

Intuitive operation and pilot training when using marine azimuthing control devices

**Report Title:** 

Deliverable 4.9: Recommendations for specific regulations and criteria



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# Publishable Executive Summary

WP4 Operational Practice is aimed at collating, reviewing and auditing available material that is relative to the operation of azimuthing control devices when manoeuvring ships in Pilotage waters.

Task 4.9 examines and evaluates existing criteria used in Task 4.1 - Review of existing recommendations, criteria and their application including:

- STCW95 Standards for Training, Certification and Watchkeeping;
- IMO Resolution A960 Recommendations on Training and Operational Procedures for Maritime Pilots other than Deep-Sea Pilots;
- M 1015 issued by the UK Governments Marine Division of the Department of Trade in UK; IMO Resolution MSC137(74) –Standards for Ship Manoeuvrability including the recommendations for the Pilot Card, the Wheelhouse Poster and recommended information to be included in the Manoeuvring Booklet.

This evaluation is then used to determine the effectiveness of such criteria in so far as it relates to azimuth drive vessels.

Task 4.9 also makes use of the work carried out in Task 4.4 *Review of bridge operational practice and the human interface*.

This task focused on a review of bridge operational practice and human interface, in particular addressed to ships using azimuthing control devices (ACD). The main objectives are to promote understanding of the needs of the bridge crews and ensure that this information is available to the bridge and systems design engineers, with the aim of enhancing usability and efficiency of these systems. Task 4.4 examined the content of:

- IMO MSC Circular 78/11/3, specifically Annex B regarding the Bridge design
- SOLAS Chapter V some references are reported.

The role of the Human Element has been addressed to bridge design, design and arrangement of navigational systems and equipment and bridge procedures with respect to SOLAS Regulation V/15 by two different approaches.

- The International Association of Classification Societies (IACS) standard for bridge design, equipment and arrangement (BDEA)
- The Advanced Technology to Optimise Man-power On Ships (ATOMOS) project.

The IACS standard is interpreted as a standardised bridge arrangement, rather than defining a path between the goals of the Regulation and assessable ergonomic criteria. It indicates that Type Approval is not only necessary, but it is sufficient.

The ATOMOS approach differs from the IACS approach in that it seeks to integrate ergonomic criteria into the decision making process as it relates to bridge design, the design and arrangement of navigational systems, and equipment and bridge procedures. The IMO Maritime Safety Committee Circular 982 entitled "Guidelines on Ergonomic Criteria for Bridge Equipment and Layout." has produced criteria to support provisions of the SOLAS V/15 regulations. (Principles relating to Bridge Design, Equipment, Arrangements and Procedures). Chapter 5.3 of the Circular refers to Ergonomic Requirements of Workstation Layout.

Task 4.9 also review existing regulations and criteria relating to training of operators handling vessels equipped with ACD.

Based on this review, examinations and evaluations, recommendations for amendments and/or additions to existing regulations and/or criteria will be put forward.

These are:

- Standardisation of ACD design and terminology
- Synchronisation of ACD in the different manoeuvring positions
- Design of Haptic feed-back systems informing the user of the status of the system
- Mandatory training in ACD ship handling

The task culminates in this report and constitutes one deliverable at M36 of the project

# **1** Introduction

The first part of the task evaluates compliance with existing regulation and criteria with respect to the operation of azimuthing control devices. It examines compliance with IMO Resolution MSC 137(74) which recommends the carriage of Pilot Cards, the Wheelhouse Poster and information to be included in the Manoeuvring booklet and makes recommendations for highlighting the manoeuvring characteristics of Azimuthing propulsion.

The second part of the task review existing regulations and criteria relating to training of operators handling vessels equipped with ACD.

The third and final part of the task suggests recommendations for amendments and/or additions to existing regulations and/or criteria based on the first and second part.

# 2 Role of the International Maritime Organisation [IMO 2009]

IMO – the International Maritime Organization - is the United Nations specialised agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships. Member Governments use IMO to draw up internationally agreed standards that can be applied to all ships. Originally known as the International Maritime Consultative Organisation, or IMCO – IMO was established by means of a convention that was adopted in Geneva in 1948. The convention received enough signatures to enter into force ten years later in 1958 and the first meeting of IMO was held in London in 1959.

The need for an international agency for shipping stems from the fact that shipping is perhaps the most international of all the world's global industries, with many different countries involved in the construction, ownership, operation, manning, survey and inspection of ships. Its global importance cannot be underestimated, as it literally underpins world trade and the global economy. Unusually, its prime assets, the ships themselves, move between countries and between different jurisdictions; hence the need for universal standards that can be applied to and recognized by all.

IMO has a no 'policing' policy. Flag State, covers own ship, and Port State Control, visitors.

The Member states of IMO use the Organisation to agree standards covering all aspects of maritime safety, security and pollution prevention for international shipping. The responsibility for implementing the standards agreed and adopted by IMO rests with the Member states themselves. They undertake to ensure that ships flying their flag comply with provisions of the IMO Conventions to which they are party. Many of them choose to delegate the survey and inspection of vessels to so-called "recognised organisations" such as classification societies.

IMO has adopted a voluntary audit scheme that will help flag states to assess how effectively they are fulfilling their obligations under the various IMO conventions to which they are party (first audits was in 2006).

# 2.1 The IMO manoeuvring criteria

The IMO acknowledged the importance of ship manoeuvrability standards with, in 1968, the adoption of Resolution A168(IV) 'Recommendation on Data concerning Manoeuvring Capabilities and Stopping Distances of Ships'. In 1993, the IMO introduced Resolution A.751(18) 'Interim Standards for Ship Manoeuvrability'; applicable to all ships of all rudder and propulsion types, of 100 meters in length and over, and chemical tankers and gas carriers regardless of length, which are constructed on or after 1st July 1994 (IMO, 1993)(IMO, 1993a). Following the introduction of these standardised sea-trails, some 499 full-scale results were compiled and used as basis for discussions on appropriate revisions to the Interim Standards (IMO, 1999; IMO, 2000; IMO, 2000a; IMO, 2000b; IMO, 2000c; IMO, 2001). In light of the findings, the 76<sup>th</sup> meeting of the IMO Maritime Safety Committee adopted Resolution MSC.137(76) "Standards for Ship Manoeuvrability"; (IMO, 2002; IMO, 2002a). Since the adoption of the Standards for Ship Manoeuvrability, additional revisions were made regarding the stopping of very large ships; (IMO, 2004).

The standard manoeuvres should be performed without the use of any manoeuvring aids, which are not continuously and readily available in normal operation.

