

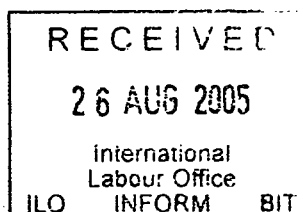
International Labour Organisation

JOINT I.L.O./I.M.C.O. COMMITTEE ON
THE TRAINING OF SEAFARERS IN THE USE
OF AIDS TO NAVIGATION AND OTHER DEVICES
(Geneva, 14-19 December 1964)

The Training of Seafarers in the Use
of Aids to Navigation and other Safety Devices
(Supplementary Information)

The information in the following pages is submitted to the Joint Committee in order to supplement that contained in the report on the Training of Seafarers in the Use of Aids to Navigation and other Safety Devices (document JCST/I/1964/1).

It includes an analysis of replies to the questionnaire from the Governments of Chile, Cuba, the Federal Republic of Germany, Greece, Nigeria, Portugal, Senegal and the U.S.S.R., which were received too late for inclusion in the main report mentioned above.



CHILE

Aids to Navigation

The training of merchant marine officer candidates is conducted through the four-year programme of the Naval Academy, one year of which consists of practical training on board operating merchant or naval vessels. Examinations for certificates of competency are taken upon completion of this programme.

Ratings are trained exclusively on board ship during the course of their daily work and during shipboard drills.

Officer candidates are given theoretical and practical instruction in radar, radio direction-finder, gyro-compass and automatic pilot, and the magnetic compass. Graduates of the Naval Academy are competent in the practical use and maintenance of these aids to navigation, and are capable of performing minor repairs.

The examinations for all grades of deck officers' certificates of competency require knowledge of the practical use of these aids to navigation.

No special certificate or endorsement is provided for seafarers in connection with the successful completion of training in any of these aids to navigation.

Life-Saving Appliances

During the three years of instruction at the Academy, and one year at sea, officer candidates receive both theoretical and practical training in the launching, handling, provisioning and maintenance of lifeboats and liferafts. They are also trained in the use and upkeep of lifejackets, lifebuoys, line-throwing apparatus and related life-saving apparatus.

Compulsory monthly safety drills held on board ship serve to exercise officers and ratings in the launching of lifeboats and use of associated life-saving apparatus.

No type of certificate is issued to seafarers in connection with training received or proven proficiency in the handling of lifeboats or use of other life-saving apparatus. Officers' certificate of competency examinations require knowledge of life-saving equipment and operations, and graduates of the four-year Naval Academy programme are considered well trained and competent in these subjects.

Devices for the Prevention, Detection and Extinction of Fire

The three years at the Naval Academy and one year on board operating merchant or naval ships provide officer candidates with both theoretical and practical instruction in the operation, practical use and maintenance of the various types of fire-prevention and fire-fighting systems and equipment found on board ships.

Fire exercises, which are required to be held at monthly intervals on board merchant and naval vessels, serve to provide continuing practical training for all officers and ratings on board.

Examination syllabi for all levels of officers' certificates of competency require knowledge of practical fire-fighting.

Seafarers employed on board tankers have received specialised training in the handling and care of, and safety precautions necessary in regard to, the cargoes carried by these types of vessels. Instruction is provided in special fire-fighting techniques applicable to petroleum cargoes.

CUBA

Aids to Navigation

The pre-sea training of officer candidates at the national Naval Academy includes instruction in the theory of operation, practical use and maintenance of marine radar installations, the radio direction-finder, Decca, Loran, Consol, the gyro-compass and autohelmsman, and the magnetic compass. No special certificates or endorsements are issued to students in connection with the satisfactory completion of training in any of these aids to navigation.

Life-Saving Appliances

Training for officer candidates at the Naval Academy includes instruction in the following aspects of marine life-saving apparatus and operations:

- (a) launching and handling of lifeboats;
- (b) equipment carried in lifeboats and the use and maintenance of this equipment;
- (c) launching and handling of rigid and inflatable liferafts;
- (d) use of line-throwing apparatus, lifebuoys and life-jackets.

No special certificates or endorsements are issued to officer candidates attesting to satisfactory completion of training in the use of any type of life-saving apparatus.

Devices for the Prevention, Detection and Extinction of Fire

The Naval Academy's pre-sea training programme for officer candidates includes instruction in both the theory of fire-fighting and the practical use of the various types of fire-fighting appliances.

Theoretical instruction, which includes practical demonstrations, covers the following topics:

- (a) theory of fire and fire extinction;
- (b) classes of fires;
- (c) types of combustible materials found on board;
- (d) application of the various types of fire-extinguishing agents;
- (e) engine-room, cargo hold, and radio-room fires.

Practical fire-fighting instruction covers the use and maintenance of the following fire-fighting equipment:

- (a) fire hoses, nozzles and hose fittings;
- (b) portable and non-portable carbon dioxide fire extinguishers;
- (c) foam-generating equipment and appliances for applying foam to fires;
- (d) water-spray systems and appliances.

FEDERAL REPUBLIC OF GERMANY

Aids to Navigation

Theoretical and practical instruction in radar, radio direction-finder, Decca, Loran, Consol, gyro-compass and auto-helmsman, magnetic compass, echo-sounder and radio telephone is given within the framework of the training programme for captains and mates in the navigation schools. Since there are no special training courses devoted to these subjects, no special certificates are issued in connection with training received or proven proficiency in the use of any of these aids to navigation.

Ratings are instructed in the practical use of the magnetic compass in the seamen's schools during the course of their training as helmsmen.

Life-Saving Appliances

Training in the operation and use of life-saving appliances is provided to ratings at the seamen's schools. A lifeboatman's certificate is issued to ratings having received this training, after a subsequent period at sea of at least one year.

Officers and ratings of all departments are constantly trained in the handling of lifeboats during their service on board. Training in other life-saving apparatus is given in the various officer's navigation schools. Special training as lifeboatman is also given in the maritime schools of the Transport and Public Services Workers' Union. This training is not obligatory under the official training regulations.

Devices for the Prevention, Detection and Extinction of Fire

Ratings are trained in the operation, practical use and maintenance of fire-fighting systems and equipment at the seamen's schools. A special "fireman's certificate" is issued to each able seaman after an appropriate examination and after completing 24 months of sea service.

The officer's navigation schools also provide instruction in marine fire-fighting equipment and techniques.

Special training as fire-fighters is given at the maritime schools of the Transport and Public Services Workers' Union; this training is not obligatory under the official regulations.

All officers and ratings of operating vessels participate in fire-fighting exercises during the regularly scheduled emergency drills which are held on board.

GREECE

Aids to Navigation

A special government school, supervised by the Merchant Marine Training Division of the Ministry of Merchant Marine, provides up-to-date training for officer candidates in modern aids to navigation. A course of two weeks' duration is given in radar, and a one-week course covers the gyro-compass. A second one-week course covers the radio direction-finder, Decca, Loran and Consol. All courses provide instruction in the theory of operation, practical use and elementary repair of these aids to navigation.

Candidates for a Master's Class B certificate of competency are required to successfully complete these three courses, as are Master Class A candidates who received their Class B certificates prior to the availability of this specialised training.

A school certificate is granted to all officers and officer candidates who, upon completion of this training, pass the required examinations.

In the near future the duration of this training in aids to navigation will be increased from the present four weeks to eight weeks and expanded to cover the radio telephone and echo-sounder.

Instruction in the magnetic compass and echo-sounder is included in the comprehensive training programmes for merchant marine officer candidates and ratings.

Life-Saving Appliances

Theoretical and practical training in life-saving appliances forms part of the curricula of the training programmes for officer candidates and ratings. Moreover, in the near future a special training centre for seafarers will provide instruction in the following aspects of life-saving operations on board ship:

- (a) lowering and handling of lifeboats;
- (b) provisioning and maintenance of lifeboats;
- (c) handling of rigid and inflatable liferafts;
- (d) practical use of line-throwing apparatus, signal rockets and lifebelts.

Devices for the Prevention, Detection and Extinction of Fire

Theoretical and practical training in fire-fighting theory, equipment and techniques forms part of the curricula of the training programmes for officer candidates and ratings.

The new training centre for seafarers will provide additional instruction in fire-fighting. The proposed training will cover:

- (a) use of the various types of fire-fighting respiratory apparatus;
- (b) fire-fighting techniques using steam, carbon dioxide and water-sprinkler systems;

- (c) fire detection and alarm systems;
- (d) use of fire extinguishers, hoses and nozzles, and the international shore connection.

NIGERIA

Aids to Navigation

A six-months training programme is conducted for future merchant navy ratings. Students are instructed in the basic theory, practical use and maintenance of the magnetic compass.

The training of experienced seafarers and future officers is achieved primarily through practical experience on board operating vessels. In this manner officers and ratings develop proficiency in the use of the various aids to navigation with which their vessels are equipped.

Life-Saving Appliances

The training programme for future ratings includes instruction and practical exercises in the launching, handling and maintenance of lifeboats. Students make frequent field trips to vessels in port to study lifeboats and other life-saving appliances and to participate in exercises conducted with this equipment.

All officers and ratings on board operating merchant vessels participate in practical exercises with life-saving apparatus during the regularly scheduled emergency drills which are required to be held on board.

Devices for the Prevention, Detection and Extinction of Fire

Instruction in the operation, practical use and maintenance of portable and non-portable fire extinguishers is provided to ratings during the six months pre-sea instruction.

Officers and ratings receive practical experience in the use of various fire-fighting systems and appliances during regularly scheduled fire and emergency drills which are held on board operating vessels.

PORTUGAL

Under the supervision of the Ministry of the Navy, the Nautical College provides training programmes leading to certificates of competency as masters, deck officers, engineer officers, radio operators and catering staff officers.

The Merchant Marine Seamen's and Mechanics' School, which is under the control of the National Assembly of the Merchant Marine, provides training for ratings.

Aids to Navigation

Deck officer candidates at the Nautical College are given theoretical and practical instruction in the various modern aids to navigation. This training includes the following equipment and subject matter:

- (i) Radar: principles of operation and characteristics of radar installations; identification of echos; auxiliary installations; radar charts and radar displays; radar navigation; use of radar in avoiding collisions.
- (ii) Consol, Decca and Loran systems: theory and practical operation of equipment; determining lines of position and using the special charts; and the precision and range of equipment.
- (iii) Radio Direction-Finder: calibration; determination of azimuths and lines of position; projection of azimuths and Mercator chart; Givrey's correction; description of equipment and types of antenna systems and principles of operation.
- (iv) Magnetic Compass: principles of operation; description of compass; practical use in navigation; maintenance; compass errors and methods of compensation and compass siting.
- (v) Gyro-Compass and Autohelmsman: theoretical principles of operation; practical operation and use of equipment; accuracy of gyro-compasses, adjustments and maintenance, advantages and disadvantages.

No special certificates or endorsements are issued in connection with the successful completion of training in any of these aids to navigation.

Life-Saving Appliances

All officer candidates at the Nautical College are trained in the launching, handling, provisioning and maintenance of lifeboats and liferafts. They also receive practical instruction in the use of lifebuoys, lifejackets, line-throwing apparatus and associated life-saving equipment.

Ratings under instruction at the Merchant Marine Seamen's and Mechanics' School are also given similar instruction in the practical use of lifeboats and other life-saving equipment found on board ship.

No lifeboatman's endorsement or other type of certificate is issued upon the satisfactory completion of training in life-saving appliances.

Emergency drills, which are held on board operating merchant vessels, exercise seafarers in the use of lifeboats and other life-saving apparatus.

Devices for the Prevention, Detection and Extinction of Fire

Future officers at the Nautical College, and ratings in training at the Merchant Marine Seamen's and Mechanics' School are given theoretical and practical instruction in the operation and use of the various fire-prevention and extinguishing systems found on board ship.

Seafarers on board operating vessels participate in regularly scheduled fire exercises.

SENEGAL

The training of masters, deck officers and engineer officers for foreign-going vessels is accomplished primarily in French navigation schools, which provide comprehensive training in aids to navigation, life-saving appliances and fire-fighting.

The newly founded National Merchant Marine School provides training programmes for future skippers of coastal vessels, fishing boats and other small craft. Graduates of these programmes are employed on board ship in subordinate officer positions for 18 months prior to becoming certificated skippers.

In the future, pre-sea training for ratings will be provided on board a training ship. The contents and duration of this instruction will be similar to that provided by comparable French schools, but will be adapted to meet the special conditions in Senegal. Students will be given practical instruction in the operation and use of aids to navigation and marine safety appliances. The equipment to be fitted on board the training ship will be used in providing practical exercises. It is not anticipated that any special certificates will be issued in connection with the satisfactory completion of this training.

U.S.S.R.

Maritime training is divided into four basic categories:

- (i) college level marine engineering institutions for young men between the ages of 17 and 35 who have a complete secondary school education;
- (ii) intermediate level technical schools for officer candidates between the ages of 15 and 30;
- (iii) maritime vocational training schools for ratings of at least 17 years of age;
- (iv) correspondence courses of college and intermediate levels for officer training of seamen employed on board ship.

Capable ratings with two years sea service are also eligible for enrolment in the college and intermediate level institutions for officers.

The training of all maritime institutions is provided free of charge, and includes board and lodging, uniform, medical treatment and other academic expenses without cost to students.

To complement the theoretical studies of professional subjects, which include modern aids to navigation, life-saving appliances and fire-fighting, all students of the three categories of training institutions receive practical instruction in school laboratories. These laboratories are fitted with complete lines of modern marine equipment for the training of officers and ratings of all shipboard departments. In addition, all students receive practical instruction on board training vessels. The college and intermediate level schools, in particular, maintain large training vessels specially fitted out for the comprehensive practical training of future merchant marine officers. This training includes instruction in the use of aids to navigation and other safety devices.

Officer candidates who have completed the programme of a college level engineering school or an intermediate level technical school qualify to sit for the government-administered examinations for merchant navy officer's certificates of competency.

The duration of instruction provided for ratings varies with the nature of the duties on board. Six months of basic training is given to prospective ratings, and can be given either at the vocational training schools or on board ship.

Ratings who have successfully completed a course of instruction are certificated for their particular positions on board ship. These seafarers are competent in the use of the basic aids to navigation, life-saving appliances and fire-fighting equipment.

The correspondence course training programme is maintained for seafarers on board ship who are studying for eventual certification as merchant navy officers. Special provisions are provided on board for seamen pursuing these programmes of study, and most Soviet seaports maintain training consultation offices for students. Students are required to pursue formal studies in the various aids to navigation and other maritime safety equipment; they receive practical instruction in the use of this equipment through their duties on board ship.

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OF AIDS TO NAVIGATION AND OTHER DEVICES

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OF AIDS TO NAVIGATION AND
OTHER SAFETY DEVICES

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INTRODUCTION

The International Conference on the Safety of Life at Sea (London, May-June 1960) adopted a Recommendation (No. 39) on the Training of Masters, Officers and Seamen in the Use of Aids to Navigation and other Devices. This instrument calls on governments to take all practical steps to see that the training of seafarers in the use of aids to navigation and other devices provided for their safety is sufficiently comprehensive and that it is satisfactorily kept up to date. It also provides that within their respective spheres of activity the Inter-Governmental Maritime Consultative Organization and the International Labour Organisation should co-operate closely with each other and with interested governments to the above ends. The Recommendation refers also to Article 3 of the Agreement between I.M.C.O. and the I.L.O., which provides for the setting up of joint committees to deal with questions of common interest. The text of the Recommendation is reproduced as Annex I to the present report.

Following the adoption of Recommendation No. 39, I.M.C.O., after consultation with the I.L.O., requested its member governments and governments of other states which had been invited to the International Conference on the Safety of Life at Sea in 1960, to furnish information about the action which they had already taken, or which they proposed to take, to give effect to the Recommendation. The information received from governments as a result of this request was published by I.M.C.O. in August 1961¹ and subsequently considered by the Joint Maritime Commission of the I.L.O. at its 19th Session (Geneva, October 1961). The Joint Maritime Commission noted with appreciation this information and adopted a resolution recommending the establishment of a Joint I.L.O./I.M.C.O. Committee to deal with the question of the training of seafarers in the use of ships' navigational aids and safety devices. This resolution was approved by the Governing Body of the I.L.O. at its 150th Session (November 1961), which instructed the Director-General to consult the Secretary-General of I.M.C.O. concerning the procedure to be adopted by the two organisations for the setting up of the proposed Joint Committee.

¹ See Training of Masters, Officers and Seamen in the Use of Aids to Navigation and other Devices (I.M.C.O., London, 1961). Additional information was published in a Supplement to the above booklet in 1962.

The Maritime Safety Committee of I.M.C.O., at its Sixth Session (London, January 1962) was informed of the recommendation of the Joint Maritime Commission and of the action taken by the Governing Body of the I.L.O. in this respect, and agreed that I.M.C.O. participation in the proposed Joint Committee should be considered, and further decisions taken, at a later meeting. At its Ninth Session (London, September 1964) the Maritime Safety Committee made recommendations concerning the scope of work of the Joint Committee and its composition, and agreed to the suggestion that it should meet at the I.L.O. Headquarters in Geneva from 14 to 19 December 1964.

With a view to supplementing and bringing up to date the information which had previously been collected by I.M.C.O., it had been decided to address a questionnaire to the States Members of the I.L.O. The questionnaire, of which the text appears as Annex II to the present report, and which had been drawn up in consultation with the Secretariat of I.M.C.O., was despatched on 21 May 1964, and by the middle of September 51 replies had been received from governments. The Maritime Safety Committee at its Ninth Session proposed that the Joint Committee should examine, with the object of settling its method of work and the necessary agenda, an analysis of the replies received from governments to the questionnaire and the material in the booklet published by I.M.C.O. in 1961, with its 1962 Supplement, as referred to above. The recommendations of the Maritime Safety Committee were approved by the I.M.C.O. Council at its 13th Session (London, September 1964).

The I.L.O. would like to express its appreciation of the co-operation of the Secretariat of I.M.C.O., which has assisted in the analysis of the material and provided technical advice and assistance in the preparation of the present report, and of the information supplied by governments which has enabled it to present to the Joint Committee the most recent data on the facilities existing in the various countries for the training of seafarers in the use of aids to navigation and other safety devices.

In Chapter I of the present report, an attempt has been made to give, in summary form, an account of the nature of the problems involved in connection with training in the various aids to navigation, life-saving appliances and fire-detection and fire-fighting equipment now commonly used in ships throughout the world.

The substantive aspects of the situation are dealt with in Chapter II, which contains national monographs under the three main headings of aids to navigation, life-saving appliances and fire-fighting equipment.

In Chapter III the available information is summarised under sections dealing with the individual subjects. In a final summing up the salient points of the information given have been set out, and certain questions have been stated which the Joint Committee may wish to use as a basis for its discussions.

CHAPTER I

NATURE OF THE PROBLEM

The concept of "safety of life at sea" is associated with the structural features of a ship, the safety equipment with which it is fitted, and the ability of seafarers to make full use of these features and equipment during emergency conditions.

Throughout the years, innovations in ship construction and equipment have not resulted in a substantial reduction of casualties at sea. Radar, for example, which was considered at the time of its introduction on board ship as a final remedy for collisions, has fulfilled this expectation only when competently used and properly maintained. Improper use has become an important characteristic, and sometimes the cause, of numerous and frequent cases of collision at sea.

Adequate training of ships' crews in the use of safety devices and navigational equipment remains one of the most effectual guarantees of safety at sea. Marine casualty reports reveal that in some instances ships have been lost, or severe damage sustained and personal injuries suffered, due to the fact that the ships' crews were not adequately trained to use the navigational and safety equipment provided, or failed to maintain this equipment in a physical condition which would permit its immediate and most effective use.

Modern ships with new construction features and more sophisticated navigation equipment and techniques, require higher skills from seafarers. If safety standards are to be improved, and even the present standards maintained, it follows that the quality, level and scope of the training of seafarers in the operation of modern vessels must be commensurate with the changing requirements of their professional duties.

Aids to Navigation

The principal modern aids to navigation that require a degree of skill in operation and maintenance are: radar, radio direction-finder, echo-sounder, very high frequency telephone, Decca, Loran, Consol and gyro-compass and autohelmsman. Of these, only the radio direction-finder is required by international agreement to be carried on international voyages¹;

¹ Safety of Life at Sea Convention 1960, Chapter V, Regulation 12, cf. Chapter IV, Regulation 11.

radar is not compulsory but is recommended¹; echo-sounders are widely fitted to ships; ~~gyro-compass-is frequently~~ standard equipment, but autohelmsman is not as common; Consol is mainly used in the North Atlantic; very high frequency telephone, which is rapidly coming into use, has a short range of up to 25 miles, and is essential if full use is to be made of port radar networks; Loran, is in use on the American coast and in the Far East; Decca, which is used mainly in European waters and the Persian Gulf. Two other systems exist - doppler navigation and inertial navigation, but these are not used in merchant ships at the present time.

This complicated and expensive electronic and mechanical equipment has added greatly both to the safety and to the complexity of life at sea. Modern aids to navigation have made it possible to manoeuvre ships safely under most unfavourable conditions provided the navigators are capable and fully experienced. In fact, the officer in charge of navigation and his assistants must be experts in the handling of this equipment and in interpreting the presentation. While it takes years of experience at sea to learn to evaluate

In addition to misinterpretation of information furnished by a properly functioning instrument, another cause of danger which has led to collisions, strandings or foundering, is poorly maintained equipment which does not function correctly. It is essential therefore that operators of radar, radio direction-finders and other aids to navigation should not only have sufficient knowledge and ability to use the equipment to the fullest possible extent, but that they should also be able to recognise when this equipment is not performing properly or is suspected of giving inaccurate information. This knowledge and ability can only be obtained by comprehensive formal training that includes practical instruction in maintenance, supplemented by operating experience and refresher training.

(a) Radar

Among the various aids to navigation, the most important from a safety point of view is perhaps radar, owing to the fact that this device can be used not only for navigational purposes but also to avoid collision. However, as has been said before, although radar is being increasingly fitted on merchant vessels, the number of collisions at sea have not diminished. This is due largely to the fact that today faster and larger vessels ply steadily denser shipping lanes, and that conditions in harbours become ever more crowded, but also to the failure in many cases of vessels to properly use their radar installations. The term "radar-assisted collisions" has come into usage as a result of

¹ Recommendation 45 adopted by the Safety of Life at Sea Conference in 1960.

investigations which have established that over-confidence in radar, or misinterpretation of the information provided by the screen, especially under reduced visibility conditions, have been contributing factors to serious ship collisions which might not have occurred had the ship not been fitted with a radar set. In order to make a proper use of radar as an aid to safety rather than as an "aid to collision", it is therefore essential for the operator to have a profound knowledge and experience of the use of radar, and an appreciation of its limitations.

The International Conference on the Safety of Life at Sea, which in 1960 revised the International Collisions Regulations, added to them a number of recommendations on the use of radar information as an aid to avoiding collisions at sea. These recommendations stress the danger connected with misuse of radar by unskilled or insufficiently trained personnel. The new Collisions Regulations, together with the recommendations on radar, will enter into force in 1965.

(b) Radio Direction-Finder

Determining the position of a ship at sea from bearings of radio transmitting stations, as received by ship-borne radio direction-finding apparatus, is a form of radio navigation which has been in use for over 50 years.

In addition to determining the position of a ship in fog or when other means are not available, the ability of the radio direction-finder to locate other ships or aircraft in distress and survival craft, contributes to the importance of this apparatus in the safety and protection of life at sea.

It follows that navigating personnel must be fully trained and proficient in the practical use of the radio direction-finder if these potential life-saving capabilities are to be fully realised.

(c) Decca, Loran and Consol

Radio-location aids to navigation such as the Decca, Loran and Consol systems are similar in that they provide lines of position from radio-wave information received by special apparatus on board ship. The navigator pinpoints his position as the inter-section of two of these lines of position.

Decca is a radio-location system for determining a ship's position at sea. It is based on the measurement of radio-wave voltage phase differences as received from two transmitting stations by a receiving station on board ship.

In the Loran radio navigation system, high-frequency radio signals transmitted simultaneously by two Loran stations ashore are received by a ship or aircraft in a Loran receiver which determines accurately the difference in time at which the two signals are received. Navigators using Loran can determine lines of position, the inter-section of which gives the position of the ship.

Consol is a long-range radio aid to navigation consisting basically of a shore-based medium-frequency radio transmitter having a special directional aerial system. Transmitted Consol signals can be received by an ordinary communication receiver, and from the bearings of these signals a fairly accurate determination of a vessel's position at sea can be made.

(d) Compass

Owing to the almost universal fitting of the magnetic compass to ships and smaller craft of all descriptions, including lifeboats, and the common installation of gyro-compass and autohelmsman in modern merchant vessels, it is essential that all categories of seafarers be familiar with the theory, practical use and maintenance of these navigational aids.

(e) Echo-sounder

The echo-sounder is an electro-audio device for measuring the depth of water. It has become an important aid to navigation and is presently installed in most modern merchant ships, fishing vessels and other small vessels. Providing practically continuous soundings, the echo-sounder eliminates the lack of accuracy encountered by the lead line, particularly when a ship is moving at an appreciable speed.

The echo-sounder must be reliable and dependable if it is to serve the navigator as intended. To ensure this accuracy it should be calibrated in port and frequently checked, as well as properly operated and serviced during routine usage. To ensure these conditions, seafarers using the echo-sounder should be fully trained and confident in their knowledge of the basic theory, practical use and maintenance of this important aid to navigation.

Life-Saving Appliances

According to the Regulations of the Safety of Life at Sea (S.O.L.A.S.) Convention, 1960, the type of life-saving appliances required to be carried on merchant ships and their quantity vary with the type and size of ship and the number of persons carried, and comprise the following: lifeboats and liferafts, lifebuoys, lifejackets, line-throwing apparatus, and various distress signalling equipment.

The S.O.L.A.S. Convention requires that all crew members shall be instructed and exercised in the use of life-saving and fire-fighting appliances at specified intervals depending on the type of ship.

