time according to the international and national maritime safety requirements and rules. These Regional and Local Harbour Superintendency Administrations have to hurry up to implement and organize the various MST courses in the next years. Because of the heavy training task and the lack of qualified or limited number of the staff members who are in charge of the MSET work, some of the Regional and Local Harbour Superintendency can not supervise and administrate this work properly. For example, due to the problems in the implementation and conduct of the MST courses in certain areas, the training programs could not be implemented thoroughly and the training quality could not be ensured.

4.2.1.3 The Maritime Institutions and Mariners Training Centers

Although China has established a lot of maritime institutions and mariners centers since the years of the great development of the national maritime industry started. The practical situation and existing development of the maritime institutions in the MSET system still can not fully meet the need of the national maritime development in China, especially in the newly developed "Economic Special Zone" in the southern part of China.

Up to now, there is still no maritime institute of higher

education in Guangzhou-Shenzhen area near Hong kong. There are also a lot of large shipping companies in this area, such as the Guangzhou Branch of COSCO, Guangzhou Bureau of Maritime Transportation Administration. Many crews in this area have to go to Shanghai or other places to attend the MST courses. The maritime institutions in this area however are already very busy with the MST courses for the seafarers of their own area.

For instance, according to the statistics of the Shanghai Harbour Superintendency Administration, during 1985-1990, It has issued about 50,000 "Four Sub-Certificates Training certificates" for crews and 3,000 "Three Sub-Certificates Training certificates" for the captains and officers in the Shanghai area which only consists of the provinces of Jiangsu, Zhejiang, Anhui and the city of Shanghai (there are total 31 provinces and Autonomous regions in China and 16 of them are connected with the sea or the larger river linked with sea).

On the other hand, due to some historic factors and influence of the Great Cultural Revolution which happened from 1966 to 1978, the present technical background of the mariners in the Chinese national fleet is not fully adapted to modern shipping industry.

Taking the practical situation of the technical education background of the officer crew in the largest national shipping company COSCO as an example. By a statistical research carried out in 1988, there were about 11,000 officers in the company, 21.1% of the them graduated from medium technical maritime institutions, 25.3% of them with the higher maritime education and the other 53.6% were not educated and trained in the medium or higher education maritime institutions before (some of them have already trained during recent years in the maritime institutions).

To change and improve such a situation, it is necessary for the maritime institutions, especially in the medium technical and higher education level to offer and provide various adult education and maritime technical training course for mariners.

At the same time, it is the urgent task for the the maritime institutions to train more qualified mariners for the future national maritime industry. The recent plan for the maritime education and training shows that the annual enrollment number of the students of the maritime specialty in the maritime universities and colleges will increase from present 1,350 to 2,000, and the students of the maritime institutions of the medium technical level will increased to 2,000. This means that the total number of the maritime students in the maritime universities and colleges will increase from 5,000 to 7,500 and there are another total 4,000 maritime students in the medium maritime institutions at the same time.

The above information and figures show that there must be an expansion of the maritime institutions and mariners training centers.

4.2.1.4 The Shipping Companies, The Social Maritime Organization and The Other Maritime bodies

In the Chinese MSET system, the Shipping Companies, Social Maritime Organizations and other maritime bodies have done a lot on MSET during the last years. There are however some problems which need to be solved, to which end a restructure of MSET might be helpful.

Firstly, although some main national shipping companies such as COSCO and the Regional Bureau of the Maritime Transportation Administrations have their own maritime institutions and training centers, most of the other shipping

companies do not have no these favorable conditions:

Secondly, in consideration of the economical efficiency of the companies and the heavy stress of the busy maritime transportation, many shipping companies have to pay prime attention to their business.

In order to meet the need of the busy maritime transportations, companies sometimes can not properly arrange the mariners to attend the relevant MST courses, especially the senior officers on board ships.

On the other hand, the training quality of MST courses which are offered by the social maritime organization and the other maritime bodies are not as good as the courses offered by the maritime institutions and mariners training centers. Although these MST courses are managed by maritime experts who used to be captain, chief engineer or officer on board ship, however their maritime knowledge and experiences might not be adapted to the developed maritime industry of today and in future. In comparison with the governmental maritime institutions and the mariners training centers, the administration, conduct and facilities of these MST courses in most of these social maritime organization and the other maritime bodies are not so efficient.

4.2.2. The Implementation and Conduct of MSET courses

In the Chapter Two of this project, the implementation and conduct of the MSET courses in China have been briefly introduced. In comparison with the international and national maritime safety conventions, regulations and rules, and in consideration of the needs of the national maritime industry, there still are problems in these fields. At the same time, the existing MSET courses have to be improved and developed as quick as possible to meet the present and future needs for the maritime safety.

4.2.2.1 General MSET Course in The Maritime Institutions

Due to the rapid developments of the modern technologies, the general MSET course in the maritime institutions have to be updated. The traditional teaching and training program and methods have to adapted accordingly.

Up to now, the implementation and conduct of the general MSET course in China is still carried in the same manner as before. The traditional MSET program and methods have not changed a lot to follow up the developments in navigation and maritime transportation. For example, there are still a large number of teaching hours arranged for the traditional celestial and coastal navigation while the lectures on modern electronic navigation and maritime transportation need to be expanded.

On the other hand, to ensure the quality of the general MSET course for the graduates of the maritime institutions, the maritime practical training in the laboratories and on board is very important. Because of the large number of students and limited numbers of labs and training vessels, the practical training items and activities of MSET courses can not be fully executed according to the training programs.

For example, in general there are 1000 students in the maritime institutions of higher education who need practice on board ship, but each maritime university or college has only one or two ships. These training vessels are not used only for the training of the cadets, but also for maritime commercial transportation. Sometimes the training voyages and activities of these training vessels have to be changed by the busy commercial transportation.

4.2.2.2 MSE Courses

According to the present MSE course program (see paragraph 3.2), in addition to the Regulations for Preventing Collision At Sea, 1972, there are no teaching hours available for the introduction of other very important international and national maritime safety conventions, regulations and rules for the maritime students. Also there are not enough lecturing hours listed in the program for some most important maritime subjects, such as the protection of marine environment and prevention of marine pollution.

The existing MSE course teaching programs and contents should be updated and further improved.

4.2.2.3 MST Courses

The various MST courses offered by the individual maritime institutions, the mariners training centers and other maritime bodies in China have developed very quickly in the recent years. Because of the huge number of the seafarers, the limited training facilities and the lack of qualified staff members, there are certain problems and shortcomings within the implementation of the training programs and the administration of these courses.

Although the Bureau of the Harbour Superintendency has

already prepared relevant standard training programs for the various specific MST courses, some of the training units cannot fully realize these training programs due to their limited training facilities.

For example, the Three Sub-Certificates Training Course offered in some maritime schools can not cover all the necessary training items on the operation of ARPA, especially for the situation of multi-ships collision avoidance and the safety navigation in the narrow channels, one reason for this is because these maritime schools have no full mission ARPA simulator and only equipped with radar simulators which have the AVIMAR Radar Targets Injector. More error analysis of the operation of ARPA should be put into the lectures and practical training of the Three Sub-certificates Training Courses.

By comparison of training program and contents of the present individual MST courses in China with the relevant courses abroad and the requirement of the international and national maritime safety conventions, regulations and rules, some of the training program and contents for the MST courses have to be modified and some training items may add into the relevant MST courses. For example, the use of free-fall lifeboats and rescue boat training should be part of the practical training of the Four Sub-certificates Training Courses.

4.3 The Training of MSET Staff

The teaching and training staff members in the maritime institutions and mariners training centers are mostly maritime teachers. In the other maritime bodies, a part of the staff are the teachers from the maritime institutions or the persons responsible for seafarers training in the shipping companies and the other part consists mostly of the

organizers of the social maritime organization.

It is fact that a lot of the training staff members in the maritime training units are qualified instructors who have been well educated and trained in the maritime institutions and also have practical experience on board ship and at sea. But there is still a number of training staff members of MST courses who lack the practical experience on board ship, some of them even did not have the chance to be well educated and trained for the technology of maritime education and training, and for their basic maritime specialty as well.

According to the relevant requirement of the national MST training rules, the training staff members for this kind of courses should be identified by the Regional and local Harbour Superintendency Administrations. Due to the tough task and heavy workload of the training courses, some of the training units have to attract teachers or staff members who are not qualified sufficiently. Meanwhile due to the limited time to fully complete the relevant MST training and certificate courses, there is a tendency for some of the regional and local harbour superintendency administration to speed up the process of the implementation of the specific MST courses with out paying enough attention to the training quality of the courses.

A problem is that only a few instructors can attend the training courses abroad, and there are no special MST instructor courses available in China yet. Apart from the three National Maritime Simulator Teachers' Workshops (see paragraph 4.1.2.3) in 1988, 1989 and in 1990, there have not been other academic updating courses.

4.4 The Training Facilities

Worldwide maritime training facilities have expanded and have been updated considerably during the recent years. The application of simulators and safety training facilities has expanded in many maritime institutions throughout the world during the last years, and there will be an increased emphasis for this part of MST in the future. In China for various reasons, which have been identified in the previous chapters, there is and will be a need for expansion of the number and type of simulators and other safety training facilities.

In addition to the maritime institutions of higher education, the other maritime institutions have not equipped with modern radar simulator and navigation aids simulator. They have to use the radar targets injector instead of the radar simulator.

Up till now, only Qingdao Ocean Mariners College has been fitted with a Norcontrol 300 Nocturnal Manoeuvring Simulator. There is no Liquid Cargo Handling simulator in the maritime universities and colleges used for the MST courses.

At the same time, the available training facilities of various maritime institutions are getting old, following with the rapid development of the modern navigation technology, and the capacities of these training facilities is not sufficient to meet the needs of the increasingly number of the seafarers and maritime students.

Another problem with modern maritime training facilities such as radar simulators and nav aids simulators is that it needs a large sum of money to repair and maintain these facilities during their daily running for the maritime training courses.