Addressing the above, one study is identified that specifically addresses the question of applying the recommended manoeuvring tests to pod-driven ships (Task 4.1). Though the study does not specifically address azimuthing devices in general, the conclusion is quite general. Specifically, the study find that applying the IMO manoeuvring criteria tests like-for-like on pod-driven ship, asks the same questions about their performance and should yield an equivalent measure to prevent the building of ship that do not meet the criteria. It should however be mentioned that this conclusion is base on the results of one author; and further validation should be considered. One practical way of achieving such validation could be the use of manned-model scale tests for various manoeuvres. This has at least been demonstrated for stopping tests in Task 4.5; but could be extended to include turning circles also.

#### 2.1.1 International Maritime Organisation – Recommendations

The IMO provides recommendations for "Provision and Display of Manoeuvring Information On Board Ships"; specified within the Annex of Resolution A.601 (15). This includes the 'Recommendations on the Provision and the display of Manoeuvring Information on Board Ships'. By implication it would appear that all ships over 100 meters should be furnished with all three pieces of information (pilot card; wheelhouse poster; manoeuvring booklet). However, it should be remembered that IMO does not carry the authority to police such implementation; this is archived through such actions as SOLAS. The implementation of the recommendations is the responsibility (and to some extent, to the discretion) of the National Administrations (Flag State Control).

#### 2.1.2 The Pilot Card

The Pilot card, to be filled by the master, is intended to provide information to the Pilot on boarding the ship. This information should describe the current condition of the ship, with regard to its loading, propulsion and manoeuvring equipment, and other relevant equipment. (Appendix 1)

#### 2.1.3 The Wheel-House Poster

The wheelhouse poster should be permanently displayed in the wheelhouse. It should contain general particulars and detailed information describing the manoeuvring characteristics of the ship, and be of such a size to ensure ease of use. (Appendix 2)

During the course of the study it became quite apparent that the wheelhouse poster is failing in its primary goal. Specifically and more generally, the proviso given in MGN 201, allowing the wheelhouse poster to be estimated is both risky and somewhat abused, even for conventional ships. Recently published studies (SIMMAN 2011) show that even the top model testing facilities get quite widely disagreeing simulation resulted for the same ship. If we consider than that the first in a series of ships may have had its wheelhouse poster information predicted by simulation; that could well be substantially different from reality. Then a sister-ship to the first may have simply inherited the firsts poster; perhaps with some scaling if necessary. Next, a ship in the series is fitted with say poddrives, and based on, little ability to simulate, the poster is again extrapolated from the last ship. Ultimately, this process results in a series of 'Chinese whispers'; that produce a wheelhouse poster that has no relevance to the actual performance of the ship. It is therefore strongly recommended that the wheelhouse poster should be validated using sea-trial data; and amended accordingly.

#### 2.1.4 The Manoeuvring Booklet

The manoeuvring booklet should be available on board and should contain comprehensive details of the ship's manoeuvring characteristics and other relevant data. The manoeuvring booklet should include the information shown on the wheelhouse poster together with other available manoeuvring information.

During the course of the Project the presence of the Pilot Card and Wheelhouse poster were readily apparent however there was no evidence to support the onboard carriage of the manoeuvring booklet. The absence of this piece of information was also supported by the lack of knowledge of its existence by the Bridge Team. There was considerable variance both in the layout and with the information contained within the Pilot Card. Two examples of a Pilot Card are included in Appendix 1.

The first Pilot Card contains sound information that is of significant value to the Pilot during the Master/Pilot information exchange. The second Pilot Card follows the IMO recommended layout and the presence of azimuthing control devices is covered in the section headed Steering Particulars. Information that could be included which would be of value to the pilot such as modes of operation and the rate at which the pods turn is not included: "Operational modes awareness"

## 2.2 Operational Modes

Among the more salient characteristics of controlling azimuthing devices is intuitive operation. It is desirable that the operator should be able to instinctively control the manoeuvring of a vessel in a variety of modes.

There exist a number of guidelines on Operational Modes of bridge systems. Obviously, the operator needs to know what mode the azimuthing device is in, otherwise, the vessel will not respond in the expected manner. It is also imperative that the operator understands the different

MANOEUVRE BOOKLET Most information can be estimated but some should be from trials

WHEELHOUSE POSTER Determined by trials, simulation or estimation. limitations that are applied to the azimuthing devices in these various modes, otherwise the vessel will not respond in the expected manner. Different manufactures have different terminology for what is essentially the same mode of operation. This can become confusing.

Operators coming aboard various vessels with differing terminology need to know what each different term is equivalent to, see the table below. Different operation modes should follow bridge procedures based on company automation policy. These procedures and terminology should be clearly laid out in the Vessel Operating Manual.

Moreover, to allow the best interaction and usability between the pilot and the controls, the current mode of operation must be clearly displayed. This is essential to allow the pilot and ships officers to be fully aware of which operating mode is being used and therefore the correct propulsion characteristics and limitations that are in available. The mode of operation active is generally indicated on the monitor or the controls.

Safety of Navigation Circular 265 - *Guidance on the Application of SOLAS Regulation V/15 to INS, IBS, and Bridge Design* states that information presented to the operator should be of a standard form. However, MSC 191(79), entitled "Performance Standards for the Presentation of Navigation-Related Information on Shipborne Navigational Displays" relates to symbols used in navigation, rather than for conning. It can be seen from various figures in this report that conning displays vary from one manufacturer to another. One example is the Thrust Direction Indicator. Whilst the displays themselves look fairly intuitive, in an emergency, where the operator is used to a different system, the potential for mistakes is increased.

Mode	Power	Rotation	Synchronised
Open Sea	Full power	$\leq 10^{\circ}$	
Cruise	i.e. 17 mgw	But may be 35°	pods and rpm
Manoeuvre	Reduced power		
Manoeuvre direct	i.e. 12/13 mgw	≤ 35°	pods and rpm
Fast Mode	Reduced power	360°	pods and rpm independent
Aziman	i.e. 10mgw		
Azimuth mode			

# 2.3 Bridge Operating Procedures and Azimuthing Devices

There is an abundance of differing configurations of azimuthing devices, and their associated controls. For example, pull type, push type, FPP, CPP, CRP, etc.. Each of these configurations varies depending upon the manufacturer. These configurations require handling in their own specialised way. It can therefore be dangerous to assume that although an operator may be proficient in handling one type of configuration, that they are capable of handling another.

Different configurations and interfaces for the bridge systems, in particular regarding azimuthing systems, could lead to human errors and accidents during manoeuvres, especially during emergencies and manoeuvres in restricted waters (in ports). These potential dangers could be avoided through a better design of these systems and in particular through a better standardization. Task 4.4, with photographic evidence, clearly highlighted the differences that exist between the control console at the centre of the wheelhouse and the control console situated at the bridge wings onboard some ACD equipped vessels.