Competency of all seafarers, particularly deck personnel, in the use and maintenance of the various life-saving appliances fitted on board ship is essential if the use of the equipment is to be fully effective in preventing casualties and loss of life at sea.

The operation of launching a lifeboat, for example, is a complex and hazardous procedure requiring training and experience on the part of all those engaged in the operation, and this is true even with boats and davits in an excellent state of repair and under optimum sea conditions. Many cases can be cited of difficulties involved with poorly maintained davits, boats, and boat falls during this operation, and of seafarers not suitably trained or experienced, which have led to delays, personnel casualties and smashed or unreleasable lifeboats.

In view of these and other problems connected with the handling of traditional lifeboats, the maritime industry is constantly introducing improved designs of launching apparatus, new types of lifeboats and their equipment, as well as inflatable liferafts. It follows that apart from the high standards of training in conventional lifeboat launching and handling which seafarers should possess, training must also keep pace with the introduction of new apparatus and the changed techniques of its use.

Devices for the Prevention, Detection and Extinction of Fire

It has often been stated that a ship's worst enemy is fire on board. Within a very short time, a shipboard fire may rage entirely out of control, resulting in loss of life and abandonment of the vessel.

International regulations have been adopted for the protection of ships against fire hazards. The S.O.L.A.S. Convention contains, in Chapter II, Parts D, E and F, detailed regulations concerning structural fire protection, fire detection and extinction, and general fire precautions to be taken on board ships. The basic principles underlying these regulations are:

- (a) separation of the accommodation spaces from the remainder of the ship by thermal and structural boundaries;
- (b) containment, extinction or detection of any fire in the place of origin; and
- (c) protection of the means of escape.

In practice the principal fire-prevention and fire-fighting devices include a wide range of both structural features and portable equipment and outfits. Some of these work automatically, while others require manual operation. In both cases it is essential that the crew be thoroughly familiar with the working of the material and have confidence in it. Various kinds of fire protection measures required in modern merchant ships include fire-resisting bulkheads, the restricted use of combustible and highly inflammable materials and furnishings, fitting of automatic sprinkler and fire alarm systems, installation of centralised ventilation control with automatic shut-off, extended valve spindles for fuel oil lines and pumps, foam fire-extinguishing systems, fixed pressure water-spraying systems, automatic closing of doors, installation of fire pumps, hoses, nozzles and hydrants throughout the vessel, provision of steam or carbon dioxide smothering apparatus for use in cargo holds, engine rooms and paint lockers, portable fire extinguishers, smoke breathing apparatus and fireman's outfit, and installation of international shore connection for fire hoses.

If efficient use is to be made of these various devices they must be kept continuously in good order, and a proper fire organisation must be established to operate them. As has been pointed out, such an organisation cannot function well if the crew is not capable of fully utilising the means at their disposal and there is no able direction and co-ordination of the fire operations. Furthermore, the value of the structural fire protection features is greatly diminished if a shipboard fire is not properly dealt with.

The question has been raised, most recently in connection with the "Lakonia" disaster, whether on larger ships, in particular passenger vessels, it would not be useful and indeed indispensable to carry an experienced fire officer as part of the crew to ensure that fire equipment is well maintained and that ship's personnel are properly trained.¹ Fire-fighting, it cannot be stressed too often, is a highly skilled profession and one really experienced fire officer to direct operations would be an invaluable asset in any fire emergency at sea.

¹ See Lloyds List and Shipping Gazette, 13 January 1964. Article by Mr. F. Rushbrook on the Lessons of the "Lakonia" Disaster.

CHAPTER II

SAFETY TRAINING PROGRAMMES IN THE VARIOUS COUNTRIES

To illustrate the current situation in respect of safety training at the national level throughout the world, the present chapter presents, in the form of national monographs, summaries of the original replies received from governments in response to the questionnaire, as well as information drawn from other sources available to the I.L.O. The chapter is divided into three parts, dealing respectively with aids to navigation, life-saving appliances and fire-fighting devices, and an attempt has been made to render the information as comparable as possible.

Of the 51 replies received by the I.L.O. up to 15 September 1964, the following countries gave information upon which this chapter is based: Argentina, Australia, Belgium, Burma, Canada, the Republic of China, Colombia, Czechoslovakia, Denmark, Finland, France, Ghana, Haiti, India, Ireland, Israel, Italy, Japan, the Malagasy Republic, Mexico, Netherlands, New Zealand, Norway, Pakistan, Peru, Philippines, Rumania, Spain, Sweden, Thailand, Turkey, the United Kingdom, the United States and Viet-Nam.

Some countries, having either none or a very small merchant marine, indicated that they have no specialised training facilities for seafarers; this is the case, for example, in Austria, Bolivia, Burundi, Cyprus, Ecuador, Ethiopia, Guatemala, Jamaica, Kenya, Paraguay, Rwanda, Sierra Leone, and Tanganyika and Zanzibar. Two countries, the Congo and Switzerland, have arrangements whereby their seafarers are trained abroad; responsibility for the training of Congolese seamen is assumed by Belgium, and therefore the information furnished by the Belgian Government applies also to Congolese personnel.

In Tunisia, a Merchant Marine School will be opened at Sousse in 1965, which will provide training, both theoretical and practical, in aids to navigation, life-saving appliances and fire-fighting equipment. In the meantime, Tunisian officer candidates will continue to be trained by means of fellowships to nautical schools in France.

The Government of Kuwait intends in the future to establish a comprehensive maritime training programme for officers of vessels registered in that country. Deck personnel of the merchant fleet at present participate in courses conducted by the Ministry of Social Affairs and Labour, the courses range in duration from six months to two years, and include instruction in seamanship, boat handling and lifeboat maintenance, safety equipment, and other navigation and communication subjects.

1. Aids to Navigation

Argentina

Merchant marine officers are trained at the National School of Navigation which offers a four-year programme of theoretical and practical instruction leading to examinations for the basic certificates of competency as deck and engineer officers. The School also serves as a national centre for the examination of experienced deck and engineer officers who wish to sit for the higher grade certificates of competency.

Theoretical and practical training in the operation and maintenance of modern aids to navigation is given to deck officer cadets during their second and third years at the School. A course entitled "Radio Electricity", consisting of three hours of classroom instruction per week for 34 weeks, gives cadets a sound theoretical understanding of electronic and radio principles and equipment. As an adjunct to this instruction, practical training in the maintenance of electronic equipment is provided by an additional four hours per week of electronic laboratory work for a period of 17 weeks.

Navigation courses at the School cover all aspects of the practical use of radar, direction-finders, the Decca, Loran, and Consol systems, and the gyro and magnetic compasses. During the third year of instruction about 200 hours of class work are given in the practical use of these aids to navigation. An additional 150 hours of instruction are devoted to analysis of problems involved in the operational use of this equipment. Basic principles of inertial navigation are also covered in the navigation course.

Thorough instruction in geomagnetism and in the theory and practical use of the magnetic compass involves about 250 hours of training in each subject during the second and third years. About 22 hours of instruction are also given in the theory and use of the gyro-compass.

During the second year of training, spent aboard a training vessel, deck cadets receive practical experience in the operation of radar, radio direction-finder and Consol, and the proper interpretation of signals from this equipment. Additional practical experience is gained by fourth-year deck cadets who are required to perform practical exercises with the aids to navigation installed in the ship to which they are assigned.

The examinations for certificates of competency as master and all grades of mate require that candidates have a comprehensive knowledge of radar, radio direction-finders, Decca,

Loran, Consul, gyro-compass and autohelmsman, magnetic compass and echo-sounder.

No special certificates are issued in connection with any training received in aids to navigation.

No formal training is available in Argentina for seamen ratings in any of the aids to navigation.

Australia

The Department of Shipping and Transport sponsors ten-day radar observers' courses which are conducted about six times annually. These courses are held periodically, one at a technological institute and the other at a naval establishment as part of the training required for obtaining a certificate of competency as second mate of a foreign-going ship. The course is open to all apprentices, cadets and students at nautical schools with sea experience in the deck department who are in training for the second mate's examination. The course can also be taken by experienced masters and mates as a separate entity. All graduates of the course receive a certificate of proficiency as radar observer. The number of students that can be accommodated at each course is limited to eight.

The syllabus for the examination as second mate (foreign-going) includes thorough coverage of radar theory and practical use for which candidates receive appropriate training at the various nautical training schools in Australia. Candidates for certificates as first mate and master are also examined in radar navigation.

The Government has not sponsored any type of training scheme for officers and ratings of the merchant navy in the other aids to navigation. Nautical schools however provide comprehensive coverage of these subjects in their courses preparing candidates for certificates of competency. As a general rule these courses cannot be taken separately or by seafaring personnel other than officer candidates enrolled in the schools.

The official examinations for the various levels and categories of mate and master require knowledge of these aids to navigation in varying degree. For the original second mate's foreign-going certificate, a very complete knowledge of the theory and principles of operation, practical use and maintenance of all the aids to navigation are required, but no special certificates are issued.

As regards, however very high frequency radio telephone and other equipment, training in this aid to navigation is included in a course at a commercial wireless school for candidates

for first and second class commercial operator's certificates of proficiency in wireless telegraphy.

No training is presently available, and the Government has not yet sponsored any type of instruction in inertial navigator or automated navigational systems.

Belgium

All maritime training, including that of radio officers, is conducted or sponsored by the Marine and Inland Shipping Administration. This training comprises the following programmes and courses:

1. Programmes for foreign-going deck, engineer and electrical engineer officer candidates at the Advanced School of Navigation at Antwerp.
2. Programmes for coastwise deck, electrical engineer and engineer officer candidates at the School of Navigation in Ostend.
3. Two nautical schools with one-year programmes for the training of seamen deck ratings and catering staffs.
4. Training of radio officers at the Advanced School of Radio Navigation in Brussels.
5. Courses for experienced deck and engineer officers in preparation for certificate of competency examinations or for obtaining certificates in the operation of specific equipment.
6. A three-year programme of the State Fisheries School at Heist which trains deck and engineer officers for service aboard fishing vessels.
7. Two-week courses preparing experienced seamen for certificates as able-bodied seamen.

The various training programmes provide classroom and practical instruction in aids to navigation, life-saving equipment, and fire-fighting techniques, in varying degrees depending on the nature and level of training.

The inspectors of the Marine and Inland Shipping Administration ensure that all maritime training is in accordance with prescribed syllabi. Moreover, the Advanced Maritime Training Council, the supervisory boards of the training schools and the Shipping Administration inspectors keep closely in touch with developments in the maritime field with a view to keeping syllabi and pedagogic methods up to date.

The initial training of officer candidates (cadets) consists of nine months of instruction on board one of three conventional merchant vessels specially built, fitted out and staffed to provide training for 24 cadets. Basic instruction is given in seamanship navigation, ship construction and other maritime subjects. This training, which is included in the first year of the Ostend and Antwerp nautical school programmes, includes basic instruction in the theory, operation and use of the various aids to navigation. Equipment fitted on board these ships include radar, radio direction-finder, Decca, Consol, gyro-compass, autohelmsman, magnetic compass, echo-sounder and radio telephone. These aids to navigation are utilised for practical instruction to cadets.

During this period all deck cadets receive basic instruction in radar on board the training vessels.

The two following years of formal studies provide the cadets with advanced theoretical and practical training in the various aids to navigation through courses in navigation, nautical instruments and marine electronics. These schools are fitted with radar simulators, Decca Navigator simulators, conventional and visual type radio direction-finders, gyro-compasses with repeaters, magnetic compasses and instruments for checking bearings, large-scale deviascopes, echo-sounding equipment, and Loran sets. Radar courses given during these two years at the two nautical schools include the following subject matters:

- (a) principles of operation, installation of equipment, and practical use of radar;
- (b) radio and radar navigation, including determining position by radar, radar charts, and radar plotting problems;
- (c) radar as an anti-collision device;
- (d) radar errors, accuracy of equipment and servicing of radar equipment.

Each cadet receives about 14 hours of instruction in radar theory, and about 16 hours of practical training using radar simulators, so that officers completing the training have a sound knowledge of the use of radar as a navigational aid and anti-collision device. They are further examined in radar knowledge when sitting for their original certificates of competency as deck officers.

Courses of six weeks' duration are available for experienced deck officers in preparation for higher grade certificate of competency examinations. Mates and masters taking these courses

are given several hours of individual instruction in the various electronic aids to navigation. This instruction covers the principles, description, operation, checking, maintenance and use of the various navigational instruments. This also includes advanced instruction in radar.

Possession of a radar observer's certificate is required of all masters and mates having received certificates of competency before the time when theoretical and practical instruction in radar were included in the syllabi of the navigation schools. Training of these personnel as qualified radar observers is accomplished through a special two-week course sponsored by the Belgian Government and the Belgian Shipowners' Association, which covers the theory of operation, practical use and maintenance of radar. This training consists primarily of exercises with radar simulators and emphasises the use of radar as an anti-collision aid to navigation. Courses are conducted at the Antwerp and Ostend navigation schools.

The initial courses on board the training ships for cadets cover the elementary theory, description, operation and use of the radio direction-finder. During the following two years of formal studies at the nautical schools navigation courses which specifically deal with radio navigation and impart instruction in the theory and practical use of the radio direction-finder are given. Among the topics covered are: theory of operation, obtaining bearings and calculating position; convergency of meridians; errors, influences, disturbances and accuracy of equipment; and maintenance of apparatus.

Examinations for all categories and levels of certificates of competency for deck officer and fishing-boat skipper require that candidates be thoroughly familiar with this basic aid to navigation.

During the first year of training, cadets are given basic instruction in Decca and Consol installed aboard the training vessels.

Advanced training in hyperbolic navigation and the theory and operation of Decca, Loran and Consol systems is provided during the following two years at the Ostend or Antwerp nautical schools. Decca, Consol and Loran simulators are used in this training, which includes such topics as: theory of operation; installation of equipment; practical use; errors and their causes; maintenance; determining position and use of Decca and Loran charts.

Experienced mates receiving training at the schools with a view to obtaining a higher grade of certificate of competency are also given instruction in Decca, Consol and Loran navigation, as well as the radio direction-finder.

Cadets receive basic instruction in the gyro-compass on the training vessels. Advanced training of the nautical schools includes theory of operation, errors and their corrections, proper operating procedures and maintenance of this equipment.

All certificate of competency examinations include questions concerning the gyro-compass systems.

Cadets on board the training vessels receive instruction also in the fundamentals of the magnetic compass. Courses during the following two years at the nautical schools provide more comprehensive coverage of this basic aid to navigation. Among the topics included in course syllabi are: fundamentals of terrestrial and marine magnetism; declination, deviation and drift; compass compensation with and without the aid of bearings; correction of course and bearings; azimuth mirrors; adjustment, maintenance and location of compasses; types of magnetic compasses.

All certificate of competency examinations for mates and masters and fishing vessel skippers require thorough knowledge of the magnetic compass. Officers undergoing training to qualify for a higher grade of certificate are given refresher instruction in the compass.

Candidates engaged in the one-year training programmes for ratings at the nautical schools are given classroom and laboratory instruction in the fundamentals of the magnetic compass, and seamen taking the two-week course for advancement to able-bodied seamen are also given instruction in the magnetic compass.

Basic instruction in echo-sounder and radio telephone is provided to cadets during their first year of training on board training vessels, using equipment installed in these ships. During the two years of advanced instruction at the nautical schools, courses in electronics and navigational instruments provide comprehensive coverage of the theory, practical use and upkeep of these two aids to navigation.

Burma

In Burma training of seafarers in the use of aids to navigation, takes place within the framework of a two-year pre-sea officer candidate training programme. Theoretical and practical instruction is given.

Officer candidates taking part in this training programme receive instruction in the theory of operation and navigational use of the various modern aids to navigation. The radar instruction syllabus includes basic theoretical principles,

operating equipment, checking equipment, fault-finding and the use of radar in meteorology, as an aid to navigation and in avoiding collision. No radar certificate is awarded.

Instruction is also provided in the principles of operation and practical use of radio direction-finder, principles of position fixing by such radio aids as Decca, Loran and Consol, basic principles of the gyro-compass and the theory and operation of the magnetic compass and echo-sounder.

Canada

The Halifax Navigation School offers a two-week radar observer course which is open to all masters and mates. The certificate of competency of a master or mate may receive the Department of Transport Radar Observer endorsement if the certificate holder produces a certificate of attendance at a radar observer course and passes a special Department of Transportation examination.

A five-day radar simulator course is offered by schools at Vancouver, Toronto and Halifax. These courses are open to all masters and mates and upon producing a certificate of attendance at one of these schools a master or mate can have his certificate of competency endorsed with the Department of Transport Radar Simulator Endorsement. No examination is required for this endorsement.

Every applicant for a certificate of competency as second mate (foreign-going) must attend an approved radar observer course and pass a radar and electronic aids to navigation examination - which forms part of the general examination for this category of certificate of competency. Candidates are expected to have a comprehensive knowledge of radar including basic principles of operation, interpretation of display and limitations of radar, effects of weather on radar performance, use of radar in position fixing, use of radar as a collision warning device, the radar log, periodic checks which should be carried out on radar sets, correct procedure for switching on and off, correct procedure for adjustment of display controls, the correct use of additional circuits, and true motion type of display.

General radar training based on the syllabus of the radar observer endorsement forms part of the training for all other deck officers' certificates of competency except those for minor waters and for service on vessels under 350 tons. During their examinations candidates for certificates are required to answer questions on the practical use of radar and to solve radar plotting problems.

Training in the use of radio direction-finder forms part of the training for master's and mate's certificates. Second mate candidates are expected to be proficient in the use of this equipment and to have knowledge of the errors to which it is subject. Master candidates must have a comprehensive knowledge of radio direction-finders and are expected to have a general knowledge of shore-based radio directional systems. All nautical schools and examination centres are fitted with a radio direction-finder simulator.

Training in the use of the Decca Navigator is included in the syllabus for all masters' and mates' certificates excepting minor waters certificates and certificates for ships under 350 tons. All Canadian nautical schools for deck officers and examination centres are fitted with a Decca Navigator simulator.

Knowledge of the theory and use of Loran forms part of the examination syllabus for all levels and categories of certificates of competency except for certificates for ships under 350 tons in the home trade. A Loran simulator is being developed in Canada and it is intended that all nautical schools and examination centres will be fitted with this training aid.

Training in the theory of Consol and its use in obtaining a fix is required for all levels of certificates of competency as mate or master (foreign-going). In addition candidates must have an understanding of the basic differences between the various systems of hyperbolic navigation.

Proficiency in the operation and maintenance of the gyro-compass is included in the examination syllabus for all masters' and mates' certificates other than those for minor waters and vessels under 350 tons. Masters' certificate candidates must have a comprehensive knowledge of this navigational aid including the causes, effects and correction of the various gyro-compass errors.

General knowledge of the operation and maintenance of the autohelmsman system is also required for all grades of certificates as master or mate of foreign-going vessels.

Certificate examinations require that all categories of Canadian mates and masters be thoroughly proficient in the use and care of the magnetic compass.

All categories of mates and masters are required to have a basic understanding of the echo-sounder to qualify for a certificate of competency. Foreign-going mates and masters have a more comprehensive training in this aid to navigation which includes familiarity with the errors to which the echo-sounder is subject

and the effects of aeration. As in the case of other aids to navigation, Canadian nautical training schools provide preparatory instruction in echo-sounding equipment leading to examinations for certificates of competency.

Provision for training ships' personnel in the use of the marine very high frequency radio telephone is made by the Telecommunications Branch of the Canadian Department of Transport.

Republic of China

The pre-sea training programme of the Taiwan Maritime College of Keelung provides instruction to officer candidates in the operation, use, and maintenance of various aids to navigation. No special certificates are issued after the completion of courses in any of these fields. In order to keep instruction up to date, special attention is given to technological progress and efforts are made to purchase new instruments and appliances for integration in the training programme.

A total of 60 hours of radar training include 32 hours' study of the theory of operation, eight hours of practical operation of equipment and interpretation of displays, and 20 hours of mechanical-electrical maintenance.

Instruction in the radio direction-finder consists of five hours of operational theory, four hours of practical operation and one hour of instruction in mechanical-electrical maintenance.

Loran training consists of 16 hours of the theory of operation, 10 hours of practical operation, and four hours of mechanical-electrical maintenance.

The 40 hours of instruction in the marine gyro-compass is composed of 24 hours study of the principles of operation, 10 hours of construction features, four hours of practical operation of equipment, and two hours of service and maintenance procedures.

Forty hours of instruction are given in the operation and marine application of the magnetic compass. This period includes four hours of principles of the earth's magnetic field, six hours of construction features, 14 hours study of the various compass errors, 12 hours of magnetic compass adjustment, and four hours of care, service and maintenance of the instrument.

Training in the marine echo-sounder or fathometer comprises 12 hours of operational theory, four hours of practical operation, and four hours of service and maintenance procedures.

Colombia

Merchant marine officer candidates are trained through the Naval School of Cadets programme which consists of three years of formal classroom studies and one year of practical training aboard ship. In addition there is a training centre which instructs ratings and petty officers of the Navy who upon retirement from the armed forces are a principal source of manpower for the Colombian merchant marine.

Officer candidates of the Naval School of Cadets have an 18-week curriculum covering theoretical and operational aspects of radar and its use in assisting the navigation of vessels. Practical instruction given at the School on two different types of radar, is supplemented by additional practical training during the year at sea.

Ratings under instruction at the training centre receive nine hours of study in radar fundamentals.

Comprehensive instruction is given at the Naval School of Cadets in the various other modern aids to navigation. This includes the radio direction-finder, Decca, Loran, Consol, gyro-compass and automatic pilot, and the marine echo-sounder. Courses of study are of 18 weeks duration and include theoretical functioning of equipment, practical operation, application in assisting the navigation of a vessel at sea and operators' maintenance procedures. Cadets receive practical training in the various navigation aids both at the School and during their year of training aboard ship. No special certificates of competency are issued for radar operation or any other aids to navigation.

Seamen ratings and petty officers in training at the training centre are given basic instruction in the various electronic and mechanical aids to navigation in connection with their official naval duties. The curricula of study for the aids to navigation are regularly revised in order to keep them up to date.

Czechoslovakia

All merchant marine officers are required to have graduated from marine schools ashore and completed a subsequent period of practical training at sea prior to being examined for an officer's certificate of competency.

The programmes of instruction at the marine schools include theoretical and practical courses in the various aids to navigation. Further experience with the use of this equipment is gained during the period at sea.

Ratings can achieve certification as able-bodied seamen after completing a specific period of sea duty and after being examined in professional subjects including fundamentals of the various modern aids to navigation.

Denmark

Maritime training for deck personnel may be divided into three categories: basic pre-sea training, training leading to coastal and home trade master's certificates, and training for certification as mate and master, foreign trade.

Candidates for sea service as deck hands are required to complete three months of basic training in one of the three state seamen's schools, or in one of two approved private seamen's schools, or to have completed a cruise on board an approved training vessel.

As regards the second category, state-approved private maritime schools provide training for the lower grade nautical examinations for certificates of competency as master for home trade and coastal navigation. This training is of four to seven months' duration.

Four state-operated navigation schools provide the training for the mates' and masters' certificates. Qualification for admission to one of these schools for enrolment in the mates' certificate programme which lasts for 18 months is that the candidate has spent 47 months at sea. The programme leading to the masters' certificate is of six months' duration. A training vessel fitted with two complete radar installations and other modern aids to navigation, makes two to three-week cruises for candidates taking part in the mates' and masters' programmes.

Apart from the radar installations of the training vessel, each of the four state navigation schools is fitted with at least one complete radar installation and a radar simulator with four radar indicator units.

The mates' curriculum at the state schools includes comprehensive theoretical and practical instruction in the use of radar. Students are examined in the practical use of radar and in radar plotting at standards expected for the mates' certificates of competency. Successful students are issued a school certificate in radar operation.

The six-month programme for the masters' certificate of the state schools, includes training in the theory and operation of radar and prepares candidates for the comprehensive certificate of competency examination in radar. Upon the successful completion of radar training, masters' candidates receive a school certificate in radar theory and operation.

Candidates for home trade master and coastal skipper certificates of competency are not examined in radar operation. They can however voluntarily earn a certificate in radar operation by completing special radar courses occasionally convened at the government navigation schools and passing an appropriate examination.

All schools preparing candidates for any level of deck officers' certificates of competency give instruction in the theory, operation, and practical use of the radio direction-finder. Practical instruction with suitable equipment is available at the four navigation schools and on board the training vessel. Candidates for all grades of certificates of competency are examined in the use of this aid to navigation.

Except in the case of coastal skipper, knowledge of the practical use of Decca is required for all grades of deck officers' certificates of competency, with theoretical knowledge being required also for the master's examination. All schools give instruction in the use of Decca, the navigation schools and training ship being equipped with this device for training purposes.

Classroom instruction in the operation and use of Loran and Consol is provided at all schools preparing candidates for certificate of competency examinations.

The four state navigation schools are fitted with the gyro-compass, one of the schools and the training vessel having automatic steering installations as well.

Instruction in the construction, operation and practical use of the gyro-compass and automatic steering is given only to student candidates preparing for the masters' foreign trade certificate examinations. However, candidates for other certificates have the opportunity to participate in the use of this equipment during cruises of the training vessel.

All Danish merchant navy schools preparing students for the various grades and categories of certificates of competency of deck officers provide instruction in the magnetic compass which is included in the examination syllabi for all certificates. Mates' and masters' training programmes thoroughly cover the theory of deviation and compass adjustment.

Examination syllabi for all levels of deck officers' certificate of competency, except that of coastal skippers, include knowledge of the echo-sounder. Students preparing for the examination concerned receive instruction in the operation, use and maintenance of echo-sounders using equipment installed at the schools and aboard the training vessel for practical experience.