The Ministry of Communications and relevant maritime units might spend a lot of money to purchase this equipment, but there is no special money for the repairing and maintenances of them.

Sometimes it is very difficult to get advices or spare parts of the facilities from the foreign manufacturers when systems have serious failures. The training courses are often disturbed by this kind of problems.

All these problems seriously effect the conduct of the MSET course in the maritime institutions and mariners training centers.

4.5 Other Maritime Safety Training Courses

To ensure the maritime safety, IMO has made and is preparing a lot of model courses involving maritime safety aspects. Apart from the existing MST courses, other maritime safety courses have to be provided for the seafarers. For example, Shiphandling Simulator Course, Marine Environment Protection Course, Dangerous Cargo Operation and Cargo Securing Course and Maritime Search and Rescue Courses.

Other important supporting MSET courses for the seafarers, such as the courses of VTS Administration and Intensive Maritime English should be designed and planned. Up to now, there are no organized and well structured specific maritime safety training courses in the previous subjects. The maritime institutions now only provide some non systematical knowledge of these maritime subjects for their students.

To fully implement the international and national maritime safety conventions and regulations, and improve the situation of the maritime safety, it is very important for China to take an active action to offer the above training courses for

the seafarers as soon as possible.

As it has been mentioned before, according to the maritime safety work report at a national safety work conference in 1988, although the maritime safety situation has much improved since 1983, there were still about 30 serious casualties which happened in the main shipping companies directly under the administration of the Ministry of Communications in 1987. At the same time, there were also a number of casualties which happened in some local small shipping units.

All the information mentioned above indicates that through the efforts given by the maritime administrations, authorities and institutions in China, the maritime safety situation has been improved a lot, but there is still a lot to be done and improved within this field.

CHAPTER FIVE: PROPOSALS FOR FURTHER IMPROVEMENT AND DEVELOPMENT OF MSET IN CHINA

A proper MSET system and its effective functions should be developed and improved in the practical implementation. As it has already mentioned previously in this dissertation, there is a lot of work to be done and a long way to go for the Chinese MSET system. Following the development and requirement of the MSET in the world and in consideration of the practical situation of Chinese MSET, it is urgent and necessary to take and carry out the following measures and reforms in this field, and thoroughly solve the problems existing in MSET system.

5.1. Acknowledging The Needs for An Effective MSET System

First of all, the staff members of different administrations in the Ministry of Communications, maritime institutions, mariners training centers, shipping companies, and other maritime bodies in the maritime industry should fully acknowledge the needs for an effective MSET system. In practice, only if the needs for an effective MSET system are fully understood then there will be the insurance of the properly developments and improvements of MSET system.

5.1.1 Enhancing Maritime Safety Consciousness

In order to ensure the maritime safety, it is very important that the maritime safety consciousness must be fully recognized by the personnel not only on board ship, but also in the various administrations of the maritime industry.

By analysis of a lot of maritime casualties which happened in China, it is clear that one of the major causes of the casualties is that relevant personnel lacks maritime safety consciousness. For example, the cause of a tanker explosion

in the Yellow sea in China several years ago was that the motor man and engineer on board did not pay necessary attention to follow the safety procedures of repairing work on board tanker at sea. The improper welding action made the tragedy of the death of about 20 crew and total loss of the ship.

Another example is that the duty officers and staff members in one of the maritime administration bureaus did not report continuous failures in receiving the ship's position telegraphs to the relevant maritime safety administration in time of a certain cargo ship (in fact, this ship had already capsized in the heavy weather, and the crew had abandoned ship). Due to the delay of the report, the Search and Rescue (SAR) system lost the time to organize and carry out the search and rescue work for this ship and finally more than twenty crew died.

It is necessary to take the various measures and forms to carry out maritime safety education in order to make the seafarers and other maritime personnel fully recognize the urgent need and importance of enhancing their maritime safety consciousness. This maritime safety consciousness education should be provided especially to the managers and officers who are directly in charge of the maritime safety transportation and administration .

5.1.2 Training for Qualified Seafarers

With the developments of the modern scientific technologies, more and more advanced maritime equipment and devices have been put into practical use on board ship. In consideration of the efficient transportation and maritime safety on board newly developed national fleet, there is an imperative need for the seafarers to update their maritime knowledge and raise their level of operational techniques.

During the recent years, the Chinese national fleet introduced many new types of ships, such as container ship, roro ship, liquefied gas carrier, chemical ships and other special purpose vessels. At the same time, the technology of modern navigation, communication, automation and computer used in the Chinese national fleet needs more and more qualified seafarers who have been well trained in these fields.

To ensure the sufficient qualified seafarers working in the Chinese fleet, the only way is to give every effort in the maritime institutions and mariners training centers to train seafarers by the different kinds of MST courses, and to train maritime students by the new reformed maritime education and training system with various updated MSET courses.

To achieve above mentioned goals, an effective MSET system must be set up. It has to be further developed and improved in the implementation of the national MSET work through out whole country. The need for having an effective MSET system must be recognized by the officers of various administrative levels in the maritime industry and all the other maritime personnel as well.

5.2. Strengthening the Structure and Administration of MSET system

The structure and administration is the foundation of the MSET system. An effective MSET system must have its own proper administration.

To further ensure and promote the success and efficiency of the MSET work in China, the existing problems in the MSET system which have been mentioned in the Chapter No.4 must be solved as quick as possible.

5.2.1 MSET Authorities in the Ministry of Communications

The authorities of MSET in the Ministry of Communication play the leading role in the national MSET work. To strengthening the structure and administration of MSET system, it must firstly solve the problems within these authorities.

5.2.1.1 Co-ordinating MSET Work

As it is mentioned before, there are some problems in the co-ordination of the MSET work between the Bureau of Harbour Superintendency and the Bureau of Education which are two MSET authorities in the Ministry of Communication. It is necessary to organize a special group and assign specific persons to be in charge of the coordination of MSET work for this two bureau.

The objective of this special group is to coordinate the major MSET work including the replanning and enhancing the national MSET system, making national MSET plans and programs and other main MSET affairs in the Ministry of Communications. It should consist of the top administrative personnel with the rich experiences for MSET work who are also working individually in the Bureau of Harbour Superintendency and the Bureau of Education. It is better that the head of this special group should be vice minister who is in charge of safety work in the Ministry of Communications.

5.2.1.2 Responsibilities of the MSET authorities

The MSET work is only one part of the routine work for both of the Bureau of Harbour Superintendency and the Bureau of Education. Due to the separate main functions of these two bureaus, there are some differences between their individual

responsibilities for MSET work.

Relating to the functions on MSET work, the Bureau of Harbour Superintendency should promote and ensure the basic technical quality of the seafarers through relevant examinations and certifications, and it also should be in charge of the raising and updating of maritime safety techniques through specific maritime training and certification courses. Apart from the above work for seafarers, the Bureau of Harbour Superintendency should also pay more attention to the maritime institutions in co-operation with the Bureau of Education. Especially for the MSET courses for the maritime students.

The Bureau of Education is generally in charge of the implementation of MSET courses for the maritime students and to ensure the technical quality and qualification of maritime students by offering efficient maritime education and training courses including MSET courses for them. Besides this main task, they should have a good cooperation with the Bureau of Harbour Superintendency and make more efforts to the training of seafarers by the specific MST courses offered in the maritime institutions which are under its administration.

The co-ordinating group and personnel should fully play their role to make the clear responsibilities of MSET authorities in the Ministry of Communications in order to ensure they carry out their MSET routine work efficiently.

5.2.2 Harbour Superintendency Administrations

Due to the dramatic development of the national maritime industry and the international trade, the existing regional and local harbour superintendency administrations can not be suitable for the new maritime situation in China now. The

existing regional and local harbour superintendency administrations should be further enhanced and new regional or local harbour Superintendency Administrations should be set up in some rapidly developed areas with maritime transportation.

5.2.2.1 Enhancing Existing Regional and Local Harbour Superintendency Administrations

To meet the needs of the maritime safety for the present developing maritime situation, the existing regional and local harbour superintendency administrations must be further enhanced. Firstly, the administrations should have enough working staff members who are qualified for their relevant job. Secondly, these staff members also have to update their maritime safety knowledge through the various kinds of the training course or job training continuously.

On the other hand, the regional and local harbour superintendency administrations have to set up a good relationship with each other to carry out the maritime administrative work, they also have to have a close cooperation with the maritime institutions, training centers and other maritime bodies for the successful implementation of national MSET work.

5.2.2.2 Establishing New Regional and Local Harbour Superintendency Administrations

For the purpose of maritime safety administration and the implementation of MSET work successfully through out whole country, there is a necessity to establish some new regional and local harbour superintendency administrations in the certain newly developed areas and the main inland water ports opened to foreign vessels in China.

For example, it is better to set up a separate regional harbour superintendency administration in Shenzhen which is the largest special economical developing area in the southern part of China. Because several local ports have already been built or under construction within this area, and there will be increasing value of cargo for these ports in the near future.

There are a lot of inland ports along the Yianze River, Nanjing is a main port among these ports. Due to the open policy of the country, more and more foreign vessels visited this port during the recent years. There are also several institutions which offer water transportation courses in this area, such as Nanjing Maritime School and other inland water technical schools. In consideration of the maritime safety administration and MSET work, a local harbour superintendency administration is needed in this port.

5.2.3 Maritime Institutions and Maritime Training Centers

Like the harbour superintendency administrations in China, the maritime institutions and maritime training centers need to be enhanced and the number of them should also be increased to suit for the new developed maritime situation.

5.2.3.1 Further developing and Improving Chinese Maritime Institutions

The Chinese maritime education system now consists of five different levels of studies, which are the postgraduate study, university, technical college, technical school and technician school level.

Although the Chinese maritime institutions have educated and trained 15,216 graduates who have a university or college educational levels since the new China was founded in 1949

until 1988, there still is a shortage of officers and engineers on board ship due to the rapid developed national maritime fleet. For example, the number of the graduates of the maritime institutions in 1987 and 1988 can only meet 50% of the demand for maritime personnel.