From interviews performed and contributions and data provided by officers and pilots, some problems have been detected concerning the use of ACD systems. Some of these problems are due to the lack of standardisation among the different systems aided by the poor configuration of the bridge layout.

The interface of the Bridge System is functional to safety of navigation, from experience we know that there is always room for improvement, it would be beneficial for improving safety in the future that new constructions may provided with an additional location, situated in a favourable position for the middle and final part of the manoeuvre (change in port / approach to pier).

Therefore the pilot from a dedicated workstation (wing bridge) should be able to control power and direction of the thrusters, rate of turn, bow of the ship, wind speed.

With regard to the way manoeuvring orders may given, the suggestion of a standardised set of verbal commands could represent the starting point of a wider and better shared system of instruction exchange, which could help all person involved in the manoeuvre to be informed about, without risks of misunderstanding due to the wording used. In 2008 Baken & Burkley suggest a standard way of verbally communicating orders. The order would comprise of the following sequence pod/direction/thrust/power e.g. port pod/inboard 30°/positive/40 rpm.

# 2.4 IMO Resolution A960(23)

In 2003 the IMO Assembly adopted Resolution A.960 (23) entitled Recommendations on Training and Operational Procedures for Maritime Pilots other than Deeps Sea Pilots (Appendix 3).

Annex 1 encourages Governments to establish and maintain Competent Pilotage Authorities to administer safe and efficient pilotage systems (s 1.3)

The Competent Pilotage Authority in cooperation with National and Local Pilot Associations should enforce the maintenance of developed standards (s 2.3.2)

The Competent Pilotage Authority is responsible for training and certification standards of Pilots. These standards should be sufficient to enable Pilots to carry out their duties safely and efficiently (s 5.1).

The syllabus for pilotage certification or licensing outlines knowledge elements that a Pilot should demonstrate that he/she possesses (s 7.1).

These elements include:

- Shiphandling for pilotage, anchoring, berthing and unberthing, manoeuvring with and without tugs and emergency situations (s 7.1.12).
- Manoeuvring behaviour of the types of ships expected to be piloted and the limitations imposed by particular propulsion and steering systems (s 7.1.18).

During Task 4.2 which was conducted during the review phase of the project and culminated in a task report at M18 Pilotage Organisations throughout the world where asked if they had any ACD vessels visiting their Districts and if so what training the Pilots had received in manoeuvring this type of vessel. Of those who responded 98% have ACD vessels visiting their Districts yet only 32% had received ACD training and as such may be considered as meeting the criteria of A960.

## 2.5 M1015

In March 1982 the Marine Division of the Department of Trade in London issued M Notice 1015 entitled Training for Masters and Chief Mates of Large Ships and Ships with unusual Manoeuvring Characteristics. This Notice is addressed to Shipowners, Ship Operators, Masters, Deck Officers and Nautical Colleges. (Appendix 4).

M Notices publicise to the shipping and fishing industries important safety, pollution prevention; and other relevant information. Since 1982 M Notices have been subdivided into three Categories:

- Merchant Shipping Notices (MSNs) often contain the fine detail of UK law and are legally enforceable when referred to by a Statutory Instrument.
- Marine Guidance Notes (MGNs) give guidance and strong recommendations about best practice to industry on interpretation of law and general safety advice.
- Marine Information Notes (MINs) provide less important time limited information and changes of address after which they expire.

M 1015 has not been replaced or superseded and therefore should be considered as remaining valid and in force.

#### Paragraph 1 of the Notice states:

"It is most important that officers who are to be appointed as master or chief mate of large ships or ships which have unusual handling or manoeuvring characteristics should have adequate or relevant experience or training before taking up their duties"

#### Paragraph 3 of the Notice states:

"Before initially taking command of such a ship, the prospective master should have sufficient and appropriate general experience as master or chief mate and either:

- a) have sufficient and appropriate manoeuvring experience as chief mate or supernumerary on the same ship or as master, chief mate or supernumerary on a ship having similar manoeuvring characteristics; or
- b) have undergone a course of training/familiarization on a suitable ship handling simulator capable of simulating the manoeuvring characteristics of such a ship"

# **3** Review of existing regulations and criteria relating to training of operators handling vessels equipped with ACD

The relevant international regulations related to the training of seafarers are:

- The Standards of Training, Certification and Watchkeeping (STCW)
- IMO Resolution A960(23) Recommendations on Training and Operational Procedures for maritime Pilots other than Deep Sea Pilots. (Appendix 3).
- International Safety Management Code (ISM)

In addition to this there are also national regulations.

# **3.1 STCW**

The STCW Code contains standards of training that are required by law for the Flag States that have signed the STCW Convention. The present version in force was adopted in 1995 (STCW95)

- **Part A** of the STCW Code contains the **mandatory provisions** which give, in detail, the minimum standards required to be maintained in order to give full or complete effect to the provisions of the STCW convention.
- Part B of the STCW Code contains recommended guidance to assist in implementing, applying or enforcing its measures

IMO has published a number of Model Courses that provide core curricula based on the minimum requirements of the STCW Code. In the Model Courses: 1.22 "Ship Simulator and Bridge Teamwork" and 7.01 "Master and Chief Mate" some curricula concerning training in ship handling is located.

No regulations or criteria related specifically to training of mariners handling vessels equipped with ACD or other special propulsion/manoeuvring equipment can be found in the STCW95 or the relevant IMO Model Courses.

In STCW95 Section B-V/3: "Guidance regarding additional training for masters and chief mates of large ships and ships with unusual manoeuvring characteristics" (Appendix 5) is located. This guidance might apply to ASD vessels assuming that they are covered by the term "Unusual manoeuvring characteristics".

Paragraph 3 in the guidance states:

- 3 Before initially assuming command of one of the ships referred to above, the prospective master should have sufficient and appropriate general experience as master or chief mate, and either:
  - 3.1 have sufficient and appropriate experience manoeuvring the same ship under supervision or in manoeuvring a ship having similar manoeuvring characteristics; or
  - 3.2 have attended an approved ship handling simulator course on an installation capable of simulating the manoeuvring characteristics of such a ship.'

The section features a footnote stating that there are no corresponding regulations in the Convention or in Part A of the Code.

# 3.2 IMO Resolution A960(23)

The IMO Resolution A960(25)(Appendix 3) is described in section 2.4 of this report. Section 7: *"Syllabus for pilotage certification or licensing"*, subsection 1.18 states:

- 7.1: Each applicant for a pilot certificate or licence should demonstrate that he or she has necessary knowledge of the following:
- .18: manoeuvring behaviour of the types of ships expected to be piloted and the limitations imposed by particular propulsion and steering systems;

This subsection might apply to ACD vessels assuming that they are covered by the term: "particular propulsion and steering systems".

