

# **The Training and Experience of Key DP Personnel**



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### **IMCA M 117 Rev. 1**

This document has been developed for IMCA under the direction of its Marine Division Management Committee.

It has been referenced as an industry standard by IMO and, if revised, the Maritime Safety Committee must be informed.

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# The Training and Experience of Key DP Personnel

IMCA M 117 Rev. 1 – February 2006

<b>1</b>	<b>Executive Summary .....</b>	<b>1</b>
<b>2</b>	<b>Glossary of Terms and Abbreviations.....</b>	<b>2</b>
<b>3</b>	<b>Introduction .....</b>	<b>3</b>
	3.1 Background .....	3
	3.2 Operational.....	3
<b>4</b>	<b>Objectives.....</b>	<b>5</b>
	4.1 Primary Objectives.....	5
	4.2 Secondary Objectives .....	5
<b>5</b>	<b>Training.....</b>	<b>6</b>
	5.1 Types of Training.....	6
	5.2 Training Records.....	6
	5.3 Training Courses for Key Marine DP Personnel .....	6
	5.4 Training Courses for Key Technical DP Personnel (including Marine Engineers/ Electronics Maintenance Staff).....	7
	5.5 Training Courses for Chief and other Marine Engineers .....	8
	5.6 Training Courses for Electricians .....	8
	5.7 Records of Training.....	8
<b>6</b>	<b>Competence of Key DP Personnel .....</b>	<b>9</b>
	6.1 Master/OIM.....	9
	6.2 Senior DPO.....	10
	6.3 DPO.....	10
	6.4 Junior DPO.....	11
	6.5 Trainee DPO .....	12
	6.6 Record of Training for DP Operators.....	12
	6.7 Chief Engineer .....	12
	6.8 ECR Watchkeepers.....	13
	6.9 EMS – Electrician/Electronic Maintenance Staff.....	13
	6.10 Electrician .....	13
	6.11 Record of Training and Experience for All Key DP Personnel.....	14
<b>7</b>	<b>Experience of Key DP Personnel .....</b>	<b>15</b>
	7.1 Minimum Experience on an Established Vessel .....	15
	7.2 Minimum Experience on a New or Unfamiliar Vessel .....	16
	7.3 Familiar Vessel – a DP Vessel with Familiar Control Systems .....	16
	7.4 Minimum Period of Familiarisation Training on a Familiar Vessel .....	16
<b>8</b>	<b>Familiarisation .....</b>	<b>18</b>
	8.1 Procedure.....	18

8.2	Project Familiarisation.....	19
<b>9</b>	<b>Principles and Practice for Maintenance of Personnel Skills .....</b>	<b>21</b>
9.1	Principles.....	21
9.2	Suggested Practice .....	21
<b>10</b>	<b>Accreditation .....</b>	<b>23</b>
10.1	Accreditation of DP Basic/Induction and Advanced/Simulator Courses .....	23
<b>11</b>	<b>Certification .....</b>	<b>24</b>
11.1	Nautical Institute DP Operator Certificates.....	24
11.2	Engineering Staff Certificates.....	24

## Appendices

<b>1</b>	<b>DP Training Courses .....</b>	<b>25</b>
<b>2</b>	<b>DP Basic/Induction Course.....</b>	<b>27</b>
<b>3</b>	<b>Validation Of Onboard Training Schemes .....</b>	<b>29</b>
<b>4</b>	<b>Advanced/Simulator Courses.....</b>	<b>31</b>
<b>5</b>	<b>DP Familiarisation Course Content .....</b>	<b>33</b>
<b>6</b>	<b>Example Familiarisation Checklists.....</b>	<b>35</b>
<b>7</b>	<b>List of Relevant IMCA Publications .....</b>	<b>39</b>
<b>8</b>	<b>Example Emergency Drill Scenarios .....</b>	<b>41</b>
<b>9</b>	<b>DP Incident Reporting .....</b>	<b>43</b>
<b>10</b>	<b>Norwegian Regulation 687 .....</b>	<b>45</b>
<b>11</b>	<b>IMO Maritime Safety Committee Circular 738 .....</b>	<b>47</b>

## I Executive Summary

This guideline reflects the recognised industry standard for the training, competence and experience required of all key DP personnel on dynamically positioned (DP) vessels.

In June 1996, the Maritime Safety Committee (MSC) of the International Maritime Organization (IMO) issued circular MSC/Circ.738 which noted that IMCA had prepared a publication on the “*Training and Experience of Key DP Personnel*” and invited member governments to bring that publication to the attention of the bodies concerned and apply them to the training of key DP personnel.

A reference to the publication was also made in the 1989 MODU Code. The committee invited IMCA to keep IMO informed of future amendments to the IMCA guidelines as appropriate. This amended version will therefore be submitted to the MSC.

The document was revised by an IMCA workgroup during 2005 to reflect current best practice and to bring its format into line with present IMCA documentation. This has led to some reorganisation and some renumbering of sections.

The guidelines are designed for vessels engaged in operations where loss of position could cause one or more of the following: loss of life, severe pollution, major damage and economic loss.

The formal training courses to be attended by DP operators are defined in content, verification and approval. The practical experience and certification requirements are also defined. Training for watchkeeping marine engineers and electronic maintenance staff (EMS) is specified. The training can be performed either at an approved training centre or onboard a vessel, provided the training is equivalent.

In addition, guidance is given on a structured familiarisation procedure for key DP personnel joining a DP vessel or commencing a new project.

The principles and practices for refresher training are provided as are the requirements for operators wishing to submit experience in lieu of formal training.

In general all formal training should be assessed and all training approved, so that a common standard exists internationally.

This document provides very useful guidance for competence assurance and assessment requirements in the industry. Its benefits can be increased if it is used in combination with IMCA C 002 – *Competence assurance and assessment: Guidance document and competence tables – Marine Division*.

## 2 Glossary of Terms and Abbreviations

Approved DP training course	A training course given approval by a recognised body such as the Nautical Institute (NI) or Norwegian Maritime Directorate (NMD)
Assessor	A person capable of training a new employee in all facets of setup and operation of all DP equipment, including basic problem identification and mitigation. For example, a person described as an assessor with respect to DGPS equipment will be able to teach and assess personnel in how to select differential correction stations, adjust an elevation mask and understand operational theory sufficiently to verify adequate performance of satellite and equipment and disable noisy satellites and correction signals as required. Both marine and technical staff would require comparable skills. Note that knowledge of a system is not always sufficient. The capability to train should include the ability to impart knowledge to others. For further guidance, see IMCA C 007 – <i>Guidance on Assessor Training</i>
BOP	Blow out preventer or basic operating panel
Controlled document	A document controlled and updated by the company or vessel operator
DP system	All systems and sub-systems that directly or indirectly effect the dynamic positioning of a vessel, comprising the following: power system, thruster system, and DP control system
DPO	A trained operator of a dynamic positioning control system, as defined in 6.3
ECR	Engine control room
ER	Engine room
ERO	Electronic radio officer
EMS	Electrical and electronic maintenance staff
ESD	Emergency shutdown
Established vessel	A vessel that has been operational with the same organisation and in the same sea area for six months
ETO	Electrical technical officer
EOD	Emergency operator drills
Familiar vessel	A vessel with a familiar control system.
FMEA	Failure mode and effects analysis
HAZID	Hazard identification analysis
HAZOP	Hazard and operability analysis
HV	High voltage, that is, electrical voltage in excess of 1kV
Installation	Unit visited by a vessel such as a fixed offshore structure, a live pipeline, a drilling unit, an accommodation unit, a floating production or storage unit
JDPO	Junior DPO, as defined in 6.4
Key DP personnel	Masters, chief officers, OIMs, night masters, chief and first engineers, DPOs, WMEs and EMS
MRU	Motion reference unit
NI	Nautical Institute
NMD	Norwegian Maritime Directorate
SDPO	Senior DPO, as defined in 6.2
Touch drills	A method of exercising emergency procedures in training and drills, by touching but not activating controls to simulate the required actions. (This may not be appropriate on active systems where equipment can be activated by light touch. Pointing to controls might be acceptable in calm conditions)
Unfamiliar vessel	A vessel with an unfamiliar control system
VRU	Vertical reference unit
WME	Watchkeeping marine engineer or personnel whose duties include the maintenance of the power plant
WSOG	Well-specific operational guidelines

## 3 Introduction

### 3.1 Background

Every vessel owner/operator agrees that trained and experienced key DP personnel are essential for a safe and commercially successful operation. The problem is always to find the most cost effective method to achieve a satisfactory standard. It is accepted that a formal training course is part of the experience necessary for a DP operator (DPO). Formal training can be provided either by using shore-based facilities or onboard using an approved simulator and/or the vessel itself. It is also accepted that vessel-specific training and experience is essential.