Finland

There are several navigation schools in Finland conducting regular training programmes leading to certification as deck officers. The courses at these institutions provide for formal instruction in the theory and use of radar as part of regular seamanship, physics, and instrument courses and through specially arranged extra-curricular, but obligatory lectures. This radar instruction, which includes complete theoretical and operational aspects of radar, true and relative-bearing radar plotting, and use of radar for collision prevention, is supplemented by practical exercises in use of radar in the school laboratories which are equipped with radar simulators.

Instruction in radar navigation is also given aboard operating merchant vessels for experienced mates and masters as well as student officers, and training in radar is provided for masters at navigation schools, but no type of certificate is issued.

The courses in navigation and marine instruments at the navigation schools provide thorough instruction in the construction, theory, maintenance and practical use of the radio direction-finder.

The theory and operation of radar, Consol, Decca and Loran have been included in the training scheme of the navigation schools since 1950. Officers and officer candidates are instructed in the operating principles and practical use of these aids to navigation. Laboratory training exercises in the use of Decca will be initiated in September 1964. No laboratory training is available for Loran or Consol inasmuch as this equipment is not at present found aboard Finnish ships.

Complete instruction in the theory, construction and practical operation of the Sperry, Anschütz, and Brown models of gyro-compass is included in the navigation and instrumentation courses given to all deck officer candidates of the Finnish navigation schools.

These schools also give thorough instruction to both officer candidates and experienced officers in the practical use of the magnetic compass. Topics covered in these courses include construction, theoretical principles of operation, correction of errors and compass compensation.

The examination syllabi for all grades of mates' certificates require that candidates be thoroughly familiar with the magnetic compass, be able to correct compass courses and bearings, have knowledge of compass declination, and be able to determine deviations in practical navigation.

A special certificate as a qualified inspector of compasses can be issued to applicants holding a master's certificate of competency who have accompanied a certified inspector on at least 20 compass surveys.

The courses in marine instruments for officer candidates and experienced deck officers of the navigation schools include instruction in the construction, operating theory, and practical use of the very high frequency radio telephone and echo-sounder as aids to navigation.

A certificate as an international radio telephone operator is issued to applicants successful in an examination sponsored by the Finnish communication authorities and held at the navigation schools.

France

Merchant navy officer training is divided into two basic categories: (i) pre-sea two-year programmes leading to certificates of competency as apprentice deck officers (foreign-going) and (ii) courses for people who have been to sea, usually of one year's duration, leading to examinations for various levels and grades of foreign-going and coastal deck officers' and masters' certificates of competency; these programmes are open to capable candidates having the requisite sea-time in subordinate deck rating or deck officer capacities. Similar arrangements are in practice for training and upgrading of engineer officers.

Pre-sea and post-sea courses at maritime apprenticeship schools for seamen ratings offer general types of training based on educational qualifications and sea experience. Pre-sea basic training of four-and-a-half to nine months, leading to a seaman's certificate, is mandatory. Seamen with five years' sea-time who complete prescribed basic training are granted the equivalent of an able-bodied seaman's certificate. Alternatively, the examination for this certificate can be taken by private study.

All training programmes for ratings involve theoretical and practical instruction in general seamanship and ship operation, in addition to professional subjects. Deck department trainees study the basic fundamentals of various modern aids to navigation, and the examination for able-bodied seamen includes questions on navigation equipment and ship safety subjects.

Candidates for the certificate of apprentice-officer (foreign-going) are given courses dealing with radar during the second year of the two-year programme. Radio-electricity and electronics courses give comprehensive coverage to the theory of radar and other electronic aids to navigation. A course in electronic aids to navigation covers the more practical aspects such as description of apparatus, operation of equipment, and maintenance.

Extensive laboratory facilities at the National Merchant Marine School at Le Havre and on two modern training vessels of the School which are well provided with radar training equipment and other aids to navigation, are used in both the theoretical and practical radar courses.

Deck officers with five years of sea experience, who are in training for a master (foreign-going) certificate of competency are given practical instruction in radar and other electronic aids. Using radar simulators and other radar sets installed in the School laboratory, radar courses cover the following topics:

- (a) the role, description and interdependence of different circuits and parts of radar;
- (b) putting radar into operation, regulating, stopping; study of common breakdowns and means of repair;
- (c) critical study of the echoes given by objects, in view of their characteristics, meteorological conditions, state of the sea, and topography;
- (d) use of radar as a navigational and anti-collision aid; determining position;
- (e) study of types of radar presentations and sources of error.

These officers are given 18 90-minute training sessions with radar simulators for the study of all types of radar collision and navigation situations.

Successful completion of this comprehensive practical training in radar qualifies officers for receipt of an official radar observer's certificate.

Through arrangements made by shipping companies, masters of foreign-going vessels are admitted to special one-week radar courses. Using radar simulators, these courses are intended to provide practice in the use of radar as an anti-collision device and a navigational aid.

Nautical school programmes for experienced seafarers which lead to various grades and categories of deck officer certificates of competency, also include practical radar training. The subject matter generally included in these radar courses is as follows: starting radar sets, adjustment, manipulation and stopping; measure of bearing and distance to an object; practice in the use of radar to avoid collisions; presentations in relative or true movement.

Theoretical and practical instruction in the radio direction-finder is given to candidates for all grades and categories of deck officers' certificates, and examinations for these certificates require thorough knowledge of the subject. For example, the pre-sea training for apprentice officer (foreign-going) covers the following instruction in radio direction-finders: description of equipment; practical operation; deviation and radio beacons; analyses of errors and making corrections. The theory of operation is covered in theoretical electronics courses. Practical instruction is carried out in school laboratories and on board training vessels.

Training in hyperbolic navigation is given to all candidates for apprentice officer or deck officer certificates of competency. Apprentice officer candidates in the two-year pre-sea programmes are given the following instruction:

Decca: theory of Decca; description of Decca receiver; hyperbolic networks and Decca charts; identification of stations and degree of accuracy.

Consol: theory of Consol; description of equipment; use of Consol charts and radio-signal handbooks to determine position; degree of accuracy of Consol navigation.

Loran: principles of operation; practical use; accuracy of position.

Theoretical classroom work is supplemented by practical instruction in school laboratories equipped with simulating equipment, and on board the two training vessels which are fitted with this equipment.

Programmes for experienced seafarers who are in training for a raise in grade of certificate also include practical instruction in the use of the Decca, Consol and Loran systems.

The following training in gyro-compass and autohelmsman is provided for cadets in the two-year apprentice officer candidate programme: theory of terrestrial gyro-compass; period of oscillation; marine gyro-compasses and repeaters; compensation for various errors; operating procedures. Equipment installed on board training vessels and in nautical school laboratories is used for practical instruction.

Practical studies of gyro-compass systems are also included in the training programmes for experienced deck officers.

Comprehensive training in the theory and practical use of the magnetic compass is given to all deck officer trainees, and examination syllabi for all certificates of competency require thorough knowledge of this basic aid to navigation. Nautical

schools and training ships are well provided with magnetic compasses for use in teaching such skills as adjustment of the compass, bearing determinations, and care and maintenance practices.

The topics listed below are given as an example of some of the subject matter covered in a typical course for apprentice officer candidates: theory of terrestrial and marine magnetism; description, function of various parts, and practical use of the compass; types of magnetic compasses and graduation methods employed; magnetic and true courses and bearings; deviation and variation; compass correction; adjustment of magnetic compasses.

Training for experienced deck officers preparing for a higher grade of certificate is chiefly of a practical nature.

The nine-month programmes at apprenticeship schools for ratings give emphasis to instruction in the magnetic compass as compared to the other aids to navigation. This instruction provides comprehensive coverage of the following topics: principle of operation of the compass; construction; and functions of various parts; types of compasses; declination, deviation, variation; compass course and true course.

Able-bodied seaman candidates are expected to be competent in the use of the compass, and those candidates not having the advantage of apprenticeship school training are examined in compass knowledge for their certificates.

Apprentice officer candidates and experienced deck officers enrolled in upgrading training programmes are instructed in the theory and use of the echo-sounder. Courses in electronic aids to navigation for officer candidates cover the following pertinent topics: theory of sound-wave transmission in water; operation of echo-sounding apparatus; description of equipment and function of various parts; practical use and maintenance of the echo-sounder; analyses of errors.

Training ships and nautical schools are fitted with actual equipment which is used extensively in this instruction. Training of experienced deck officers places emphasis on practical use of this equipment.

Radio-electricity and electronics courses given to apprentice officer candidates ensure a thorough understanding of the theory of the marine radio telephone.

Ghana

The government Nautical College was established in 1958 to provide training for deck and engineer officer candidates. Cadets complete two years of pre-sea in-residence training at the college

and four years of required sea time aboard merchant ships before being qualified to sit for the second mate or second engineer examination.

During their two years at the college, deck cadets are instructed in the theoretical aspects and basic principles of operation of the various modern aids to navigation. These courses include part of the training required for obtaining certificates as second mate (foreign-going) and the syllabus of instruction is commensurate with the standards set by the United Kingdom Ministry of Transport. Further training is obtained during the required four years at sea aboard Ghanaian National Line ships of recent construction which are fitted with modern aids to navigation. Cadets are examined in the theory and operational use of the various aids to navigation for their second mate's certificate of competency at the completion of the four years sea service.

There are no pre-sea training programmes in Ghana for ratings. All candidates for the certificate of competency as able-bodied seaman complete a 12-month training programme aboard ship and after having passed an examination as an efficient lifeboatman, are qualified to take the able-bodied seaman examination. The syllabus for training able-bodied seamen candidates in this 12-month programme includes basic instruction in the various modern aids to navigation fitted aboard ships, and candidates for the able-bodied seaman certificate are examined in this subject matter for their certificate.

Ratings not engaged in the 12-month training programme are qualified for examination as an able-bodied seaman after they have successfully completed a test as a proficient lifeboatman.

Haiti

The information set out below concerns the training of personnel of the Haitian Coast Guard.

Being a relatively small establishment in terms of vessel tonnage and number of personnel, the scope of training of the Coast Guard is rather limited.

Most Coast Guard officers have taken short marine training programmes at naval training establishments in Italy, the United States, or Venezuela. Training given in these countries covers the theory and practical use of radar, echo-sounding equipment, gyro-compass, and magnetic compass. Certificates of attendance are generally issued to officers who have successfully completed the various courses. Certain other electronic aids to navigation are not fitted in Haitian Coast Guard vessels and no training is provided for such equipment.

Coast Guard seamen recruits receive 12 months of practical training in seamanship and navigation at the Haitian Coast Guard Training Centre. They are given courses in the practical use of radar, echo-sounding gear, gyro-compass and magnetic compass.

India

The Ministry of Transport training ship "Dufferin" has a two-year pre-sea programme for the training of deck officer candidates. Basic instruction is given in the theory and operation of radar and its use as a navigational and anti-collision device. Through classroom instruction using audio-visual aids, and practical instruction with the shipboard radar installation, trainees are prepared for radar operation proficiency examinations required upon completion of their training.

The Nautical and Engineering College of the Ministry of Transport prepares experienced seamen for original or upgraded deck and engineer officer certificates of competency up to the grades of master and first class engineer.

A special radar observer's course of two weeks duration is conducted continuously throughout the year and successful completion of this training is a required condition for obtaining a second mate's certificate of competency.

The radar observers course is a comprehensive training programme in the theory, operation and navigational use of marine radar. The course of study includes the following topics: detailed theoretical and practical principles of operation; practical instruction in operation of radar systems and checking of performance; the use of radar as a navigational aid including detailed analysis of interpretation effects of weather, position fixing, collision warning, the radar observer's log, and operating precautions.

Students passing the final examination in the theory and practical use of radar are granted the radar observer's certificate necessary for the second mates' certificate of competency.

The syllabus of the examination for master, (foreign-going) and (home trade) includes extensive coverage of radar operation. Operating principles, displays, range and bearing discriminations, calibration, range strobes, monitoring, spurious echoes, side lobe effects, blind sectors, anomalous propagation and weather effects, and use of radar as an anti-collision and navigational aid, with appreciation of its limitations, are topics included in this syllabus.

Deck officer candidates serving on the training vessel "Dufferin" are instructed in the marine direction-finder. Training in the radio direction-finder at the Nautical and Engineering College forms part of the syllabus for the first mate (foreign-going) and master (home trade) certificates of competency. The training at both institutions consists of general theoretical and operational aspects of this equipment and covers such topics as rotating loop and goniometer systems, maximum and minimum signals, sense, quadrantal error, calibration, and sunset, sunrise and land effects. In addition, deck officer students of the Nautical and Engineering College study shore-based R/T directional systems.

The training in the Decca system for pre-sea students on the "Dufferin" covers principles of hyperbolic navigation, the Decca system, master and slave stations, charts, interpretation of dial readings and plotting on charts.

At the Nautical and Engineering College the Decca system is part of the syllabus for the master certificate for both foreign and home trade. The College is equipped with a Decca simulator and the syllabus of training covers general principles of hyperbolic navigation including Loran and Consol and differences between the various systems. No training in Loran or Consol is provided for pre-sea students on the training ship "Dufferin".

Pre-sea students enrolled in the training programme of the training vessel "Dufferin" are instructed in the construction, operation and use of the gyro-compass systems in navigating vessels. The Sperry and Brown gyro-compasses fitted on board are used for practical training.

Instruction in the gyro-compass system is included in the curriculum for deck officers undergoing training at the Nautical and Engineering College for a higher grade of certificate of competency to either master or first mate (foreign-going) and this subject forms part of the syllabus for examination for these two certificates.

Apart from an understanding of the operation and use of shipboard gyro systems, the first mate's examination covers the principle of the free gyroscope, effect of earth's rotation, tilt and drift, precession, gravity control, and damping.

The master examination requires a more comprehensive knowledge of the theory of operation of gyro-compass systems. Topics covered include course and speed errors, correction for latitude, ballistic deflection and its relation to course and speed error, and minimisation of rolling error. Master certificate candidates are expected to know the fundamental differences in construction of various types of gyro compasses and error correcting methods. The Nautical and Engineering College is equipped with both Sperry and Brown gyro-compasses.

Theory of operation and navigational use of the magnetic compass is included in the navigation courses given on the training ship "Dufferin". Students are trained in compass correction and application of deviation.

The magnetic compass is included in the examination syllabus for master and first mate. For master a thorough knowledge of the theory, operation, and correction of magnetic compasses is required. The examination syllabus includes analysing of the effects of a ship's magnetic field on the magnetic compass and methods of determining table of deviations, general principles of compass correction, siting of compasses, analysis of heeling error and care and maintenance of magnetic compasses.

The Nautical and Engineering College which provides magnetic compass training has a deviascope for demonstration purposes as well as a standard magnetic compass with steering arrangements for practical instruction.

The curriculum of the training vessel "Dufferin" includes instruction in the basic principles of operation and use of the echo-sounder, including practical training by the echo-sounding equipment installed in this vessel.

The Nautical and Engineering College is equipped with an echo-sounder and a high frequency radio-telephone. Instructions in the use of these aids are given to all deck officer candidates studying in the College.

Ireland

Candidates for original or upgraded certificates of competency as masters and mates, and as skipper and second hands of fishing vessels, receive theoretical and practical instruction in radar, radio direction-finder, Consol, gyro-compass, magnetic compass and echo-sounder. Decca and Loran are studied only in theory.

Comprehensive courses covering all topics required by certificate of competency examination syllabi of 12 to 14 weeks' duration and consist of theoretical lectures and exercises and demonstrations with actual equipment in the well equipped laboratory of the college.

For seafarers with three years qualifying sea service a special radar observer's course is conducted for training certificated radar observers. Successful completion of the course and receipt of the radar observer's certificate is a required condition for obtaining a certificate of competency as a deck officer for either the home or foreign trade.

The Gallway Technical School has facilities for the instruction of candidates for certificates of competency as masters, mates, and second hands of fishing vessels. These courses cover the magnetic compass as well as other aids to navigation.

Israel

The Nautical College, a four year residential school offering general high school courses and pre-sea nautical studies covering the syllabus for third mate and third engineer, offers a 24 lecture course in the theory and use of radar as a navigational aid and includes demonstrations with actual working equipment. The syllabus of this course includes the following topics: theory of operation, explanation of the function of various components, practical operation of equipment, interpretation of presentations and practical work in a radar workshop.

A special maritime training centre offers rating and officer preparatory courses for certificates of competency ranging in duration from three days to 21 weeks. Candidates for the second mate's certificate attend a one-week radar course of detailed study in the theory of operation of radar, practical operation of radar sets at the school and one day at sea, analysis of improper operation of equipment, and radar plotting.

Successful completion of the course and its examination are a required condition for obtaining a second mate's certificate.

At the training centre candidates for a master's certificate attend a two-week course in advanced radar operation, passing of the final examination of which is one of the requirements for a master's certificate. Included in the subject matter of this comprehensive radar instruction are: analysis of radar as a navigational aid, advanced principles of radar operation, the block diagram, the cathode ray tube, the direction finding, range and bearing limitations of radar, fading and false echoes, practical operation of radar in laboratory.

As regards radio direction-finder, Decca, Loran, Consol and echo-sounder, pre-sea training at the Nautical College includes the theory of these aids to navigation as part of the general education in applied physics.

At the training centre the theory and use of these instruments are taught by candidates for the second mate, first mate and master certificate of competency. Knowledge of these aids to navigation forms part of the examination for the certificate of competency of each of these grades.

The syllabus for the second mate examination includes the operating principles of Decca, Loran, Consol and radio direction-finder with emphasis on the maintenance and practical use of the radio direction-finder as a navigational aid. In addition, the examination syllabus for first mate includes detailed knowledge of radio beacons and radio stations as well as the operation and maintenance of the echo-sounder.

The master's examination requires a comprehensive theoretical and practical knowledge of the operation and use of Decca, Loran, Consol, direction-finder and echo-sounding equipment as aids to navigation.

Deck department students of the Nautical College receive 15 lectures in gyro-compass theory and operation including demonstrations with actual equipment.

Candidates for the second-mate's certificate at the training centre attend a one-week course in the theory of operation, practical use as a navigational aid, and maintenance of the gyro-compass, including one day of practical training at sea. Successful completion of the final examination of this course is required for the granting of a second mate's certificate of competency. A two-week advanced course in the use of the gyro-compass is provided for first mate candidates; success in the final examination on completion of the course is a required condition for obtaining a first mate's certificate of competency.

A 50 lecture comprehensive course on the compensation and adjustment of the magnetic compass is taken by candidates for master's certificates at the training centre. Masters' examinations include a paper in this subject.

Apart from the training in navigational aids offered by the Nautical College and the maritime training centre, pre-sea instruction in the use of navigational aids is provided by a Fishery and Shipping School and by the nautical division in conventional high and elementary schools, and sea training in the use of this equipment, through special courses and programmes of the active merchant marine conducted at sea.

The Fishery and Shipping School is a two to three-year boarding school with a general education curriculum including nautical subjects covering the syllabus for the third mate and third engineer examinations.

At various high schools about 50 lectures per year in nautical knowledge are given by master mariners and marine engineers.

The courses conducted at sea consist of three months' basic training aboard an operating merchant ship under the guidance of an instructor for each 10-15 men.

Men from these courses may graduate to other programmes which consist of a 12-month course aboard an operating merchant ship. Studies include practical work and lectures covering the syllabus for third mate and third engineer.

Italy

Training in the use and maintenance of aids to navigation is imparted in nautical institutes to young persons studying to become deck officers and masters. Some training is also given to those who follow courses to become masters of coastal vessels and skippers of fishing boats. This training is given both in the schools and on board ship; the syllabi of the nautical schools are kept up to date and follow the technical development of the subjects studied.

No other special training scheme exists for officers or ratings, and no certificate is required which would certify a special knowledge concerning aids to navigation.

However, insofar as radar is concerned, special training courses have been set up in the use of this instrument in Genoa and Spezia. These courses, which have been officially recognised by the Ministry of the Merchant Marine, last for 12 days, during which an intensive training is carried out on the theoretical principles and practical use of radar. The syllabus includes a study of the various types of radar, the technical specifications of the equipment, possible faults and, finally, the solution of practical nautical problems.

These courses are open to officers of the merchant navy, and participation therein is on a voluntary basis. An examination is carried out at the end of the course, and a certificate of attendance issued.

The Ministry of the Merchant Marine is considering an amendment to the Navigation Code (Section 250) according to which participation in the courses would be compulsory for deck officers, while the certificate issued on completion of the course in the use of radar would become compulsory also for deck officers and masters who are already in possession of their certificate of competency.

Japan

Facilities for maritime officer training includes two institutions of the University of the Mercantile Marine which offer four-and-a-half year programmes, and five maritime schools attached to the Mercantile Marine Upper Secondary School, each with five year curriculae. A post-sea Marine Technical College provides advanced training for experienced seamen, and ten seamen training schools conduct one and two year courses for ratings.

The University of the Mercantile Marine, the Mercantile Marine Upper Secondary School, and the Marine Technical College provide theoretical and practical instruction in all modern aids to navigation. The University of the Mercantile Marine provides 225 hours of formal courses in the theory and operation of navigational aids in addition to one year of practical

training in this equipment aboard training vessels. At the schools of the Mercantile Marine Secondary School, 245 hours of lectures and laboratory work are supplemented by one and one-half years of practical experience aboard training vessels.

Post-sea instruction at the Marine Technical College offers instruction in all the aids to navigation.

Although comprehensive theoretical and practical instruction in radar is given to deck students at the various maritime training facilities no qualifying radar certificates are issued. Japanese regulations require that shipboard radar observers must be specially trained radio operators who are examined and licensed by the government as special radio operator (radar). Training leading to the achievement of this qualification is offered at several of the Japanese maritime training establishments. A specially qualified radar operator, responsible for the interpretation of radar information and in charge of the operation and maintenance of the equipment is carried aboard each vessel fitted with radar.

Malagasy Republic

Deck officer candidates and apprentice ratings receive professional training at the National Merchant Marine School at Majunga.

Included in the 28 week navigation course for future deck officers are about 30 hours of instruction over a period of 2 months in the theory, practical use, and maintenance of various modern aids to navigation. Future plans of the school call for providing additional training for deck officer candidates which will lead to a certificate of competency as coastal master. This will involve an increase in the time, scope, and comprehensiveness of the training provided by the School in the various aids to navigation.

A 56 hour navigation course for apprentice ratings includes about 30 hours of instruction in the practical use of the magnetic compass and echo-sounding equipment.

Deck officer candidates are instructed in the practical use of radar including interpretation of presentation and radar plotting. They study the practical use of the radio direction-finder, as well as the operating principles involved. Instruction in the gyro-compass for future officers includes description of equipment and its practical use as a navigational aid. Deck officer candidates are instructed in the principles of operation and practical use of the magnetic compass. This includes study of the various compass errors and their compensation; and also a description of the principal types of magnetic compasses. Apprentice seamen are instructed in the practical use of the magnetic compass. Officer candidates

are instructed in the construction features, principles of operation, and practical use of echo-sounding equipment. Apprentice seamen receive instruction in the practical use of the echo-sounder.

No qualifying certificate is issued in connection with training in any of these aids to navigation.

Mexico

The training of merchant marine officer candidates is conducted at three pre-sea maritime schools located at Vera-Cruz, Mazatlan, and Tampico. The programmes of instruction for future engineer and deck officers are of five years' duration with each school having identical syllabi as approved by government maritime authorities. During the first three years, deck and engineer students pursue the same courses; with specialisation taking place during the final two years of training.

Future deck officers are instructed in practical navigation during the final year. This training includes extensive instruction in the theory, practical use and maintenance of the various electronic aids to navigation including radar, radio direction-finders, Decca, Loran and Consol, as well as the gyro-compass and autohelmsman.

Additional practical experience in the use of the various aids to navigation is obtained on board ship upon completion of the training programme.

There is no training available ashore for ratings.

Morocco

Officers of the merchant marine are trained at nautical schools in France. They usually receive pre-sea theoretical instruction and some practical instruction in training vessels or on board merchant ships during visit to ports. Successful completion of this pre-sea training and passing of appropriate examinations qualify trainees as certified officer candidates.

About five years of apprenticeship at sea follows. Officer candidates then return to their nautical schools for about six months of advanced training which serves to instruct them in new marine technological or legislative developments, and to prepare them for certificate of competency examinations. Included among the professional subjects of the certificate of competency examination syllabi are aids to navigation.

Pre-sea theoretical and practical laboratory instruction of officer candidates in the various aids to navigation covers the following equipment and topics:

Radar: principles of operation; manual operation, manipulations and adjustments; determining bearings and distances; use of radar in avoiding collisions; radar plotting and corrections for relative and real movement.

Radio Direction-Finder: description of equipment and principles of operation; practical use of apparatus; accuracy, sources of error, adjustments, and use of radio beacon handbooks; determination of deviation curve; plotting a straight line with a radio direction-finder.

Decca, Loran, Consol: principles of hyperbolic navigation; use of charts and handbooks for hyperbolic navigation; accuracy of position-finding.

Gyro-compass and Autohelmsman: theoretical principles of operation; manual operation of equipment and use in navigating vessels; accuracy of gyro-compass, adjustments and maintenance.

Magnetic Compass: principles of operation; description of compass, practical use in navigation, maintenance; compass errors and methods of compensation; compass disturbances caused by environmental factors.

Sounding Apparatus: types and use of mechanical sounding machines; principles of operation of electronic echo-sounder, practical use of equipment and accuracy of readings.

No special certificates are issued in connection with training received in any aids to navigation.

Netherlands

Candidates for the third, second, and first officer (foreign-going trade) and tugboat officer (foreign-going trade) certificates of competency are required to have successfully completed the radar observer course offered.

A radar navigator course, issuing a qualifying certificate, must be successfully completed to obtain a certificate of competency as first officer (foreign-going trade), and in the near future this requirement will be extended to other categories of navigation officers. The radar-navigator course is also attended by already certificated masters and first officers (foreign-going trade).

At the various nautical schools trainees receive theoretical and practical instruction in the handling and use of other navigational aids during their two-year pre-sea training. The following year at sea provides continued practical training; thorough knowledge of operation and use of the various aids to navigation is a condition for obtaining a certificate as a deck officer upon completion of training.