## 3.3 ISM Code

The International Safety Management Code (ISM) came into force in 1. July 2002 as Chapter IX of the International Convention for the Safety of Life at Sea (SOLAS). Its purpose is to provide an international standard for the safe management and operation of ships and for pollution prevention. There is no mentioning of ASD training in the code either but Section 6: *"Resources and Personnel"* subsection 6.3 states:

6.3 The company should establish procedures to ensure that new personnel and personnel transferred to new assignments related to safety and protection of the environment are given proper familiarization with their duties. Instructions which are essential to be provided prior to sailing should be identified, documented and given.

Good ship handling skills goes hand-in-hand with safety and protection of the environment and "new personnel" or "new assignment" do apply to a captain signing on an ASD vessel for the first time.

This leads to the point that procedures for some kind of training in such cases should be established by the company.

#### **3.4** National regulations

The Flag States have interpreted the different IMO codes in their own way. An example is the M Notice 1015, issued by the Marine Division of the Department of Trade in London (Appendix 4) as described in section 2.5 of this report. The text is almost identical with STCW95 Section B-V/3: "Guidance regarding additional training for masters and chief mates of large ships and ships with unusual manoeuvring characteristics" (Appendix 5).

Based on IMO Resolution A960(25)(Appendix 3) The Danish Maritime Authorities have made it mandatory for Danish Marine Pilots to receive training in:

- ACD handling prior to piloting ACD vessels
- ASD Tug handling prior to use ASD tugs for berthing operations

This training can be carried out in simulator or manned models (Danish Law no. 567 of 09/06/2006)

# **3.5** Discussion of existing regulations and criteria relating to training of operators handling vessels equipped with ACD

As it can be seen from the description of the international regulations, ACD vessels are not addressed directly anywhere.

The notion in STCW94 B-V/3: "Ships having unusual manoeuvring and handling characteristics" are very open to interpretations, what are exactly usual or unusual manoeuvring characteristics? Most mariners however would probably agree that ACD vessels are unusual compared to traditional vessels.

Flag states have interpreted the international regulations differently, some requesting training in ACD handling to some extent, others not at all.

This project has clearly shown that handling of vessels equipped with Azimuthing Propulsion and ACD is very different from handling of traditional "propeller & rudder" vessels and that ACD training in necessary in order to maintain a high level of safety and efficiency during manoeuvres especially in emergency situations.

# 4 Recommendations for amendments and additions to existing regulations and criteria

Based on the review described in this report we recommend the following amendments and/or additions to existing regulations and criteria.

# 4.1 Recommendations related to existing criteria

Regarding the IMO Resolution A.601 (15) "Provision and Display of Manoeuvring Information On Board Ships"; and specifically the provision of the Wheelhouse Poster. It is strongly recommended that the Wheelhouse poster should be validated using sea-trial data; and amended accordingly.

Regarding the applicability of the IMO manoeuvring criteria MSC137(76) to ACD ships: Manned-model tests could be used to supplement the existing simulated results and further validate the applicability of the criteria to ACD ships.

## 4.2 Recommendations related to Operational aspects

From 2.2 and 2.3 above it can be seen and readily understood how manoeuvring errors may occur as a result of different terminology and different design features used by individual ship owners/operators. While there may be an argument from equipment manufacturers that standardisation stifles innovation and development this argument is not upheld when examining the design and layout of aircraft cockpits and instrumentation where standardisation is very much the norm and development and improvements still occur.

Task 4.4 carried out a review of accident and incident reports to establish the type and commonality of various accidents and incidents. It concluded that manoeuvring error and transfer of control issues are relevant in 60% of the incidents. With regard to transfer of control issues accidents attributable to this action could be reduced or eliminated if the bridge wing and central bridge consul controls are linked so that they follow each other. In this way control is transferred by a single movement, that of a switch being activated, rather than a series of actions that could be mishandled.

Work has been carried out and is ongoing into the use of Haptic controls that produce an output which is felt by the user rather than seen or heard. Such controls would be beneficial to the user to alert him/her when they attempt a manoeuvre that will be blocked by the operational mode the controls are currently engaged in or when the user attempts a manoeuvre that may be detrimental to the operational efficiency of the propulsion unit.

# 4.3 Recommendations related to Training aspects

It can be seen during the progress of this project that ACD's are not intuitive and that training in the handling of vessels equipped with ACD's are necessary in order to enhance safety and effectiveness of operation. (ref. AZIPILOT project task reports 2.4, 3.1- 3.8, 4.1 – 4.6). We recommend that:

- The STCW code Table A-II/1 2 & 3, under competence: "Manoeuvre the ship" is amended with a subparagraph requesting knowledge of unusual manoeuvring systems such as Azimuthing Propulsion Systems
- The STCW code Section B-V/3 is amended accordingly
- An IMO Model Course for Azimuth Propulsion Ship Handling is developed addressing both Human Factors as well as manoeuvring aspects
- The IMO Resolution A960(25) is amended with a paragraph requesting knowledge of and training in manoeuvring of the specific type of vessels they are piloting hereunder vessels equipped with Azimuthing Propulsion or other extraordinary manoeuvring equipment

## **5** References

- 1. STCW95 Standards for Training, Certification and Watchkeeping
- 2. IMO Resolution A960 Recommendations on Training and Operational Procedures for Maritime Pilots other than Deep-Sea Pilots
- 3. UK Governments Marine Division of the Department of Trade: M 1015
- 4. IMO Resolution MSC137(74) –Standards for Ship Manoeuvrability including the recommendations for the Pilot Card, the Wheelhouse Poster and recommended information to be included in the Manoeuvring Booklet.
- 5. IMO MSC Circular 78/11/3. Annex B
- 6. SOLAS Chapter V
- 7. IMO Model Courses 1.22 "Ship Simulator and Bridge Teamwork" 2002 edition
- 8. IMO Model Courses 7.01 "Master and Chief Mate" 1999 edition
- 9. International Safety Management Code (ISM)
- 10. R. Gargiulo, G. Rees & N. Allen, A. de Graauw: AZIPILOT Task 4.2 Report: "Review of existing operational practice"
- 11. R. Gargiulo, D. Trodden 6 S. Short, G. Rees & N. Allen: AZIPILOT Task 4.4 report: "Review of bridge operational practice and the human interface".
- Stern F., Agdrup K., Kim S. Y., Hochbaum A. C., Rhee K. P., Quadvlieg F., Perdon P., Hino T., Broglia R., Gorski J., "Experience from SIMMAN 2008 – The First Workshop on Verification and Validation of Ship Manoeuvring Simulation Methods", J. of Ship Research, Vol. 55, No. 2, June 2011, pp. 135-147