However, it should also be possible for vessel owners/operators to have flexible control of the availability of key DP personnel, because movement between different vessels can be beneficial and is often unavoidable. Benefit should also accrue to vessel owners/operators who purchase and formally use simulators and similar exercises for practical training onboard.

All key DP personnel need to learn from incidents, whether they occur to them or to other DP personnel, whether on their location or anywhere else.

- ◆ The incident could result from human error, equipment failure or from any other reason.
- ◆ If an error occurs, (as defined in Appendix 9), the industry will benefit from shared knowledge of it.
- ◆ All relevant parties in the industry can use that experience to improve their operating skills, capabilities and understanding.
- ◆ To ensure safe practice, every incident and/or operator error should be investigated and reported.
- ◆ One of the best tools available for an owner to focus training expenditure is an accurate and comprehensive DP incident database.
- ◆ Responsible personnel should feel able to report errors and faults without fear of adverse company or client reaction.

One way of supporting this is to use the IMCA DP incident reporting system (see Appendix 9). Relevant incident reporting forms are available from IMCA. IMCA publishes reported errors and faults in an anonymous form, for example without reference to dates, names, vessels or locations.

### 3.2 Operational

Vessel owners/operators should allocate time in their DP vessels' schedules for training and drills; clients should encourage this as suitable opportunities arise.

Should opportunities not arise due to operational restraints, alternative methods should be used. Commercial arguments alone should not defer the employment of full scale drills.

Limitations of bed space, helicopter flights or other matters can frequently impinge upon verbal handovers between key DP relief personnel. A system should always be agreed prior to the event to ensure a proper handover. It is in the interest of a vessel owner/operator and his client to facilitate handovers without interrupting the work.

Some projects are unusual and key DP personnel with vessel experience alone may additionally need detailed project familiarisation. These can be in the form of HAZIDs and HAZOPs for example. Further guidance on DP operations is available in IMCA M 103 – *Guidelines for the Design and Operation of Dynamically Positioned Vessels*.

The key DP personnel should not only be competent and vessel-experienced, but they need to be able to work together and communicate effectively. Clients should respect the advice of vessel owners/operators in this area.

As with an FMEA, any training or operating manuals should be treated as 'living' documents so that they are constantly updated and amended as required, for example as a result of lessons learned as result of an incident.

For a new vessel, or a vessel that is new to a particular owner/operator, special arrangements might be necessary to bring the key DP personnel up to an adequate standard of vessel familiarisation and experience.

## **4 Objectives**

### **4.1 Primary Objectives**

The primary objectives of this guidance are to improve the safety of DP operations by defining minimum industry guidelines for:

- ◆ the formal training and competence of key DP personnel;
- ◆ the familiarisation programme for key DP personnel new to a vessel.

### **4.2 Secondary Objectives**

The primary objectives should assist in achieving the following secondary objectives:

- ◆ Internationally accepted guidance for the training and experience of key DP personnel
- ◆ Training resources being spent where they are most effective
- ◆ Onboard training, familiarisation programmes and simulators being encouraged
- ◆ Providing verification as to the suitability of key DP personnel, allowing operators the flexibility to manage change.

## 5 Training

### 5.1 Types of Training

Training of key DP personnel is essential and can take several forms:

- ◆ shore-based training courses
- ◆ onboard training as operations permit and under the supervision of an experienced operator with trainer level skills, normally a senior DPO or above (see section 6.2).
- ◆ suitable onboard DP simulator instruction and exercises. The emphasis of such training should be scenario-based specific to the operations expected. One of the methods of doing that is by the use of touch drills and simulation.
- ◆ onboard instruction and familiarisation particular to that vessel
- ◆ supervised operation of the control system
- ◆ manufacturers' training ashore and onboard
- ◆ seminars with open discussions on vessel operation
- ◆ company schemes relevant to the specific DP operations.
- ◆ refresher courses, both theory and simulator
- ◆ computer- (including internet-) based training

### 5.2 Training Records

It is often necessary to provide evidence of training, for vessel audits, for human resource administration and for employment purposes. This indicates a need to have a demonstrable record of training.

The amount of training and experience necessary for key DP personnel should depend on the type of vessel and the consequences of any position loss during their work. It is in the interest of vessel owners/operators as well as the individuals onboard to keep records of the training and experience of key DP personnel.

DP *training* logbooks are produced by the Nautical Institute. The required book is called the *Dynamic Positioning Operator's Log Book* and is available at all approved DP training establishments for DPOs.

Once a Nautical Institute DPO certificate is obtained, it is necessary to demonstrate continued competency. An essential part of that process is to record post-certificate DP time. Such a log of DP time after certification can be kept in the *IMCA Dynamic Positioning Logbook*, which can also be used by all key DP personnel to record DP operational time aboard DP vessels. These logbooks are available from IMCA ([www.imca-int.com/publications](http://www.imca-int.com/publications)).

Attendance at training should be logged in the NI logbook and drills recorded in the vessel's permanent records. The vessel owner should establish a requirement for attendance at drills or alternate training and a system to verify that all DPOs attend onboard drills or alternate training at least once every 24 months.

### 5.3 Training Courses for Key Marine DP Personnel

Formal training courses for DPOs have been in operation for several years. These courses are structured and approved by the Nautical Institute, which reviews, revises and audits them from time to time. The Nautical Institute works with industry and trade associations, such as IMCA, in order to collate and input current industry needs as appropriate. Some of these courses are also approved in structure and content by the Norwegian Maritime Directorate. Details of courses and their locations can be obtained from the NI website at [www.nautinst.org](http://www.nautinst.org)

The structure of the training course for DPOs to achieve a Nautical Institute certificate is updated from time to time as indicated in 5.3. Current information is available on the NI website at [www.nautinst.org](http://www.nautinst.org)

At present, the structure for DPOs is as follows:

**Phase 1** Attendance of a DP Basic/Induction course\* at an approved training centre or organised onboard, (see Appendix 2 and Appendix 3) where the course will provide an introduction to the functions and use of a dynamic positioning system, or as a trainee DPO with onboard training under the supervision of a senior DP operator. The course should be based around the content outlined in Appendix 2 and approved as set out in section 10.

**Phase 2** Documented practical experience in the use of DP systems on DP vessels for a minimum period of 30 days as a trainee DPO after the completion of the basic/induction course.

NB The practical experience referred to should be in accordance with chapter C in the NI DP operator logbook – *Seagoing Familiarisation Watchkeeping*.

**Phase 3** Attendance at a DP simulator course at an approved training centre or onboard the vessel, where the course will provide training in the use of DP systems, including simulator exercises and emergency operations. The course should be based around the content outlined in Appendix 4 and, if onboard, approved as described in Appendix 3.