New Zealand

Radar observer courses are available at the School of Navigation at Auckland for experienced deck officers, deck officer candidates with sea experience, pilots, harbour police officers, tugboat officers, and other categories of personnel who navigate vessels. These courses last two weeks and student officers or officer candidates passing the final examination are issued a radar observer certificate which is presently required before an original certificate of competency as a second mate (foreign-going) can be issued.

For senior merchant navy officers not possessing a radar observers certificate or for officers desiring refresher training a senior radar course of five days duration is convened six times each year at the Auckland School of Navigation. A large portion of this programme is composed of practical training afloat.

The two schools of navigation of the Marine Department of New Zealand include in their curricula instruction in other aids to navigation including medium-frequency direction-finder, Decca, Loran, Consol, gyro-compass and autohelmsman, magnetic compass and echo-sounders, a comprehensive knowledge of which is required for the issuance of an original or upgraded deck officer's certificate of competency.

Norway

The training facilities provided at each of the 15 navigation schools in Norway include at least one installation of the following aids to navigation: radar, medium-frequency direction-finder, gyro-compass, magnetic compass and echo-sounder. Several of the schools are also equipped with either a radar or Decca simulator, a Loran installation, a very high frequency telephone, as well as with other aids to navigation. It is planned to eventually provide each of the training institutions with all the various modern aids to navigation.

The two national training ships circulate between the 15 navigation schools and provide practical training in the various aids to navigation. Each vessel is fitted with several radar sets, gyro-compasses with repeater, radio direction-finders, echo-sounders and at least one Loran, Decca, and very high frequency telephone unit. All equipment is especially installed for training purposes. A radar simulator recently installed in one of the training vessels has one true motion display and five relative motion slave displays.

At the maritime schools students being trained for the second mate's certificate of competency receive 42 hours of instruction in the theory of radar and its application as a navigational aid. The second mate's certificate examination includes radar theory and radar navigation and candidates can receive a radar certificate upon successfully completing a special radar test.

Advanced theoretical radar and radar navigation instruction is given to certificated second and first mates in training for the next higher grade certificate, the examination for which includes advanced knowledge of radar theory and practical radar use. Most of the students in this category successfully complete a special test which qualifies them for a radar certificate.

Students in training for either the second mate, first mate, or master's certificate of competency receive training in the theory and use of the radio direction-finder, Decca, Loran, Consol, gyro-compass and autohelmsman, magnetic compass and other navigational aids at both the schools and aboard the training vessels.

Regulations require that second mate students and first mate students receive 80 and 40 hours' instruction respectively in the theory and use of these modern navigational aids.

No special certificates are issued in connection with any of these courses but the subject matter is rearranged from time to time to keep it up to date.

Pakistan

Basic principles of the various navigational aids are taught at the Marine Academy, Chittagong, where pre-sea training is imparted to officer cadets. The duration of training at the Academy is two years.

As far as radar is concerned, courses are conducted specially for candidates wishing to sit for the examination for a certificate of competency as second mate (foreign-going). This course can be taken after a candidate has completed two years' qualifying sea service; it is of two weeks' duration, during which theoretical as well as practical training is imparted both on shore and afloat. The course is designed to give an observer on board a non-technical, but sufficiently intelligent understanding of his equipment to enable him to make the most efficient use of its potentialities, while being fully aware of its limitations and bearing in mind the appropriate safeguards to be adopted.

An examination is held on completion of the course. Those who are successful are issued with a certificate of proficiency as radar observer. No candidate for a certificate of competency as second mate is issued with a certificate of competency unless or until he produces a certificate of proficiency as radar observer.

Instruction in the basic principles of radar and its operation is also included within the framework of pre-sea training in aids to navigation mentioned above to officer cadets at the Marine Academy.

Peru

Maritime training is provided at a training institution and aboard merchant vessels in operation.

The Miguel Grau Maritime School offers a four-year programme for future deck and engineering officers, the final year of which consists of practical training aboard auxiliary naval vessels in the capacity of apprentice officer. Completion of the school programme and passing of professional examinations conducted by the Naval College provides graduates with certificates of competency as third mates or third engineers, as well as an equivalent military rank and status. The higher grade officers' certificates of competency are obtained through experience at sea and self-preparation for additional qualifying examinations.

The Peruvian Steamship Corporation, which operates the largest number of merchant vessels, and the International Petroleum Company, an operator of tanker vessels, provide practical training aboard ship for seafarers in their employ, which, when

combined with self-study, prepares officer candidates for the Naval College third mate's certificate of competency examination. Qualifications for higher ranks up to that of master are achieved through additional sea experience, self-study and competency examinations.

The training programme of the Miguel Grau Maritime School includes instruction for deck officer candidates in the theory, practical operation and maintenance of radar, radio direction-finders, Decca, Loran, gyro-compass and autohelmsman, and the magnetic compass. Further experience in the use of these aids to navigation is obtained during the final year of the programme aboard ship.

Deck officers employed by the International Petroleum Company attend company-arranged seminars designed to enhance officers' knowledge of the various aids to navigation fitted in company ships. Radar, Decca, radio direction-finders, gyro-compass and the echo-sounder are among those aids to navigation in which instruction is given.

The Peruvian Steamship Corporation trains its deck officers on board the ships in the use of the various modern aids to navigation. Manufacturers' instruction books for all equipment are carried aboard for consultation.

Certificate of competency examination syllabi for all grades of deck officers up to master require knowledge of the operating principles and practical use of all the modern electronic and mechanical aids to navigation.

No special certificates of competency in the use of any aids to navigation are issued.

Philippines

The training programme of the Merchant Marine Academy provides formal instruction for future merchant marine officers. Presently operating with limited physical equipment, this new institution has extensive plans for future expansion of academic buildings, laboratories and practical training facilities as well as for broadening the programme of instruction.

At the present time the navigation curriculum of the Academy includes classroom theoretical instruction only in radar, radio direction-finder, Loran, gyro-compass and magnetic compass with particular emphasis on the latter. Practical training in this

and other equipment such as the echo-sounder is obtained during the two-month summer cruises of students aboard navy vessels. Additional practical experience is obtained during the required one year of apprenticeship training aboard national merchant vessels.

No special certificates of competency in the use of any navigation aids are issued to graduates of the training programme, but with the expected future adoption of specialised theoretical and practical instruction in such equipment as radar, graduates will be qualified for such certification.

Rumania

The National Marine College provides a four-year programme for the training of merchant marine officers leading to a certificate of competency as third mate. The College also acts as a training centre which prepares experienced deck officers for examinations leading to second mate's, first mate's, and master's certificates of competency. At least 24 months' sea time are required in each grade in order to qualify for preparatory training and examination to the next higher grade.

The training of ratings is accomplished exclusively through practical experience under the instructions of experienced officers aboard merchant vessels.

Officer candidates and experienced officers attending programmes of the National Marine College receive instruction in the principles of operation, practical use, and maintenance of the various mechanical and electronic aids to navigation.

Thorough knowledge of the theory and practical use of these aids to navigation are required for obtaining certificates of competency of all grades of mate and master.

No special certificates are issued in connection with training received in any aids to navigation.

Spain

Under the auspices of the Ministry of Commerce, the training of merchant marine deck and engineer officer candidates is conducted at nautical schools offering three-year courses, which include at least one year of practical training aboard ship. Examinations for certificates of competency as junior deck and engineer officers follow successful completion of the training programmes.

Other vocational training institutions provide programmes for coastal trade deck officers, fishing-boat skippers, and deck

and engine-room ratings.

All training programmes leading to any category of deck officer certificates of competency include varying degrees of theoretical and practical instruction in mechanical and electronic aids to navigation. Certificate of competency examinations also require knowledge of this equipment.

No special certificates are issued in connection with training received in radar or any of the other aids to navigation, but it is anticipated that this will be one of the outcomes of a revision of maritime training facilities in Spain, to be undertaken in the near future.

Sweden

Five officer candidate nautical schools provide one-year training programmes which include about 45 hours of theoretical and practical instruction in radar. This training, and receipt of a radar navigator's certificate which is issued on graduation, are required conditions for the issuing of an original certificate of competency as a deck officer.

A two-year master's certificate candidate programme for experienced officers includes theoretical and practical radar training within the seven hours per week of navigation instruction and four hours per week of instrument instruction. Practical instruction emphasises problems associated with the use of radar for navigation and collision prevention.

For masters and officers who received their certificates of competency before the radar certificate requirement was in effect, special radar training courses, leading to radar certificates, are arranged at the officers' schools.

All officer radar training courses include practical instruction, with the aid of radar simulators which are installed in the laboratories of each institution.

Sixteen-week training programmes leading to certificates of competency as fishing-boat skippers include an obligatory 30-hour radar course. Moreover, trainees are given the opportunity, on a voluntary basis, of increasing their knowledge and experience with the objective of qualifying for the radar navigator's certificate.

Navigation and instruments courses included in the various training programmes for officer candidates, master candidates and fishing-boat skippers include theoretical and practical training in all the modern aids to navigation. These include

the radio direction-finder, Decca, Loran, gyro-compass and autohelmsman, magnetic compass and echo-sounder.

Instruction given to candidates for the master's certificate is generally more comprehensive and gives greater emphasis to theoretical aspects of these navigational aids. Moreover, only the master's programme includes instruction in Loran.

Pre-sea training schools for ratings also give fundamental instruction in some of the basic aids to navigation such as the magnetic compass.

Thailand

Maritime training is restricted to practical experience aboard ship. No measures are taken to ensure comprehensive pre-sea or afloat training in the various aids to navigation, although efforts are currently being made to establish a formal maritime training programme.

Because the merchant marine of Thailand is very small and practically confined to local and coastal operations vessels are fitted only with the magnetic compass as an aid to navigation. Training of helmsmen, quartermasters, and other navigation ratings is achieved purely through practical experience afloat.

Turkey

Maritime training is provided by the Maritime College and the Turkish Maritime Bank. No details of the training syllabus of the former institution are available, but the Turkish Maritime Bank conducts training for officers of the merchant marine in the practical use of aids to navigation.

A special radar course was first organised by the Bank in 1962 for captains and officers. A radar operator's certificate was issued to all course graduates.

Certificated merchant marine officers from the Maritime College are trained in the use of the radio direction-finder and utilise this equipment regularly aboard Turkish merchant vessels.

Knowledge of the practical use of the magnetic compass, gyro-compass and autohelmsman is required for the examinations for deck officer certificates of competency. Officers from the Maritime College have some theoretical training in this equipment, but for all officers of the merchant marine, knowledge of equipment is acquired mainly through personal study and experience. There are no courses for training seafarers in any other aids to navigation.

United Kingdom

Training in electronic aids to navigation is provided through various channels. There are special courses leading to examinations for radar observer and radar maintenance certificates. Training is included in courses leading to the examinations for Ministry of Transport certificates of competency for certain grades. There are also some special courses and some general training at certain nautical colleges which do not lead to Ministry of Transport examinations. Manufacturers of radio and radio aids to navigation also conduct training courses for deck and radio officers in the operation and practical use of particular types of equipment.

Training is available in the operational use and maintenance of radar as follows:

Fourteen nautical colleges in the U.K. offer a radar observer course of ten days' duration with an examination for the Ministry of Transport radar observer certificate on the tenth day. These courses are designed to provide training in the use of radar as an aid to navigation for masters and officers of merchant ships. Students study the fundamental principles and limitations of radar prior to being taught methods of adjusting operational controls, the interpretation of the radar display, detection of movement, and the obtaining of navigating information from radar plotting. Courses are limited to ten students per instructor and the radar observer certificate is issued to graduates passing the Ministry of Transport written and oral examinations.

A five-day radar simulator course is limited to six students who should be serving masters or senior officers. This course is designed to give senior personnel practice and experience in using radar to avoid collisions with other ships. It utilises the radar simulator's ability to simulate realistically the radar view of a situation in which action must be taken to avoid a collision and show the effects of the action taken. The radar simulator course is approved by the Ministry of Transport and the radar set and radar simulator used must have been awarded a Ministry of Transport Certificate of Type Testing. A radar simulator certificate is issued to each student after satisfactorily attending a course for which, however, there is no examination.

Courses at all nautical colleges which lead to the examinations for certificates of competency of master (foreign-going), master (home trade) and skipper (full) of fishing boats, include training in the theory and practical use of radar. The Ministry of Transport examinations for these grades require

knowledge of the theoretical and practical use of radar and its limitation as a navigational aid. All candidates for second mates' certificates must have obtained a radar observer certificate through attendance at an officially approved radar observer course before the certificate of competency will be issued. This course can be taken either before or after the examination for the certificate of competency.

Courses of three months' duration in the theory and maintenance of shipborne radar are conducted at thirteen technical colleges in the United Kingdom. They are open to officers and men of the merchant navy and fishing fleets and give the technical knowledge of marine navigational radar which is necessary to maintain the equipment and use the appropriate test gear.

A correspondence course in radar maintenance is also provided by one technical college for sea-going officers unable to attend the normal course. The correspondence course, together with a final period of four weeks for practical training and examination ashore at the college, covers the same ground as the normal course.

Radar maintenance certificates are issued to graduates of these courses who pass an independent examination held by the Ministry of Transport. It is not essential however for a candidate for the radar maintenance examination to have completed one of these formal courses before he can take this examination.

Training in the theory and use of the marine radio direction-finder is given in the courses which lead to the examinations for Post-Master General Certificates in Wireless Telegraphy.

Training in the theory, practical use, and maintenance of the direction-finder is included in the courses of the various nautical colleges leading to deck officers' certificates of competency. Moreover Ministry of Transport examination syllabi for certificates of competency as first mate (foreign-going), master (home trade), and skipper (full) require complete knowledge of the practical use of the direction-finder. For the master (foreign-going) examination, a comprehensive theoretical knowledge of this equipment is required including the various errors and influences to which direction-finder equipment is subject.

The Ministry of Transport certificate of competency examinations for master (foreign-going), master (home trade) and fishing-boat skipper (full) require an understanding of the general principles of hyperbolic navigation and practical uses of Decca,

Loran and Consol. Training in these aids to navigation is included in the curricula of the nautical schools leading to the examinations for these certificates of competency.

Training in the theory and use of the gyro-compass is included in the nautical school courses leading to examinations for the master (foreign-going) and first mate (foreign-going) certificates of competency. These examinations require understanding of theoretical principles of operation. The master's examination requires a fuller understanding of theory, errors and their correction, as well as construction features of various types of gyro-compasses.

Some nautical colleges also conduct special courses in the gyro-compass and autohelmsman, but details are not available.

Nautical school training in the magnetic compass is included in courses leading to certificates of competency as master and first mate (foreign-going), master (home trade) and fishing-boat skipper (full). The syllabi of these examinations require in varying degree, depending on the level of certificate, detailed knowledge of principles of magnetism; theory of the magnetic compass, errors and error correction; siting of compasses and care, maintenance and practical use of a ship's magnetic compass.

Questions on the echo-sounder are included in examinations for certificates of competency, and the subject is included in the nautical school courses preparing students for examinations for master (foreign-going) and fishing-boat skipper (full). Examinees are required to be familiar with the principle of operation and practical use of echo-sounders, methods of transmission and recording errors, and the reliability of indications.

Any training available for very high frequency radio telephone is given by the manufacturers of equipment supplied to ships. This subject is not included in examinations for certificates of competency.

United States of America

Instruction in the theory and application of radar as an aid to navigation is provided for deck cadets as part of their sea and post-sea training at the Federal Merchant Marine Academy, Kings Point, New York and the five state-operated merchant marine academies of Maine, Massachusetts, New York, Texas and California.

Often part of a broader marine electronics course, radar training involves techniques of operation, interpretation, and application of radar equipment as a navigational aid, and to a

limited degree, a study of design and maintenance of equipment. Exercises in practical use of radar equipment are conducted in school laboratories which are fitted with radar simulators. Practical training is also afforded on board operating merchant vessels and training ships during the sea service part of the training programmes.

For licensed deck officers there are three radar observer schools in New York, San Francisco, and New Orleans, operated by the Maritime Administration of the Federal Government. The radar observer course, which lasts for five days, is intended to instruct deck officers in the operation, interpretation and use of radar as a navigational aid, and officers completing the course qualify for an endorsement on their certificates of competency as a radar observer.

Those merchant marine officers who are naval reserve officers and participate in the U.S. Navy's training programme, are eligible to enrol in a radar course for merchant marine officers. Of two weeks' duration, these courses are convened continuously throughout the year at certain naval establishments. This radar training consists of both theoretical studies and instruction in the navigational use of radar in extensive laboratory facilities fitted with the latest radar equipment.

No training in radar is available for unlicensed seafarers.

Cadets of the six merchant marine academies receive instruction in the theory and application of radio direction-finder, echo-sounder, Loran, radio telephone, magnetic compass and autohelmsman in the various navigation, communications, and electronics courses provided at the various stages of their training programmes.

Private schools located in major seaports of the United States offer basic instruction in navigational aids to licensed deck officers studying for a raise of license grade and for candidates for original licenses. Similar instruction is also provided by schools operated by deck officers' maritime unions.

Plans are presently being made to establish training for ratings on the Eastern Seaboard of the United States in which the United States Maritime Administration will provide guidance. In New York, the Masters, Mates and Pilots Association, a union of licensed deck officers, is presently initiating the programme for licensed deck officers. The training programme proposed is a six-week course totalling 180 hours in 14 subjects including navigation, rules of the road, and signalling. It is expected that instruction in electronic aids to navigation will be included in this programme.

Courses in navigation with a gyro-compass are required of cadets at the various academies; these courses provide cadets with comprehension of the principles of operation of the gyro-compass; mechanics of operation, interpretation of equipment performance, and understanding of maintenance techniques. Equipment installed in school laboratories, school ships, or merchant ships provide practical experience with gyro-compass equipment at various stages of the training programmes. A manufacturer's gyro certificate is awarded cadets upon completion of advanced course work in gyro-compass navigation.

Certificated deck officers are offered gyro-compass instruction on a voluntary basis at the New Orleans Radar Observer School only, which is operated by the U.S. Government. The length of instruction is five days and a manufacturer's gyro certificate is awarded graduates.

No training in the gyro-compass is available for uncertificated seafarers.

Viet Nam

The Merchant Marine School conducts a seven-year training programme leading to a certificate of competency as master (coastal and inland waters). This training comprises two years of theoretical studies at the school, five years of practical training at sea as an officer apprentice, and three months of comprehensive review and final studies for the examination leading to the certificate.

Although there are no special courses devoted entirely to any particular aid to navigation, navigation and seamanship courses include study of many of the modern aids to navigation. Comprehensive instruction is given in the theory, use, and maintenance of the magnetic compass, radio direction-finder and gyro-compass during both of the two pre-sea years at the school. During the second year navigation courses cover the theory and operation of radar, Decca, Loran and echo-sounder. Practical training in the use of the various aids to navigation is obtained during the five-year apprenticeship at sea. The examination for certificate of competency covers this equipment. No special certificates endorsing officers in the use of radar or other devices are issued.

2. Life-saving Appliances

Argentina

Basic instruction of deck and engineer cadets of the National School of Navigation in the use of marine life-saving equipment takes place during the second year of training when cadets are assigned to a training vessel.

During the fourth and final year of the School's training programme cadets receive thorough instruction in the theoretical and practical use of life-saving equipment in comprehensive courses covering all aspects of abandoning ship and survival at sea. This training consists of 63 hours of instruction and includes 15 hours of practical training in survival in the water.

The following subjects are covered by the 48 hours of classroom instruction.

- (a) International conventions dealing with the safety of life at sea with emphasis on sections concerned with abandoning ship. Regulations concerning number of persons to be carried in lifeboats and life-saving equipment carried aboard ship.
- (b) Techniques of abandoning ship including abandonment in a situation of burning oil on the sea. Proper use and care of various types of lifejackets.
- (c) Construction and use of different types of lifeboat davits and lifeboats. Techniques of launching and propelling boats and the equipment required to be carried in lifeboats. Maintenance of davits, lifeboats and lifeboat equipment. Use of distress signals.
- (d) Construction, maintenance, and use of various types of rigid and inflatable liferafts. Equipment carried in liferafts.
- (e) Navigating in lifeboats and determining landfalls.
- (f) Survival at sea. Medical problems of survivors and use of medicine chests. Protection against weather, sea life and air raids during hostilities. Techniques of obtaining food from the sea.

The 15 hours of survival in the water training is conducted at a specially designed training tank of the School. Cadets participate in the following practical exercises:

- (a) Techniques of jumping into the water from simulated shipboard heights, with and without lifejackets. The proper use of different types of lifejackets.
- (b) Removing clothing in the water and improvising lifefloats.
- (c) Use of inflatable and rigid liferafts and the techniques of righting capsized lifeboats.
- (d) Handling injured persons in the water and improvising lifefloats for the injured.

Successful completion of this training is required as a condition for the issuing of certificates of competency as deck and engineer merchant marine officers.

With the exception of practical experience obtained aboard ship no training exists for seamen ratings in life-saving equipment.

No lifeboatman or other type certificates are issued.

Australia

The Australian Government does not provide courses of instruction concerning lifeboats, but efficiency in their use is promoted by the issue of a lifeboatman certificate to seafarer candidates who pass an examination conducted by the maritime authorities. The preparation of candidates for this examination is provided by the deck officers of sea-going ships to those officers and ratings in all departments of the ship's crew who volunteer to take a series of lectures and to participate in practical exercises during the ship's voyage. Moreover, legislation by which a specified number of certified lifeboatmen are required to be carried on board passenger ships results in shipping companies encouraging such voluntary instruction.

The regularly held emergency drills at sea and in port required of Australian merchant vessels also serves to instruct and maintain the efficiency of all crew members in lifeboat operations and use of life-saving gear. These drills are supervised by proficient deck officers.

Certificate of competency examinations for foreign-going and coastal-waters mates and masters require knowledge of lifeboat and liferaft launching, handling and maintenance, as well as the use of other life-saving appliances such as signal rockets and line-throwing apparatus. Examination preparatory training programmes of the various navigation schools include extensive instruction in the use of all life-saving appliances. Students acquire the required knowledge for passage of the lifeboatman's certificate.

Belgium

All maritime training establishments in Belgium provide instruction in the launching and handling of lifeboats and liferafts, as well as the use of associated life-saving apparatus.

For officer candidates this training is spread over three years. During the first year, while attached to a training ship, two hours per week are devoted to formal instruction and practical exercises in all of the various types of marine life-saving apparatus. During the entire two years at the nautical schools, officer candidates are given two hours per week of theoretical and practical instruction in all aspects of life-saving equipment.

Certificates of competency examinations for all grades of deck and engineering officer, as well as fishing-boat skippers, require knowledge of lifeboat and liferaft launching and handling, use of lifejackets, lifebuoys, line-throwing apparatus and related subjects.

The two seaman schools of Ostend and Antwerp offer one-year courses for the training of deck ratings. Catering staff personnel are also trained at these schools. Included in the thorough programme of natural science, maritime and liberal arts courses, is instruction in the handling and theory of life-saving apparatus. Classroom instruction is supplemented by practical exercises in school laboratories and training vessels. Training in life-saving apparatus includes the following subject matter:

- (a) types of lifeboats, liferafts, lifejackets and lifebuoys, and legislation concerning this gear;
- (b) construction and outfitting of lifeboats;
- (c) lifeboat davits and methods of lowering and hoisting boats;
- (d) handling lifeboats under oar, sail and motor;
- (e) launching and handling of rigid and inflatable liferafts;
- (f) embarking passengers and crew into lifeboats;
- (g) maintenance of lifeboats and other life-saving appliances;
- (h) operation and use of signal rockets and line-throwing apparatus.

All graduates of either of the seaman schools are provided with a lifeboatman's certificate.

Regular emergency drills held on board Belgian merchant ships serve to maintain both officers and crews in a state of proficiency in the use of the various life-saving equipment.

There are no lifeboatman's certificates or other type of safety equipment endorsements for officers, inasmuch as their certificates of competency are evidence that they have the necessary theoretical knowledge and practical experience.

The two rating schools, which operate as departments of the officer schools at Antwerp and Ostend, offer a special two-week course of instruction for experienced deck ratings in seamanship, life-saving equipment and related subjects.

Successful completion of this training course, which includes inflatable liferafts and other modern equipment and practices, provides graduates with an able-bodied seaman's certificate. Possession of a lifeboatman's certificate is a condition for admission to this course.

Burma

Officer candidates of the Burmese two-year pre-sea maritime training programme receive formal instruction in the various life-saving appliances. This includes launching and handling of lifeboats and liferafts and their provisioning and maintenance, as well as the operation and use of line-throwing and signalling apparatus. No special certificates of competency are issued in connection with training in life-saving equipment.

Canada

Instruction in the launching, handling, provisioning and maintenance of lifeboats and liferafts as well as in the use of line-throwing apparatus and other life-saving equipment is included in the training for all certificates as master or mate. Engineer officer candidates are also required to have knowledge of life-saving appliances.

Candidates for certificates as qualified able-bodied seaman must show through oral and practical demonstration-examinations a thorough knowledge of these same operations. Special courses in life-saving operations for able-bodied seamen are provided at several nautical training centres.

Candidates for a lifeboatman certificate are also examined in all aspects of lifeboat and inflatable liferaft

launching and handling. The bulk of this training is conducted aboard ship for the purpose of ships' crews being certified as qualified lifeboatmen.

Canadian nautical training centres also provide pre-sea instruction in lifeboat and liferaft operations and related life-saving equipment and procedures.

Republic of China

Officer candidates participating in the pre-sea training programme at the Maritime College of Keelung receive a total of 32 hours instruction in the launching and handling of lifeboats. Subjects which are studied include the various types of davits and the respective methods of lowering and hoisting boats, launching of lifeboats in heavy weather, handling of lifeboats in the water and against heavy surfs, making landings through heavy surfs, embarking and disembarking in heavy weather, towing lifeboats, and methods of stowage and securing.