# **Appendix 1: Pilot Cards**

Swept Path (m)           Angle (X) (Y) Path Swept Path Graphic           Angle (X) (Y) Path         Swept Path Graphic           1         201         2.4         44.5           2         20.9         2.9.5         50.4           3         21.8         34.5         56.3           7         24.9         54.7         79.6           9         26.5         64.6         91.1           10         27.3         95.6         68.8           11         2.17.3         59.6         79.7           10         27.3         95.6         68.8           11         2.17.3         59.6         9.8           12         2.8.8         79.4         10.8           12         2.8.8         79.4         10.8           12         2.8.3         113.8         14.3           13         2.9.2         119.4         125.0           13         3.9.4         117.8         15.3           30         40.5         162.4         202.8	Register: Bahamas Call Sign: DCA: Bahamas Call Sign: DCA: Bahamas Breadth: Aker-Yard, Finland 2008		
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Ship's Particulars         Call Sign: C6WW4         Year Built: 2008, Aker-Yards, Finland         IMO Number: 3949681         MMSI Number: 39374000         Flag: Nassan, Bahamas         Class: DNV 1A1, Passenger Ship         Gross Tonnage: 154,407 ton         Deadweight: 14,517 ton         Deadweight: 14,517 ton         Displacement: 71,000 ton         Deadweight: 8.5 m / 27.8 ft         Block Coefficient: 0,7         Length Overall: 33.8 m / 1112 ft         Length Overall: 33.8 m / 112.6 ft         Moulded Breadth: 49.02 m / 160.8 ft         Max Air draft: 6.5 m / 208.3 ft (d=8.60 m)         Height W.LEridge: 32.7 m / 107.3 ft (d=8.60 m)         Wind Area: 13,015 m2         Bridge to Blow: 47.5 m / 155.8 ft         Bridge to Stere: 29.1 m / 95.7 ft         Anchors: Port / Stbd 14 x shackles each (385m)		
Maneuvering SpeedsPitchRevering SpeedsPitchRPMSpeed (kts.)10143235.5801246071.5301-2-30-1-4-55-5-5.5-80-9-10-105-13Sperry IBS Equipment Pod Angle Indicator ROT Indicator ROT IndicatorMain Y Y Y ROT IndicatorWings Y Y Y Depth SounderY Y Y Y NinsterY Y Y Y Y Nyster ControlsY Y Y Y Y Y Y 	Ship's Particulars         Propulsion: 3 x 14 MW ABB: two azimuth propellers, one fixed center propeller Azjood: 5.6m diameter (pushing)         Fixipod: 5.4m diameter (pushing) right hand Max Azipod Angle: 35°         Bow Thrusters: A x 3400 kW / 4 x 4500 hp         Type of Engines: Diesel Electric Propulsion Main engine: 6 x Wartsliß 12V46C         Total propulsion power: 42 000 kW / 103 345 hp         Total propulsion power: 42 000 kW / 57 540 hp         Max Speed: 12.5 knots / 2.6 Mph         Service Speed: 22.5 knots / 2.6 Mph         Service Speed: 22.5 knots / 2.6 Mph         Service Speed: 22.5 knots / 2.6 Mph         Max Speed: 22.5 knots / 2.6 Mph         Marcuvering Speed: 4.4 knots by 10° azipod angle         Stabilizers: 2 x Rolls Royce (18m2) fins         Fuel Consumption @ Full Speed: 2659 gallons/hr         Max Number of Cuests: 4375         Max Number of Cuests: 4375         Max Number of Cuests: 4375         Max Number of Caust: 5728		
Thrusters         Image: Thrusters         Image: Thrusters         Image: Thrusters         Turn rate at change in the state of			

PILOT CARD

NT 50447

Ship's name:	ARCADIA		Dat	e: 7,05,2005
Call sign:	ZCDN2	Max. deadweight:	7200.0 tow Year	r built: 2004
Draught aft:	7.89 🖷	fore: 7.50 m	Displacement:	42808 t
	t T			
Length overall:	285.1 •	Breadth: 36.9 .	Bulbous bow:	yes
Anchor chains:	Port 13 sh	ackles Starboard	13 shackles Sterr	NIL shackles
	( 1	shackle = 27.50 = = 15	5.04 fathoms )	



#### ENGINE DATA

Type of engine: 2x 17.	6 MH Azipot Electric	Maximum power:	35.2 KH	
Manoeuvring engine		Speed (knots)		
order	rpm	Loaded	Ballast	
Full ahead	130.4	22.8		
Half ahead	112.6	19.6		
Slow ahead	70.0	11		
Dead slow ahead	50.0	6.0		
Dead slow astern	-50.0	Time limit astern:		
Slow astern	-70.0	Full ahead to full	astern:	
Half astern	-112.6	Max. starts:	-	
Full astern	-130.4	Min. rpm controllab	ole: 0.0	
		Astern power:	68.5 % ahead	

#### STEERING PARTICULARS

Type of rudder: Azipods	Maximum angle:	360.0 °
Rudder angle for neutral effect: 0.6 °	Hard-over to hard-over:	23.0 sec
Thruster: Bow: 5700.0 KW	Stern: Azipods	

#### NAUTICAL CHECKLIST

Anchors:	
Whistles:	
Multipilot/Radar	1:
Multipilot/Radar	2:
Radar 3:	
Speed Log:	
Doppler Log:	
Water speed:	
Ground speed:	
Engine telegraphs	:
Steering gear:	

Number of power units operating:
Indicator rudder:
Indicator pitch:
Indicator rate of turn:
Compass system:
Constant gyro error:
VHF :
GPS 1:
GPS 2:
NACOS :
Classification:

# **Appendix 2: Wheel-House Poster**



# Appendix 3: IMO Resolution A.960

#### **IMO RESOLUTION A.960**

#### RECOMMENDATIONS ON TRAINING AND CERTIFICATION AND OPERATIONAL PROCEDURES FOR MARITIME PILOTS OTHER THAN DEEP-SEA PILOTS

THE ASSEMBLY,

RECALLING Article 15(j) of the Convention on the International Maritime Organization concerning the functions of the Assembly in relation to regulations and guidelines concerning maritime safety and the prevention and control of marine pollution from ships,

RECOGNIZING that maritime pilots play an important role in promoting maritime safety and protecting the marine environment,

BELIEVING that the maintaining of a proper working relationship between the pilot, the master and, as appropriate, the officer in charge of a navigational watch is important in ensuring the safety of shipping,

NOTING that since each pilotage area needs highly specialized experience and local knowledge on the part of the pilot, IMO does not intend to become involved with either the certification or licensing of pilots or the systems of pilotage practised in various States,

RECOGNIZING ALSO the high standards of pilotage services already established in many States and the need for these standards to be maintained,

CONSIDERING that in those States developing pilotage services, the establishment of practical minimum training standards, certification requirements and operational procedures to provide effective co-ordination between pilots and ship personnel, taking due account of ship bridge procedures and ship equipment, would contribute to maritime safety,

HAVING CONSIDERED the recommendation made by the Maritime Safety Committee at its seventy-fifth session,

- 1. ADOPTS the following Recommendations:
  - a. Recommendation on training and certification of maritime pilots other than deep-sea pilots, given in Annex 1 to the present resolution;
  - b. Recommendation on operational procedures for maritime pilots other than deep-sea pilots, given in Annex 2 to the present resolution;
- 2. URGES Governments to give effect to these Recommendations as soon as possible;
- 3. REQUESTS the Maritime Safety Committee to keep the Recommendations under review and to amend them as necessary in the light of experience gained from their implementation;
- 4. **REVOKES** resolution A.485 (XII).