**Phase 4** Documented confirmation of a minimum of six months supervised DP watchkeeping, dependent upon the level of certification sought, in an approved DP logbook from the Master/OIM and that the above training programme has been followed and completed, will result in the issue of a DP certificate from an approved body.

NB Care should be taken that the six month training period in Phase 4 includes sufficient practical training, such as handling the vessel on joystick, changing from auto DP to joystick to transit and vice versa. This may cause difficulty in some situations, such as on floatels, or on drilling operations, which often have long periods of static DP operation, with the unit on the same heading and in the same position for several months.

Achievement of an NI (or NMD) DPO certificate does not guarantee provision of a fully qualified senior DPO capable of handling any DP situation. The certificate provides evidence that a DPO has been trained in the basics of DP and may require additional vessel and equipment specific training (see 6.2 to 6.5).

#### **5.4 Training Courses for Key Technical DP Personnel (including Marine Engineers/Electronics Maintenance Staff)**

In respect of all training, it is often necessary (for audits or human resource administration) to have a demonstrable record of the training completed. The IMCA DP logbook provides one useful method of doing so. Companies could also make use of computer-based records onboard and/or in human resources departments.

Training should be appropriate to the vessel and include subjects covering vessel control systems, high voltage (HV) safety, DP maintenance, power management systems (PMS), fire and gas detection, emergency shut downs (ESD) and emergency drills.

DP maintenance staff, including marine engineers and electricians/electronic maintenance staff (EMS), should attend a DP control system manufacturer's maintenance course, or a course approved by the manufacturer, designed to enable understanding of the control system and the procedures necessary for fault finding. Training on vessel-specific equipment is necessary if the equipment is sufficiently unique that training on similar equipment does not provide an adequate level of knowledge. Such training should be recorded in DP logbooks. It is in the interest of vessel owners/operators to maximise the ability of the relevant personnel to fault find and repair the control system.

The aim of the training should be to provide marine engineers and EMS onboard capable of responding quickly and appropriately to equipment failures that can result in DP incidents. The minimum competence requirements are set out in 6.7 to 6.11.

Good understanding of the DPO's responsibilities and onboard familiarisation with the DPO's task in controlling specific DP operations, will aid quick and appropriate response to problems associated with any equipment that affects DP.

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\* For NMD courses the terminology 'DP Basic' applies, whereas for NI courses, the term 'Induction' applies.

In general, all DP key personnel should have a good understanding of each other's tasks and responsibilities.

Marine engineers and EMS should attend a DP familiarisation course, either at an approved training centre, or organised onboard the vessel. It is important that they have a full understanding of the risks and consequences of maloperation and/or malfunction of the DP system. The course should be based around the content outlined in Appendix 5. This course may also be useful for other personnel involved in DP, e.g. a diving supervisor, or certain shore-based personnel and can include, but not be limited to, anyone who is critical to the DP operation.

### **5.5 Training Courses for Chief and other Marine Engineers**

The above listed marine engineers should attend a DP familiarisation course either at an approved institution or as organised onboard. It is important that engineers have a full understanding of the risks involved and the consequences of maloperation and/or malfunction of the DP system. They should also fully understand their role in the successful DP operation of the vessel. The course should be based around the content outlined in Appendix 5. Chief engineers can be sent on the DP control system manufacturer's maintenance course.

Vessel owners/operators should always have onboard at least one marine engineer or EMS who has received appropriate training on any integrated control system from the system manufacturers/suppliers. Details of such training should be recorded in the DP logbooks.

### **5.6 Training Courses for Electricians**

Electricians on vessels with high voltage (HV) systems should attend a course in the safe operation of HV systems. The course can be carried out by a training establishment, an equipment supplier or manufacturers at their premises or onboard a vessel.

Training on vessel-specific equipment may be necessary if the equipment is sufficiently unique that training on similar equipment does not provide an adequate level of knowledge. Such training could be by suitable personnel onboard.

Training should be sufficient for the electrician to have a complete understanding of operational theory and troubleshooting techniques for all electrical generation, distribution, protective relays, and control systems used on all class certificated and critical electrical and ventilation equipment on the vessel.

### **5.7 Records of Training**

All relevant training should be recorded in the IMCA DP logbooks.

## 6 Competence of Key DP Personnel

### 6.1 Master/OIM

The Master or OIM should hold, as minimum, a formal qualification, which is equivalent to an appropriate, approved, current STCW convention standard, or an OIM certificate as appropriate and hold a current DP certificate issued by the NI or NMD.

Further guidance can be obtained from IMCA C002 chapter 10.1

***Competence for navigational watches is covered by the STCW Code.***

The Master or OIM should be trained, experienced, appropriately qualified and competent to take charge of a DP watch for any DP operation that the particular vessel may become engaged in.

Additionally, the Master should be competent to conduct annual trials, lead DP drills, train new DP personnel, and assess the skill level of new and existing DP personnel (see Appendix 8 for examples of types of drills).

The Master needs to have all of the qualifications and competence of the senior DPO (see 6.2) and the Master's knowledge and experience, relevant to the vessel, should also include:

- ◆ DP incident investigation;
- ◆ comprehensive understanding of the DP computer/control system(s), including changing between systems and the various modes of operation;
- ◆ training on any other system that they will be responsible for, such as, but not limited to, vessel management systems, PMS, fire, gas and ESD;
- ◆ detailed knowledge of emergency procedures and actions due to failures of:
  - generator/power
  - thrusters
  - sensors
  - input systems
  - computer
  - commands
  - feedback
  - any other systems/equipment relevant to dynamic positioning;
- ◆ detailed knowledge of emergency procedures and actions that have impact on the DP operation as defined in the emergency/contingency procedure manual;
- ◆ assessor level in the setup and use of all position reference systems;
- ◆ assessor level in the understanding, setup, functionality, failure modes and use of any equipment and system associated with DP operations on the vessel;
- ◆ the ability to plan, execute and lead DP drills including blackout recovery.

The Master should actively participate in HAZID/HAZOP meeting as part of project planning.

The Master/OIM should have knowledge of relevant IMCA documentation. A list of possibly relevant documents can be found at Appendix 7.

The Master/OIM should record DP operating hours in order to maintain a demonstrable level of experience.

In the case of senior staff who have not attained assessor level due to recent transfer or equipment upgrade, training should be scheduled as soon as possible.

## 6.2 Senior DPO

Companies assign levels of DPO status to suit their own operations. The DPO hierarchy set out below gives an overall guidance, but will not necessarily apply to all companies. For example, some companies may not have 'Junior DPOs', but this designation has sometimes been adopted. See also the note below 6.5.

### 6.2.1 Definition

A senior DPO (SDPO) is defined in this guidance as a trained DP operator meeting the competence requirements outlined below in 6.2.2 and who has completed training to a *minimum* of Phase 4 as defined by the NI. The SDPO should have satisfied company requirements (for example DP hours) and been assessed by the Master as capable of taking sole charge of a DP watch and providing supervision to junior and trainee DPOs, for any DP operation that the particular vessel may become engaged in. The SDPO should be able to provide supervision of junior and trainee DPOs and when doing so, the senior DPO should be in the same work space and maintaining continuous oversight of the activities of the DPO.

Competence for navigational watches is covered by the STCW Code. Further guidance is available in IMCA C 002.

### 6.2.2 Knowledge and Experience

SDPOs need to have all of the qualifications of the DPO (see 6.3) and in addition their knowledge and experience should also include:

- ◆ assessor level in the setup and use of all position reference systems;
- ◆ assessor level in the setup and use of the data logger to save data, export data, and print out data charts for analysis;
- ◆ assessor level in the understanding, setup, functionality, failure modes and use of any equipment and system associated with DP operations on the vessel.