The 12 hours of study devoted to lifeboat equipment includes general specifications, classification and requirements of lifeboats, equipment required for lifeboats of foreign-going vessels, maintenance of lifeboats and their equipment, and determining safe capacities of lifeboats.

Twelve hours of study are devoted to liferafts. This course is made up of studies of the general requirements for a suitable liferaft, operation of rigid and inflatable liferafts and equipment carried in rigid and inflatable liferafts.

Instruction is provided in the specifications and proper use of approved lifebuoys, lifejackets and lifebelts, handling of line-throwing appliances and use of the rocket distress signal.

Colombia

The Naval School of Cadets training programme includes instruction for the merchant marine officer candidates in the various marine life-saving appliances. Formal instruction in lifeboat handling includes studies of types and operation of boat davits, handling lifeboats in the water and provision and equipment required in lifeboats. Practical training in boat handling is obtained at the School as well as during the one-year training period aboard ship. Studies also include regulations concerning, and practical use of lifejackets, lifebuoys, line-throwing apparatus and other safety services. No special qualifying certificate is issued students upon completion of this training.

No formal instruction in life-saving equipment is given at the Naval Training Centre for ratings and petty officers but these receive practical instruction in the use of this equipment on board vessels from officers who are trained in this subject matter.

Czechoslovakia

Merchant marine officer candidates at marine schools receive pre-sea instruction in shipboard life-saving apparatus. Studies in lifeboat handling, launching, provisioning and use of equipment contained therein, and the use of line-throwing apparatus, signal rockets, lifejackets and lifebuoys are supplemented by practical exercises in boat handling and the use of the various safety equipment.

Regularly scheduled lifeboat launching and other safety drills are conducted aboard operating merchant ships. Although no shore training facilities exist for seaman ratings in life-saving appliances, candidates for the certificate of able-bodied seaman are required to pass an examination in the practical use of this equipment.

Denmark

The pre-sea government and private schools and the approved pre-sea training vessels give short-term practical training courses of three months' duration to future officers and ratings in the use of conventional marine life-saving apparatus.

Launching, handling and maintenance of lifeboats and liferafts, use of lifebuoys, lifejackets, emergency radios and line-throwing apparatus, and the transport of injured persons are among the topics covered by this instruction.

Graduates of these courses at the various schools are issued a lifeboatman's certificate upon the completion of a further nine months' employment at sea.

All examinations for the various categories of deck officer certificates of competency include knowledge of lifeboat launching and handling and the use of related life-saving apparatus.

Finland

Seamanship courses for officers, officer-candidates, and ratings conducted at the nautical schools include classroom and practical instruction in the launching, handling and maintenance of lifeboats, liferafts and associated equipment.

Theoretical instruction is also given in line-throwing apparatus, signalling equipment and other life-saving appliances. In addition, the appropriate sections of the International Convention for the Safety of Life at Sea dealing with life-saving apparatus are studied in these courses.

Lifeboatman's certificates are issued to students completing this training who on examination demonstrate knowledge of lifeboats, their equipment and the ability to launch and handle boats.

France

Both deck and engineer officer candidates are given practical and theoretical instruction in life-saving apparatus during their two years at the national merchant navy schools.

These courses cover all aspects of the launching, handling and maintenance of lifeboats and liferafts and the use of related life-saving apparatus. Trainees are exercised in the use of safety equipment installed at the schools and on board training vessels.

Some of the topics covered in the various courses are as follows:

- (a) studies of regulations in force relating to life-saving appliances on board passenger and cargo vessels;
- (b) description of construction and types of lifeboats, davits and liferafts;
- (c) launching and hoisting lifeboats and liferafts;
- (d) handling boats under oar, sail and motor; landing in surfs;
- (e) maintenance and provisioning of lifeboats;
- (f) types and practical use of lifejackets, lifebuoys and signalling equipment;
- (g) practical use of line-throwing apparatus.

Certificate of competency examinations for all grades and categories of deck and engineer officer require knowledge of the proper use of life-saving equipment. Accordingly, preparatory courses for these certificates taken at the nautical schools include practical instruction and exercises in the use of these appliances.

Part of the pre-sea and post-sea basic training given to seamen ratings at the apprenticeship schools is devoted to lifeboat operations and the use of other life-saving apparatus. Competency in the use of this equipment is required of those preparing to embark on ships as well as those seamen under instruction for the able-bodied seaman's certificate. During the 9-months pre-sea training programme, 180 hours of detailed instruction is given in the following topics:

- (a) lifejackets and lifebuoys;
- (b) types of lifeboats and davits;
- (c) rigid and inflatable liferafts;
- (d) launching and hoisting boats;
- (e) handling boats under oar, sail and motor;
- (f) associated life-saving operations such as picking up survivors, survival at sea, navigating a lifeboat to a landfall, etc.

Classroom instruction is supplemented by demonstrations and student handling of lifeboats, liferafts and other equipment installed at these schools and aboard school training vessels.

A lifeboatman's certificate is issued to all deck and engineer officers, officer candidates and ratings who have successfully completed the prescribed training in boat-handling and have demonstrated their competence in this subject.

Ghana

Throughout the two-year programme cadets at the pre-sea Nautical College receive two hours of practical instruction each week in the various life-saving appliances fitted aboard ship. This includes lifeboat and liferaft handling and maintenance as well as the use of line-throwing apparatus, signal rockets and other life-saving apparatus. Additional experience in the use of this equipment is gained during the following three years at sea and candidates for certificates of competency as second mate or second engineer are examined in these topics in accordance with standards laid down by the United Kingdom Ministry of Transport.

Ratings of the merchant marine engaged in the one-year training programme for the certificate of competency as able-bodied seaman are instructed in the handling and launching of

lifeboats and liferafts and the use of the various life-saving appliances. A qualifying examination for proficiency in lifeboat handling must be passed before trainees can attempt the examination for able seaman, which covers life-saving appliances. Training of ratings is conducted on board, and three years' sea time is required to qualify as an able seaman.

All other seamen aboard ship attend regularly held safety drills during which they are exercised in the launching of lifeboats, and the use of other life-saving apparatus.

Haiti

Coast Guard seamen recruits engaged in the 12-months' course in basic seamanship and navigation at the Haitian Coast Guard Training Center are instructed in the use of life-saving apparatus. The courses given cover the practical use and maintenance of lifeboats, liferafts and associated life-saving equipment. Additional instruction and exercises in the use of this equipment is given during regularly scheduled drills held aboard Coast Guard vessels.

India

Deck officer candidates undergoing pre-sea training aboard the training vessel "Dufferin" are given extensive training in boat handling during the two-year programme to enable them to launch and handle lifeboats under oars, sails and power. Instruction also covers the equipment required in lifeboats and lifeboat maintenance.

During the last term of training a surveyor of the Mercantile Marine Department examines the cadets' efficiency as lifeboatmen.

At the Nautical and Engineering College a special one-week course is conducted for merchant seamen and apprentices. Practical and theoretical instructions are given in launching and handling of lifeboats, equipment of lifeboats and their maintenance. On completion of the course a practical examination is held and lifeboatmen certificates are awarded to successful candidates.

Regular students in training for certificates of competency at the Nautical and Engineering College receive thorough training in the launching and handling of lifeboats, their equipment and maintenance. In addition, practical instruction is given in the operation of inflatable liferafts and lifejackets and students study the various aspects of other life-saving procedures and appliances. Several times annually, students participate in actual demonstrations of line-throwing apparatus, signal rockets, etc.

The pre-sea training vessels "Mekhala", "Bhadra" and "Naulakshi", each of which offers a three-month residential training course for ratings in the deck and engine departments, provide practical and classroom instruction in the launching and handling of lifeboats, and rigid liferafts, the equipment found on this apparatus, and liferaft maintenance. They are also instructed in the handling of such life-saving apparatus as line-throwing gear, signal rockets, and lifebelts.

The inspection of fire and life-saving equipment aboard Indian vessels by surveyors from the Mercantile Marine Department during regularly scheduled emergency drills ensures that life-saving equipment is maintained in good order and that crews are trained in its use.

Ireland

All students at the Irish Nautical College for an original officer's certificate of competency are required to pursue theoretical studies and practical training in the various marine life-saving appliances. These courses, which are also available to experienced officers of both merchant and fishing vessels in training for a higher grade of certificate cover the launching, handling and maintenance of lifeboats and liferafts and the use of line-throwing apparatus, signal rockets and related safety equipment.

A certificate of competency as lifeboatman is assigned those students who have successfully completed this training and who have demonstrated their proficiency in handling water-borne lifeboats which are fitted in davits at the College.

Training in lifeboat handling and life-saving apparatus is also given to apprentices and ratings who take various seamanship and navigation courses at the College. Lifeboat certificates are issued to these categories of personnel successfully passing appropriate practical proficiency tests.

Israel

The pre-sea training programmes of the Nautical College Fishery and Shipping School, and nautical divisions in high and elementary schools include complete instructions in the use and maintenance of lifeboat equipment and practical instruction in sailing and rowing boats. The high and elementary school students receive about 100 hours per year in small boat sailing practice.

A comprehensive course in the launching and handling of both rigid and inflatable lifeboats, their equipment, construction, use and maintenance is taught in weekly three-day courses at the seamen's upgrading training centre. Sailing of lifeboats, types of davits and coming alongside under oar and sail are included in this course. Qualification as a competent lifeboatman is required

by seamen prior to their being examined for certificates of competency as able-bodied seaman, third or second mate and third engineer. Seamen are examined by a certificated examiner in lifeboat or liferaft launching, handling, equipment and maintenance and may receive the qualifying endorsement on their papers.

The handling of life-saving appliances such as line-throwing apparatus, signal rockets, lifebelts, etc. is included in the seamanship curriculum of the upgrading training centre.

The examinations of all grades of mates and masters cover knowledge of the various life-saving appliances.

Italy

Training in the use of lifeboats, their equipment, launching and manoeuvre, is imparted both to officers and ratings on board ship during their sea service. A lifeboatman's certificate is issued to those seafarers who are competent in launching lifeboats and their handling in bad weather.

Japan

Curricula of the University of the Mercantile Marine and the Mercantile Marine Upper Secondary School include 105 and 210 hours respectively of classroom and practical instruction in lifeboat and liferaft launching, handling and maintenance as well as the use of line-throwing apparatus, signal rockets and other life-saving apparatus. Practical instruction of these officer candidates is done with life-saving equipment fitted at the schools and through the assignment to training vessels as part of the aggregate training programmes. Students successfully completing this training are granted a certificate of competency as lifeboatman.

A lifeboatman's certificate is also granted to graduates of the 160 hours minimum training in the launching and handling of lifeboats and liferafts and other life-saving apparatus included in the curriculum of the ten seamen training schools.

Malagasy Republic

Officer candidates and apprentice seamen in training at the National Merchant Marine School receive, over a period of 28 weeks, 42 hours of instruction in the use of marine life-saving equipment. The programme of instruction covers the following subject matter:

- (a) Standards for lifeboats according to tonnage and size of crew. Operation of various types of davits. Launching and handling of lifeboats.

- (b) List and maintenance of supplies and equipment carried in lifeboats. Maintenance of wooden and metal lifeboats.
- (c) The construction and handling of rigid and inflatable liferafts.
- (d) Operation and use of line-throwing apparatus, ordinary signal guns, parachute rockets, and Very pistols. Use of lifebelts and lifejackets and the advantages of particular designs. Use of circular and horse-shoe type life-buoys with or without light signals.
- (e) International standards for life-saving apparatus.

No certificates of competency in the handling of lifeboats or in the use of other safety equipment are issued.

Mexico

No specific information is available concerning the training of seafarers in the use of life-saving appliances. It is assumed, however, that deck and engineer officer candidates enrolled in the Vera Cruz, Mazatlan and Tampico schools are instructed in lifeboat operations and the use of other life-saving appliances at some stage during the five-year curricula.

Although no pre-sea training institutions exist for ratings, these seafarers probably are exercised and instructed in the use of lifeboats and other equipment under the guidance of trained officers during emergency drills customarily held on board merchant ships.

Morocco

Merchant marine officer candidates are trained through programmes offered by French nautical schools. These programmes generally involve one year of pre-sea training followed by several years at sea in an apprentice officer status. Examinations for certificates of competency are taken after the tenure at sea.

Pre-sea training always includes classroom instruction and practical exercise in the launching, handling, provisioning and maintenance of lifeboats and liferafts, as well as the use of life-saving equipment related thereto. Further training in the practical use of the various types of lifeboat davits, lifeboats, lifejackets, lifebuoys and line-throwing equipment is obtained in exercises aboard ship during the apprenticeship period at sea.

Certificate of competency examinations require knowledge of life-saving appliances and operations.

No lifeboatman's certificate is issued.

Netherlands

All officer candidates of the nautical schools are instructed in the operation and use of the various shipboard life-saving appliances. During the further training at sea additional practical instruction in the equipment is given, as a thorough knowledge of life-saving appliances is required for obtaining a certificate of competency as a deck or engineer officer.

The various training programmes for ratings provide instruction in the operation, use and maintenance of shipboard life-saving equipment and knowledge of this equipment forms part of the official examination for the certificate of able-bodied seaman. Moreover, masters of ships are required to hold life-saving drills regularly and instruct crews in the proper use of life-saving equipment.

New Zealand

Detailed information concerning the duration and contents of training programmes for officers and ratings of the merchant navy in marine life-saving appliances is not presently available.

However, instruction in this subject is included in training programmes leading to certificates of competency for the various grades and categories of deck and engineer officer. Presumably this instruction is given at the School of Navigation in Auckland.

Moreover, training in the launching and handling of lifeboats and the use of related life-saving equipment is included in the training leading to an able-bodied seaman's certificate.

Periodically conducted abandon-ship and emergency drills held on board merchant vessels serve to maintain officers and crew proficient in the use of life-saving appliances.

Norway

Students at the various schools for the second mate's certificate of competency receive a total of 40 hours of instruction in lifeboat launching, handling of equipment and maintenance, and handling of liferafts, line-throwing appliances, and other life-saving gear. Practical experience in the use of the equipment is afforded by the two training vessels. No special certificates are issued upon completion of training in life-saving apparatus. Instruction material is kept up-to-date by regular revision.

Pakistan

Training of officers in the operation and maintenance of life-saving appliances is included within the framework of pre-sea training given to officer cadets at the Marine Academy, Chittagong.

Ratings are instructed in the operation and maintenance of life-saving appliances at the Seamen Training Centre in Karachi, within the framework of the general training imparted to the ratings at this Centre. The duration of the course is three months. The Seamen Training Centre also holds special lifeboat classes with a duration of four weeks to prepare ratings for the special lifeboatman examination which is mentioned below. The Centre is in its formative stage, and the syllabus and training programme is being finalised.

A special lifeboatman examination is held in Karachi for deck apprentices, engineer officers and ratings who wish to obtain a certificate of efficiency as lifeboatmen. This examination includes launching and handling of lifeboats, knowledge of lifeboat equipment and its maintenance, handling of liferafts, etc., and a special certificate is issued to persons who pass this examination.

Peru

The Miguel Grau Maritime School instructs officer candidates in the practical use of life-saving apparatus. Seamanship and ship construction courses at the School cover the launching, handling, provisioning and maintenance of lifeboats and also the use of line-throwing apparatus, signal rockets and life-jackets.

This training is supplemented by practical exercises in the use of life-saving equipment aboard ship during the final year of the training programme.

Officers and ratings employed on board the vessels of the International Petroleum Company are exercised at least once a week in the practical use of safety equipment. During these drills short lectures are given by officers which cover the launching, handling, provisioning and maintenance of lifeboats, and the use of lifebelts, lifejackets and distress signals.

Aboard Peruvian Steamship Corporation vessels safety and emergency exercises are carried out every three months at which time crew members are instructed in the use of life-saving equipment.

Safety departments of the various shipping companies issue circulars and posters regarding safety aboard ship. A Safety Committee aboard each International Petroleum Company vessel, and regular inspections by company supervisors ensure that life-saving equipment is maintained in good order and that crew members are trained in its use.

No lifeboatman's certificate or other endorsement in the use of life-saving equipment is issued.

Philippines

The seamanship curriculum of the Merchant Marine Academy includes classroom theoretical instruction in the launching, handling, and provisioning of lifeboats and liferafts, and the use and maintenance of other life-saving equipment such as line-throwing apparatus, lifejackets and lifebuoys, and signal rockets.

Practical exercises in the launching and handling of lifeboats and use of other emergency safety equipment are given during cruises aboard naval vessels and during the apprenticeship year at sea aboard Philippine merchant vessels.

Changes in the curriculum of the Academy which are to be introduced will provide for specialised courses in boat handling which will qualify graduates of the course as certificated lifeboatmen.

Rumania

At the National Marine College the training programmes for officers' certificates of competency include training in marine life-saving equipment. Instruction is provided in all aspects of lifeboat and liferaft operations and in the operation and use of other life-saving and safety equipment related thereto.

All examinations for certificates of competency require knowledge of these subjects.

Ratings are trained in the use of lifeboats and life-saving equipment through practical experience aboard ship.

A lifeboatman's certificate is issued to seafarers passing a theoretical and practical examination conducted by the port authorities.

Spain

The various training schemes for foreign-going deck and engineer officers, coastal vessel masters and mates, fishing-boat skippers and ratings include courses dealing with the use of lifeboats, liferafts and other marine life-saving

appliances. Nautical schools provide instruction for officer candidates in life-saving equipment according to standards set by the International Convention for the Safety of Life at Sea.

Classroom instruction ashore is always supplemented by practical exercises with equipment at the training stations or aboard merchant vessels. In addition, seafarers are periodically examined in the use of lifeboats and other safety equipment by governmental maritime authorities while in port. At sea, regularly held drills serve to provide practical experience and maintain officers and crew in a state of proficiency in the use of this equipment.

No lifeboatman's certificate is issued in connection with training received.

Sweden

All training programmes for officer candidates and experienced officers provide for practical instruction in the launching, handling and maintenance of lifeboats and liferafts. Training is also given in the use of other life-saving appliances with which ships are customarily equipped.

Pre-sea schools offering 20-week training programmes for ratings provide practical instruction in the use of all the standard life-saving appliances found on board ship, including demonstrations with equipment on board training vessels.

A lifeboatman's certificate is issued to seafarers who demonstrate, before an official marine inspector, their proficiency in the handling of lifeboats.

Thailand

Officers and ratings of Thai vessels are instructed in the launching and handling of lifeboats and the operation and maintenance of other life-saving equipment fitted aboard through regularly scheduled safety and emergency drills held aboard.

There is no type of training ashore available to seafarers.

Turkey

Regularly scheduled lifeboat and emergency exercises conducted by officers aboard Turkish merchant ships serve to train crew members on a continuing basis, in the launching, handling and maintenance of lifeboats and liferafts, and in the practical use of related life-saving equipment.

An examination covering practical knowledge of lifeboat operations and use of other life-saving apparatus is conducted by government maritime authorities under the Ministry of Communications. Successful candidates are provided with a certificate as a qualified lifeboatman. Crew members of passenger-carrying vessels are required to possess this certificate, training for which is primarily through self-study and practical experience.

United Kingdom

Apprentices, cadets and ratings receive at the many nautical schools and training vessels in the United Kingdom, pre-sea classroom and practical instruction in the launching, handling, outfitting and maintenance of lifeboats and life-rafts, as well as the use of other life-saving apparatus. This training is supplemented by exercises aboard ship during regularly held boat drills.

Lifeboatman's certificates are issued by the Ministry of Transport to experienced ratings who pass an examination conducted by surveyors. This examination requires practical demonstration of knowledge of the preparation, swinging out and lowering of boats, and getting boats away from the ship; candidates must also show ability to take charge of the launching operation; to pull oars, steer and act as coxswain; to know the details and use of lifeboat equipment; and to follow orders used in boat handling.

Experienced seamen ratings who are candidates for certificates of competency as able seaman or efficient deck hand, apart from being required to be holders of a lifeboatman's certificate, must pass examinations which include practical knowledge of the use, care and maintenance of life-saving appliances. Candidates are required when possible to give practical demonstrations of their ability to launch lifeboats, manage boats under unfavourable sea conditions and land boats on beaches. They must also be familiar with the equipment carried in lifeboats and the starting and operating of engines in a powered lifeboat.

Deck officers are examined in life-saving appliances when taking examinations for certificates of competency for all grades and categories of merchant navy officers. For example, the examination syllabus for second mate (foreign-going) requires knowledge of the functions of all parts of a lifeboat; types of lifeboat construction and capacities of boats; and care and maintenance of lifeboat equipment, lifebuoys, life-jackets, line-throwing appliances, fire appliances and light and sound signals.

United States of America

Training in life-saving appliances is given cadets at the six maritime academies in both the pre-sea and post-sea training programmes. This instruction includes understanding of the design, function and maintenance of lifeboats, boat equipment, line-throwing appliances, signal rockets, lifebelts etc. and skill in the use of such gear. Practical instruction is always provided. Boat handling courses include individual exercises in the handling of lifeboats under oars and sail so that cadets are skilled in the use of this equipment under emergency conditions. Deck cadets generally receive more comprehensive instruction in boat handling than engineer cadets, qualifying them for supervision and execution of emergency drills and actual rescues. Coast Guard endorsements as qualified lifeboatmen are issued to each cadet completing pre-sea basic boat-handling courses.

Seamen's unions also operate schools which offer instruction in life-saving appliances on a voluntary basis. The Sailor's Union of the Pacific has a school in San Francisco, California, and the Seamen's International Union in Brooklyn, New York, and on the Gulf Coast. Seamen receive instruction in the use and maintenance of the various life-saving appliances. The boat-handling section of the training programme includes both classroom work and actual practice in handling lifeboats and qualifies graduates for the Coast Guard Lifeboatman endorsement. Training is provided to both prospective and experienced ratings.

At least three public high schools in the United States provide regular maritime vocational training in all three shipboard departments. Curricula of these schools include training in the various life-saving appliances as well as boat-handling techniques. Located in major ports where classroom studies can be supplemented by field trips and practical experience, three of these schools are: Food and Maritime Trades High School (S.S. John W. Brown) New York; Delgado Trades and Technical Institute, New Orleans; and Gulf Area Vocational Technical School, Morgan City, Louisiana.

Coast Guard regulations require fire and boat drills to be conducted aboard U.S. merchant vessels at sea at least once per week. Practical training is thereby imparted to all crew members who, under the supervision of officers, man emergency stations, wear lifejackets, handle fire hoses under water pressure, operate lifeboat davits and swing boats out.

The Masters, Mates and Pilots' Association and the Marine Engineers' Beneficial Association both operate schools for their respective members providing professional courses intended as refresher training in preparation for examination for a higher grade of license. Since knowledge of shipboard

safety, life-saving apparatus use, and fire fighting techniques are required by the U.S. Coast Guard, officer students are provided with appropriate courses in these subjects.

Viet-Nam

The two years of pre-sea training at the Merchant Marine School include theoretical and practical instruction in life-boat and liferaft launching, handling, fitting-out and maintenance. Students receive practice in handling boats under oar, sail and motor as well as the use of lifejackets, emergency signal gear and other emergency equipment. This training is continued during the five years at sea when apprentice officers are in responsible positions during regularly held emergency drills. Upon the completion of sea service, the proper use and maintenance of life-saving apparatus is included in the three months of refresher studies preparing students for the examination for the certificate of competency.

No lifeboatman's certificate or other type of qualifying endorsement for life-saving apparatus is provided.

3. Devices for the Prevention, Detection and Extinction of Fire

Argentina

Deck and engineer cadets of the National School of Navigation receive theoretical and practical instruction in fire-fighting and the use of fire-extinguishing equipment during the latter part of the four-year training programme.

Training facilities at the Argentine Navy's Fire and Damage Control Training Centre are utilised for the 30 hours of practical exercises in fire-fighting and for part of the 60 hours of theoretical instruction which are given to cadets.

Theoretical instruction includes the following subjects:

- (a) The theory of fire, types of fire, and spontaneous combustion.
- (b) Theory of the use of foam, carbon dioxide, steam and water as extinguishing agents.
- (c) Practical use and maintenance of the various types of portable and non-portable fire-extinguishers, fixed fire-extinguishing systems, portable pumps, hoses and nozzles, smoke helmets and safety lamps.
- (d) Fire-detection systems, automatic sprinklers and automatic carbon dioxide extinguishing systems.
- (e) Systems of ventilation and communication in fire-fighting.

The practical training consists of demonstrations and participation in the use of various types of fire-extinguishers and fire-extinguishing equipment. This includes exercises in extinguishing burning fuel oil, and other types of shipboard fires under realistic conditions. Cadets are exercised in the handling of fire-hoses, nozzles and related hose fittings, portable fire-pumps, smoke helmets, and other fire-fighting equipment.

In conjunction with the fire-fighting training, cadets receive both theoretical and practical instruction in shipboard damage control. Among the topics covered, and in which cadets perform practical exercises, are:

- (a) Methods of shoring bulkheads and decks, and plugging leaks in hull and piping.
- (b) Isolating and draining flooded compartments.

(c) Welding and cutting steel plate in connection with damage control operations.

(d) Organisation of damage control parties aboard ship.

Instruction is also given in various aspects of radiological, biological and chemical defense. Deck cadets are given comprehensive instruction in ship stability as related to damage control.

With the exception of practical experience and instruction given by officers on board ship in the use of fire-fighting equipment, there exist in Argentina no training schemes for seamen ratings in fire-fighting.

The examination syllabi for all grades of deck and engineer officer certificates of competency include questions on fire-fighting techniques.

Australia

The maritime authorities have not established any co-ordinated training programme for seafarers in fire-fighting techniques or in use of the various fire-extinguishing systems and equipment found aboard ship.

Nautical schools preparing students for deck officer certificates of competency examinations provide fire-fighting instruction since knowledge of this subject is required for these examinations.

The training of ratings in the use of fire-fighting equipment is reached by practical exercises at regular intervals at sea by the personnel allocated to operate them in emergencies. These exercises are a statutory requirement and are recorded in the ship's log.