#### ANNEX 1

## **RECOMMENDATION ON TRAINING AND CERTIFICATION OF MARITIME PILOTS OTHER THAN DEEP-SEA PILOTS**

#### 1 Scope

- 1.1 It is recognised that pilotage requires specialised knowledge and experience of a specific area and that States with many diverse waterways and ports have found it appropriate to administer pilotage on a regional or local basis.
- 1.2 The maritime pilots referred to in this Recommendation do not include deep-sea pilots or shipmasters or crew who are certificated or licensed to carry out pilotage duties in particular areas.
- 1.3 Governments should encourage the establishment or maintenance of competent pilotage authorities to administer safe and efficient pilotage systems.

#### 2 Competent pilotage authority

- 2.1 Competent pilotage authority means either the national or regional Governments or local groups or organizations that by law or tradition, administer or provide a pilotage system. Governments should inform competent pilotage authorities of the provisions of this document and encourage their implementation.
- 2.2 The assessment of the experience, qualifications and suitability of an applicant for certification or licensing, as a pilot, is the responsibility of each competent pilotage authority.
- 2.3 The competent pilotage authority in co-operation with the national and local pilots' associations should:
  - .1 establish the entry requirements and develop the standards for obtaining a certificate or licence in order to perform pilotage services within the area under its jurisdiction;
  - .2 enforce the maintenance of developed standards;
  - .3 specify whatever prerequisites, experience or examinations are necessary to ensure that applicants for certification or licensing as pilots are properly trained and qualified; and
  - .4 arrange that reports on investigations of incidents involving pilotage are taken into account in maritime pilots' training programmes.

#### **3** Pilotage certificate or licence

Every pilot should hold an appropriate pilotage certificate or licence issued by the competent pilotage authority. In addition to stating the pilotage area for which it is issued, the certificate or licence should also state any requirements or local limitations that the competent pilotage authority may specify such as maximum size, draught or tonnage of vessels that the holder is qualified to pilot.

#### 4 Medical fitness

- 4.1 Each pilot should satisfy the competent pilotage authority that his or her medical fitness, particularly regarding eyesight, hearing and physical fitness meets the standards required for certification of masters and officers in charge of a navigational watch under the international Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended, or such other standards as the competent pilotage authority considers appropriate.
- 4.2 If a pilot has experienced a serious injury or illness, there should be a re-evaluation of his or her medical fitness prior to return to duty.

#### 5 Training and certification or licensing standards

- 5.1 The competent pilotage authority is responsible for training and certification or licensing standards. The standards should be sufficient to enable pilots to carry out their duties safely and efficiently.
- 5.2 Standards for initial training should be designed to develop in the trainee pilot the skills and knowledge determined by the competent pilotage authority to be necessary for obtaining a pilot certificate or license. The training should include practical experience gained under the close supervision of experienced pilots. This practical experience gained on vessels under actual piloting conditions may be supplemented by simulation, both computer and manned model, classroom instruction, or other training methods.
- 5.3 Every pilot should be trained in bridge resource management with an emphasis on the exchange of information that is essential to a safe transit. This training should include a requirement for the pilot to assess particular situations and to conduct an exchange of information with the master and/or officer in charge of navigational watch. Maintaining an effective working relationship between the pilot and the bridge team in both routine and emergency conditions should be covered in training. Emergency conditions should include loss of steering, loss of propulsion, and failures of radar, vital systems and automation, in a narrow channel or fairway.
- 5.4 Initial and continuing training in the master-pilot information exchange should also cover:
  - .1 regulatory requirements governing the exchange;
  - .2 recognition of language, cultural, psychological and physiological impediments to effective communication and interaction and techniques for overcoming these impediments; and
  - .3 best practices in the specific pilotage area.
- 5.5 Competent pilotage authorities should be encouraged to provide updating and refresher training conducted for certified or licensed pilots to ensure the continuation of their proficiency and updating of their knowledge, and could include the following;
  - .1 courses to improve proficiency in the English language where necessary;
  - .2 sessions to enhance the ability to communicate with local authorities and other vessels in the area;
  - .3 meetings with local authorities and other responsible agencies to envisage emergency situations and contingency plans;
  - .4 refresher or renewal courses in bridge resource management for pilots to facilitate communication and information exchange between the pilot and the master and to increase efficiency on the bridge.
  - .5 simulation exercises, which may include radar training and emergency shiphandling procedures;

- .6 courses in shiphandling training centres using manned models;
- .7 seminars on new bridge equipment with special regard to navigation aids;
- .8 sessions to discuss relevant issues connected with the pilotage service including laws, rules and regulations particular to the pilotage area;
- .9 personal safety training;
- .10 techniques for personal survival at sea; and
- .11 emergency first aid, including cardio-pulmonary resuscitation (CPR)and hypothermia remediation.

#### 6 Continued proficiency

- 6.1 In order to ensure the continued proficiency of pilots and updating of their knowledge, the competent pilotage authority should satisfy itself, at regular intervals not exceeding five years, that all pilots under its jurisdiction:
  - .1 continue to possess recent navigational knowledge of the local area to which the certificate of licence applies;
  - .2 continue to meet the medical fitness standards of paragraph 4 above; and
  - .3 possess knowledge of the current international, national and local laws, regulations and other requirements and provisions relevant to the pilotage area and the pilots' duties.
- 6.2 Possession of knowledge required by subparagraphs 6.1.1 and 6.1.3 may be proved by an appropriate method such as personal service records, completion of continuing professional development courses or by an examination.
- 6.3 Where a pilot in cases of absence from duty, for whatever reason, is lacking recent experience in the pilotage area, the competent pilotage authority should satisfy itself that the pilot regains familiarity with the area on his or her return to duty.