There are two ways which can be taken to solve this problem, one is to increase the enrolling number of students in the maritime institutions, another is to establish some new maritime institutions. The former way has been already taken, for example, the navigation department of Shanghai Maritime University has increased the enrolling number of the students from 100 to 150 recently. But some of the maritime institutions can not increase this number very much because of some limitations. So it is necessary to establish some new maritime institutions of higher education in the country.

The new maritime institutions can be set up in the southern part of China near the coast. The locations may be selected in Gwangzhou or Shenzhen.

In order to ensure the educational and training quality of the maritime students in the present newly developed situation, the qualification of the teaching and training staff should be strictly ensured and the maritime facilities should be developed and updated to meet the requirements of various MSET courses. The details about the qualification of the teaching and training staff and training facilities will be discussed in the following.

5.2.3.2 Consolidating Existing Mariners Training Centers and Establishing Chinese Mariners Training Center

As being mentioned in Chapter No.2, the mariners training centers in China are under different levels of the administrations. Unlike the maritime institutions, there is

no specific standard management and administration rules for these centers. The training centers need to consolidate their management and administration.

Shanghai Mariners Training Center directly under the administration of the Bureau of Education in the Ministry of Communications is more formally managed and administrated than the others. Apart from the Bureau of Education, Shanghai Harbour Superintendency takes the administrative function for the routine work of the center, Shanghai Maritime University is in charge of running of the center, and the other members from the COSCO Shanghai Branch, Shanghai Marine Transportation Administration Bureau and Shanghai Ship and Transportation Research Institute will assist the educational and training work carried out in the center. There is a consultative committee consists of the representatives from the above mentioned units acting as the governing body in the center.

Some of the other maritime training centers are only organized by the local shipping companies and under the administration of the relevant regional or local harbour superintendency administrations. There are some difficulties for them to manage and administrate their maritime training work properly.

To consolidate the management and administration of the mariners training centers and consider the practical needs of MSET for seafarers in China, it is better to establish a general national mariners training center "Chinese Mariners Training Center" which should be directly under the administration of the Ministry of Communications. The Chinese Mariners Training Center can be developed to have a main role in maritime safety training both for the Chinese seafarers and foreign seafarers. The existing mariners training centers can be adjusted and become the branches of

this general center in the well planned individual areas.

The location of this general Mariners Training Center is very important. In consideration of the privileges to the geographic situation of the economical and shipping business, and the possibility of using existing training bases, the Chinese Maritime training Center can be established in Shanghai on the base of existing Shanghai Mariners Training Center. Because Shanghai is the largest economical and commercial center with developed shipping industry in China. It is situated in the middle of the Chinese coastal line and has several maritime institutions and main national shipping companies having a broad exchange and communication with the other units both at home and abroad. The members of the governing body for this center may consists of the representatives of the Bureau of Education and Harbour Superintendency, the major maritime institutions, the main national shipping companies and also the main maritime scientific research institutes.

Apart from the conduct of its own maritime training courses, the Chinese Mariners Training Center should make the detailed maritime training plan and detailed training programs for each of the branches and monitoring the implementation of the maritime training in the branches. In this way, it will be easy for the mariners training centers to arrange properly their training work, standardize the training programs and ensure the training quality.

5.3. Improving existing MSET courses

To carry out and implement the national and international conventions and regulations for the maritime safety, some MSET courses in China have been conducted for several years (see chapter 3). Comparing the existing MSET courses

conducted in China with the requirements of international maritime safety conventions and regulations and the practical implementation of similar courses in some of other maritime countries of the world, a lot of improvements can be made for the existing MSET course.

5.3.1 General MSET Course

The General MSET course should be followed and updated in accordance with the developments of the maritime technology to meet with the needs of the developed maritime industry.

The present General MSET course in the Chinese maritime institutions which is still based on the traditional maritime education and training has to be speeded up its reform.

First of all, a thoroughly review of the present MSET programs with the comparison of the development and real needs of the maritime industry should be made.

It is necessary to reduce the teaching contents and hours for those traditional and theoretical knowledge which is not so very important to today's maritime industry, for example, the traditional celestial and coastal navigation courses.

On the other hand, It is necessary to increase the teaching contents and hours for the new theoretical and practical maritime technology on the aspects of maritime applications, such as computer, electronic navigational aids, various cargo operations, modern maritime transportation and so on.

It is also very important to enhance and increase the MSET facilities in the maritime institutions, such as the modernized laboratories, new training vessels and other necessary facilities for MSET.

5.3.2 Special MSE Course

The new offered special MSE course has to be improved during its conduct and implementation.

Following the new developments of the shipping industry, the international conventions and regulations relating maritime safety are getting more and more important for the safety of every national fleet and marine environment protection in the worlds. Some important international maritime safety conventions and regulations, for example the SOLAS 1974, STCW 1978 and MARPOL 73/78, should be arranged as the part of the teaching contents for the special MSE course.

As it is known to all that about 80 % maritime casualties are caused by human errors, it is required to review the human element in maritime casualties and to stress the importance of human element in maritime operations. These educational contents can be also arranged in the special MSE course.

At the same time, it is better to provide more detailed and practical knowledge about safety management and manning of ship, prevention of maritime accidents, emergency procedures in this course. There is no need to arrange too much theoretical knowledge on "Security Engineering" because of the characteristics and practical aim of this MSET course.

5.3.3 Basic Maritime Safety Training Course

The basic maritime safety training course which includes Four Sub-Certificates Training Courses are broadly conducted in China. Due to high costs of certain training facilities, there are no sufficient training facilities in some of the Chinese maritime institutions and mariners centers. As a result, some training contents of the course can not be conducted to meet fully the requirements of relevant

international conventions and regulations, but the national standardized training programs as well.

The basic maritime safety training in Travemunde Seaman School, Germany has conducted MST courses very successfully with various required equipment. The school is equipped with various kinds of training facilities such as Free-fall lifeboat, new type of rescue boat, various kinds of enclosed lifeboat, immersion suit and other facilities required according to newly revised regulations of SOLAS convention. The College of Maritime Studies, Warsash in UK has also conducted these courses very well. Apart from the conventional training facilities, it is also equipped with special fire fighting facilities for training in extinguishing liquid natural gas fire and use helicopter for rescuing survival training course.

In order to fully complete the training items and contents of the basic maritime safety training course according to the relevant requirements, the Chinese maritime institutions and training centers have to enhance and update their training equipment such as the training facilities mentioned in above paragraph.

The training programs made by the MST authority also have to be updated and improved, for example, the training of use and operation of Emergency Position Indicating Radio Beacons (EPIRBs), the immersion suits, the free-fall life boat and rescue boat training are not included in the present training program of Manoeuvring Survival.

5.3.4 Advanced and Special Maritime Safety Training Courses

Like the basic maritime safety training course, there are some similar problems in the advanced and special maritime safety training courses which include Three Sub-Certificates

Training Courses, the Safety Operation of Tanker Training course and Special Training of ship carrying Liquefied Gas in Bulk Safety Management Training Course. For example, in the conduct of the radar and ARPA training courses, some of the maritime institutions have to use the AVIMAR Radar Injectors instead of a radar and navigation simulator. These AVIMAR Radar Injectors have many limitations, for instance, due to lack of proper coastal line and the limited moving targets, they can not used for Narrow Channel, Traffic Separation Scheme areas navigation training. The efficiency of these training courses will be affected by this problem. Meanwhile, in the conduct of ARPA operation course, one very important training point has not been emphasized, this is the error analysis of ARPA. It is also not clearly listed in relevant training program.

For the Safety Operation of Tanker Training course, because there is no any Liquid Cargo Handling Simulator available for training, the practice training has to be carried out on board real ships. For limited practical condition and high training costs, sometimes the practical training time and items have to be reduced.

To meet the needs of training requirements and really ensure the training quality of these training courses, it is necessary to serious summary the previous MST work in the implementation of various training courses. The training programs of various existing training courses have to be corrected and adjusted in accordance with the updated national and international conventions and regulations. At the same time, it is also necessary to increase and update the training facilities in consideration of the needs and requirement of individual MST courses through the introduction of new maritime training aids from abroad and development of needed training facilities at home.

5.4. Offering New MST Courses for Maritime Personnel

According to the requirements of the conventions and regulations of IMO relating to the maritime safety, reference to the international development of the maritime safety training in the maritime institutions of the other countries, some new MST courses should be planned and provided to maritime personnel for the purpose of maritime safety in China.

It must be emphasized that the teaching hours listed for each of the following new training courses are the minimum values. They should be adjusted and increased according to the practical situations of the trainees' number and the training facility for the different training courses. The listed training contents for each of the training courses should also be updated to meet with the needs of the new relevant requirements in the future.

5.4.1 Shiphandling Simulator Training Courses

Nowadays the shiphandling simulator training course has been broadly offered for mariners and maritime students in USA, European countries and other developed areas. Due to the shortage of shiphandling simulators, the shiphandling simulator course has not been formally offered in the Chinese maritime institutions now, only the Qingdao Ocean Shipping College has offered a collision prevention course using a nocturnal manoeuvring simulator which was the only one in China.

According to the requirements about the maritime training of IMO and needs of the development of the present shipping, it is necessary to have more shiphandling simulators in the Chinese maritime institutions and offer the shiphandling simulator course in China as quick as possible.

Fortunately, some of the Chinese maritime institutions and research centers have already got great achievement for design and manufacturing of shiphandling simulator, for example, a small shiphandling simulator system has been developed by Shanghai Maritime University and it will be put into use later in 1991. Shanghai Ship Transportation Research Institute also has made progresses for a new shiphandling simulator system.

This course can be arranged for a time of one week. The objective, main contents are given in the next paragraphs.

I. The objective of the course

The objective of the shiphandling simulator training course is to help the trainees to further understand ship manoeuvring characteristics and to master the technique of ship's safety manoeuvring for preventing collision at sea and navigating in narrow channels. At the same time, the trainees will be able to take the correct actions in the situation of man overboard as well as search & rescue at sea.