*NB See section 2 for definition of an assessor.*

## 6.3 DPO

### 6.3.1 Definition

A DPO is defined in this guidance as a trained DP operator meeting the competence requirements outlined below in 6.3.2 and who has completed training to a minimum of Phase 4 as defined by the NI. Although competent to maintain a DP watch for any DP operation the particular vessel may become engaged in, a DPO would not yet be capable of taking sole charge of the watch or providing supervision to junior and trainee DPOs. The senior DPO should be in the same work space and maintaining continuous oversight of the activities of the DPO.

Competence for navigational watches is covered by the STCW Code. Further guidance is available in IMCA C 002.

### 6.3.2 Knowledge and Experience

A DPO's knowledge and experience should include:

- ◆ controlling the vessel using manual and joystick controls;
- ◆ changing operational modes between auto DP to joystick to manual controls to autopilot and vice versa;
- ◆ principles and planning of DP operations in depth;
- ◆ DP information input systems;
- ◆ detailed understanding of the DP computer/control system(s), including changing between systems and the various modes of operation;

- ◆ thruster units and associated systems;
- ◆ power supplies;
- ◆ equipment redundancy, availability and maintenance requirements;
- ◆ operational capabilities and footprints;
- ◆ comprehensive knowledge of system functional specifications, one-line diagrams, equipment operator manuals and the vessel's operations manuals;
- ◆ comprehensive knowledge of the vessel's communications systems;
- ◆ knowledge of emergency procedures and actions due to failures of:
  - generator/power
  - thrusters
  - sensors
  - computers
  - commands
  - feedback
  - any other systems/equipment relevant to the DP;
- ◆ knowledge of the vessel's FMEA and an understanding of the implications of all identified failure modes;

If the DPOs do not have to also keep the navigational watch then they need not have a navigational watchkeeping qualification to an approved STCW convention standard. (This enables engineers and EMS to be DPOs).

## 6.4 Junior DPO

### 6.4.1 Definition

A junior DPO is defined in these guidelines as a trained DP operator meeting the competence requirements outlined in 6.4.2 and who has completed training to a minimum of Phase 3 as defined by the NI. The junior DPO should be supervised while on watch by an SDPO.

Competence for navigational watches is covered by the STCW Code. Further guidance is available in IMCA C 002.

### 6.4.2 Knowledge and Experience

A junior DPO's knowledge and experience should include:

- ◆ controlling the vessel using manual and joystick controls;
- ◆ changing operational modes between auto DP to joystick to manual controls to autopilot and vice versa;
- ◆ principles and planning of DP operations;
- ◆ basic knowledge of the practical operation of DP control system, including changing between systems and the various modes of operation;
- ◆ knowledge and use of reference systems and other peripheral equipment;
- ◆ system redundancy, alarms and warnings;
- ◆ knowledge of vessel systems and their limitations;
- ◆ knowledge of DP alarm sequences and communications with reference to operational condition;
- ◆ knowledge of the vessel's operations manuals and communications system;
- ◆ knowledge of the vessel's FMEA and its implications;
- ◆ training on any other systems relevant to the DP that they are responsible for.

If Junior DPOs do not have to also keep the navigational watch then they need not have a navigational watchkeeping qualification to an approved STCW convention standard. (This enables engineers and EMS to be DPOs).

## 6.5 Trainee DPO

A trainee DPO is defined in these guidelines as a trained DP operator meeting the competence requirements outlined in 6.4.2 and who has completed training to a minimum of Phase 2 as defined by the NI. The trainee DPO would have no watchkeeping responsibilities and should be regarded as a supernumerary.

*NB It should be noted that the Nautical Institute would define a trainee as someone working toward obtaining a DPO certificate, irrespective of whatever designation a company or vessel might use for that person. Similarly, the Nautical Institute regard a DPO as someone who holds a valid DPO certificate.*

## 6.6 Record of Training for DP Operators

Reference is made to the comments under 5.2.

Trainees should keep a record of all training undertaken toward becoming a DPO in the NI DPO log book and obtain signatures of Master and/or SDPOs or training school supervisors as appropriate.

The IMCA DP logbook provides a facility for recording training post certification, while some companies also have their own systems specifically for doing so.

It can be useful, both for audits and for company personnel training programmes to have a system onboard the vessel and in the shore office, for recording the training and tracking of Trainee and Junior DPOs' progress.

## 6.7 Chief Engineer

The Chief Engineer should have appropriate experience and sufficient competence to take charge of a watch in the ER or ECR during DP operations and understand the DP operational requirements of the vessel, the consequences of failures and the optimisation of the redundancy available in equipment such as:

- ◆ power generation;
- ◆ power distribution;
- ◆ thruster units electrical power and sensors;
- ◆ thruster units and associated systems;
- ◆ network;
- ◆ power management/logic;
- ◆ power and UPS systems;
- ◆ DP control system interfaces;
- ◆ DP control system hardware;
- ◆ DP control system software;
- ◆ computer functions, tests and fault finding.

The Chief Engineer should understand the need for and implement good communications between the bridge and engine control room and have a comprehensive knowledge of the vessel's operations manuals including the FMEA as currently updated.

The chief engineer should be:

- ◆ at assessor level in the setup and use of all DP related systems operated by the technical department;
- ◆ able to plan, execute and lead blackout recovery drills.

The Chief Engineer should hold a formal, appropriate, current qualification to an approved STCW convention standard and have attended the manufacturer's/supplier's training course on any integrated DP/power management control system onboard.

## 6.8 ECR Watchkeepers

ECR watchkeepers should be experienced and sufficiently competent to take charge of a watch in any ER or ECR or equivalent during DP operations and understand the operational requirements of the vessel and the consequences of various failures in equipment of importance to DP operations such as:

- ◆ power generation;
- ◆ power distribution;
- ◆ thruster units and associated systems;
- ◆ power management/logic.

They should understand the need for and implement good communications between the bridge and engine control room and have comprehensive knowledge of the vessel's operations manuals, including the FMEA as currently updated, with respect to the significance of machinery redundancy.

They should hold formal, appropriate, current qualification to an approved STCW convention standard and should have attended a manufacturer's/supplier's training course on any integrated DP/power management control system. This training could be carried out onboard by the supplier.

## 6.9 EMS – Electrician/Electronic Maintenance Staff

EMS should be experienced and sufficiently competent to maintain the DP control system and associated systems and carry out routine checks and maintenance. They should also have a comprehensive knowledge of the vessel's operations manuals and FMEA as currently updated with respect to the following equipment:

- ◆ power and UPS systems;
- ◆ thruster units electrical power and sensors;
- ◆ DP control system interfaces;
- ◆ power and UPS systems;
- ◆ DP control system hardware;
- ◆ DP control system software;
- ◆ computer functions, tests and fault finding.

They should be able to carry out tests and effect maintenance, repairs and replacements to systems and components with reference to the manufacturer's approved operation and maintenance procedures. They should understand when such work is safe and sensible to carry out, have appropriate understanding of the vessel's current FMEA and implement good communication with bridge and engine control locations.

All EMS should hold a DP control system maintenance course certificate. If they are also electricians, they should satisfy requirements set out under chapter 6.10.

## 6.10 Electrician

On a DP vessel where the electrician is responsible for the DP control system hardware and software he/she should meet the requirements for EMS above under chapter 6.9. In addition, if the vessel has a high voltage system, he/she should hold a certificate for operating an electrical high voltage system and have had instruction on the particular high voltage system installed.

The electrician should possess a complete understanding of operational theory and troubleshooting techniques for all electrical generation, distribution, protective relays, and control systems used on all class certified and critical electrical and ventilation equipment on the vessel.

*NB Shipboard instruction from manufacturers/suppliers can be replaced by instruction from experienced ship's personnel, that is, for example, personnel who have had more than six months' operational experience of the relevant equipment.*

## **6.11 Record of Training and Experience for All Key DP Personnel**

All key DP personnel can utilise an IMCA Dynamic Positioning Logbook to record their DP experience.