#### 7 Syllabus for pilotage certification or licensing

- 7.1 In the syllabus, area means the waters for which the applicant is to be certified or licensed. Each applicant for a pilot certificate or license should demonstrate that he or she has necessary knowledge of the following:
  - .1 limits of local pilotage areas;
  - .2 International Regulations for Preventing Collisions at Sea, 1972 as amended, and also such other national and local navigational safety and pollution prevention rules as may apply in the area;
  - .3 system of buoyage in the area;
  - .4 characteristics of the lights and their angles of visibility and the fog signals, racons and radio beacons and other electronic aids in use in the area;
  - .5 names, positions and characteristics of the light vessels, buoys, beacons, structures and other marks in the area;
  - .6 names and characteristics of the channels, shoals, headlands and points in the area;
  - .7 bridge and similar obstruction limitations including air draughts;
  - .8 depths of water throughout the area, including tidal effects and similar factors;
  - .9 general set, rate, rise and duration of the tides and use of the tide tables and real-time and current data systems, if available, for the area;
  - .10 proper courses and distances in the area;

- .11 anchorages in the area;
- .12 shiphandling for piloting, anchoring, berthing and unberthing, manoeuvring with and without tugs, and emergency situations;
- .13 communications and availability of navigational information;
- .14 systems of radio navigational warning broadcasts in the area and the type of information likely to be included;
- .15 traffic separation schemes, vessel traffic services and similar vessel management systems in the area;
- .16 bridge equipment and navigational aids;
- .17 use of radar and other electronic devices; their limitations and capabilities as navigation and collision avoidance aids;
- .18 manoeuvring behaviour of the types of ships expected to be piloted and the limitations imposed by particular propulsion and steering systems;
- .19 factors affecting ship performance such as wind, current, tide, channel configuration, water depth, bottom, bank and ship interaction including squat;
- .20 use and limitation of various types of tugs;
- .21 the English language to a standard adequate to enable the pilot to express communications clearly;
- .22 IMO Standard Marine Communication Phrases;
- .23 IMO Code for the investigation of marine casualties and incidents;
- .24 Master-Pilot Relationship, Pilot Card, operational procedures;
- .25 pollution prevention;
- .26 emergency and contingency plans for the area;
- .27 safe embarking and disembarking procedures; and
- .28 any other relevant knowledge considered necessary.

#### ANNEX 2

# **RECOMMENDATION ON OPERATIONAL PROCEDURES FOR MARITIME PILOTS OTHER THAN DEEP-SEA PILOTS**

#### 1 General

Efficient pilotage depends, among other things, upon the effectiveness of the communications and information exchanges between the pilot, the master and the bridge personnel and upon the mutual understanding each has for the functions and duties of the other. Establishment of effective co-ordination between the pilot, the master and the bridge personnel, taking due account of the ship's systems and equipment available to the pilot, will aid a safe and expeditious passage.

#### 2 Duties of master, bridge officers and pilot

- 2.1 Despite the duties and obligations of a pilot, the pilot's presence on board does not relieve the master or officer in charge of the navigational watch from their duties and obligations for the safety of the ship. It is important that, upon the pilot boarding the ship and before the pilotage commences, the pilot, the master and the bridge personnel are aware of their respective roles in the safe passage of the ship.
- 2.2 The master, bridge officers and pilot share a responsibility for good communications and understanding of each other's role for the safe conduct of the vessel in pilotage waters.
- 2.3 Masters and bridge officers have a duty to support the pilot and to ensure that his/her actions are monitored at all times.

#### **3** Pilot boarding point

- 3.1 The appropriate competent pilotage authority\* should establish and promulgate the location of safe pilot embarkation and disembarkation points.
- 3.2 The pilot boarding point should be at a sufficient distance from the commencement of the act of pilotage to allow safe boarding conditions.
- 3.3 The pilot boarding point should also be situated at a place allowing for sufficient time and sea room to meet the requirements of the master-pilot information exchange (see paragraphs 5.1 to 5.6).

#### 4 **Procedures for requesting pilot**

- 4.1 The appropriate competent pilotage authority should establish, promulgate and maintain procedures for requesting a pilot for an inbound or outbound ship, or for shifting a ship.
   \* "Competent pilotage authority" has the same meaning as in annex 1.
- 4.2 As human resources and technical means have to be planned well in advance, the operation of an efficient pilotage service requires information on the Estimated Time of Arrival (ETA) or Departure (ETD) to be furnished by the ship as early as possible with frequent updates where possible.
- 4.3 Communication by VHF or other dedicated means should be established as soon as possible to enable the master to confirm the ship's ETA and the Pilot Station to furnish relevant information regarding pilot boarding.
- 4.4 The initial ETA message to the Pilot Station should include all the information required by local regulations, including:
  - .1 ship's name, call sign, ship's agent;
  - .2 ship's characteristics: length, beam, draught, air draught if relevant, speed, thruster(s);
  - .3 date and time expected at the pilot boarding point;
  - .4 destination, berth (if required, side alongside); and
  - .5 other relevant requirements and information.

#### 5 Master - pilot information exchange

- 5.1 The master and the pilot should exchange information regarding navigational procedures, local conditions and rules and the ship's characteristics. This information exchange should be a continuous process that generally continues for the duration of the pilotage.
- 5.2 Each pilotage assignment should begin with an information exchange between the pilot and the master. The amount and subject matter of the information to be exchanged should be determined by the specific navigation demands of the pilotage operation. Additional information can be exchanged as the operation proceeds.
- 5.3 Each competent pilotage authority should develop a standard exchange of information practice, taking into account regulatory requirements and best practices in the pilotage area. Pilots should consider using an information card, form, checklist or other memory aid to ensure that essential exchange items are covered. If an information card or standard form is used by pilots locally regarding the anticipated passage, the layout of

such a card or form should be easy to understand. The card or form should supplement and assist, not substitute for, the verbal information exchange.

5.4 This exchange of information should include at least:

1

- presentation of a completed standard Pilot Card. In addition, information should be provided on rate of turn at different speeds, turning circles, stopping distances and, if available, other appropriate data;
- .2 general agreement on plans and procedures, including contingency plans, for the anticipated passage;
- .3 discussion of any special conditions such as weather, depth of water, tidal currents and marine traffic that may be expected during the passage;
- .4 discussion of any unusual ship-handling characteristics, machinery difficulties, navigational equipment problems or crew limitations that could affect the operation, handling or safe manoeuvring of the ship;
- .5 information on berthing arrangements; use, characteristics and number of tugs; mooring boats and other external facilities;
- .6 information on mooring arrangements; and
- .7 confirmation of the language to be used on the bridge and with external parties.
- 5.5 It should be clearly understood that any passage plan is a basic indication of preferred intention and both the pilot and the master should be prepared to depart from it when circumstances so dictate.
- 5.6 Pilots and competent pilotage authorities should be aware of the voyage planning responsibilities of masters under applicable IMO instruments\*.