In consideration of the needs of the maritime safety training and the practical situation in China, this course can be firstly organized and conducted for the captains and officers of the national fleet, and later gradually developed for the maritime students after more shiphandling simulators are fitted in the maritime institutions.

II. The main contents of the course

This course is a practical course for shiphandling. Apart from a few hours used for the review or introduction of the ship's manoeuvring abilities, most of the training hours and items will be used and carried out on the simulator for

practical training.

A. Theoretical lectures

- a. Ship's manoeuvring abilities related to ship's rudder and engine.
- b. Ship's manoeuvring characteristics of turning, speed control, stopping distance.
- c. Effects of wind and current related to ship manoeuvring.
- d. Shallow water effects and interaction of ships.
- e. Knowledge about taking actions for man overboard and search rescue at sea.

B. Practical training

- a. Ship's course changes and turning at the different rudder angles and ship's speeds in deep water and shallow water.
- b. Ship's Zigzag tests at various rudder angles.
- c. Ship's stopping distance tests with different speeds and different engine orders.
- e. Steering abilities with the different effects of wind and currents.
- f. Navigation in narrow channels with buoys/lights.
- g. Collision avoidance at sea (three meeting situations and the restricted visibility situation)

h. Demonstration of the shallow water effects and interactions of ships.

i. Measures and actions taken for a man overboard.

j. Practice the search and rescue patterns for SAR at sea.

The shiphandling simulator training course for mariners and maritime students can be arranged accordingly to their different background and the requirements of the trainees. The course for students can be simplified for learning of the basic knowledge of ship's manoeuvring abilities and dynamic characteristics, but the training course for captains and officers should be beneficial for them to update and learn more practical techniques for maritime safety navigation.

5.4.2 Marine Environment Protection Courses (MARPOL 73/78 Annex I and Annex II)

The prevention of maritime pollution also has to be educated in China. During the last years, some marine pollution had happened along the Chinese coast. For example, there were 14 serious oil spill accidents within the Chinese coastal waters (including the accidents caused by the foreign vessels) from 1974 to 1984. The most serious oil spill at sea was caused by the Somalian vessel "NANYAN" which collided with a Dutch vessel near the coast of Guandong Province and the Panama tanker "ORIENT AMBASSADOR" grounded in the Qingdao Harbor, the value of the oil spill for these two accidents were 8,000 and 3,343 tons.

It is a pity that there is no any special marine environment and protection of mariner pollution training course specially offered for seafarers and other maritime industry personnel in the Chinese maritime institutions and mariner training centers up to now. There is also no special learning subjects

arranged for the navigation students in the maritime institution, they can only learn a little about this subject from the other relevant maritime subjects.

For the purposes of the protection of marine environment and maritime safety, IMO has made relevant decisions and requirements for training of seafarers in the STCW 1978 convention according to the MARPOL 1973/1978 and the model course programs relating to this subject had also been made by the IMO.

According to the IMO Model Course Program 1.1.1 MARPOL 73/78 Annex I and 1.1.2 MARPOL 73/78 - Annex II, the maritime environment protection training courses can be organized and offered by two individual sub-courses, the teaching hours for these two sub-courses are 27 hours and 17 hours.

5.4.2.1 MARPOL 73/78 - Annex I Training Course

This sub-course for marine environment protection is to provide training for masters, deck officers and engineer officers in order to enable them to maintain and operate a ship in accordance with MARPOL 73/78, with a view to: protecting the marine environment against oil pollution from ships; ensuring safe and environmentally sound tanker operations; preventing ships being delayed in port as a result of port state action.

This sub course is presented in two parts. Part 1 deals with the purpose and arrangement of Convention and its five Annexes, and provides detailed guidance on the Annex I requirements applicable to machinery space of ships. This part of the training is included in the general certificate course for deck and engineer officers. Part 2 covers the Annex I requirement applicable to oil tankers and to tanker washing, cargo and ballast operation on board oil tankers.

Those attending this part should have completed or be familiar with Part 1 of the course.

I. The objective of the training course

The trainees who successfully complete Part 1 of the course should be able to appreciate the concern about pollution of marine environment, understand the impact of oil pollution, describe how ships contribute to this form of pollution and explain the international rules aimed at preventing such pollution. They will also be able to comply with these rules and describe the monitoring measures designed to ensure compliance.

The trainees successfully completing Part 2 of the course should in addition be able to explain in detail the principles involved in the prevention of marine pollution by cargo oil through specific construction and equipment requirements for oil tankers and to comply effectively with the relevant operational requirements.

II. The Main contents of the course

Part 1:

- a. Marine pollution including its historical development, effects and sources.
- b. MARPOL 73/78 including its articles, technical annexes and reporting of incidents.
- c. Control of oil discharges from machinery spaces including oily waters, discharge provisions, construction of and equipment for machinery spaces, oily waters separators and ancillary equipment.

- d. Marine pollution documentation including routine work for oil record book and the requirement of the International Oil Pollution Prevention Certificate (IOPP).
- e. Shore and mobile reception and treatment facilities for pollutants and the knowledge about force majeure.

Part 2:

- a. General introduction about the definition of the terms relating to oil tankers and their operation.
- b. Environmental threat and the principles of preventing oil pollution from oil tankers.
- c. Control of oil discharges from oil tankers including discharge provisions, retention of oil on board, segregated ballast tanks(SBT), clear ballast tanks(CBT), crude oil washing(COW), limiting the effects of accidents, slop tanks, equipment, pumping and piping arrangements.
- d. Exceptions, exemptions and special situations relating to control oil discharges from oil tankers.
- e. Introduction and demonstration of the oil record book and the IOPP certificate specially on board oil tankers.

5.4.2.2 MARPOL 73/78 - Annex II Training Course

This sub-course for marine environment protection is to provide training for masters, deck officers of chemical tankers in the maintenance and operation of their ships in accordance with the provisions of MARPOL 73/78.

I. The objective of the training course

This training course is to help the trainees to be able to correctly identify the categories of noxious liquid substances offered for shipment; take proper account of potential impact on the marine environment of pollution by noxious liquid substances; take proper account of construction features required of chemical tankers, which are required to be provided; correctly apply the principles and procedures and ensure correct use of the appropriate equipment involved in the prevention of marine pollution; effectively protect the marine environment against pollution by noxious liquid substances carried in bulk and avoid ship delays in port arising from port state action.

II. The Main contents of the course

- a. General introduction about the construction, equipment, cargo operation and other characteristics of chemical and liquefied gas tankers.
- b. Annex II substances including the principles, division of substances, hazard profiles, categorization and ship type assignment, updating the list of substances and inclusion of noxious liquid substances in BCH/IBC Codes.
- c. Discharge of Noxious liquid substances including principles and definition, discharge provisions, efficient stripping, prewash operations, ventilation procedures, existing ship until 1994 and underwater discharge outlet.
- d. Unloading, stripping and prewash operations for the four different categories (A, B, C and D) of substances and ballast containing not more than 1 ppm category B or C residue.

- e. Introduction and demonstration of the procedures and arrangement (P & A) manual, cargo record book and IOPP certificate.
- f. Shore and mobile reception and treatment facilities for pollutants and knowledge about force majeure.

5.4.3 Integrated Safety Navigation Training Course

An analysis of a lot of maritime accidents, especially collision and grounding showed that most of them were caused by human errors such as lack of cooperation of the bridge team, incorrect use of electronic navigation aids for fixing ships' position, over reliance on and misunderstanding of the information from radar or ARPA.

Although the maritime safety training courses for radar and ARPA have been offered in some of the maritime institutions and mariners training centers and most of the captains and officers of Chinese national fleet will have attended these courses by the end of 1991, there is no specific bridge team and procedure training course and also no electronic navigation aids training course for captains and officers in China yet.

In consideration of the situation in China, it is proposed to plan and offer a new "Integrated Safety Navigation Training Course" in the Chinese maritime institutions.

This integrated safety navigation training course can be planned to consist of three sub training courses. They are Bridge Team and Procedure training course, Electronic Navigation Aids training course and Radar and ARPA Refreshing training course. Apart from some theoretical lectures for

review and updating relevant technology, most of the time will be arranged for practical training on the radar and navigation simulator or shiphandling simulator.

The detailed training objective and the main training aspects and contents for these three sub training courses are listed in the following paragraphs.

5.4.3.1 Bridge Team and Procedure Training Course

This course has to be conducted on a shiphandling simulator or some advanced radar and navigation simulator. The objective can only be achieved through a series of simulator exercises with briefing and planning sessions prior to the exercises and comprehensive debriefing.

This course can be arranged in one week's time, total training hours is 42 hours.

I. The objective of the course

This training course is to train captains and officers to formulate and execute a detailed passage plan; to be aware of the need to achieve optimal utilization of manpower and equipment in conducting the navigation; to be able to interpret and make efficient use of the ship's manoeuvring data; to know how to respond effectively to hazardous and emergency situations.

II. The main contents of the course

- a. Organization of bridge work.
- b. Duties of the officer of the watch
- c. Operation and maintenance of navigational equipment

d. Planning and preparation of a passage and executing the planned passage, including the following:

- (a). Produce a safe and economic navigational plan;
- (b). Consider different methods of position fixing;
- (c). Establish procedures to monitor navigation;
- (d). Maintain a planned track in a narrow channel with cross tides and moderate wind;
- (e). Respond effectively to emergency situations, including failures of main engine, steering, gyro / compass bridge control / telegraph, imminent collision / collision, stranding, fire, flooding, boat / liferaft station, man overboard and search / rescue.

5.4.3.2 Electronic Navigation Aids Training Course

The Electronic Navigation Aids Training Course covers the aspects of the Radio Direction Finder, Decca, Loran-C, Satellite and Integrated Navigation Systems (although there are still some Omega systems fitted on board the Chinese ships, Omega positioning operation system in the world will be phased out in the near future, so there is no need to offer the training for this system). Because there are considerable developments in these aspects, it is necessary to arrange for theoretical lectures to review and update their knowledge .