## 7 Experience of Key DP Personnel

The experience of key DP personnel is governed by the amount of DP operational time they are able to acquire on a vessel. The vessel operator should ensure that all key DP personnel have received any necessary additional training and experience appropriate to their role onboard and have completed the appropriate familiarisation.

For a guide as to what training might be considered appropriate, the following could be of assistance.

For the purposes of this guidance, if the vessel is not brand new and has been working in DP for an acceptable period after initial trials (defined in this guidance as for six months), then it is defined as an 'established vessel,' for which the guidance in 7.1 applies. For all other vessels, defined as 'new or unfamiliar vessels,' the guidance in 7.2 applies.

Thus, for the purposes of crewing a vessel with the appropriate key DP personnel, it can be useful for companies to define vessels as either:

- ◆ established DP operational vessels (see 7.1); or
- ◆ new or unfamiliar vessels (see 7.2).

### 7.1 Minimum Experience on an Established Vessel

At their option, owners may require additional DP experience, or equipment or vessel specific training in addition to these minimum guidelines.

The example of operations near to an installation, or for installations that are DP controlled, is used for convenience, but clearly there could be a wide range of operating parameters for DP vessels.

When a vessel changes owners and/or operators, or is deployed in a new area, it may be difficult to crew the vessel with adequately experienced and trained personnel. It would thus be necessary to establish appropriate adequate vessel experience as quickly as is reasonably practical.

A vessel is defined as 'established' after six months' DP operations with the vessel's key DP personnel having the competence described in section 6, together with vessel experience as described in Table I below, particularly if the vessel is engaged in diving support, drilling or operations close to installations.

Table I – Minimum Experience for Key DP Personnel

Key DP Personnel	Previous DP Vessel		Subject DP Vessel	
	Hours	Weeks	Hours	Weeks
Master/OIM	250	10	100	4
Senior DPO	250	10	150	2
DPO	150	3	50	1
Chief Engineer	250	10	100	4
ECR Engineer	100	4	50	2
ETO/ERO	250	10	100	4
Electrician	250	10	100	4

Table I gives the basis for an established vessel's key DP personnel's experience for any class 1, 2 or 3 DP vessel worldwide, even if a large change of personnel has taken place. There will be occasions when the requirements set out in Table I are not fulfilled, such as when personnel do not have the requisite previous experience in their rank or rating. In the six month period for a vessel to become established the subject vessel experience should, however, be never less than that required for a new or unfamiliar vessel as set out below in 7.2.

Where personnel do not have the requisite previous experience in their rank or rating, a period of enhanced familiarisation for that person could be required. The procedure for such familiarisation would need to be flexible to cope with the vessel's specific operational requirements and the individual's competence and experience. The goal of such enhanced familiarisation would be to achieve a level of knowledge and skill equivalent to what would be gained by the experience listed in Table I.

## 7.2 Minimum Experience on a New or Unfamiliar Vessel

A new or unfamiliar vessel is a new or different vessel to some or all key DP personnel. A brand new or converted vessel has generally had owner's/operator's acceptance trials as well as commissioning and FMEA trials, all of which should enable key DP personnel to become vessel-experienced in less time than in normal vessel service.

For a vessel with an unfamiliar control system(s) that acts as an installation, or that is expected to carry out DP operations near installations, a supervised programme of onboard training is essential. The minimum period of familiarisation/training/practice that has been found to be satisfactory in the past is as set out below.

The following assumes that, where possible, vessel experience is as per 7.1 and that instruction from manufacturers/suppliers is called onboard as appropriate during the following time periods.

Table 2 – Minimum Period of Familiarisation, Training or Practice

Key DP Personnel	Minimum Vessel Experience	
Master/OIM	50 hours	over 7 days at sea
Senior DPO	50 hours	over 7 days at sea
DPO	50 hours	over 7 days at sea
Chief Engineer	21 days	including 7 at sea
ECR Engineer	14 days	including 7 at sea
EMS	21* days	including 7 at sea

The DP hours above can be reduced if a simulator of the DP control system is available together with a structured and supervised training programme. The maximum benefit will be half the required hours at a rate of two hours simulation to one hour of actual DP operation. This assumes that the actual DP operation consists of continuous active use of the DP control system and not just monitoring position keeping.

The days required for engineering staff assume that time is spent in port and on passage becoming familiar with the vessel's engineering systems and their control.

If personnel are moving from a class 1 to a class 2 or 3 vessel, and have limited certificates, they should also have an additional 50 hours (another seven days) and should then gain three months experience as a junior DPO.

Where personnel do not have the requisite previous experience in their rank or rating, a period of enhanced familiarisation for that person could be required. The procedure for such familiarisation would need to be flexible to cope with the vessel's specific operational requirements and the individual's competence and experience.

## 7.3 Familiar Vessel – a DP Vessel with Familiar Control Systems

A familiar vessel is defined in these guidelines as one that has the same DP control system, or the same type of engines and switchboard manufacturer and is engaged in similar operations. If the equipment supplier is the same, this will not necessarily mean that the control system is 'familiar' because third and fourth generation DP control systems are likely to be quite different to operate, although the concepts are the same. It can be helpful if vessel owners/operators indicate to clients those systems which are similar within their fleet.

## 7.4 Minimum Period of Familiarisation Training on a Familiar Vessel

For personnel on a vessel with a familiar control system that acts as an installation, or that is expected to carry out DP activities near installations, there is a minimum period of familiarisation/training recommended, as outlined below:

\* If EMS and an electrical engineer are normally onboard at the same time, EMS vessel time can be reduced to 14 days.

Master/OIM	24 hours of active DP operations over a period of at least 3 days, with a vessel-experienced DPO providing instruction/supervision. Alternatively, if DP operations are not in progress, then 3 days of instruction/ demonstration of the vessel from a vessel-experienced DPO.
Senior DPO/DPO	24 hours of active DP operations over a period of at least 3 days, with a vessel-experienced DPO providing instruction/supervision. Alternatively, if DP operations are not in progress, then 3 days of instruction/demonstration of the vessel from a vessel-experienced DPO.
Junior DPO	24 hours of active DP operations over a period of at least 3 days, with a vessel-experienced DPO providing instruction/supervision. Alternatively if DP operations are not in progress, then 3 days of instruction/demonstration of the vessel from a vessel-experienced DPO.
Chief Engineer	24 hours of active ship operation over a period of 3 days with an experienced engineer of the same position and discipline, or alternatively, if DP operations are not in progress, 3 days of overlap with an engineer of the same position and discipline.
ECR Engineers	24 hours of active ship operation over a period of 3 days with an experienced engineer of same position and discipline, or alternatively, if DP operations are not in progress, 3 days of overlap with an engineer of the same position and discipline.
ETO/ERO/Electrician	24 hours of active ship operation over a period of 3 days with an experienced engineer of the same position and discipline, or alternatively, if DP operations are not in progress, 3 days of overlap with an engineer of the same position and discipline.

If DP operations are not in progress, then an equivalent level of training could be provided by simulator training. See comments in section 9.2 regarding simulators and Appendix 3.

*Note 1:* In addition to the above a familiarisation procedure should be in place. Familiarisation procedures are covered in the following section.

*Note 2:* Whilst the above general guidance on key DP personnel experience in section 7 is the product of industry practice, such familiarisation procedure may need to incorporate some flexibility to cope with the variation in individual key DP personnel's competence and ability, together with the vessel's operational requirements.

## 8 Familiarisation

### 8.1 Procedure

All key DP personnel joining any DP vessel should have a structured familiarisation procedure which includes the reading of appropriate manuals, DP incident reports, FMEAs, DP operations manual and any documented DP history, e.g. annual DP trials reports, checklists etc. IMCA M 109 Rev. 1 – *A guide to DP-related documentation for DP vessels* – describes the documentation that should be available. Vessel familiarisation requirements should be controlled onboard to ensure relevant manuals and familiarisation routines are completed.