Proper maintenance of all fire-fighting equipment is ensured by compulsory annual survey and by legislation requiring regular inspections and tests.

Belgium

For officer candidates attending the Ostend and Antwerp navigation schools theoretical and practical instruction in the handling of fire-fighting systems and equipment is given during each of the three years of training.

During the pre-sea year, this instruction is given in part at a naval training centre and in part aboard the merchant training vessels to which cadets are attached. Theoretical

instruction in the operation, use and maintenance of fire-fighting equipment is supplemented by laboratory demonstrations and student participation in realistic shipboard fire situations. Students are trained to take action in accordance with the kind of situations which might occur at sea. All exercises, including the weekly fire drills held aboard ship, are followed up with explanations and comments. For the following two years at the nautical schools, officer candidates are given fire-fighting instruction in further detail, within the framework of such courses as ship construction, chemistry, engineering practice, etc.

The examination syllabi for certificates of competency as deck or engineer officer and fishing-boat skipper include questions on fire-detection, fire-prevention, and the theory, practical use and maintenance of the various marine fire-extinguishing equipment and systems.

Future ratings engaged in the one-year training programmes of the two nautical schools are instructed in practical fire-fighting. Classroom lessons and demonstrations in the theory of fire, types of fire-detection and extinguishing equipment found aboard ship, and the proper use and maintenance of this equipment, are combined with practical exercise aboard school training vessels and with fire-fighting training facilities established at the schools.

The two-week special course for the training of able-bodied seamen candidates also includes instruction in fire-fighting. Final examinations for this course require that examinees be familiar with fire-fighting techniques and equipment.

The regularly scheduled fire-drills held aboard all Belgian merchant ships maintain the proficiency of officers and crew members to cope with fire emergencies.

Burma

The two-year pre-sea officer training programme includes theoretical and practical training in fire-fighting as well as instruction in the use and maintenance of the various pieces of modern fire-fighting and fire-detection equipment.

Canada

The examinations for certificates of competency as master, mate or engineer officer require that candidates have a knowledge of the prevention and extinction of fire aboard ship. This includes the construction, use and maintenance of the various fire-detection and extinguishing systems and equipment, with emphasis on the dangers of spontaneous combustion and methods of extinguishing fuel oil fires. No separate courses

of study in fire-fighting are offered by regular nautical schools, but this subject is dealt with in other courses. For formal practical training of seafarers in fire-fighting techniques, use is made of the fire-fighting training facilities of the Royal Canadian Navy.

China

A total of 60 hours of instruction is given in fire-fighting equipment at the Taiwan Maritime College. Eight hours of course work are devoted to the use of oxygen breathing apparatus and gas masks in fighting fires; to tests conducted on these masks and their maintenance. Twelve hours of instruction is divided between studies of the steam, carbon dioxide and inert gas smothering systems; the carbon dioxide hose and reel installation; the theory of the effect of fires on smothering systems, and safety precautions in using these systems. Six hours of instruction are devoted to the automatic sprinkler system; its operation and maintenance, and six hours of instruction are given in the fire-detection and alarm systems, the efficiency of these systems, correct operational procedures and necessary maintenance. A total of 16 hours of instruction are given on the subject of fire-extinguishers. Topics covered include: installation and maintenance of a ship's fire-main, use of the various types of foam-generating systems and appliances for fighting oil fires, operation and maintenance of portable and carbon dioxide extinguishers and the use of portable gasoline driven fire-pumps in fire-fighting. The 12 hours of instruction devoted to fire-hoses and other fittings covers the regulations concerning the number and type of fire-hoses required to be carried aboard ship, the proper handling, tests and stowage of fire-hoses, the various types of hose couplings and the International Shore Connection.

Also included is instruction in the proper use of the all-purpose nozzle and in particular its use to generate high and low velocity water spray to fight certain types of fires.

A special course of 54 hours entitled "Tanker Practice" is included in advanced seamanship studies. The special safety problems involved in such tanker operations as loading and discharging, ballasting, and tank cleaning are studied, and six hours are devoted to the fire explosion and gas hazards of tankers.

Colombia

The training programme of the Naval School of Cadets training programme includes courses in the theory and practical use of shipboard fire-extinguishers, fire-extinguishing systems and related fire-fighting equipment. Included in this training are the following subjects: types, operation and upkeep

of portable and fixed fire-extinguishers; types of fire-hydrants, hoses and nozzles and their proper use and maintenance; principles of operation of fire detection and alarm systems as well as shipboard maintenance required; steam and carbon dioxide smothering systems and methods of use; description, operation and maintenance of smoke breathing apparatus and related equipment. Comprehensive practical training in the use of fire-fighting equipment is included in the training received during the year aboard ship. No special certificates are issued after the successful completion of this training.

With the exception of a course covering the special safety precautions necessary on tanker vessels, the training centre does not provide fire-fighting instruction for ratings or petty officers in addition to the practical training these personnel receive aboard ship.

Czechoslovakia

Monthly fire-fighting drills are held aboard all merchant vessels, during which all crew members are instructed in the use of the various fire-extinguishing equipment and systems, and fire-fighting apparatus as well as theoretical considerations in extinguishing particular categories of cargo fires and fires in other ships' spaces.

Candidates for certificates of competency as deck or engineer officers, and able-bodied seamen are examined in the use of fire-fighting equipment and related equipment by the competent marine authority; proficiency is required in the use of the latest types of fire and safety equipment.

Denmark

The three government pre-sea navigation schools give practical training in the techniques of fighting fires aboard ship with the various types of fire-fighting extinguishers and appliances.

A four-day course in fire-fighting theory and the use of fire-fighting apparatus is required for all candidates for an original mate's certificate of competency.

Experienced mates and masters are enrolled in short fire-fighting courses arranged by the Danish Shipowners' Association. These courses include instruction in the theory of fire, use and maintenance of the various fire-extinguishing systems and equipment, and participation in extinguishing of simulated, realistic shipboard fires. Emphasis is placed on the techniques of using smoke helmets. Also included in this course is instruction in radiological defence, in particular the effects of atomic explosions, ~~personnel safety~~ and decontamination measures necessary.

Course graduates have their discharge books endorsed as having completed training in fire-fighting and the use of smoke helmets.

Finland

Preparatory classes for master's certificate examinations at the Finnish navigation schools include an analysis of the provisions of the Convention on the Safety of Life at Sea relating to fire-safety and discussions of fire-fighting principles. Training in practical fire-fighting is given at basic vocational training establishments for seamen. No other type of formal specialised fire-safety courses is offered at any training institution.

Regularly scheduled fire and emergency exercises held aboard Finnish merchant vessels serve to educate seamen through appropriate instruction given by experienced ships' officers. Fire-safety education of seafarers is also assisted by pertinent literature deposited aboard ship by shipowners' organisations.

Inasmuch as the curricula of the navigation schools are presently being revised, their expected early implementation will considerably improve the fire education of seafarers as well as the training in aids to navigation and life-saving apparatus.

France

The maritime authorities give priority to fire-fighting training for seafarers, and courses of instruction are particularly comprehensive in this subject.

Deck and engineer officer candidates, and experienced engineer and deck officers preparing for a higher grade of certificate, receive this training as part of the regular curricula of the nautical schools.

Part of the four-and-a-half to nine-months pre-sea and post-sea programmes of the seaman apprenticeship schools is devoted to practical instruction in the theory of fire, types of fires, and the use of various types of extinguishers and other fire-fighting equipment. Refresher training in fire-fighting techniques is continued on board ship during the regularly held fire exercises.

Special two to four-week fire-fighting courses are given by naval establishments and municipal fire brigades for both officers and seaman ratings; training in these courses is primarily practical. Introductory explanations and demonstrations of fire-fighting theory and fire-fighting equipment are followed up by the trainees' participation in combating simulated shipboard type fires.

A special certificate in fire-fighting is awarded each graduate on completion of these courses, and it is these officers and seamen who comprise the fire-safety squads required to be organised on board French passenger and cargo ships.

An example of the main subject matter covered in detail in a typical fire course included in the programme of studies for a higher grade of deck or engineer officer certificate of competency is shown below. These fire courses for all officers are particularly comprehensive.

- (a) Ship construction features for fire-safety, and importance of fire security.
- (b) Fire prevention, fire detection and alarm systems, and fire watches.
- (c) Theory of fire and fire-extinction.
- (d) Types of extinguishing agents, characteristics and type of action.
- (e) Classes of fires and use of appropriate extinguisher.
- (f) Types of fire-extinguishing equipment and systems found on board ship, and techniques of use.
- (g) Fire-fighting respiratory apparatus and methods of use.
- (h) Maintenance and testing of fire-extinguishers, fire-extinguishing systems, and other fire-fighting apparatus.

Ghana

The deck and engineer cadets engaged in the two years of pre-sea instruction at the Nautical College are required to complete a comprehensive programme of instruction in both the theoretical and practical aspects of fire-fighting. Classroom studies of fire-detection and alarm systems and use of the various types of fire-extinguishers, hoses and nozzles, steam and carbon dioxide smothering systems and smoke breathing apparatus are complemented by practical fire-fighting training with a shore fire brigade. Further training is received in the use of fire equipment during the remaining four years at sea, upon the completion of which deck and engineer officer candidates are examined in this subject matter in accordance with standards laid down by the United Kingdom Ministry of Transport in order to qualify for their certificates of competency.

The syllabus for the shipboard training of ratings as able-bodied seamen ensures the acquisition by ratings of a broad knowledge of the proper use of the various fire-fighting

systems and fire-fighting apparatus in meeting emergencies aboard ship. Other ratings aboard ship receive instruction in fire-fighting techniques during the regularly scheduled fire and boat drills for all hands. All candidates for the certificate of able-bodied seamen are expected to understand basic fire-fighting principles and be able to use the various types of fire-extinguishing and related equipment.

Haiti

Instruction in practical marine fire-fighting is given to all seamen recruits during their 12 months of basic instruction at the Haitian Coast Guard Training Centre. Continued training aboard ship in fire-fighting techniques and in the use of the various types of fire-fighting equipment serves to keep both officers and crew efficient in handling fire emergencies.

India

The pre-sea training for deck officer candidates provided by the training vessel "Dufferin" includes theoretical instruction in the operation, use and maintenance of fire-fighting appliances and systems. Practical demonstrations in the handling and use of smoke helmets and various fire-extinguishers is provided and students handle this equipment during regularly held fire-fighting drills. In addition, field trips are made to sea-going ships in port for study of fire-fighting appliances and systems.

The seamanship instruction at the Nautical and Engineering College includes one hour per week of instruction in the practical use and maintenance of fire-fighting equipment, knowledge which is required for obtaining all grades of certificates of competency.

In order to ensure that life-saving appliances and fire-fighting equipment is maintained in good order and that crews of Indian vessels are efficient in the use of this equipment and properly conduct their duties at emergency stations, surveyors of the Mercantile Marine Department attend emergency drills conducted aboard ships in port. This is done prior to each voyage for foreign-going passenger ships, once a month for coastal passenger ships, and every three months for all cargo ships.

Ireland

Courses dealing with the theoretical aspects of fire-prevention, fire-detection and fire-fighting are provided for all students of the Irish Nautical College in training for original or upgraded certificates of competency as masters and mates.

These courses prepare students for an examination in fire safety which is required for the various certificates of competency.

Israel

The Ministry of Transport maintains a special fire-fighting and damage-control training section. All candidates for third and second mates' certificates and all candidates in training for the third engineer's certificate at the Maritime Training Centre are required to take a one-and-a-half day course at this section. The curriculum includes theoretical aspects of fires, fire-fighting, damage-control, and use of fire-fighting equipment; regulations regarding fire-fighting, equipment, and practical fire-extinguishing and damage-control exercises.

Candidates for all grades of mate's and master's certificate are examined orally in the theory of fire-fighting equipment, its use and maintenance. Master certificate candidates are comprehensively examined in fire-prevention, spontaneous combustion, knowledge of fire-fighting equipment and the limitations and dangers of each, the extinguishing of oil fires and the specifications of fire pumps.

Practical training in the use and maintenance of fire-fighting gear is given to personnel aboard operating merchant vessels during required and regularly held fire, boat and damage control drills.

Italy

Training in the use of fire-fighting appliances is acquired by seafarers during their sea service. No certificate is issued. It is considered that the knowledge acquired by seafarers in this way is adequate and sufficient, and that there is therefore no need to institute special training courses or refresher courses concerning these appliances.

Japan

The curricula of all pre-sea and post-sea maritime training institutions for merchant marine officers and ratings include comprehensive theoretical and practical instruction in the techniques of fire prevention, detection and extinction aboard ship. Students are trained in the use of the various types of fire-extinguishers and extinguishing systems installed aboard ship as well as related fire-fighting equipment.

No special fire-fighting training is provided for special categories of vessels. All maritime safety training is constantly under review by the Marine Technical Council of the Ministry of Transportation in order to maintain training at the highest standards.

Malagasy Republic

Officer candidates and apprentice seamen in training at the National Merchant Marine School receive 42 hours of instruction in fire-fighting and the use of fire-fighting equipment over a period of 28 weeks. The programme includes theoretical studies and practical exercises and covers the following topics:

- (a) Use of oxygen and fresh air breathing apparatus. Use of Schaeffer respiratory equipment.
- (b) Operation and use of steam and carbon dioxide smothering systems for holds and engine rooms. Operation of Grinnell and other types of automatic extinguishing systems.
- (c) Description of fire-detection systems.
- (d) Handling of foam, dry powder, carbon dioxide, and carbon tetrachloride fire-extinguishers. Recharging of foam and dry powder extinguishers.
- (e) Handling and stowage of fire hoses and use of various types of nozzles and hose equipment. Stowage of fire-fighting equipment.

Mexico

No specific information is available as to the training of Mexican seafarers in fire-fighting but it may be assumed that deck and engineer officer candidates are instructed in this subject at some stage of the fire-year curricula of the Vera Cruz, Mazatlan and Tampico nautical schools.

No pre-sea training in fire-fighting is available for seamen in Mexico; these seafarers are exercised and instructed in fire-fighting under the supervision of experienced officers during fire-drills customarily held on board merchant ships.

Morocco

The pre-sea training received by Moroccan officer candidates in French nautical schools includes instruction in practical fire-fighting. This instruction covers the principles of operation, practical use and maintenance of the various marine fire-extinguishers, and fire-extinguishing systems and equipment.

Practical exercises in the use of fire-fighting equipment are further provided during the apprenticeship periods at sea.

Officers' certificate of competency examinations require knowledge of fire-fighting techniques and equipment.

Netherlands

Instruction in fire-fighting and related equipment forms part of the two-year pre-sea curriculum of the nautical schools for deck and engineer officer candidates. Practical training in the use of this equipment is continued during the year at sea through the regularly held fire-fighting exercises.

Knowledge of causes, detection and prevention of fires and the handling and maintenance of the various components and systems of fire-fighting equipment is required for a certificate of competency as an engineer or deck officer. In each of the three successive stages of upgrading of their certificates of competency, deck and engineer officers are examined in fire-fighting knowledge along with the professional subject matter of the higher grade certificate. In this manner officer personnel undergo refresher studies of fire-fighting which enhance their knowledge of up-to-date fire-fighting techniques.

A council of shipowners, in co-operation with local fire brigades, provides courses in fire-fighting techniques for various categories of seafaring personnel. The teachers are fire-brigade experts.

New Zealand

A four-day fire-fighting course is offered every three months to all classes of seafaring personnel and harbour craft officers in a joint programme of the Marine Department and the Royal New Zealand Navy. Among the topics covered in this comprehensive programme are:

- (a) Theoretical aspects: conditions causing fires, types of fires common aboard ship and techniques of extinction.
- (b) Fire precautions and causes of fires aboard ship.
- (c) Damage control as related to fires and prevention of spread of fires; effect of flooding on stability.
- (d) Methods and apparatus for fighting shipboard fires. Different types of extinguishers for individual fires, spray jet and wall nozzles; handling hoses with foam connections; fire mains and hydrants, watertight and fire doors; smothering gas, sprinkler, detection and alarm systems in ships.

- (e) Maintenance of fire-fighting equipment, care of hoses, recharging extinguishers.
- (f) Action to take in smoke, fitting and use of breathing apparatus and smoke helmets; dangers in using breathing apparatus; methods of communication.
- (g) Training of crews in fire-fighting; organisation of fire teams; liaison between ship officers and shore fire brigades in cases of fires in port.
- (h) Nuclear explosions and fires and safeguarding of life in such instances.

Classroom studies of theoretical and practical aspects of fire-fighting include use of visual aids, and are supplemented by practical demonstrations in which students participate.

Norway

Students at the navigation and engineering schools receive both theoretical and practical training in marine fire-fighting systems, appliances and procedures and are examined in these subjects. Practical experience is obtained aboard the schools' training vessels and through a two-day course at local fire stations. No special qualifying certificates are issued to students.

Pakistan

Instructions and training in fire-fighting equipment are included within the framework of pre-sea training imparted to officer cadets at the Marine Academy, Chittagong, and of the general training imparted to ratings at the Seamen Training Centre in Karachi.

Since the Marine Academy started operation only in 1962, the training imparted there is sufficiently comprehensive and up-to-date. The syllabus and the training programme will be kept under constant review in order to bring them into line with technological progress.

Peru

Officer candidates in training at the Miguel Grau Maritime School receive theoretical instruction in fire-fighting techniques and equipment as part of a damage-control course. The fire safety training covers fire-detection alarms, gas smothering systems, automatic sprinklers, fire-extinguishers, and use of fire hoses and nozzles. This instruction is supplemented by subsequent practical training aboard ship.

Part of the general safety programme of the International Petroleum Company consists of weekly fire-fighting drills held aboard all vessels at sea, during which officers and ratings are exercised in the use of fire-fighting equipment. During each drill short lectures are given to officers and ratings in the use and maintenance of the following fire-fighting equipment: respirators, resuscitators, remote control carbon dioxide systems, steam smothering systems, portable fire-extinguishers and fire hoses and nozzles. Fire safety literature distributed and posted aboard ship by the safety departments of the shipping company serves to instruct crew members further in this subject.

Philippines

Advanced practical seamanship instruction of the Philippine Merchant Marine Academy includes studies of theoretical and practical fire fighting aboard ship and covers the various types of shipboard fire-extinguishing systems, fire-extinguishers, hoses and nozzles, fire detection and alarm systems and related fire-fighting equipment such as smoke helmets.

During their year of apprenticeship aboard Philippine merchant vessels and the two-month summer cruises aboard Philippine naval vessels, the cadets of the Academy are further instructed in practical fire-fighting techniques.

Rumania

Training programmes of the National Marine College leading to original, or to upgraded officers' certificates of competency include training in fire-fighting techniques and the use and maintenance of marine fire-fighting systems and equipment.

All certificate of competency examinations deal with practical fire-fighting subjects.

Ratings are trained in fire-fighting through practical experience and regular exercises held aboard ship.

Spain

Maritime training schools and facilities which train foreign-going deck and engineer officers, coastal vessel masters and mates, fishing-boat skippers and ratings, include in their curricula some instruction in practical shipboard fire safety. This instruction is provided as part of the training and knowledge required for the various certificates of competency and for providing competency in fire-fighting among ships' crew members.

In the near future, in order to broaden the scope of this training, the Ministry of Commerce plans to establish fire-fighting and safety training centres at all nautical and fisheries schools. Moreover, it is planned to offer courses for which special certificates of competency will be issued.

Sweden

The various nautical school training programmes for deck and engineer officer candidates, fishing-boat skippers, and experienced deck and engineer officers preparing for a higher grade certificate include theoretical and practical instruction in fire-fighting.

Classroom studies in such subjects as the chemistry of fire and techniques of fire extinction make use of visual training aids and demonstrations. Schools are provided with all the modern fire-fighting appliances commonly found on board ship, including smoke breathing apparatus. Students participate in demonstrations, and are exercised in the proper use, care and maintenance of these various pieces of equipment. This training prepares candidates for those parts of the examinations for certificates of competency which concern shipboard fire-fighting theory and practice.

In addition to the formal training provided for officers at the nautical schools, special four-day fire-fighting courses for active merchant navy officers are organised under the auspices of a Maritime Fire Prevention Committee. Consisting of two days each of theoretical lectures and practical exercises in the use of appliances, these courses have been specially designed for merchant marine officers. Included in the training are analyses of experience gained from fires which have occurred at sea, the commonest causes of fires on board, and national and international legislation concerning fire prevention at sea. Demonstration fires enable participants in the course to gain practical experience in the use of smoke breathing apparatus, fire-extinguishing equipment and extinguishing agents.

Instruction in the theory of fire, and practical use and maintenance of the various fire-fighting equipment and systems found aboard ship is also given to ratings during their 20-week pre-sea training at the seamen's schools. On board ship, additional knowledge and experience is gained during the regularly held fire and emergency drills.

In order to discharge their responsibility of ensuring that fire-fighting equipment supplied to ships and the training provided for seafarers meets the most advanced standards, the Maritime Fire Prevention Committee and administrations of nautical schools take account of new technical developments and of experience gained in fire-fighting by the maritime industry.

Thailand

Fire-extinguishing equipment fitted aboard merchant ships consists solely of fire-main systems using water hoses and nozzles, and portable and non-portable fire extinguishers. All crew members are regularly exercised in the practical use of this equipment through the fire and emergency drills which are required to be held on board at least once a month.

Turkey

Deck and engineer officers and all other crew members of passenger liners are required to complete a practical training course in the proper use and maintenance of fire-fighting equipment which is provided by a fire-fighting school ashore.

All crew members of passenger vessels are maintained in a state of fire-fighting training through attendance at fire-fighting exercises which are required to be held aboard ship at least once each week. During these exercises crew members are instructed in, and participate in the use of, the various types of modern fire detection, alarm and extinguishing systems and equipment which are fitted in these vessels.

United Kingdom

Fire-fighting training for merchant navy personnel is available at about nine different courses throughout the United Kingdom. Sponsored by city fire brigades, the Royal Navy, shipowners and other shipping interests, these courses for officers, apprentices, cadets and ratings of the merchant and fishing fleets are from one to three days' duration. Most of the courses are held either weekly or monthly at city fire brigades. Instruction includes theoretical aspects of shipboard fire-prevention and fire-fighting, instruction and demonstrations in the use and maintenance of the various types of fire-extinguishers and fire-fighting equipment, and participation by students in realistic fire-extinguishing exercises using smoke masks and other equipment. One major refinery in the United Kingdom runs a special two-day fire-fighting course for tanker personnel each month. Some shipowners give their engineers a three-day fire-fighting course with the Royal Navy.

Practical fire-fighting instruction is included in all pre-sea training courses for ratings, cadets and apprentices. The able seaman's examination requires basic knowledge of fire precautions and practical fire-fighting. Regularly scheduled fire and emergency drills held aboard British merchant ships exercise all crew members in the use of fire-fighting equipment in effectively combating fires.

Practical fire-fighting and proper use and maintenance of fire-fighting equipment and systems are included in all examinations for certificates of competency of all grades of merchant navy officers. The majority of engineering officers' courses include one or two days' training with the civil fire departments, at which time lectures and demonstrations in the use of fire equipment and the prevention and detection of fires aboard ship are given. Knowledge of the maintenance and use of fire-fighting equipment is tested on each occasion on which an officer sits for an engineering certificate.

The subject of fire-fighting is constantly under review by shipping authorities. The reasons for any fire casualty are always carefully investigated, and if necessary regulations are amended, or in less serious cases information and warnings are passed on to shipowners and ships' officers through Notices issued by the Ministry of Transport. Training schemes are revised in order to keep them up-to-date.

United States of America

The curricula of the six merchant marine academies include theoretical and practical instruction in fire-fighting prior to assignment of cadets to merchant vessels or training vessels. Consisting of about 40 hours' instruction, these courses are intended to provide an understanding of the design and function of fire and related emergency gear and skill in use of such equipment. Cadets study the construction, maintenance and use of various fire-extinguishing equipment, including steam, water and carbon dioxide systems aboard ship. Instruction is provided in fire detection equipment, alarm systems and the use of various types of breathing apparatus. This pre-sea training is intended to prepare cadets to participate in routine drills and emergency operations, to assist in the maintenance of fire equipment, and to make effective use of opportunities to observe and gain additional experience in fire-fighting when attached to a vessel.

To develop further confidence in the ability to successfully combat fires at sea, during the final year of their three or four-year training programme, cadets receive instruction in shipboard fire-fighting techniques at a naval fire-fighting school. Here all shipboard fire-fighting equipment is demonstrated and cadets participate in extinguishing large oil fires in confined shipboard spaces, using breathing apparatus in smokefilled compartments. For all seamen of the merchant marine the U.S. Navy Fire Fighting Schools at Bayonne, New Jersey and San Francisco, California, offer a two-day course in theoretical and practical fire-fighting.

Teams of students in proper fire-fighting attire extinguish very realistic shipboard type fires using a variety of fire-extinguishing and breathing equipment. A qualifying certificate is provided to all graduates of the course.

Apart from professional subjects, U.S. Coast Guard license examinations for deck and engineer officers include a section on shipboard fire-fighting, general safety precautions, and emergency procedures. Examinees not having the benefit of cadet or other formal maritime training, or desiring refresher studies, frequently enroll in various license preparatory schools in major U.S. ports for several weeks prior to their sitting for the examination. Operated by licensed officers' unions or private interests, these preparatory schools provide experienced officers or officer candidates with courses in fire-fighting techniques, use and maintenance of fire-fighting gear, and proper methods of dealing with other shipboard emergency situations.

Viet-Nam

A special fire-fighting course included in the second year of the two-year pre-sea training programme at the Merchant Marine School instructs student officers in the theory of fire-fighting and in the use of the various types of fire-extinguishing systems and appliances. Fifteen hours of theoretical study are devoted to causes and prevention of fire, detection of fire and alarm methods, and fire-fighting techniques, including maintenance of equipment. In co-operation with municipal fire authorities ten hours of realistic fire-fighting exercises are included in the course. In these exercises students encounter various types of fires and use appropriate extinguishing apparatus in addition to smoke helmets and other fire-fighting apparatus.