This training course can be arranged in a period of ten days, the total teaching hours is 70.

I. The objective of the course

This training course is to enable the trainees to be aware of the basic principles of operation of the various electronic navigation aids and to operate equipment properly so accurate information for fixing ships' position and safe navigation is obtained.

II. The main contents of the course

A. Theoretical lectures (45 teaching hours)

- a. Operating principles of Radio Direction Finders; potential error sources; calibration; advantages, limitations and accuracy of the system; its use for search and rescue.
- b. Operating principles of Decca Navigation System; coverage areas; accuracy; sources of and causes of errors and limitations of the system.
- c. Operating principles of Loran-C System; coverage areas; ambiguity; corrections and expected accuracy; sources of errors and limitations of the system.
- d. Operating principles of Satellite Navigation System, including Navy Navigation Satellite System (NNSS) and Global Positioning System (GPS) including Radio Determination Satellite System (RDSS), and basic knowledge about the satellite control system; potential errors and their sources; accuracy and limitations of the system.
- e. Operating principles of Integrated Navigation System, including basic concept of an integrated navigation system, its' data input, processing, and presentation; advantages; accuracy; errors and limitations of the

system and future developments of the system.

B. Practical Training (25 teaching hours)

- a. Operating Radio Direction Finder to select and identify suitable radio beacons and a distress frequency; set up and tune in manual and automatic mode; obtain a bearing of a transmitting station and apply appropriate corrections. Plot bearing and position lines on a navigational chart.
- b. Operating a Decca receiver to select the appropriate Decca Chain; interpret correctly the information shown on the display; apply corrections and allowances for fixed and variable errors; plot coordinates to obtain the ship's position and determine expected accuracy.
- c. Operating Loran-C System to select the appropriate Loran-C chain; interpret correctly the information shown on the display; apply corrections; plot coordinates to fix ship's position and determine expected accuracy.
- d. Operating Satellite Navigation System to input the necessary data; obtain the appropriate the data for ships' position and navigation and determine accuracy.

The Navigation Aids Simulators can be used to support the practical training, but it is necessary to arrange comprehensive simulated navigation exercises on a radar and navigation simulator or shiphandling simulator.

5.4.3.3 Radar and ARPA Refreshing Training Course

Because most of the captains and officers of the Chinese national fleet will have their Three Sub-Certificates Training Course (radar and ARPA are parts of this) by the end of 1991, it is proposed to plan a Radar and ARPA Refreshment

Training Course for captains and officers who had previous training some years before.

Because the conduct of Bridge Team and Procedure Training Course and Electronic Navigation Aids Training Course of this planned Integrated Navigation Training Course will also be connected with use of radar and ARPA, this refreshing training course should be arranged as part of the Integrated Navigation Training Course.

This course can be arranged for a time of three days with 20 teaching hours. In addition to a few hours for review of the basic principles and operational knowledge about radar and ARPA and also the analysis of errors and their sources, most time will be arranged on the practical operations in simulated exercises.

I. The objective of the course

The objective of this training course is to enable the trainees to consolidate their ability and techniques level in proper operation of radar and ARPA for collision avoidance and safety navigation, especially to make them be further aware of the errors and limitations of radar and ARPA when in use for avoiding collisions and fixing positions.

II. The main contents of the course

A. The theoretical lectures (6 teaching hours)

a. Review the basic principles of radar and ARPA.

b. Further analysis of the errors and sources of radar and ARPA, emphasis on the precautions for proper use of radar and ARPA.

(B). Practical Training (16 teaching hours)

- a. Enhancing and raising the techniques of the proper use of radar and ARPA through further practical training on a radar and navigation simulator or shiphandling simulator.
- b. Fluent use radar and ARPA for collision avoidance and safety navigation in heavy traffic areas near approaches to ports and traffic separation schemes.
- c. Fully use the other functions of ARPA such as navigational line setting, video maps setting and display.
- d. Demonstrations of relevant limitations of radar and ARPA through specific simulated exercises.

At the last stage of this Integrated Navigation Training Course, the trainees will attend some specially programmed simulated exercises which need the comprehensive application of the knowledge of bridge term and procedures, electronic navigation aids, radar and ARPA facilities.

5.4.4 GMDSS course

Following the development of the modern technology of communication and occurrence of the new advanced communication equipment on board ship, the radio officers' routine work can be done by bridge officers. The satellite communication technology has already been used for maritime safety and maritime transportation communications.

The Global Maritime Distress and Safety System (GMDSS) will come into use in February, 1992 and all ships will have to be fitted with the GMDSS equipment on board ship. To

ensure the successful operation of GMDSS and the efficiency of modern radio communication, the Sub-Committee on Standard of Training and Watchkeeping of the IMO has already discussed the training of radio personnel for GMDSS, and the issued relevant preparation of recommendations on training for radio operators note by the International Confederation of Free Trade Unions (ICFTU).

According to the recommendations and reference to the practical training course conduct in Germany and Sweden. This detailed training can be arranged for two weeks, the objective and training contents are given in the next paragraphs.

I. The objective of the course

This training course is to help the trainees to understand the knowledge of the principles of GMDSS system, radio communication equipments and their testing and maintenance; to be able to correctly and efficiently use GMDSS equipment.

II. The main contents of the course

A. Theoretical lectures:

a. Knowledge of the principles of electricity and the theory of radio electronics in the following:

(a). GMDSS radio communication equipment, including narrow band direct - printing telegraph, radiotelephone transmitters and receivers, digital selective calling equipment, ship earth station, emergency position-indicating radio beacons, marine antenna system, radio equipment for survival craft together with all auxiliary items, supplies of power, radio navigation and maintaining the equipment in service.

- (b). Reliability, availability, maintenance procedures and test equipment circuits.
 - (c). Microprocessors and microprocessor system fault diagnosis.
 - (d). Control system including testing and analysis.
- b. Knowledge about the requirements and regulations for radio equipment in GMDSS.
 - c. Links for distress and safety communication, procedures in maritime distress and safety communication, urgency and safety messages including maritime safety information.

B. Practical training

- a. Correct and efficient operation of GMDSS equipment under normal typical interference condition.
- b. Safe operation of all the GMDSS communication equipment and ancillary devices, including safety precautions.
- c. Adequate and accurate keyboard skill, at 25 w.p.m., for the satisfactory exchange of communication.
- d. Operational techniques for:
 - (a). Transmitter and receiver adjustment for the appropriate mode of operation, including reception of digital selective calling and direct - printing telegraphy.
 - (b). Satcom antenna adjustment, re - alignment and maintenance as appropriate, other antenna rigging,

repair and maintenance as appropriate.

- (c). Use of radio life-saving appliances for survival craft and emergency-position indication radio beacons (EPIRBs).
- (d). Reading and understanding of circuit diagram.
- (e). Use and care of those tools and test instruments required to be carried.
- (f). Soldering techniques, including those involving semiconductor devices and modern circuits.
- (g). Logical location of faults to component level, emphasizing a system approach.
- (h). Remedying of faults to component level, including recognition of condition contributing to fault.
- (i). Maintenance procedures, both preventive and corrective.
- (j). Direction finder calibration procedure and taking direction finder bearings.
- (k). Methods of alleviating electrical and electro-magnetic interference such as bonding, shielding and bypassing.

5.4.5 Transportation and Handling of Dangerous Cargo Course

Due to the developments of the maritime transportation and chemical industry, more and more special knowledge and techniques are required for the present ship transportation and dangerous cargo handling.

Maritime students can learn theoretical knowledge about dangerous cargo handling during their studies at the maritime institutions, they also need practical knowledge in this field. There also are many seafarers who have to update their knowledge about the dangerous cargo handling.

The teaching hours can be various depending on the different kinds of participants. For example, the "Bremen Port Training Center" offers so called "Tailor Made" course for this subject, the teaching hours vary from 16 to 40 or more according to the demanded training requirements.

I. The objective of the course

The objective of this training course is to help the trainees acquire knowledge of various aspects of the transportation of dangerous goods and enable them to understand the properties and characteristics of dangerous cargoes, their potential hazards, packing, classification, labelling, handling, storage and segregation. They will also can take the correct measures in case of emergency of dangerous goods.

II. The main contents of the course

The main aspects and training contents include the following:

A. Theoretical lectures:

- a. The general knowledge of the definition, classification of dangerous cargoes.
- b. The properties and characteristics of different kinds of dangerous cargo in physical, chemical reactions.
- c. The IMO Dangerous Goods Code and its application to the relevant cargoes of ship board transportation.
- d. The handling, stowage and segregation requirements for different kinds of dangerous cargoes.
- e. The pollution caused by dangerous goods and the prevention of pollution from dangerous goods.
- f. The emergency procedures and personal protection for the accidents of dangerous cargo.

B. Practical training:

- a. Classification and identification dangerous cargoes transporting on board ship.
- b. Practically apply the IMO Dangerous Goods Code.
- c. Practical operation of the handling, stowage and segregation of dangerous cargo.
- d. Taking the emergency procedures and measures for the accidents of dangerous cargoes.

Because the operation and transportation of dangerous cargoes is not only carried out by crew members of ships, but is also

related to shore personnel. To fully ensure the safe operation and transportation of dangerous cargoes, the training courses should be offered both for seafarers and shore personnel.

At the same time, this training course is also necessary for the managers at different levels working at the dock areas. It is better to offer some special short training courses for this personnel.

5.4.6 Cargo Securing Course

The present sea transportation of the cargo such as pallets, containers, construction parts, factory facilities, vehicles/trailers makes the cargo security work getting more and more complicated.

There was a serious casualty a few years ago in China that a cargo ship loaded with steel coils and iron bars capsized in the heavy weather in the Yellow Sea due to improper cargo security. In another accident, a bosun died by the impact of a trailer which was not properly secured on board a ship.

Like the above transportation and handling of dangerous cargo course, the teaching hours can also varies depending on the different kinds of participants, such as ship and shore personnel.