The vessel owner/operator is responsible for establishing, issuing and maintaining controlled documents onboard the vessel. The overall responsibility for familiarisation lies with the vessel's Master or OIM. The Master or OIM is also responsible for the correct implementation of the familiarisation programme. The vessel owner/operator is responsible for checking that the procedure is followed.

#### 8.1.1 All Personnel

On arrival onboard the vessel, a guided tour and general familiarisation routine should be completed by all personnel. Guidance can be found in IMCA SEL 003 – *Initial and Refresher Familiarisation of Vessel Crews*. In addition, personnel should be made aware of:

- ◆ job descriptions;
- ◆ restricted practices;
- ◆ instruction on controlled documents;
- ◆ reporting forms;
- ◆ personnel management system;
- ◆ familiarisation of client procedures;
- ◆ the importance of good, clear and early communications with bridge/control room in the event of any changes to normal mode of vessel's operating capabilities.

#### 8.1.2 DP Operators

In addition, operators of the DP control system should receive instruction which will familiarise them with the following, which should include, but not necessarily be limited to:

- ◆ control of the vessel's movements about a set point using manual controls;
- ◆ control of the vessel's movements about a set point using joystick controls;
- ◆ switching and changing between systems;
- ◆ general understanding of the DP system installed on the vessel;
- ◆ setting up the vessel on DP, understanding reasons for procedures;
- ◆ ability to use DP panel whilst on DP;
- ◆ use of desk facilities;
- ◆ use of reference input systems and the vessel-specific limitations;
- ◆ power supplies for DP computers and thruster control units;
- ◆ emergency power supplies;
- ◆ alarm sequence and signals (e.g. BOP controls, DP status lights etc.);
- ◆ loading and general use of DP control computers;
- ◆ system configurations – thruster/main engine/sensors expected in normal and emergency situations, and if all changeovers are manual or automatic;
- ◆ use, understanding and location of position reference sensors;
- ◆ use, understanding and location of:

- gyros
- MRUs
- VRUs
- anemometers
- other data input systems;
- ◆ the vessel's power generation, distribution and propulsion together with fire and watertight sub-division;
- ◆ understanding of functions, operation, FMEAs and limitations of the vessel, including the vessel's capability plots.
- ◆ use and understanding of the consequence analysis, both for present operation and for planning purposes;
- ◆ features of the DP control programme unique to the vessel;
- ◆ operational limits for all DP equipment (weather, power, rotation, etc.);
- ◆ effects of environment and operations on operating limits in conjunction with machinery set-up

### 8.1.3 Engineering Personnel

In addition to 8.1.1 engineering personnel should receive instruction which will familiarise them with the following, including but not necessarily limited to:

- ◆ being conversant with all of the vessel's engine room standing instructions concerning normal and emergency operations
- ◆ correct configuration of equipment in the normal mode of operations;
- ◆ correct configuration of equipment to allow changed operation to auxiliary units on any single failure;
- ◆ alarm equipment and the consequences of such alarms;
- ◆ handling of blackout situation;
- ◆ handling of ESD (emergency shutdown);
- ◆ FMEAs.

## 8.2 Project Familiarisation

### 8.2.1 Operational

Key DP personnel should be familiar with the risk assessments pertinent to the particular operation and consider hazards arising from operational activities connected with the project. The need to provide information to the vessel concerning procedures and safety management of the project prior to the commencement of activities is vital. It is essential that the experience and knowledge gained through operational activity is retained. To ensure that the continuity of operational and project experience is not lost through the rotation of personnel the key DP personnel should have knowledge of:

- ◆ all relevant formal risk assessments

and should have experienced:

- ◆ project familiarisation;
- ◆ worksite familiarisation;
- ◆ vessel familiarisation;
- ◆ DP system familiarisation.

Continuity of operational knowledge can be assured by:

- ◆ project and work scope briefing;
- ◆ staggering of crew rotation;

- ◆ overlapping shift rota;
- ◆ allocating time for training and familiarisation.

The vessel owner/operator has a responsibility for establishing and maintaining a system whereby operational knowledge and procedures are retained throughout the project in the event of personnel rotation.

Whichever party (owner or charterer) has the responsibility for operation of the vessel should ensure that familiarisation takes place if there is a change of management system, or operating manual, or any other change in situation that effects DP operations.

## 9 Principles and Practice for Maintenance of Personnel Skills

### 9.1 Principles

It is essential that skills acquired through DP training are maintained. The maintenance and retention of such skills can be assured by:

- ◆ continuous regular performance of DP operations; and/or
- ◆ frequent regular training and practice of DP skills; and/or
- ◆ formal refresher training.

In assessing whether refresher training is required, the following questions should be addressed and considered. Each case will vary according to individual circumstances.

- ◆ Have there been changes to the subject operational matter since the individual assessed was last involved with its use?
- ◆ Has the individual's past performance highlighted the need for re-training?
- ◆ Is the individual regularly involved in performing the task assessed?
- ◆ Is the individual employed for a prolonged period on a vessel with passive DP activities? For example, on a drilling unit or a floatel for several months on one location and on the same heading.
- ◆ Is the level of in-house training provided by the company adequate?
- ◆ Will the individual and vessel safety benefit?

### 9.2 Suggested Practice

The three main issues that affect key DP personnel experience are:

- ◆ individual DP experience;
  - ◆ the DP vessel and its operational requirements;
  - ◆ the specific DP systems.
- i) Persons who have not operated a DP system for more than 2 years should attend a DP refresher course or otherwise demonstrate their competency. Additionally, 12 hours of simulator training either at a training centre or onboard should be executed prior to standing a watch. Care needs to be taken over the term 'simulator'. For DP training there are basically two types of simulators in the industry – the onboard simulator and the simulator found in a shore-based training centre. The onboard simulator can be limited in the range of variables which can be input. On the shore-based simulator it is usually possible to input a full range of variables, including errors and failures. Another development has been the inclusion of the DP simulator into a full mission bridge simulator, where the trainee has the entire bridge to manage, including the DP system with all its inputs. Companies should consider what options are available and appropriate. See also Appendix 3 and Appendix 6.
  - ii) If DP trials are to be performed, all key DP personnel new to the vessel should attend the trials.
  - iii) Attendance at DP trials should be scheduled for any key DP personnel who have not attended a DP trial in the previous two years.
  - iv) If the vessel is to recommence DP operations after non-DP activities for a period of 90 days, then three days of re-familiarisation coupled with annual DP trials and instruction from equipment suppliers during the trials should be arranged.
  - v) The three-day period of re-familiarisation can be reduced by half if 12 hours of simulated DP operations spread over a period of three days are organised and executed.
  - vi) For personnel returning to a vessel on which they formerly served more than two years previously, with or without DP experience in between, a minimum period (see vii) below) of familiarisation training is recommended.

- vii) For recommended periods of familiarisation for key DP personnel, see section 7.4.
- viii) The above assumes that a familiarisation procedure is in place and that each of the above personnel has time to operate equipment prior to the vessel starting work.
- ix) After three years without operating a particular type of DP system, or not operating any DP system, a DP operator shall be deemed to be joining a vessel with an unfamiliar DP system and guidance is provided under section 7.2.
- x) In addition to ix) above, a DP operator who has not operated a DP control system for five years or more shall retake the DP simulator course or a special refresher course designed for such personnel.

*Note 1:* Whilst the above general guidance in section 9.2 is the product of industry practice, such practice may need to incorporate some flexibility to cope with the variation in individual key DP personnel's competence and ability, together with the vessel's operational requirements.

*Note 2:* If DP operations are not in progress, then an equivalent level of training could be provided by simulator training. See comments in i) regarding simulators.