#### 6 Communications language

- 6.1 Pilots should be familiar with the IMO Standard Marine Communication Phrases and use them in appropriate situations during radio communications as well as during verbal exchanges on the bridge. This will enable the master and officer in charge of the navigational watch to better understand the communications and their intent.
- 6.2 Communications on board between the pilot and bridge watchkeeping personnel should be conducted in the English language or in a language other than English that is common to all those involved in the operation.
  \* Refer to SOLAS regulation V/34 and resolution A.893(21) on Guidelines for voyage planning and STCW Code, Section A-VIII/2, Part 2
- 6.3 When a pilot is communicating to parties external to the ship, such as vessel traffic services, tugs or linesmen and the pilot is unable to communicate in the English language or a language that can be understood on the bridge, the pilot should, as soon as practicable, explain what was said to enable the bridge personnel to monitor any subsequent actions taken by those external parties.

#### 7 Reporting of incidents and accidents

When performing pilotage duties, the pilot should report or cause to be reported to the appropriate authority, anything observed that may affect safety of navigation or pollution prevention. In particular, the pilot should report, as soon as practicable, any

accident that may have occurred to the piloted ship and any irregularities with navigational lights, shapes and signals.

#### 8 Refusal of pilotage services

The pilot should have the right to refuse pilotage when the ship to be piloted poses a danger to the safety of navigation or to the environment. Any such refusal, together with the reason, should be immediately reported to the appropriate authority for action as appropriate.

#### 9 Fitness for duty

Pilots should be adequately rested and mentally alert in order to provide undivided attention to pilotage duties for the duration of the passage.

#### \*\*\*In accordance with I.M.O. requirements and I.M.P.A. recommendations

# Appendix 4: M.1015

#### DEPARTMENT OF TRADE MERCHANT SHIPPING NOTICE NO. M.1015 TRAINING FOR MASTERS AND CHIEF MATES OF LARGE SHIPS AND SHIPSWITH UNUSUAL MANOEUVRING CHARACTERISTICS Notice to Shipowners, Ship Operators, Masters, Deck Officers and

Nautical Colleges.

The recommendations contained in this Notice supersede those on the same subject contained in Notice No. M771

- 1. It is most important that officers who are to be appointed as master or chief mate of large ships or ships which have unusual handling and manoeuvring characteristics should have adequate relevant experience and training before taking up their duties.
- 2. The Department recommends, in conformity with Resolution 17 of the 1978 International Conference on the Training and Certification of Seafarers, that prior to appointment to a large ship or a ship of considerable deadweight, draught, unusual design or of high speed, prospective masters and chief mates should
  - a) be informed of that ship's handling characteristics particularly in relation to the matters detailed in the appendix to this Notice; and
  - b) be thoroughly familiar with the use of all navigational and manoeuvring aids fitted in the ship concerned, including their capabilities and limitations.
- 3. Before initially taking command of such a ship, the prospective master should have sufficient and appropriate general experience as master or chief mate and either
  - a) have sufficient and appropriate manoeuvring experience as chief mate or supernumerary on the same ship or as master, chief mate or supernumerary on a ship having similar manoeuvring characteristics; or
  - b) have undergone a course of training/familiarization on a suitable ship handling simulator capable of simulating the manoeuvring characteristics of such a ship.
- 4. The Department emphasizes the particular importance of the master drawing the attention of all deck officers who are to be in charge of a navigational watch to the special or unusual handling characteristics of the vessel concerned. Masters of such ships should in addition ensure that their chief mates are given opportunities to understudy and familiarize themselves with the handling and manoeuvring techniques necessary in preparation for emergencies and future command.

Department of Trade Marine Division London WC1V 6LP March 1982

# APPENDIX SHIP HANDLING AND MANOEUVRING

Manoeuvring and handling of a ship in all conditions, including:

- a) manoeuvres when approaching pilot vessels or stations with due regard to weather, tide, headreach and stopping distances;
- b) handling a ship in rivers, estuaries, etc., having regard to the effects of current, wind and restricted water on the response to the helm;
- c) manoeuvring in shallow water, including the reduction in keel clearance due to the effect of squat\*, rolling and pitching;
- d) interaction between passing ships and between own ship and nearby banks (canal effect);
- e) berthing and unberthing under various conditions of wind and tide with and without tugs;
- f) choice of anchorage; anchoring with one or two anchors in limited anchorages and factors involved in determining the length of anchor cable to be used;
- g) management and handling of ships in heavy weather, including assisting a ship or aircraft in distress, towing operations, means of keeping an unmanageable ship out of a sea trough, lessening drift and use of oil;
- h) precautions in manoeuvring for launching boats or life rafts in bad weather.

\* Squat: the decrease in clearance beneath a ship which occurs when the ship moves through the

water and is caused both by bodily sinkage and by change of trim. The effect is accentuated in

shallow water and is reduced with a reduction in ship's speed. Dd 8248257 15,005 3/82 (18715)

# Appendix 5: STCW95 Section B-V/3

#### STCW 95 Section B-V/3\* \*\*

# Guidance regarding additional training for masters and chief mates of large ships and ships with unusual manoeuvring characteristics

- 1 It is important that masters and chief mates should have had relevant experience and training before assuming the duties of master or chief mate of large ships or ships having unusual manoeuvring and handling characteristics significantly different from those in which they have recently served. Such characteristics will generally be found in ships which are of considerable deadweight or length or of special design or of high speed.
- 2 Prior to their appointment to such a ship, masters and chief mates should:
  - 2.1 be informed of the ship's handling characteristics by the company, particularly in relation to the knowledge, understanding and proficiency listed under ship manoeuvring and handling in column 2 of table A-11/2 Specification of the minimum standard of competence for masters and chief mates on ships of 500 gross tonnage or more; and
  - 2.2 be made thoroughly familiar with the use of all navigational and manoeuvring aids fitted in the ship concerned, including their capabilities and limitations.
- **3** Before initially assuming command of one of the ships referred to above, the prospective master should have sufficient and appropriate general experience as master or chief mate, and either:
  - 3.1 have sufficient and appropriate experience manoeuvring the same ship under supervision or in manoeuvring a ship having similar manoeuvring characteristics; or
  - 3.2 have attended an approved ship handling simulator course on an installation capable of simulating the manoeuvring characteristics of such a ship.'
- 4 The additional training and qualifications of masters and chief mates of dynamically supported and high-speed craft should be in accordance with the relevant guidelines of the IMO Code of Safety for Dynamically Supported Craft and the IMO International Codes of Safety for High-Speed Craft (1994 HSC Code and 2000 HSC Code), as appropriate.

\*Note there are no corresponding regulations in the Convention or sections in part A of the Code for sections B-V/3

\*\*Note in STCW 2011 edition this section is named: B-V/a