I. The objective of the course

The objectives of this training course is to enable the participants to get the knowledge about cargo securing and master properly the techniques of the basic theoretical calculations and practical use of relevant equipment and tools in the operation of cargo securing.

II. The Main contents of the course

A. Theoretical lectures

- a. Basic knowledge of transport medias, goods and types of packing;
- b. Basic knowledge of the use of friction as force for securing;
- c. Basic knowledge about ships stability and their reaction by seas, the main different motions of ships relating to dangers of cargo and ship (rolling, pitching, heaving, vibration etc.);
- d. General theoretical knowledge in lashing techniques, such as: vertical and horizontal lashing system, the connection between pretension and residual strength, homogeneity of lashing and influence of lashing angle to the effective force;
- e. Knowledge about different cargo securing and lashing equipment such as ropes, wires, chains, shackles, steel-strips, stripes, belts, turnbuckles and tensioning devices lashing eyes and bars, tweistlocks, stickers, timber etc.
- f. The elastic and plastic qualities related to the deformation of materials, as well as the tensile strength.
- g. Knowledge about the possible thumb rules for daily use of cargo securing;
- h. Types and methods of lashing in general use and how they could be properly used;

- i. General analysis of the advantages and disadvantages of various lashing methods in daily uses.

B. Practical training

- a. Proper operation and safe use of cargo securing and lashing equipment and tools.
- b. Correct calculation of safety lashing system by using different material of different strength and in different situation.
- c. Practice of the different securing and lashing methods in general uses on board ship.
- d. Practical uses of different cargo securing and lashing equipment and materials in order to get the maximum strength of lashing and a good physical efficiency of lashing.

Like the dangerous cargo training course, the participants should consist of seafarers and shore workers.

5.4.7 Search and Rescue Course

The Search and Rescue at sea is very important component of the maritime safety system in case of a maritime accident should happened. The SAR personnel who ever are in charge of commanding and co-ordinating SAR operation ashore or on board SAR units should be well trained to acquire the necessary technology and practical techniques for their job.

Although China has established the SAR system for a long time, there is no special SAR training course for SAR

personnel. So it is necessary to organize the SAR experts who have a lot of practical experience to discuss and prepare a SAR training course for SAR personnel and also for seafarers.

I. The Objective of the course

The objective of the SAR training course is to help the trainees to be able to perform their duties properly during a SAR operation.

According to the different duties which are carried out by the personnel ashore and on board SAR units at sea, the training course can be divided into two kinds. Part A for the SAR personnel ashore and Part B for the SAR personnel on board SAR unit at sea. The teaching hours for these two parts of training can be arranged for a time of 10 days.

II. The Main contents of the course

The detailed training contents and the aims of the training course for the Part A and Part B are as the follows:

Part A (For SAR personnel ashore)

- a. Administrative organization and responsibilities of SAR service.
- b. International and national provisions governing search and rescue.
- c. Maritime , terrestrial and satellite communication and the relevant communication facilities and ship reporting systems.
- d. Overview of meteorological and navigation aspects affecting SAR operations.

- e. Design, equipment operation and coordination of rescue service performed by various SAR units.
- f. Resources and information used for search and rescue operation at sea.
- g. Public relations for keeping the public information about operations performed by various SAR units.

At the end of the course, the trainees should be familiar with the following:

- a. The techniques and conduct of SAR service operations, their limitations and requirements.
- b. The facilities and equipment used in SAR operations.
- c. The communication systems available and procedures of their operations in each of SAR units.

PART B (For SAR personnel on board SAR units at sea)

- a. Organization of SAR service in the country and the coordination of SAR operation.
- b. The responsibilities and operation of a SAR unit at sea.
- c. Emergency communication, reporting and recording.
- d. Sources used in SAR operations and the responsibilities of the on-scene commander.
- e. Establishment of search areas and search patterns for different SAR situations.

f. SAR operating procedures and communications between surface search and air search units.

After the trainees complete this training course, they should be able to perform their SAR duties on board SAR units as on scene commander and coordinate surface search at sea efficiently.

It is also very important to train seafarers to get a certain level of the knowledge about SAR. For example, like some of the foreign countries, the training contents about the basic knowledge of SAR can be arranged in radar simulator, shiphandling simulator or navigation control training courses for captains and officers.

It is also necessary to arrange some basic maritime SAR operation training for the maritime students before their graduation during their study by radar simulators and other communication facilities.

5.4.8 VTS Operators Training Course

In recent years, there was a rapid expansion in vessel traffic services which has led to a significant increase in the number of VTS operators required world wide. China had established first VTS system in Beilen harbour at the beginning of eighties, and now new VTS system are under development and research for the various harbours along the Chinese coastal waters and harbours.

For the safety and efficiency of VTS operation, the operators of VTS system should be trained specially for their qualification of their job. A dedicated VTS training scheme has been developed in the Netherlands, with the installation of a VTS simulator, to provide qualified VTS operators for

the Dutch system. Guidelines on recruitment, qualifications and training of VTS operators is under preparation by IMO.

I. The objective of the course

The objective of VTS operators training course is to help the trainees to understand the knowledge of VTS system and master the skills to perform the duties as a VTS operator.

II. The main training contents of the course

There are two kinds of VTS operators working with VTS system in China. One is the persons who have already had a lot of maritime knowledge and practical experiences (captains and pilots) and another is the persons who have not got enough maritime knowledge and sea experience (maritime administrative personnel). According to the technical background and the duties performed of the trainees to VTS operation, the training course can be divided into two different types of training level, they are the basic training and advanced training.

The main aspects and contents of the training course for these two types of training levels (Part A and Part B) are as follows:

Part A. The basic training of VTS operators

- a. General maritime knowledge.
- b. Specific nautical knowledge relating to VTS operation and traffic administration.
- c. Maritime English language.
- e. Maritime communication.

- f. Local geographic knowledge about harbour and fairway.
- g. Responsibilities and obligation of VTS assistant operators.
- h. Operation and handling of VTS equipment and instruments.
- i. Acquiring and processing maritime information and data.
- j. Routine control of vessels and manoeuvres to avoid collisions.

A relative long period of study time (at least half year) should be arranged for this kind training course in order to ensure the trainees to have a suitable maritime knowledge background and to get the techniques for a assistant operator of VTS system.

Part B. The advanced training of VTS operators

- a. Updating and renewing the maritime knowledge relating to the operation and control of ships.
- b. Responsibilities and obligation of a VTS operator.
- c. Operation and handling of VTS equipment and instruments.
- d. Acquiring and processing maritime information and data.
- e. Routine control of vessels and manoeuvres to avoid collisions.
- f. Allocation of berth, anchorage, mooring place for ships.

h. Enforcement and remedial functions of a VTS system.

g. The management of the personnel and routine work of a VTS system.

The trainees for Part B training course should be the persons who have already got a certain maritime knowledge and sea experiences or who have already worked as an assistant operator of VTS for a certain period of time. This kind of course will not deal with the basic maritime knowledge and the study time can be much short than Part A training course.

5.4.9 Maritime Accident and Incident Investigation Course

In order to ensure the maritime safety, it is very important to learn and summarize the valuable experiences for preventing maritime accident and incident through the investigations of the present and previous maritime accidents and incidents. To ensure the quality of the investigation, the persons who carry out these maritime investigations should have a systematic and proper training through a formal "Maritime Accidents and Incidents Investigation Course".

There is still no such specific training course offered in China up to now, but there is a real necessity to provide such a training course for relevant officers and staff members of the harbour superintendency administrations and other maritime units who engage in the work dealing with this aspect.

According to the IMO Model Course 3.11 "Maritime Accidents and Incidents Investigation", this training course can be briefly arranged as follows:

I. The objective of the course

The objective of the training course is help the trainees to be able to organize and conduct investigations into maritime accidents and incidents in accordance with general accepted practice, subject to their familiarizing themselves with the national law and regulations governing the conduct of maritime investigation in the State concerned and any guidelines, investigation manuals or instructions issued by the Administration concerned. Experience should first be gained in the investigating minor casualties before undertaking the investigation of major casualties.

II. The main contents of the course

- a. International obligation including the conventions and protocols, Convention provisions touching on accident investigation, resolutions and circulars.
- b. Investigative purposes and procedures including purposes and types of investigation, initiation of investigation, documentary evidence, physical evidence, examination of witnesses, records of testimony and liaison with other authorities.
- c. Analysis of evidence including general aspects, technical aspects, human aspects, determination of sequence of events and casual factors.
- d. Inquiry reports including control of reports and attachment of documentary evidence.
- e. Administration of investigations including enabling legislation, appointment of investigators, informal inquires, preliminary inquires, formal hearings, the

investigator's advisory role at formal hearings, appearance at a formal hearing, co-operation with other states and costs of inquiries and hearings.

f. Findings and recommendations including recommendations on standards, recommendations on research, dissemination of information, implications of investigation results and submission to IMO.

g. Group activity case studies including engine-room fire, capsizes and grounding.

The total teaching hours can be arranged for 90 hours

5.4.10 Intensive Maritime Safety English Course

In China, most of the mariners have learned their English when they were studying the maritime specialty in the maritime institutions. Due to limited English teaching hours and language learning facilities, their English knowledge is often not enough to meet the need of their maritime job. They have to learn English further by self-study and through practice. In practice, there are many Chinese seafarers who still have the difficulty of using English in maritime communication.

In 1985, a scientific survey project was carried out in Dover strait. Due to the problem of English language, the survey ship could not use VHF to properly communicate with two Chinese vessels passing by and let them keep away properly from the survey area. When one of the Chinese ships proceeded very closely to the anchored survey ship which had a long and out extended chains, this anchored survey ship had to slack its anchor chains to let this ship pass safely.

Shanghai Mariner Training Center has made a questionnaire for 43 captains and offers who were having a certification course at the training center about the necessity of offering a "Intensive Maritime Safety and Business Course". The result of the investigation showed that 38 of them (88%) considered it is necessary for them to have this course.

Nowadays, some maritime institutions and mariners training centers only provide a short term maritime English study course for seafarers when they attend the professional certification training course.