Practical training of student officers in fire-fighting is continued during the five years at sea by means of the fire exercises regularly held on board.

Candidates for certificates of competency as deck officer are examined in practical knowledge of fire-prevention and fire-fighting.

CHAPTER III

GENERAL PRINCIPLES AND METHODS OF MARITIME SAFETY TRAINING

A. SUMMARY

From the information set out in the previous chapter it is now possible to form a reasonably clear picture of the efforts being made throughout the world with a view to ensuring that seafarers responsible for the safety of merchant ships possess the competence and ability to operate and maintain in good order the various equipment and devices which are fitted on modern ships to protect life and limb under emergency conditions. Although the scope, contents and duration of the various training schemes may vary from country to country it is clear that basically the principles and also the training methods which govern maritime safety training are based on old established maritime practices and are essentially the same in all countries. The difference lies rather in the character of the training given, whether thorough and comprehensive or cursory and narrow, whether up-to-date or outmoded, and in the measure in which sustained and co-ordinated efforts are made in each country to provide training to all levels of the seafaring population.

Organisation

Basic or initial maritime safety training is as a general rule given within the framework of training that prepares officers and ratings for certificates of competency. In many countries it is a formal condition for obtaining a certificate of competency that the candidate should have successfully undergone training in certain navigational aids and life-saving devices, and the general maritime training institutions also have the responsibility for imparting safety training.

A few countries including Congo, Haiti, Morocco and Switzerland, utilise the training facilities of other countries, while Thailand relies entirely on practical on-the-job training on board operating merchant vessels.

Where formal training schemes have been introduced, these are often characterised by the variety of the types of schools and establishments providing the training.¹ In some countries

¹ See for example: "Vocational Training for the British Merchant Navy" by I.A. Gunn, in International Labour Review, Vol. LXXIX, No. 2, February 1964, pp. 166 et seq.

the industry itself has taken the lead; in other countries most maritime training is entirely provided by the government or by government-sponsored organisations. Also manufacturers of various kinds of navigational equipment contribute to the training effort by providing instruction in the use of their equipment. In all countries, however, the government has a hand in drawing up the requirements for obtaining the various certificates of competency and retains the exclusive authority for the issuing of these.

Examinations are conducted by government officials or under the supervision of governmental authorities who are also charged with the responsibility of ensuring that the organisation and operation of the training schemes are in conformity with the laws and regulations governing maritime vocational training.

Often, as is commonly known, advisory training boards or committees have been established by the government to provide expert advice and assistance in all matters pertaining to the training of seafarers. These bodies, which in addition to government officials are generally made up of representatives of owners and seafarers and individual training experts, co-ordinate the various training programmes by maintaining contact between the individual training institutions, and adjust the training efforts to the industry's over-all requirements for the different categories of skilled manpower. In many countries, these bodies assist in setting up practical training programmes, disseminate information about existing training programmes, and propose measures designed to attract suitable recruits to the maritime industry; they also establish training syllabi and examination requirements, review training programmes to ensure that they are constantly related and in tune with technical progress, and study arrangements for the placement of the candidates having received training in the various institutions.

Duration and Contents of Training in Aids to Navigation

1. Radar

Practically all the countries which replied to the questionnaire indicated that they provide both theoretical instruction and practical training in radar for deck officers; a few, such as Colombia, also include fundamental knowledge of radar in the basic instruction given to ratings. Some countries did not specifically cite radar instruction, but indicated that training given to deck officers covered all aids to navigation. Other countries, including the Philippines, Spain and Thailand, stated that they have plans for a complete overhaul of their maritime training programmes.

Radar training is usually included in programmes leading to deck officers' certificates of competency. In addition, special short-term radar observer courses for the training of experienced deck officers who may not have received previous radar training, are given in a number of countries including Australia, Belgium, Canada, Denmark, Finland, India, Ireland, Israel, Netherlands, New Zealand, Turkey, the United Kingdom and the United States. With the exception of Finland and Israel, these courses lead to the issuing of radar observers' certificates or similar endorsements attesting to training received and proficiency in radar operation. In France, Norway and the United Kingdom, for example, radar certificates may also be issued on the basis of training received in connection with examinations for advanced levels or categories of certificates of competency. In the United Kingdom, in particular, possession of a radar observer's certificate is a condition for obtaining a navigating officer's certificate of competency.

Short-term courses are also provided in radar simulator training. In the Netherlands and the United Kingdom, for example, this training, which is given to masters and senior navigating officers, is intended to exercise those in direct charge of vessel manoeuvres in realistic ship-handling situations as portrayed on the radar screen. The advantage of the simulator is the ability to simulate realistically the radar view of a situation in which action must be taken to avoid a collision, and to show the effects of the action taken.

Provision has also been made in a few countries for the instruction of officers in radar maintenance. Since electronic equipment may frequently require adjustments and corrections to function properly, the importance of having on board personnel capable of taking the necessary corrective action should not be underestimated, and it may be asked if more emphasis should not be put on radar maintenance training in the various countries.

Training by correspondence courses in various aspects of radar operation and maintenance is available to seafarers in certain countries such as the United Kingdom and the United States. These courses combined with routine operation of equipment on board ship represent a simple, yet effective method, of training seafarers.

As regards the contents of radar training programmes, most countries indicate that their radar training courses cover the theory, operation and practical use of radar, both as a navigational aid and as an anti-collision device. Detailed descriptions of the exact contents of radar courses given to deck officers have been provided by Belgium, France, India, Israel and the United Kingdom. Several countries forwarded examination syllabi for deck officers' certificates of competency, indicating the scope of knowledge for which radar training prepared candidates.

An example of the comprehensive coverage of radar operation and practical use given during the training of deck officers leading to certificates of competency is given by the examination syllabus for second mate (foreign-going) in Canada. The syllabus includes training in:

1. Basic radar principles as follows:

- (a) a simple understanding of the principles of range and bearing measurement by radar;
- (b) an elementary understanding of the electronic principles involved in marine radar;
- (c) a simple understanding of the principles of pulse transmission and reception, and the measurement of short time intervals by means of a cathode ray tube;
- (d) an understanding of the display and its controls with emphasis on the aspects which an observer needs to understand in order to obtain best results;
- (e) an elementary understanding of the methods of aerial rotation and synchronisation;
- (f) an elementary understanding of the production of the heading marker, calibration rings, variable range marker, and the electronic cursor;
- (g) an elementary understanding of the propagation of radar waves and factors within the set itself which affect performance;
- (h) a knowledge of siting precautions and the possibilities of interference with other devices; and
- (i) a knowledge of the functioning of a radar set as illustrated by block diagrams.

2. Interpretation of the display and limitations of radar, including:

- (a) the comparison of radar vision and ordinary vision and the value of clear weather practice;
- (b) the effect of the earth's curvature and the effect of wavelength on maximum range;
- (c) the effect of size, shape, aspect and composition of the target on detection range;

- (d) the factors affecting minimum range and range discrimination;
- (e) the factors affecting bearing discrimination;
- (f) the characteristics of echoes likely to be of value;
- (g) the causes and dangers of shadow areas, blind arcs and reduced signal arcs;
- (h) the causes, characteristics and dangers of reflections from the ship's superstructure, false and indirect echoes, multiple echoes, side lobes and interference; and
- (i) the detection of movement.

3. Effects of weather on radar performance and display, including:

- (a) the effects of wave clutter;
- (b) the effects of precipitation of all types;
- (c) the effects of fog, mist, smoke and dust or sand in suspension;
- (d) the detection range and echo characteristics of ice of all types and the intelligent use of radar in ice;
- (e) the effects of horizontal and vertical temperature distribution upon radar propagation;
- (f) non-standard propagation including propagational ducts; and
- (g) the characteristics of second trace returns.

4. The use of radar in position fixing with particular reference to:

- (a) the use of range and bearing and the application of plotting methods;
- (b) the effect of topography on off-shore fixing;
- (c) the comparison of range scales with chart scales and the methods of chart comparison including the use of radar mosaiques; and
- (d) radar aids such as corner reflectors, ramarks and racons.

5. The use of radar as a collision warning device, including:

- (a) a sound understanding of the difference between true motion and relative motion;
- (b) the recognition of the collision hazard;
- (c) a clear understanding of the necessity for following a proper plotting procedure when using radar as an anti-collision device;
- (d) the ability to plot and make intelligent use of the information made available by plotting;
- (e) an appreciation of the limitations and inaccuracies inherent in plotting;
- (f) a knowledge of the methods of plotting available including the use of plotting aids;
- (g) a knowledge of the radar plotting terms as published by the Department of Transport; and
- (h) an appreciation of the responsibilities of a radar equipped vessel.

6. The purpose and contents of the radar log, including:

- (a) the responsibility for keeping a proper log;
- (b) its use in checking performance; and
- (c) its use as an aid in recognising distinctive coastal features recorded therein.

7. Period checks which should be carried out, including:

- (a) the routine checking of performance;
- (b) the proper use of an echo box or performance monitor;
- (c) the use of the heading marker to check synchronization of scanner and trace; and
- (d) the correct centring of the display.

8. Correct procedure for switching on and off.

9. Correct procedure for adjusting display controls, and the effects of maladjustment.

10. Correct use of additional circuits, including:
 - (a) the sensitivity/time control (S.T.C.) circuit;
 - (b) the discrimination circuit or fast time constant (F.T.C.) circuit; and
 - (c) the expand centre circuit.
11. The true motion type of display, including:
 - (a) a general understanding of how the true motion display is achieved;
 - (b) an elementary knowledge of the purpose and action of the trackmaster unit;
 - (c) a knowledge of the effects of maladjustment of the trackmaster unit;
 - (d) a knowledge of the effect of tidal stream or current upon the adjustment of the trackmaster unit;
 - (e) a knowledge of the effects of off centring;
 - (f) a knowledge of the use of the electronic cursor and the mechanical cursor;
 - (g) a general understanding of the effects of range scale, target speed and the tube persistence on the afterglow tail of a moving target;
 - (h) a knowledge of the effects of gyro stabilization of display; and
 - (i) the method of assessing the collision hazard including the aspect, course, speed and closest approach of a target vessel.

In most countries the contents of the special short-term radar courses for deck officers is much less comprehensive, and the approach is essentially non-technical. The period of training generally varies from ten days to two or three weeks. An example of the contents of a two-week radar observer's course for experienced deck officers is given below. The course, which is currently conducted in the United Kingdom, is intended to train officers in the use of radar as an aid to navigation. The emphasis is on navigation and making the best use of the display. The syllabus is intended to apply equally to any type of merchant navy radar equipment.

Part 1

A. Fundamental Principles

Explanation of the principles of radar; how range is determined by measurement of elapsed time between transmission and reception of pulses; determination of bearing by directive transmission and reception; characteristics of the set minimum range, range discrimination and bearing discrimination. Non-technical description of the radar set with emphasis on a description of the P.P.I. type of display and its associated range and bearing measuring systems, the heading marker, etc. Explanation of the factors concerned with the set which determine whether or not echoes will be displayed and of factors which affect the maximum detection ranges of targets.

B. Adjustment of Operational Controls

Functions and effects of operational controls, importance of proper adjustment and dangers of maladjustment.

Practical experience in starting and stopping of the equipment and the need for observing the delays which occur before the equipment becomes fully operational. Adjustment of operational controls and methods of checking whether or not controls are properly adjusted (a) controls which affect detection ranges of targets and (b) controls which affect accuracy of information.

C. Interpretation of the display

- (a) Shore targets; coastlines, hills, built-up areas, etc.; effects of topography, composition, height, shape, etc. Radar conspicuous objects, relating the display to features shown on the navigational chart;
- (b) Ship targets; effects of size, shape, aspect and composition on echo characteristics and detection ranges;
- (c) Factors which affect the detection ranges of targets; radar horizon, sea-clutter, rain, snow, shadow sectors, etc.
- (d) Factors which might cause faulty interpretation of the display; false echoes, multiple echoes, side lobes, etc.

D. Detection of Movement

Movement of target echoes on a radar display:

- (a) Stationary target on display of moving ship;
- (b) Moving target on display of stationary ships;
- (c) Moving target on display of moving ship.

Distinction between stabilised and unstabilised displays.
Relationship between visual and radar sightings of targets.
Relative accuracy of visual and radar ranges and bearings.

E. Radar Plotting

The principles of relative and true plots. Recognition of target movement and measurement of aspect, nearest approach and course and speed of the observed vessel. Exercises in practical radar plotting, and the measurement of aspect, nearest approach and time to nearest approach.

Part 2

This part of the course is of four days' duration and is followed by a written and practical examination on the fifth day.

A. Interpretation of the Display

A fuller theoretical treatment of the subjects contained in Part 1 under this heading together with demonstrations on the equipment and practical exercises in interpretation of the display. Effects of super and sub refraction, second and multiple trace returns, ice detection ranges. Siting of the aerial and its effects on the display; detection ranges, false echoes, side lobes, shadow sectors, effects of aerial height. Methods of eliminating ghost echoes and methods of avoiding the effects of shadow sectors etc. Chart comparison units. Aids to interpretation of the display, corner reflectors, remarks, racons etc. Radar log keeping as an aid to keeping a check on performance, set characteristics and characteristics of echoes of targets encountered.

B. Practical Exercises

Measurement of ranges and bearings, relative accuracy etc., effects of maladjustment of heading marker, checking accuracy of heading marker and range markers. Checking accuracy of ranges and bearings. Checking set performance by use of performance monitor. Effects of operational controls on set performance.

C. Radar Plotting

A fuller treatment of the true and relative plots than was given in Part 1 of the course. Effects on plot of alteration of course by own and/or target vessel, effects of alterations of speed by own and/or target vessel. Determination of set and drift of tidal stream by plot of fixed target. Continuation of plot through alterations of course and/or speed by own vessel. Effects on the plot of recurring small alterations of course. Description of the various aids to plotting.

D. Exercises in Practical Radar Plotting

Working of examples of plots containing fixed and moving targets, with alterations of course and/or speed. Working of examples containing examples of the effects of tides and currents.

Use of Plotting devices, R.A.S. plotter, Locatorgraph, Deccaplot, etc., Plotting Charts.

2. Radio Direction-finder

All countries with established maritime training facilities indicated that they provided training in the theory and use of the radio direction-finder. This training is generally given in preparatory courses for both original and up-graded certificates of competency, and examinations for the latter certificates usually require knowledge of the use of this aid to navigation. Training programmes for ratings seldom include more than a brief description of this apparatus.

Countries which described their syllabi of instruction in the radio direction-finder for original deck officer certificates of competency are Colombia, France, India, Morocco, and Viet-Nam. The contents of this training generally includes the following subject matter:

1. Description of equipment
2. Principles of operation
3. Determination of sense
4. Types of aerial systems
5. Principal errors and their causes:
 - (a) phase difference;
 - (b) errors caused by surroundings;
 - (c) sunrise, sunset and coast effects;
 - (d) other errors.
6. Methods of error correction
7. Practical operating instructions:
 - (a) interfering conductors;
 - (b) homing on stations;
 - (c) reading bearings, obtaining data, and plotting position;
 - (d) accuracy of radio bearings;
 - (e) adjustment of equipment;
 - (f) maintenance of apparatus.

8. Calibration:

- (a) on first installation;
- (b) change of position of aerial;
- (c) changes in ships' structure;
- (d) annual calibration checks.

9. Radio beacons and radio direction-finding stations.

The training usually consists of both classroom theoretical studies and practical instruction and exercises with equipment in nautical school laboratories or on board training vessels. Moreover, training is generally given in stages, that is, first-year students are instructed in fundamental principles of equipment and the basics of its practical use, while the more sophisticated aspects such as knowledge of electrical circuits, analyses of errors, plotting of position and maintenance of equipment, is received in advanced training courses in such subjects as navigation, and electronics. At the end of the training programme trainees have a thorough knowledge of the radio direction-finder, and enabling them to pass examinations in this subject for certificates of competency.

Several countries, including Australia, Belgium, Canada and the United Kingdom, described the knowledge of this apparatus required by examinations for certificates of competency in the various grades of deck officers. These examinations usually stress knowledge of the practical application of the direction-finder as an aid to navigation. They also deal with such practical aspects as correct operating procedures, causes of erroneous readings, and servicing of apparatus. Consequently short-term training programmes for a higher grade of certificate of competency usually focus on the practical use of this equipment.

In no country is a special diploma or endorsement issued certifying proficiency in the use of the direction-finder or completion of training in this equipment.

3. Decca, Loran, Consol

Nearly all the countries which replied to the questionnaire stated that their maritime training programmes for officer candidates included theoretical instruction in the Decca, Loran and Consol systems.

Eight countries require knowledge of these systems for the various grades of certificates of competency. In these cases, training programmes for experienced deck officers preparing for promotion examinations include both theoretical and practical instruction in these three navigational aids.

Practical training in the Decca, Loran and Consol systems is not so widespread. This may be for three reasons. In the first place the vessels of some nations may not be fitted with all or any of these aids to navigation, primarily because their ships may not normally ply those ocean areas where these systems can be used. The Consol system, for example, is restricted to ocean areas between Spain and Norway.

Secondly, apart from observation of apparatus and training in its manual operations, practical instruction in the navigational use of these electronic aids requires the possession of simulating equipment. Simulators are expensive and require highly qualified instructors, and preferably experienced and active deck officers as students. Moreover, this training is only of a few day's duration and therefore a sufficient volume of potential trainees must be on hand to make the establishment of this training on a permanent basis worthwhile.

Finally, Loran and Consol are not intended primarily as location systems for marine navigation, but rather for aviation which requires longer ranges but less demand for accuracy. It is possible that the degree of radio location accuracy achieved with these two systems has influenced their limited acceptance by merchant navies. Consol is usually more accurate than the radio direction-finder, however, and it is used extensively by fishing fleets. Moreover, a great advantage of the Consol system is that it requires only a normal receiving apparatus which is usually already installed on board merchant ships; such a receiver can very easily be fitted in lifeboats, and this reason alone would justify training of seafarers in its use.

Only Belgium, France, Ireland and the United Kingdom have realistic training with Consol simulators. Norway expects to have this type of training available in the near future.

At least eight countries provide training in Decca and Loran with simulators, but not necessarily the same countries in each of these systems. For example, Denmark, Finland and India give practical training in Decca but not in Loran. On the other hand, the Republic of China, the Philippines and the United States give simulator training in Loran but not in the Decca system.

With the exception of Belgium and France, only general descriptions of the contents of training courses in Decca, Loran and Consol were provided by the countries. No comprehensive syllabi under actual implementation can therefore be cited.

Training in radio location aids to navigation might cut across a variety of basic and advanced courses for future officers in electronics, navigation and seamanship given during their attendance at general training schemes. No attempt has therefore been made to describe in detail the contents of actual courses in these subjects.

4. Gyro-compass and Autohelmsman

The almost universal application of the gyro-compass on board ship has made training in its theory, operation and practical use a standard condition in practically all maritime nations. For the same reason, almost all countries require knowledge of the autohelmsman, usually an auxiliary mechanism of the gyro-compass as installed in most modern vessels.

With the exception of Pakistan, Rumania and Spain, which did not specify gyro-compass training, all countries with ocean-going vessels and providing maritime training, include instruction in gyro-compass systems for officer candidates. Moreover, in these same countries, knowledge of the gyro-compass is usually required for both original and higher grade deck officer certificates of competency, and preparatory training programmes for examinations for certificates of competency include refresher training in gyro-compass systems.

Some countries did not specifically indicate that training is given in the autohelmsman, but it may be assumed that such training is provided.

A few countries, among which are Belgium, Colombia and France, provide instruction in the operation of the gyro-compass as part of the basic seamanship courses in pre-sea programmes for ratings.

The United Kingdom and the United States are the only two countries which have special short-term courses in gyro-compass systems for experienced deck officers, the United States programme in addition granting a gyro-compass certificate to graduates of the courses.

Most countries are able to provide gyro-compass instruction, which includes demonstrations and trainee participation in the operation of actual equipment. This is made possible by the common installation of gyro-compass systems on board training vessels and in nautical schools. Many countries are able to provide instruction in the gyro-compass at sea during training cruises of officer candidates.

An example of the subjects covered by courses in the operation of the gyro-compass given in many national nautical schools to officer candidates is set out in the following list:

1. Theoretical principles of the free gyroscope:
 - (a) effect of earth's rotation
 - (b) tilt and drift
 - (c) precession
 - (d) gravity control
 - (e) damping.
2. Errors and their correction:
 - (a) course and speed error - causes, effects, correction
 - (b) latitude error - causes, effects and correction
 - (c) ballistic deflection and its relation to course and speed error
 - (d) rolling error - its causes, effects and methods of minimising.
3. Gyro-compass systems and construction features:
 - (a) types of gyro-compass systems and methods of allowing for errors - Sperry and Brown systems
 - (b) gyro compass repeating systems - principles of operation and major parts
 - (c) autohelmsman systems - principles of operation and major parts.
4. Operation and maintenance:
 - (a) gyro-compass
 - starting
 - stopping
 - routine oiling, cleaning and inspection
 - (b) electronic components
 - (c) repeaters
 - (d) autohelmsman
 - engaging and disengaging
 - routine inspection and maintenance

5. Magnetic Compass

Training for both officers and ratings in the theory and practical use of this basic aid to navigation is considered of fundamental importance in all countries. Nearly all replies indicated that training for deck officer candidates includes instruction in the magnetic compass. Theoretical instruction is often given in pre-sea courses, and is usually supplemented by practical demonstrations and exercises on actual equipment, with which nautical schools are supplied. Moreover, some nautical schools such as those in Japan and the United States utilise special steering training devices which exercise students in navigation by compass.

In the Republic of China, 40 hours of pre-sea instruction are devoted exclusively to the magnetic compass, whereas in the Malagasy Republic 56 hours of instruction are divided between the magnetic compass and the echo-sounder.

On board training vessels, future officers gain additional experience in the practical use of the compass. Their knowledge of this basic aid is tested in both school course examinations and examinations for certificates of competency upon the completion of formal training.

Examinations for certificates of competency for all grades and categories of deck officers serving on ocean-going ships, coastal craft, fishing boats and other small craft, usually require knowledge of the compass. Countries which provide training programmes for experienced officers preparing for a higher grade of certificate therefore generally include in these programmes instruction in the magnetic compass. For example, a course comprising 50 lectures on the compensation and adjustment of the magnetic compass is taken by candidates for masters' certificates in Israel. In Finland a special certificate as a qualified instructor of compasses is issued to masters having sufficient compass survey experience. In Canada, a special endorsement in compass deviation is issued to holders of foreign-going masters' or mates' certificates who pass a special examination covering theoretical and practical aspects of magnetism.

Those countries which have training for ratings generally include basic instruction in the magnetic compass as part of the pre-sea training. Belgium, France, Japan, the Malagasy Republic and the United Kingdom, for example, give this instruction at nautical schools for ratings, whereas in Colombia and Haiti compass instruction is given in connection with coastguard or naval training. Other countries such as Ghana, Israel, Peru and Thailand indicated that ratings are instructed in the use of the compass by formal instruction on board or through practical experience at sea.

In some countries, able-bodied seamen candidates are required to be competent in the use of the compass, and examinations for certificates generally ensure this proficiency.

6. Echo-sounder and Radio Telephone

The majority of countries indicated that training given to officer candidates in aids to navigation included instruction in the echo-sounder, and that questions concerning this apparatus were included in examinations for the various categories of original and up-graded deck officers' certificates of competency, including fishing-boat skippers. Nevertheless, there are a number of countries having maritime training programmes which did not specify whether or not instruction in the echo-sounder is given. Thailand and Turkey stated that such training was definitely not provided.

Generally, training in the echo-sounder is included in electronics and navigation courses given to officer candidates in the course of their certification training. Training is usually provided in nautical schools which utilise echo-sounders installed in school laboratories and training vessels for practical instruction. For example, in Argentina the 102 hours of instruction in radio-electricity, and 68 hours in the electronics laboratory, include training in echo-sounder and high frequency radio telephone. In the United States similar courses are given to officer candidates. In the Republic of China instruction in the echo-sounder at the state nautical school includes 12 hours of theory, four hours of practical operation, and four hours of service and maintenance. In a few countries, such as Peru, all training is given on board operating merchant ships.

Instruction for experienced deck officers consists of refresher training, usually with emphasis on practical use of the equipment as a navigational aid, as required for certificate examinations.

In Colombia and Haiti, where former naval ratings are an important source of merchant navy manpower, instruction in the echo-sounder is given to ratings in connection with their official naval duties. In the Malagasy Republic, a 56-hour navigation course for apprentice merchant navy seamen includes about 30 hours of instruction in the practical use of the magnetic compass and echo-sounder. No other country stated that it provided instruction in the echo-sounder specifically for merchant navy ratings.

Formal training of officer candidates or deck officers in the use of the radio telephone is not widespread, although in many countries, such as Belgium, France, the United Kingdom and the

United States, theoretical and practical knowledge of this apparatus is acquired in electronics and navigation courses given at nautical schools. Generally speaking, examinations for deck officers' certificates of competency do not require knowledge of this aid to navigation.

In some countries, such as Australia and Finland, use of the radio telephone is a collateral duty of radio officers, who have received special training and certification in the use of this apparatus.

In the United Kingdom and the United States, manufacturers of marine radio telephone equipment often provide practical instruction to officers of vessels in which the manufacturer's apparatus has been installed. Instruction manuals and other descriptive literature distributed by manufacturers also serve to instruct officers.