## **10 Accreditation**

### **10.1 Accreditation of DP Basic/Induction and Advanced/Simulator Courses**

Vessel owners, represented by IMCA and other trade associations and other interested organisations and parties, liaise with the Nautical Institute on training programmes in order to ensure the quality and consistency of DP Basic/Induction and Advanced/Simulator courses. The training centres are accredited by the Nautical Institute.

Training centres are re-accredited at regular intervals. When re-accrediting centres, the Nautical Institute will expect to see improvements to reflect current best operational practice including, for example, updated simulations that incorporate recent reported incidents. See also Appendix 3 in respect of onboard training.

Further details of the procedure can be found in the Nautical Institute's document accreditation, which is available from the Institute or at [www.nautinst.org](http://www.nautinst.org)

NI accreditation is also recognised by the Norwegian Maritime Directorate.

It should also be noted that this publication will be submitted by IMCA to the International Maritime Organization for its comment and approval, following the wording of IMO MSC. Circ 738 of 24 June 1996.

## II Certification

### II.1 Nautical Institute DP Operator Certificates

Training of DP operators is in four parts:

- i) attendance and satisfactory completion of an approved DP Basic/Induction course;
- ii) sea-going DP familiarisation (30 days) in accordance with Section C of the Nautical Institute DP Watchkeeping Log Book;
- iii) attendance and satisfactory completion of an approved simulator course;
- iv) satisfactory and logged completion of six months operating the DP in DP operations including assessment by Master – see various IMCA information notes concerning DPO certification. It is stressed that much reliance for the assessment of the DP trainee (also see below) may be placed on the signature of the Master in the DP logbook.

Training schools only prepare the student for the learning obtained on DP operations on a vessel. Training is ongoing even after obtaining a full DP certificate.

Each trainee will be required to keep a logbook. This will record their progress through the training process as well as the items which will need to be learnt, understood and applied in the sea going phases.

Satisfactory attendance and performance at the DP Basic/Induction and simulator course are a requirement for certification.

DP watchkeeping experience whilst working towards certification should be recorded in the Nautical Institute's DP operator's logbook and authenticated by the Master. The Master will recommend the trainee to the Nautical Institute for certification by completing section F of the logbook, the statement of suitability of the trainee to undertake full watchkeeping responsibility onboard a DP vessel. It may be necessary to have this section endorsed by a certificated DPO if the Master does not hold a DP certificate. In either case those who authenticate the logbook and recommend the trainee should be fully satisfied with the trainee's ability to become a DPO. If applicable the training shall also be endorsed by the company's appointed DP training authority.

Operators that gain a certificate through serving on a class 1 vessel will be issued with a certificate endorsed as 'limited'. To have the 'limited' endorsement removed, they require:

- ◆ a minimum of a further three months' DP watchkeeping experience on class 2 or 3 DP vessels or equivalent, where two months' class 1 equals 1 month class 2 or 3. This time must include two months actually on a class 2 or 3 DP vessel where the time requirement relates to operating the DP in DP operations;
- ◆ authentication as described above.

### II.2 Engineering Staff Certificates

Following satisfactory completion of an HV course an electrician will be issued with a certificate to authenticate this (see section 6.8).

## DP Training Courses

Refer to the Nautical Institute website at [www.nautinst.org](http://www.nautinst.org) for details of course providers.



## DP Basic/Induction Course

The current aims and objectives of the NI and NMD are constantly under review and may be amended as necessary. Details can be found on their respective websites. IMCA and other industry organisations liaise with the NI in respect of issues dealt with in this document. General guidance on the current targets is as follows.

The induction course should provide the trainee with:

- ◆ a knowledge of the principles of DP;
- ◆ the ability to set up and operate DP equipment and position sensors;
- ◆ the ability to recognise alarms and warnings;
- ◆ a knowledge of the total DP system;
- ◆ an understanding of capability plots and footprints.

Induction training should detail the following:

- ◆ a definition of dynamic positioning, the six degrees of freedom and the DP control function;
- ◆ elements of a DP system; power generation, power distribution, power management, thrusters, DP control system, sensors, communications and the operators;
- ◆ details of elements of the DP control system including processors, control consoles, and position, heading, vessel and environmental sensors;
- ◆ the use of position sensors, input validation and error testing e.g. pooling, voting, weighting;
- ◆ the principle of wind feed forward;
- ◆ the concept of power and thrust limiting by the DP control system, the PMS and the thrusters;
- ◆ the types of vessel using DP. Consideration of the various modes and functions available, e.g. joystick, DP, follow sub, track follow, weather vane bias etc.;
- ◆ types of thrusters and manoeuvring systems; their configuration, capabilities and limitations;
- ◆ the principle of the action of DP control system controllers;
- ◆ the requirement and provision of redundancy in vessel's systems and DP class notations;
- ◆ applying risk analysis and safe working limits to various operations;
- ◆ operational procedures including; work site approach, planning DP operations and planning for contingencies and emergencies;
- ◆ procedures for operating the DP system including; maintaining a logbook record, use of checklists, communications and manning levels;
- ◆ assessment of vessel capabilities with respect to environmental conditions, shallow and deep water etc. Use of the consequence analysis, in present and planning modus;
- ◆ failure mode and effect analysis, proving trials, annual trials and mobilisation trials;
- ◆ principles of set-up and operation of all commonly used position references.



## Validation Of Onboard Training Schemes

*This note is provided by the Nautical Institute.*

The notes in 5.3 and 10.1 regarding training refer to training centres that are shore-based establishments. To date, all establishments approved for the conduct of phases 1 and 3 of the Nautical Institute scheme are shore-based, but this does not preclude the approval of a properly conceived and run scheme based onboard a working vessel.

In general, the shipboard environment is not the best one for the conduct of the theoretical and simulator-based elements of the training scheme. In order for an effective course of training to be conducted onboard, a number of factors must be present:

- i) The officers undertaking the training must be fully available for attendance upon the course programme;
- ii) The vessel DP systems must be available for practice and demonstration during the conduct of the training;
- iii) If conducting a course to fulfil the requirements of Phase 3 of the Nautical Institute scheme (the DP Simulator Course), then the DP system must be equipped with simulation of the standard found in approved training centres;
- iv) Courses conducted must be subject to the process of course design and be accompanied by all the documentation expected and described earlier in this section;
- v) Staffing of any onboard training scheme must be in the hands of personnel deemed competent by the Nautical Institute to conduct such training.

For any onboard training scheme to be approved by the Nautical Institute, that scheme must be validated in exactly the same way as one conducted by a shore-based establishment and be subject to the same inspections relating to training quality. If an onboard scheme is approved, it is important that continuity of training is maintained. If courses are not conducted for a period of between six months and one year, then the scheme may need to be re-validated in order to retain Nautical Institute approval.



## Advanced/Simulator Courses

The current aims and objectives of the NI and NMD are constantly under review and may be amended as necessary. Details can be found on their respective websites. IMCA and other industry organisations liaise with the NI in respect of issues dealt with in this publication. General guidance on the current targets is as follows.

The DP simulator course should provide the trainee with:

- ◆ a practical knowledge of the planning, conduct and execution of DP operations;
- ◆ the ability to correctly use and interpret work site diagrams and plan in detail every stage of an operation, as well as planning for a variety of emergencies;
- ◆ the ability to demonstrate understanding and competence in a variety of simulated scenarios using a DP simulator. This will include the handling of normal operations as well as a variety of emergency failure modes.