By the way, captains and deck officers have to have more English knowledge for the use of GMDSS system. So there is the necessity to offer a specific intensive maritime safety English course for them.

In consideration of the characteristics of English study, a relative long training period has to be arranged for this course. The course can be arranged for at least one month to three months or more depending on the basic English knowledge of the trainees and the training demands.

I. The objective of the course

The objective of the training course is to help the trainees be able to understand and master IMO's Standard Marine Navigational Vocabulary; properly set up VHF communication at sea; correctly read and write maritime safety information and reports for routine work on board ship.

II. The main contents of the course

- a. Review and updating of the study of Marine Navigational Vocabulary.
- b. Fluently practice of VHF communication in English at sea

and in ports.

- c. English knowledge about the communication and information of the VTS, SAR system.
- d. English knowledge about the communications with GMDSS system.
- e. English knowledge about ship handling, cargo handling, bridge team & procedures and emergency procedures.
- f. English knowledge about Maritime Weather Reports, Sailing Directions, Guide to port entry, Tidal tables, Admiralty List of Radio Signals and other maritime safety information and reports for routine work on board ship.

The intensive maritime English course should be well arranged according to the practical English background knowledge of the trainees and the training demands. There must be relevant audio laboratories and equipment available for this course and video recorder and film can be fully used for the training course.

5.4.11 Refreshing training course for the Former Three and Four Sub-certificates Training Courses

Although the seafarers on board the Chinese ships will all attend the Four or Three Sub-certificates Training Courses by the end of 1991, there are already more than or about five years passed for the seafarers who first attended these courses at the start. Because of the long passed learning time, some of the trainees can not fully remember or understand the relevant knowledge, meanwhile the training courses, facilities and efficiency of the early training courses are not as good as the later ones. So there is need

to offer the refreshing training course for the Three and Four Sub-Certificates Training. In accordance with the training objectives and contents of the former training courses, this refreshing training course can be arranged into two independent two parts.

Part A. Four Sub-Certificates Refreshing and Updating Training

This part of the training can be arranged for 28 teaching hours (four days), each of the days can be used for one individual subjects (Survival At Sea, Manoeuvring Survival Craft, Ship's Fire Fighting and First Aid at Sea).

I. The objective of the courses

The objective of the courses is to help the trainees to further understand & update the knowledges and fluently master the relevant techniques which are listed in the paragraph 3.3.1.

II. The main contents of the Part A of the course

- a. Review of the basic knowledges of the former Four Certificates Training.
- b. Practice of the main practical points of the former Four Certificates Training.
- c. Introduction of the information of the newly revised international and national maritime safety conventions and regulations dealing with the contents of the Four Certificates Training.
- d. Study and practice of the new training items in accordance with the newly revised international and national maritime

safety conventions and regulations.

Part B. Three Sub-Certificates Refreshing and Updating Training

The refreshing training of Radar and ARPA for the Three Sub-Certificates Refreshing and Updating Training has been already mentioned and discussed in the paragraph 5.4.3 (Integrated Safety Navigation Training Course). Apart from Radar and ARPA, the another training subject of this training course, Radio Telephony, has also been mentioned in the paragraph 5.4.10 (Intensive Maritime Safety English Course).

In consideration of the arrangement of the training subjects for the individual training courses, the Three Sub-Certificates Refreshing Course can be arranged into two ways. One is the course fully programmed with three training subjects for the trainees who have not attended Integrated Safety Navigation Training Course and Intensive Maritime Safety English Course. Another is the training subjects partly programmed according to the trainees' training background.

The course fully programmed with three training subjects can be arranged for 42 hours. The objectives of this refreshing training course are mentioned in 3.3.2, and for the training contents please refer to the relevant paragraphs in 5.4.3 and 5.4.10.

5.5 Establishing A Training System for MSET Instructors

In order to ensure the efficiency of the MSET work, a very important factor is that there must be enough qualified MSET instructors in the maritime institutions and mariners training centers. These instructors should have enough theoretical knowledge and rich practical experience in their own teaching and training fields, at the same time they have to continuously update their own maritime knowledge and raise the teaching and training techniques.

The practical situation of MSET instructors in China shows that although many qualified MSET instructor have contributed a lot to MSET, but there are still a number of instructors who lack the practical experience on board ship and training techniques, some of them even did not have the chance to be well educated and trained in the maritime institutions.

From the view of practical need, it is necessary to establish a specific training system for the MSET instructors. First of all, a MSET instructors training guiding group must be organized by the MSET authorities in the Ministry of Communication. In addition to the officials of the Bureau of the Harbour Superintendency, the Bureau of Education and some major maritime institutions and mariners training centers, this group should consist of a certain number of experts who have been in charge of MSET work. Then this group should firstly further study and investigate the real situation of the maritime technical knowledge background and training practical techniques of the MSET instructors and make standardized requirements for qualified MSET instructors. Afterwards it has to plan the detailed training programs according to the results of their studies and investigation.

The training of MSET instructors can be carried out by the different ways for different kinds of instructors. It is

better to offer a relative long term training course specially for those who did not have the chance to be well educated and trained in the maritime institutions to let them have a systematical training. The others who lack practical experience on board ships should be arranged to work or practice on board ship for a certain period of time, their work and practice should be closely connected with their later training aspects in the maritime institutions or mariners training centers.

The qualified MSET instructor also have to join some specially organized courses to update their maritime knowledge and raising their training techniques. This kind of training courses for the instructors can be arranged into various forms, such as knowledge updating, training technique discussions, mutual visits and demonstrations or the formal academic exchanges which are mentioned and discussed in the later paragraph of this chapter.

All the training courses and activities should be well organized and arranged by the guiding group. This group also has to select the experienced experts to conduct the training courses according to the requirement of the standard training requirements. These teachers can be the experienced MSET instructor in maritime institutions or mariners training centers, experienced captains or chief engineers and experienced managers or officers from the shipping companies or other maritime units.

The establishment of MSET instructors' training system could be connected with the consideration of the whole national maritime lecturers training. Now there is no any special maritime lecturers training in China, but the need for the establishment the relevant system for the training of the maritime lecturers has been already under consideration by the Bureau of Education in the Ministry of Communication.

5.6 Expanding MSET Academic Exchange Activities

The academic exchange activities is also an effective method for the promotion and improvement of the MSET work. It is not only for the teaching staff members that they can discuss and learn a lot about the education and training methodologies, effective exercises and the development and conduct of the relevant courses, but also the MSET programs can be fully discussed, analyzed and summarized during this kind of seminars. Further more practical problems such as dealing with the maintenance and enhancement of the training facilities, the financial affairs, organization and administration of the trainees who are joining the training courses can be discussed and improved.

The MSET authorities (Bureaus of Education and Harbour Superintendency) should pay more attention to organize a national MSET academic organization which including the groups of the individual type of MSET courses. This academic organization can become the sub-body of the MET Association with in the Chinese Maritime Institute.

This national MSET academic organization can consist of the the following four groups:

- a. No.1 MSET Group will deal with the present Four Sub-certificates training and other basic maritime subjects training)
- b. No.2 MSET Group will deal with the present Three Sub-certificates training, the navigation aids and navigation control training, Shiphandling training.
- c. No.3 MSET Group will deal with the Dangerous goods and

Cargo Securing, the operation of oil and chemical tanker, the liquefied gas transportation and prevention of pollution from ships.

d. No.4 MSET Group will deal with VTS, SAR, GMDSS and other MSET subjects.

According to the experiences of the existing national Radar & Navigation Simulator Teachers Workshop which was founded in 1988 and got some ideas from the international maritime academic association such as IMLA and IRN SLC the national MSET academic organization and its four groups should have their relevant steering committees which is responsible for the organization of the seminars of specific subjects at a certain period of time. The members of the steering committee should be experienced instructors who are in charge of the specific type of the training course and the representatives of the individual maritime institutions.

5.7 Enhancing and Updating MSET Training Facilities

To follow up the international development of the MSET training courses and meet fully the international and national maritime safety conventions and regulations, the Chinese maritime institutions and mariners training centers have to enhance and update their training facilities.

According the newly revised regulations in the convention of SOLAS 1974, the new type of the rescue boat and the free-fall life boat should be used for basic maritime safety training in operation of life craft. The Travemunde Seaman School in Germany has already equipped these new life boats for training. Although the training costs for the free-fall life boat is very high and it has not been broadly fitted in the

maritime institutions in the world, it is necessary to introduce these specific life boats for maritime safety training in order to fully meet the requirements of the international conventions and regulations.

Following the rapid development of the technologies of computer and electronics, the various maritime simulators have been broadly used in the maritime institutions all over the world. From table 5-1 which presents the number of the maritime simulators (Nautical) used in six countries, including United States, United Kingdom, France, Germany, Sweden and Soviet Union, we conclude that maritime simulators already have become main training facilities in the field of maritime education and training, especially in the maritime safety training.

At present, there are only 6 radar and navigation simulators and 1 shiphandling simulator (Nocturnal system) in the Chinese maritime institutions.

In order to enhance and update the maritime safety training facilities, the authorities should try their best to let the maritime institutions get more budgets, and maritime institutions also should do their best to efficiently use the existing training facilities for getting some financial income through the maritime training for seafarers from the shipping companies.

Table 5-1

TABLE OF TYPES AND NUMBERS OF MARITIME SIMULATORS (NAUTICAL)
IN USA, UK, FRANCE, GERMANY, SWEDEN AND USSR

NAME OF COUNTRY	TYPE AND NUMBER OF SIMULATORS				
	RADAR-SIM	SHIP-SIM	LCH-SIM	SATCOM-SIM	TOTAL
UNITED STATES	19	6	1	0	26
UNITED KINGDOM	8	5	1	0	14
FRANCE	4	1	0	0	5
GERMANY	10	3	1	1	15
SWEDEN	3	0	0	0	3
SOVIET UNION	31	5	0	0	36
TOTAL NUMBER	75	20	3	1	99

NOTE: The abbreviation SIM stands for simulator, LCH stands for Liquid Cargo Handling and SATCOM stands for Satellite Communication.