Duration and Contents of Training in the Use of Life-Saving Appliances

The importance which is attached in the different countries to this kind of safety training is illustrated by the comprehensive character of the instruction given and the range of personnel trained. Thus, all officers' training courses include extensive theoretical instruction and practical training in the use of life-saving appliances, although in many countries the training of navigating personnel is more thorough and comprehensive than that of engineer officers. Formal pre-sea training programmes for ratings in many countries, including Belgium, Canada, Denmark, Finland, France, Ghana, Ireland, Israel, Japan, the Netherlands and the United Kingdom, also cover both theoretical instruction and practical training in the use of life-saving appliances, while in Argentina, Australia, Colombia, Italy, and Thailand, ratings acquire the necessary training during their sea service, either by participating in the prescribed emergency drills or by following also short lectures delivered by one of the deck officers on board ship. In some countries, pre-sea training of ratings, which includes also safety training, is given only to deck and engine-room personnel, while catering department personnel are trained on board ship; in the United States, safety training is on a voluntary basis for ratings.

Training imparted in the nautical schools is almost invariably practical as well as theoretical; nearly all the schools are equipped with lifeboats, davits, liferafts, line-throwing apparatus etc., on which students carry out their practical exercises.

The amount of time devoted at school to the instruction of students in the use of life-saving appliances varies considerably. For example, officer candidates in Argentina receive 48 hours of theoretical and 15 hours of practical instruction during their vocational training; in Belgium, cadets receive safety training for two hours per week during a period of three years; in France, cadets are trained in safety during the two-year pre-sea courses, and complete their instruction during their service at sea, while the nine-month pre-sea training for ratings includes 180 hours of safety training; in Israel, ratings are instructed, for 100 hours, in the handling of small boats; in Japan, cadets receive safety instruction for 210 or 105 hours, and ratings for 160 hours; in Norway, 40 hours of training in the use of life-saving appliances are necessary in order to obtain the second mate's certificate; in Pakistan, training to ratings lasts for three months and includes safety training.

A lifeboatman's certificate is issued to officers and ratings, who have passed the required examination, in Australia, Belgium, Canada, Denmark, Finland, France, India, Ireland, Israel, Japan, Pakistan, Rumania, Turkey, the United Kingdom and the United States. In many instances the holding of this certificate is a requirement for obtaining an officer's certificate of competency or the able seaman's certificate.¹ Officers and ratings generally qualify for the lifeboatman's certificate upon the successful completion of pre-sea or upgrading training programmes at nautical schools. But in a few countries, special short-term boat-handling courses leading to the certificate are given for officers and ratings. In still other cases, lifeboatman certificates are issued to crew members who have demonstrated, before a maritime inspector, their knowledge of lifeboats and proficiency in handling the lifeboats of their ship.

Qualifications for a lifeboatman's certificate always require proven proficiency in the following operations:

1. Participation in and taking charge of the preparation, swinging out and lowering of a lifeboat and getting the lifeboat away from the ship.
2. Pulling oars and steering, and acting as coxwain.

¹ As regards the able seaman's certificate, the Certification of Able Seamen Convention, 1946, provides that the prescribed examination shall be such as to qualify a successful candidate to hold the special lifeboatman's certificate provided for in the International Convention for the Safety of Life at Sea.

3. Knowledge of the details and use of lifeboat equipment, including compass, sails, sea anchor and distress signals.
4. Ability to understand and carry out the orders commonly used in lifeboat operations.

In nearly all countries, boat-handling courses also include practical instruction in the use and maintenance of the various other life-saving appliances found on board, such as liferafts, lifebuoys and lifejackets. Detailed instruction and exercises in the use of line-throwing apparatus is normally given only to deck officers or deck ratings.

The following list of subjects illustrates the contents of a typical course of instruction in boat-handling and life-saving appliances for officers and ratings:

1. Regulations in force relating to life-saving appliances on board passenger and cargo vessels:
 - (a) lifeboats and liferafts
 - construction
 - carrying capacities and number carried on board
 - equipment carried
 - (b) lifejackets and lifebuoys
 - (c) line-throwing appliances
 - (d) practice drills and musters.
2. Types of life-saving appliances, their construction, and operational features:
 - (a) lifeboat davits
 - (b) lifeboats
 - wooden
 - metal
 - manual propulsion
 - motor propulsion
 - (c) liferafts
 - rigid
 - inflatable
 - (d) equipment carried in lifeboats and liferafts

- (e) lifejackets
- (f) lifebuoys
- (g) line-throwing apparatus
 - Lyle gun
 - line-throwing rocket.

3. Life-saving operations:

- (a) launching and hoisting of lifeboats with various davits
- (b) abandoning ship:
 - proper use of lifejackets
 - embarking passengers and crew into boats
 - lowering boats
 - jumping into water and improvising floats from clothing
 - rescue from the water
 - action to be taken in case of burning oil on the sea
- (c) handling of lifeboats
 - getting away from the ship
 - handling under sail, oars or motor
 - navigating and determining landfalls
 - making landings
 - coming alongside.
- (d) launching and handling of rigid and inflatable liferafts
 - inflation and proper use of inflatable liferafts
- (e) use of line-throwing apparatus
- (f) man overboard
 - using lifebuoys
- (g) use of distress signals
 - hand flares
 - parachute flares
 - signalling mirror
 - smoke signals
 - radio equipment

(h) survival at sea:

- medical problems and use of first-aid kit
- food from the sea.

4. Stowage, maintenance, inspection and testing of life-saving appliances:

- (a) lifeboat davits, lifeboats and lifeboat equipment
- (b) liferafts and liferaft equipment
- (c) lifejackets
- (d) lifebuoys
- (e) line-throwing apparatus.

Duration and Contents of Training in the Use of Fire-prevention and Fire-fighting Devices

Practically all countries indicated that their training programmes for deck and engineer officer candidates provide instruction in the theoretical and practical aspects of fire-fighting. This training generally includes practical instruction, either with the help of school facilities, on board training vessels, or through special short-term courses sponsored by naval stations or municipal fire brigades.

In Israel, the Ministry of Transport operates a special fire-fighting station which conducts a one-and-a-half day practical course which is mandatory for all officer candidates. Italy and Thailand stated that no type of fire-fighting training ashore is made available to any category of seafarer.

The duration of theoretical training given to officer candidates varies from 30 hours in the case of Argentina to 60 hours in the Republic of China. In the Malagasy Republic, for example, 42 hours of training are given. The duration of practical demonstrations and exercises at fire-brigade stations or other special fire-training institutions varies in the different countries; two to four-day courses are given in Argentina, Denmark, Norway, the United Kingdom and the United States, whereas in France this practical training lasts from two to four weeks.

Fire safety training for officer candidates is generally comprehensive, and includes theoretical aspects of fire, detailed descriptions of fire-fighting apparatus found on board, and fire-fighting techniques, in addition to practical exercises in the use and maintenance of equipment.

In most countries, examinations for all grades and categories of original deck and engineer officers' certificates of competency include questions in practical fire-fighting.

Fire-fighting training for experienced officers is conducted in Belgium, Canada, Denmark, Finland, France, India, Ireland, Japan, the Netherlands, Sweden, Turkey, the United Kingdom and the United States. This training is usually provided either in nautical school programmes preparing officers for a higher grade of certificate, or in special short-term courses conducted at naval stations or municipal fire brigades which are intended to improve proficiency in fire-fighting. In some countries theoretical studies at nautical schools are supplemented by practical exercises with fire brigades. In Israel and New Zealand, the Ministry of Transport maintains a special fire-fighting training station for officers and ratings, and in the United Kingdom a large tanker firm offers a two-day course for its officers. Turkey provides a special short-term fire-fighting course ashore for all officers and ratings of passenger ships. In Denmark and Sweden, special fire-fighting courses for masters and mates are sponsored by special committees of the maritime industry. Nearly all of these short-term practical courses include exercises in the extinction of demonstration fires, the use of smoke breathing apparatus and of various fire-extinguishing appliances commonly found on board.

Examinations for higher grades of deck or engineer officers' certificates of competency in practically all countries require knowledge of fire-fighting on board ship.

Pre-sea training in fire-fighting for ratings is given at nautical schools in Belgium, Denmark, Finland, France, Japan, the Netherlands, Spain, the United Kingdom and the United States. Instruction usually covers theoretical fundamentals of fire-prevention and fire-fighting, as well as practical use of the various fire appliances found on board. Instruction on board school training vessels is a common method of providing practical knowledge and enabling students to participate in demonstrations of equipment and in fire-fighting exercises.

Most countries which do not provide formal fire training for ratings, such as Argentina, Australia, Burma, Colombia, India, Israel, Italy, Mexico, Peru, Philippines, Rumania and Thailand, indicated that ratings were instructed in fire-fighting techniques and use of equipment on board ship. These countries point out that the regularly scheduled fire drills held on board, and the instruction given by ships' officers, serve to train ratings in fire-fighting techniques and the proper application and maintenance of the various fire-fighting appliances and systems.

Training in fire-fighting for experienced ratings is provided in many countries, often as voluntary courses for self-improvement. Belgium, Czechoslovakia and Ghana offer this training as part of the training leading to the able seaman's certificate. In France, a special two to four-week practical course is offered to both officers and ratings leading to a special ship fire-squad certificate. Other countries having fire-fighting training for experienced ratings are: Haiti, Japan, Netherlands, Turkey, the United Kingdom and the United States. In Ghana this formal training is conducted on board ship, but in most countries courses of from three days to two weeks' duration are provided through the co-operation of naval training facilities or municipal fire brigades. In the United Kingdom there are nine such training facilities in continuous operation.

In a number of countries, such as Turkey and the United Kingdom, private shipping lines provide short fire-fighting courses ashore for ratings employed on their ships. In a few others, such as the United States, private schools preparing ratings for examinations for certificates of competency as officers, include fire-fighting subjects in their curricula.

Fire-fighting training for experienced ratings usually combines classroom lessons and demonstrations in the theory of fire, types of fire-extinguishing and fire-fighting equipment found on board ship and the proper use and maintenance of this equipment, with exercises in the use of appliances in extinguishing simulated shipboard type fires.

The following list of subjects illustrates the contents of a typical fire-fighting course for officers or ratings as provided in fire-fighting training programmes of numerous countries. Theoretical instruction is usually supplemented with practical demonstration of equipment, and often by exercising students in the extinction of fires similar to those occurring on board ship.

1. Theory of fire:

(a) Chemistry of combustion

- fuel, ignition temperature, oxygen
- the spread of fire by radiation,
convection, conduction

(b) Classes of fire

- solid
- oil
- electrical

- (c) Spontaneous combustion
 - (d) Fire prevention techniques
 - special precautions to be taken on board tankers
 - (e) The extinction of fire
 - cooling agents (water, spray or jet, liquid chemicals)
 - smothering agents (foam, steam, carbon dioxide, inert gas, carbon-tetrachloride, dry chemicals, sand)
 - fire-fighting tactics.
2. Fire-fighting appliances:
- (a) Hoses, nozzles, spray nozzles, foam generators and other hose attachments; international shore connection
 - (b) Portable and stationary fire extinguishers: carbon dioxide, soda-acid, foam, water, dry chemical
 - (c) Smoke helmets and fresh air breathing apparatus
 - (d) Other fire-fighting equipment
 - portable pumps
 - protective clothing
 - acetylene torch and other hand tools.
3. Fixed fire-fighting systems and fire-prevention construction of vessels:
- (a) Fire detection and alarm systems
 - (b) Ships' fire-main systems
 - (c) Steam, carbon dioxide and inert gas smothering systems
 - (d) Foam systems
 - (e) Automatic sprinkling systems
 - (f) Fire-prevention construction features of ships.

4. Fire-fighting techniques:

- (a) Discovery of fire: at sea, in port, in dry dock
- (b) Engine-room fires
- (c) Use of fixed extinguishing systems
- (d) Proper use of appropriate portable or stationary fire extinguishers
- (e) Tactics of approaching fires, handling appliances and applying extinguishing agents
- (f) Ships' stability in relation to fire-fighting.

5. Care, maintenance, inspection and testing of fire-fighting systems and equipment:

- (a) Fixed systems
- (b) Portable and stationary extinguishers
- (c) Fire hoses and attachments
- (d) Breathing apparatus and other miscellaneous fire-fighting equipment.

B. CONCLUDING REMARKS

The purpose of the Joint Committee, as determined in Recommendation 39 adopted by the 1960 Conference on the Safety of Life at Sea is broadly to further international co-operation designed to ensure that the training of seafarers in the use of aids to navigation, life-saving appliances and authorised devices for the prevention, detection and extinction of fires or for preventing or alleviating casualties at sea is sufficiently comprehensive and is kept up to date and in step with modern technological developments in this field.

1. The Need for International Action

The first question that arises for the Committee would seem to be whether or not there exists in fact a current need for an international practical action which would be likely to achieve the ends set out in Recommendation 39. This question has two aspects. In the first place it may be asked if the present situation in respect of maritime safety training in the various countries is on the whole considered satisfactory. If the answer is in the affirmative, then obviously there is no need for any action, whether international or national, to be taken at the present juncture. If, on the other hand, the situation is not considered satisfactory, and it is accepted, as has been pointed out by numerous courts of inquiry into casualties at sea, that lack of proper training in many cases has been at least a contributory cause of such casualties, then it is pertinent to inquire whether the interested circles in the various countries - the authorities, owners and seafarers - have any demonstrable interest in putting the matter to an international body for examination and possibly advice, or whether they feel confident in their ability to make on their own such improvements as they consider necessary, leaving other countries also to go their own way.

(a) The State of Maritime Safety Training

The Committee would no doubt consider it entirely inappropriate and falling outside the scope of this report if it were to pass judgment on the measures taken in the countries which replied to the questionnaire, to ensure that their safety training schemes are comprehensive and up to date. It must suffice for the purpose of the Committee's work that the report attempts no more than a general broad appreciation of the state of maritime safety training throughout the world. The following remarks are based on the summary which appears in Part A of this chapter.

Training in the use of radar is in most cases designed to meet the needs of navigating officers at various stages of their career:

- (i) Before becoming eligible for his first certificate of competency, a navigating officer candidate is required to undergo training in both the theoretical and practical aspects of radar.
- (ii) The syllabus of the examination for the master's certificate covers in particular and usually in a more extensive way the theoretical aspects of radar operation.
- (iii) For deck officers and masters who obtained their certificates of competency before the general introduction of radar on merchant vessels, many countries provide short-term radar observer courses leading to a special radar observer's certificate.
- (iv) A few countries offer radar simulator courses to senior navigating officers, usually on a voluntary basis. Training in radar maintenance, on the other hand, is not generally given, and only a few countries have made provision for deck and radio officers to receive training in this field.

The contents of the various radar training schemes for deck officers generally comprise in a detailed fashion both theoretical knowledge and practical experience of the use of radar as a navigational aid and also as an anti-collision device.

Training in the use of radio direction-finder is generally directed towards deck officers, and is seldom included in training schemes for ratings. It forms an integral part of certification training both for mates and masters, and is of short duration. The contents of training courses in the use of this device cover both theory and practice, with emphasis however on the practical application.

Training in the use of Decca, Loran and Consol is also generally directed towards deck officers, but only in a certain number of countries is knowledge of these systems required for obtaining a certificate of competency. Training courses cover both theory and practice and simulators are an essential part of training equipment.

Training in the use of gyro-compass and autohelmsman forms in most countries an integral part of deck officers' certification training, but certain countries also provide instruction in the

gyro-compass for ratings during pre-sea training. Special training courses are sometimes given by manufacturers of this equipment. The contents of the training covers both theory and practice, with emphasis on the latter.

Training in the use of the magnetic compass is directed at both deck officers and ratings, and forms an integral part of basic pre-sea and advanced certification training for both officers and able-bodied seamen.

Training in the use of echo-sounder and radio telephone is of very short duration, as these devices are essentially simple to use. Courses are sometimes given to officer candidates as part of their certification training, and in certain countries also to ratings. The contents of the training cover both theory and in particular practice.

Training in the use of life-saving appliances is included in all officer training courses and in formal pre-sea training programmes for ratings; and the main emphasis is on the handling of lifeboats. The contents of the training cover also theory, but practical exercises are particularly stressed. The formal training is supplemented by regular drills at sea. A lifeboatman's certificate is issued to officers and ratings having passed the required examination; possession of this certificate is a requirement in many countries for obtaining an officer's certificate or the certificate of able seaman.

Finally, formal training in the use of devices for the prevention, detection and extinction of fire is nearly always given to officers and often also to ratings. The contents of the courses, which are of short duration, cover theory as well as practice, but the emphasis is on practical exercises, in particular for the ratings. Regular fire drills are held on board ship. A special ship's fire squad certificate is issued in a few countries to officers and ratings having taken a special course.

(b) Desirable Standards of Maritime Safety Training

The above summary of the present state of maritime safety training would seem to indicate that while in general the scope, contents and duration of such training is in conformity with the highest standards, there are nevertheless areas in which improvement could no doubt be made. These areas may be identified by a comparison with recommendations made by the International Conference on the Safety of Life at Sea, 1960.

As regards training in the use of radar, this Conference recommended desirable standards of training in this field. The

Conference pointed out that incorrect use of ship-borne radar, or failure to appreciate its limitations, may jeopardise rather than facilitate safe navigation, and emphasised that those using radar should be competent to do so. It specifically recommended:

- (1) that appropriate steps be taken to ensure:
 - (i) prior to obtaining full certification status, all intending deck officers receive suitable instruction in the use of radar and be examined as to their proficiency; and
 - (ii) all deck officers are encouraged to undergo comparable training in the use of radar and examination as to their proficiency; the objective being that all officers in charge of a watch on radar-equipped vessels will be the holders of appropriate qualifications in the use of shipboard radar;
- (2) that such training should include instruction in the capabilities and limitations of radar, the proper operation of radar equipment, the extraction and interpretation of information from it and the ability to recognise when either the reliability of the equipment or the accuracy of the information it gives is affected. The opportunity should be afforded during training of observing radar equipment set up so as to present display conditions similar to those which would be encountered operationally.

In the light of this recommendation, and in view of the numerous "radar-assisted collisions" which have been reported in recent years, it may perhaps be asked whether in national training schemes sufficient emphasis is put on the anti-collision aspect of radar operation, and whether a wider use of simulator equipment for this purpose would be capable of increasing the efficiency of the training of deck officers. There might be a case for extending the training in radar observation to certain categories of senior deck ratings. Moreover, it might be desirable to introduce on a wider scale training in radar maintenance.

With reference to the other aids to navigation dealt with above, no official standards of training endorsed by an international body are in existence, but in general it would seem that the standards of training in those countries where formal instruction is given are high.

The 1960 Safety of Life at Sea Convention provides expressly that all crew members shall be instructed and exercised in the use of life-saving and fire-fighting appliances at specified intervals depending on the type of ship, and contains in Regulation 26, Chapter III, detailed rules concerning musters of the

crew for boat and fire drill. On the other hand, no recommended standards regarding the contents of the training given within the framework of formal training programmes for officers and ratings have been established by international agreement. In view of the complaints which are often made regarding the lack of ability of crews to competently handle lifeboats and fire-fighting equipment in emergency situations, it may perhaps be asked whether existing training programmes in these fields are adequate not only for deck officers and ratings but also for personnel of the engine-room and catering departments. Consideration might be given to the possibility of establishing in every ship an efficient fire-fighting organisation, including a special highly-trained fire squad which, it has been suggested, in larger passenger vessels might be commanded by a professional fire officer.

(c) National or International Action

It is clearly of the greatest importance that all questions which have a direct bearing on the safety of life at sea be dealt with at the international level, and this has been generally recognised for a long time. The decision of the International Conference on the Safety of Life at Sea to recommend that maritime safety training be considered on an international level is therefore entirely in line with generally accepted principles. Moreover, in respect particularly of training, although most maritime countries undoubtedly have at their disposal sufficient know-how to successfully cope with their own training problems, there are few other fields where international co-operation has proved so useful, and even the advanced countries have benefited from learning from each other's experience.

To illustrate the need for appropriate international action to be taken at an early date, reference may be made to the report prepared in response to the questionnaire by Argentina. In this report the Director of the National School of Navigation "Manuel Belgrano" points out that the available literature on the matters dealt with in the questionnaire, in particular fire-fighting, damage-control, abandoning ship and survival at sea, is not very extensive. He refers to the comprehensive series of manuals, booklets and guides on various questions published by the I.L.O., and suggests that consideration might be given to the possibility of publishing an exhaustive study on maritime safety training, with the collaboration of outstanding experts in this field. Such a publication would be greatly welcomed by the various navigation schools and by merchant marine officers. He finally suggests that another initiative which would be most welcome to maritime countries would be the promotion by the International Labour Office of courses in maritime safety training for instructors of the various national navigation schools.

Other countries, including the Congo, Ethiopia, Kuwait and Tunisia, have informed the I.L.O. of their interest in receiving the conclusions of the Committee with a view to incorporating them in the maritime training programmes which are being established.

2. The Form of International Action

The second basic question with which the Committee is faced would seem to be what sort of action it could take in order that the objectives set out in Recommendation No. 39 may be reached.

One line of action which the Committee might wish to consider would be to examine existing international instruments concerned with the training and certification of ships' officers and ratings with a view to the inclusion in these of appropriate provisions which would ensure that the training of these personnel in aids to navigation and other safety devices is adequate and up to date. For example, the Officers' Certificates of Competency Convention, 1936, might be revised to include provisions requiring all certificated navigation officers to hold a radar certificate, all ships' masters to attend a radar simulator course, and all certificated navigation officers to hold a lifeboatman's certificate and to attend an approved fire-fighting course. It might also be considered whether the Certification of Able Seamen Convention, 1946, might be supplemented with a provision requiring all candidates to have attended an approved fire-fighting course, and whether the Vocational Training (Seafarers) Recommendation, 1946, be expanded to include desirable standards for maritime safety training.

Another line of action would involve the production in various languages of international manuals or guides for the operation and maintenance of the various aids to navigation and other safety devices, as suggested by the Government of Argentina. Proposals for direct action by international organisations under the United Nations technical aid and assistance programmes, including training of instructors abroad and provision of foreign experts and equipment to countries requesting such assistance, might also be considered.

ANNEX I

RECOMMENDATION 39 OF THE
INTERNATIONAL CONFERENCE ON SAFETY OF LIFE AT SEA, 1960

Training of Masters, Officers and Seamen in the
Use of Aids to Navigation and other Devices

The Conference -

- (i) having in mind the provisions of Regulation 13 of Chapter V of the present Convention in regard to the manning of ships from the point of view of safety of life at sea;
- (ii) taking due account of the provisions of the two Conventions adopted by the International Labour Conference, that is to say, the Officers' Competency Certificates Convention, 1936 (No. 53) and the Certification of Able Seamen Convention, 1946 (No. 74);
- (iii) recognizing that the effectiveness of aids to navigation, life-saving appliances and devices for use in the prevention, detection or extinction of fire is dependent to a large degree on the ability of officers and seamen to use them properly and in the full knowledge of their limitations;
- (iv) recognizing that lack of such ability may be a contributory cause of casualties at sea;
- (v) taking note of the Agreement concluded between the Organization and the Governing Body of the International Labour Organisation providing for co-operation between the two Organizations, and, in particular Article 3 of that Agreement;

recommends -

- (a) that Contracting Governments should take all practical steps, if necessary in co-operation with other Contracting Governments, to ensure that the education and training of masters, officers and seamen in the use of aids to navigation of life-saving appliances and of authorized devices designed for the prevention, detection and extinction of fires or for preventing or alleviating casualties at sea is sufficiently comprehensive and also that, by supplementary or refresher

courses, or by other appropriate means, such education and training is kept up to date and in step with modern technological developments in this field, and

- (b) that within their respective spheres of activity the Organisation and the International Labour Organisation should co-operate closely with each other and with all interested Governments to the above ends.

ANNEX II

International Labour Organisation

QUESTIONNAIRE
CONCERNING MARITIME SAFETY TRAINING

1. Describe in detail¹, giving full particulars of duration and contents of, any training scheme for officers and ratings in the Merchant Navy concerning the operation and maintenance of the following aids to navigation, and indicate whether this training is given in whole or in part within the framework of pre-sea training, as separate courses, or as part of the training required for the obtaining of certificates of competency:

- (a) Radar.
- (b) Medium-frequency direction-finder.
- (c) Decca.
- (d) Loran.
- (e) Consol.
- (f) Gyro-compass and autohelmsman.
- (g) Magnetic compass.
- (h) Other aids, e.g. very high frequency telephone, echo-sounder, inertial navigator, and automated navigational systems.

2. If any special certificates are issued after completion of a course in one of the aids to navigation mentioned under point 1 above, please list these.

3. Describe in detail, giving full particulars of duration and contents of, any training scheme concerning the operation and maintenance of the following life-saving appliances, and indicate whether this training is given in whole or in part within the framework of pre-sea training, as separate courses or as part of the training required for the obtaining of certificates of competency:

- (a) launching and handling of lifeboats;

¹ Copies of all documents referred to in the reply to this and the following questions should be enclosed.

- (b) knowledge of lifeboat equipment and its maintenance;
- (c) handling of liferafts, rigid and inflatable;
- (d) handling of other appliances such as line-throwing apparatus, signal rockets, lifebelts, etc.

4. If any special certificate is issued after completion of a course in the use of the life-saving appliances mentioned in point 3 above, please list this.

5. Describe in detail, giving full particulars of duration and contents of, any training scheme concerning the practical use and maintenance of the following types of fire-fighting and associated equipment and installations, and indicate whether this training is given in whole or in part within the framework of pre-sea training, as separate courses, or as part of the training required for the obtaining of certificates of competency:

- (a) smoke helmets and other types of breathing apparatus;
- (b) steam, CO₂ and inert gas smothering systems;
- (c) automatic sprinklers;
- (d) fire detection and alarm systems;
- (e) fire extinguishers, portable and non-portable;
- (f) use of hoses and nozzles, also international shore connection.

6. What measures are taken to ensure that the training mentioned under points 1, 3 and 5 above is sufficiently comprehensive and kept up to date? Is, for example, any special consideration given from time to time to rearranging training schemes to bring them into line with technological progress?

7. If special safety training is given to officers and ratings of particular categories of vessels such as oil tankers and nuclear-propelled ships, give a separate description of the duration and contents of this type of training.