In consideration of the practical needs and situations of the maritime training facilities, the following can be taken into account.

Firstly, the maritime institutions should fully use various functions of the existing training facilities and carry out research work to enhance and add the functions of these

facilities simultaneously.

Secondly, a certain number of necessary training facilities from abroad, such as advanced ship handling simulators, liquid cargo handling simulators, satellite communication simulators and other new types of maritime simulators, should be purchased and introduced. Also the maritime research centers and institutions should have good cooperation to speed up the development of various maritime simulators and other facilities.

From the view of long term necessity, the main emphasis should be put into domestic development of the maritime training facilities, because maintenance and repair work will be much efficient and costs will be much less for home made training facilities.

It is sure that if the safety consciousness of maritime personnel has been fully recognized, and MSET system, courses, training facilities and other relevant problems which are discussed in the above paragraphs of this Chapter have been enhanced and solved, then the Chinese MSET will be certainly further developed and improved.

CHAPTER SIX: CONCLUSION

Following the rapid development of the worldwide maritime industry and the new technology in various scientific field, the number, tonnage and kinds of ships for the world fleet are increasing accordingly.

On the other hand, the increase of the maritime casualties has happened not only in China, it has happened through out the whole maritime world. From the following table 6-1 about the statistics of reported total loss of ship in the world, we can find that the ship's GRT and DWT of total loss in the world had increased from 776,000 and 1,400,000 in 1988 to 1,149,000 and 1,935,000 in 1990 (the figures in 1990 was only calculated by November of this year). The total lives lost in 1989 is still up to 688 (see table 6-2)

Nowadays the impact and hazards associated with maritime casualties do not only affect seafarers and ship owners, but also ports, harbours, beaches, coral reefs and coast lines all over the world. The recent maritime accidents of the passenger ships, such as "Herald of Free Enterprise" and "Scandinavian Star", also affected the citizens of many countries because of the tremendous growth which has taken place in world tourism and caused serious results of life lost. There had been growing concern about the maritime safety problem in the world.

According to the Statistics of World Orderbook of the Fairplay Information System 1991, there are 2,171 new ships with a total DWT of 69,513,305 on order, meanwhile recent study into the worldwide supply and demand for seafarers which was carried out by the International Shipping Federation has concluded that at the end of 1990 there was a shortage of some 50,000 ship officers, unless the supply of officers increases, the shortage will increase to 400,000 by

CHAPTER SIX: CONCLUSION

the year 2,000. There is also shortage of 360,000 ship ratings by the same year.

All abovementioned factors meant that plenty of work has to be done in MSET field through out the maritime countries all over the world.

Table 6-1

THE REPORTED TOTAL LOSS BY MONTH 1988-1990

Ships of 500GRT/GT and over

MONTH	1988			1989			1990		
	NO.OF SHIP	1000 GRT/GT	1000 DWT	NO.OF SHIP	1000 GRT/GT	1000 DWT	NO.OF SHIP	1000 GRT/GT	1000 DWT
JAN.	8	19	275	14	72	104	17	101	185
FEB.	15	71	82	12	73	109	16	76	132
MAR.	9	57	92	19	128	221	9	130	218
APR.	9	53	81	8	57	102	13	48	51
MAY	12	111	100	18	171	270	6	120	220
JUNE	16	82	142	10	173	100	15	104	195
JULY	7	43	57	9	135	288	10	94	171
AUG.	5	11	14	11	80	120	10	184	284
SEP.	14	78	143	11	46	75	13	224	381
OCT.	15	60	84	16	98	157	9	36	57
NOV.	19	119	224	16	53	90	10	32	41
DEC.	18	72	106	12	65	108	:	:	:
TOTAL	147	776	1400	156	1151	1744	127	1149	1935
AVER.									
JA-NO	12	64	118	13	99	149	12	104	176

Source: Shipping Statistics, January / February 1991. DWT partly calculated by ISL, DWT figures in most cases

Table 6-2

LIVES LOST BY CATEGORY IN THE YEARS 1983 - 1989

Category	1983	1984	1985	1986	1987	1988	1989
Foundered	570	317	440	431	523	561	443
Missing	0	68	32	82	78	29	26
Fire/Explosion	53	51	94	29	29	83	57
Collision	25	54	14	448	3156	63	76
Contact	0	1	3	7	0	0	42
Wrecked/stranded	15	6	9	27	34	23	34
Lost etc.	8	28	27	43	21	4	10
Total Lives Lost	671	525	619	1067	3841	763	688
Total Casualties	340	327	307	265	219	231	211

Source: IMO NEWS Number 4. 1990

In order to ensure the world maritime safety and meet the needs of the worldwide maritime development, all the maritime countries have to seriously summarize the existing MSET situations, positively take the relevant measures to enhance their MSET system, develop and improve MSET courses, increase and update the training facilities in accordance with the international and national maritime safety conventions and regulations. Only when all maritime countries have successfully implemented the above conventions and regulations, then the world maritime safety can be improved thoroughly.

THE LIST OF THE PROPOSALS FOR FURTHER DEVELOPMENT
AND IMPROVEMENT OF MSET IN CHINA

SUBJECT	PARAGRAPH	PAGE
ACKNOWLEDGING THE NEED FOR AN EFFECTIVE MSET SYSTEM	5.1	69
Enhancing the Maritime safety consciousness	5.1.1	69
Training the qualified seafarers	5.1.2	70
STRENGTHENING THE STRUCTURE AND ADMINISTRATION of MSET SYSTEM	5.2	71
MSET Authorities in the Ministry of Communications	5.2.1	72
Coordinating MSET Work	5.2.1.1	72
Responsibilities of MSET work	5.2.1.2	73
Harbour Superintendency Administration	5.2.2	74
Enhancing Existing Regional and Local Harbour Superintendency Administrations	5.2.2.1	74
Establishing New Regional and Local Harbour Superintendency Administrations	5.2.2.2	75
Maritime Institutions and Mariners training Centers	5.2.3	75
Further Developing and Improving Chinese Maritime Institutions	5.2.3.1	76
Consolidating Existing Mariners Training Centers and Establishing Chinese Mariners Training Center	5.2.3.2	77
IMPROVING EXISTING MSET COURSES	5.3	79
Basic Maritime Safety Training Course	5.3.1	79
Advanced and special Maritime Safety Training Courses	5.3.2	81

OFFERING NEW MST COURSES	5.4	83
Shiphandling Simulator Training Course	5.4.1	83
Marine Environment Protection Course	5.4.2	86
MARPOL 73/78 Annex I Training Course	5.4.2.1	87
MARPOL 73/78 Annex II Training Course	5.4.2.2	89
Integrated Safety Navigation Training Course	5.4.3	91
Bridge Team and Procedures Training Course	5.4.3.1	92
Electronic Navigation Aids Training Course	5.4.3.2	93
Radar and ARPA Refreshing Training Course	5.4.3.3	95
GMDSS Course	5.4.4	97
Transportation and Handling of Dangerous Cargo course	5.4.5	101
Cargo Securing Course	5.4.6	103
Search and Rescue Course	5.4.7	105
VTS Operators Training Course	5.4.8	108
Maritime Accident and Incident Investigation Course	5.4.9	111
Intensive Maritime Safety English Course	5.4.10	113
Refreshing Course for Four and Three Sub Certificates Training Courses	5.4.11	115
ESTABLISHING A TRAINING SYSTEM FOR MSET INSTRUCTORS	5.5	118
EXPANDING MSET ACADEMIC ACTIVITIES	5.6	120
UPDATING MSET TRAINING FACILITIES	5.7	121

ABBREVIATIONS

ARPA	Automatic Radar Plotting Aids
BCH Code	The Code for the construction and equipment of ships carrying dangerous Chemicals in Bulk
CBT	Clear Ballast Tanks
COLREG	Collision Regulations
COSCO	China Ocean Shipping Company
COW	Crude Oil Washing
CPA	Closest Point of Approach
DWT	Dead Weight Tonnage
EPIRBs	Emergency Position Indicator Radio Beacons
GPS	Global Positioning System
GMDSS	Global Maritime Distress and Safety System
GRT	Gross Registered Tonnage
IBC Code	International Code for the Construction and Equipment of ships Carrying Dangerous Chemicals in Bulk
ICFTU	International Confederation of Free Trade Unions
IMLA	International Maritime Lecturers Association
IMO	International Maritime Organization
IOPP	International Oil Pollution Prevention
IRN SLC	International Radar And Navigation Simulator Lecturers' Conference
ISL	Institute of Shipping Economics and Logistics
LCH	Liquid Cargo Handling
MARPOL	Marine Pollution
MEPC	Marine Environment Protection Committee
MSC	Maritime Safety Committee
MSET	Maritime Safety Education and Training
MSE	Maritime Safety Education
MST	Maritime Safety Training

NNSS	Navy Navigation Satellite System
NRT	Net Registered Tonnage
PC	Personal Computer
RDSS	Radio Determination Satellite System
RORO	Roll on/Roll off
SAR	Search and Rescue
SATCOM	Satellite Communication
SBT	Segregated Ballast Tanks
SIM	Simulator
SOLAS	Safety of Life at Sea
STCW	Safety Training, Certification and Watchkeeping
STS	Ship Transportation Security
TCPA	Time to Closest Point of Approach
VTS	Vessel Traffic Service
WMU	World Maritime University

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- 1.07 Radar Observation and Plotting
- 1.08 The Operational Use of ARPA
- 1.09 Radar simulator
- 1.11 MARPOL 73/78 - ANNEX I
- 1.12 MARPOL 73/78 - ANNEX II

- 1.13 Medical Emergency - Basic Training (including compendium)
- 1.19 Personal Survival
- 1.20 Basic Fire Fighting
- 2.02 Maritime Search and Rescue Co-ordinator Surface Search (including Compendium)
- 3.11 Maritime Accident and Incident Investigation (including compendium in three volumes)
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