The course should include the following content:

- ◆ a study of case histories in respect to vessel incidents and accidents, based on the incident data and newsletters;
- ◆ construction and use of work site diagrams, charts and vessel templates for use in operations;
- ◆ preparation of plans for a projected DP operation, contingency plans for expected deviations and emergencies;
- ◆ participation in simulated situations in a variety of capacities while handling routine and emergency situations. The simulated situations should include failure modes drawn from industry experience, for example from IMCA. If a particular failure cannot be covered by the simulator's features or due to insufficient time then they should be discussed with the trainee;
- ◆ new developments in DP systems including position sensors and control systems;
- ◆ applying risk and defining DP equipment classes;
- ◆ other DP applications including pipelay, cable lay, shuttle tankers, etc.;
- ◆ handling of the types of incidents that have occurred including; drift off, drive off, other losses of position caused by operator error, equipment failures or procedural matters, either singly or in combination;
- ◆ a knowledge of the types of incidents that have occurred including; drift off, drive off, other losses of position caused by operator error, equipment failures or procedural matters, either singly or in combination.



## DP Familiarisation Course Content

The DP familiarisation course should provide trainees with the following:

- ◆ an understanding of how the DP control system, vessel sensors and position references operate. Their limitations and importance should be covered;
- ◆ an understanding of redundancy and importance of the DP system's component parts; power generation, power distribution, thrusters, power management, DP control system, sensors and communications;
- ◆ a knowledge of the types of incidents that have occurred including; drift off, drive off, other losses of position caused by operator error, equipment failures or procedural matters, either singly or in combination;
- ◆ an understanding of redundancy as applied to the DP system for classes specified by Lloyd's, DNV/NMD, IMO and IMCA guidelines;
- ◆ in particular, knowledge of physical failures such as fire and flood.



## Example Familiarisation Checklists

### General

Reference	Instructed by	Instructor's Signature
<b>All Personnel</b>		
◆ Job descriptions		
◆ Restricted practices		
◆ Instruction on controlled documents		
◆ Reporting forms		
◆ Personnel management system		
◆ Familiarisation of client procedures		
◆ Being aware of the importance of good, clear and early communications with bridge/control room in the event of any changes to normal mode of vessel's operating capabilities.		
<b>DP Operators</b>		
◆ Control of vessel's movements about a set point using manual controls		
◆ Control of vessel's movements about a set point using joystick controls		
◆ Switching and changing between systems		
◆ General understanding of the DP system installed on the vessel		
◆ Setting up the vessel on DP, understanding reasons for procedures		
◆ Ability to use DP panel whilst on DP		
◆ Use of desk facilities		
◆ Use of reference input systems and the vessel specific limitations		
◆ Power supplies for DP computers and thruster control units		
◆ Emergency power supplies		
◆ Alarm sequence and signals (e.g. BOP controls, DP status lights etc.)		
◆ Loading and general use of DP control computers		
◆ System configurations thruster/main engine/sensors expected in normal and emergency situations, and if all changeovers are manual or automatic		
◆ Use, understanding and location of position reference sensors		

Reference	Instructed by	Instructor's Signature
<ul style="list-style-type: none"> <li>◆ Use, understanding and location of: <ul style="list-style-type: none"> <li>– Gyros</li> <li>– VRUs</li> <li>– Anemometers</li> <li>– Other data input systems.</li> </ul> </li> </ul>		
◆ Vessel's power generation, distribution and propulsion together with fire and watertight subdivision		
◆ Understanding of functions operation, FMEAs and limitations of the vessel, including vessel's capability plots.		
◆ Use and understanding of the consequence analysis, both for present operation and for planning purposes.		
◆ Features of DP control programme unique to the vessel		
◆ Operational limits for all DP equipment (weather, power, rotation, etc)		
◆ Effects of environment and operations on operating limits in conjunction with machinery set-up		
<b>Engineering Personnel</b>		
◆ Being conversant with all vessel's engine room standing instructions concerning normal and emergency operations		
◆ Correct configuration of equipment in the normal mode of operations		
◆ Correct configuration of equipment to allow changed operation to auxiliary units on any single failure		
◆ Alarm equipment and the consequences of such alarms		
◆ Handling of black-out situation		
◆ Handling of ESD (emergency shutdown)		
◆ FMEAs		

Name of person instructed: .....

Position of person instructed: .....

Instructor's signature: .....

Master's signature: .....

Date: .....

Vessel: .....

### Example of a Company's Seagoing Familiarisation Checklist for DP Trainees

Name DP trainee: .....

Name Master: .....

Name Senior DPO: .....

Rig/ Drillship name: .....

DP system and class: .....

Date: .....

Field: .....

No	Activity	Date performed	Activity performed by Trainee DPO	Accepted by Senior DPO
1	Planning leaving present location and arrival next location			
2	Disconnecting and pulling of the BOP			
3	Recovery of transponders			
4	Recovery of all subsea equipment and post survey			
5	Complete leaving location checklist			
6	Transfer from Auto DP to Manual DP joystick and rotation			
7	Transfer to autopilot and main propulsion			
8	Responsibility for navigation during transit			
9	Preparation of power management system, propellers, DP system, all position reference system and any other system required for next operation. Based on the WSOG.			
10	Set-up of DGPS systems, including difflinks			
11	Make a transponder plan for next location			
12	Co-operation with survey, drilling and deck department about sequence of next operation, taking into account the environmental forces			
13	Transfer to Manual DP joystick upon arrival near next location			
14	Transfer to Auto DP, setting up rig/ship for next operation			
15	Setting out transponders and LBL array			
16	Complete arrival checklist			

Signatures:

.....  
DP trainee

.....  
Senior DPO

.....  
Master



## List of Relevant IMCA Publications

Reference	Document Title	Date
IMCA M 103	Guidelines for the design and operation of dynamically positioned vessels	1999
IMCA M 109 Rev. 1	A guide to DP-related documentation for DP vessels	2004
IMCA M 117	The training and experience of Key DP personnel	1996
IMCA M 118	Failure modes of the Artemis Mk IV position reference system (if fitted)	1994
IMCA M 119 Rev. 1	Engine room fires on DP vessels	1997
121 DPVOA	DP position loss risks in shallow water	1994
IMCA M 125	Safety interface document for a DP vessel working near an offshore platform	1997
126 DPVOA	Reliability of electrical systems on DP vessels	1995
IMCA M 129	Failure modes of CPP thrusters (if fitted)	1995
IMCA M 131	Review of the use of Fanbeam laser system for dynamic positioning	1995
IMCA M 138	Microbiological contamination of fuel oil – IMCA questionnaire results	1997
IMCA M 139	Standard report for DP vessels annual trials	1997
IMCA M 140 Rev. 1	Specification for DP capability plots	2000
IMCA M 141	Guidelines for the use of DGPS as a position reference in DP control systems (if fitted)	1997
IMCA M 149 Issue 5	Common Marine Inspection Document	2005
IMCA M 154	Power management system study (if fitted)	2000
IMCA M 155	DGPS network provision and operational performance – A world-wide comparative study (if fitted)	2000
IMCA M 162	Failure modes of variable speed thrusters (if fitted)	2001
IMCA M 166	Guidance on failure modes and effects analysis	2002
IMCA M 167	Guidance on the Use of the Common Marine Inspection Document (IMCA M 149)	2005
IMCA M 170	A review of marine laser positioning systems – Part 1: Mk IV Fanbeam© and Part 2: CyScan (if fitted)	2003
IMCA M 178	FMEA management guide	2005
IMCA C 002	Competence and assurance assessment	2003
-	Annual IMCA DP incident reports	Annual
-	IMCA safety flashes on DP issues	Ongoing



## Example Emergency Drill Scenarios

*The following is taken from a company's EOD procedures*

### Introduction

The following emergency drill scenarios should be developed as a result of the results obtained from the annual DP trials and FMEA review undertaken onboard the vessel.

The drills should be operational specific (e.g. pipelaying, drilling, diving, floatel, etc) and should also include scenarios based on the emergency/contingency manual; e.g. collision danger imminent

The drills are outlined in a very brief format and are intended to provide the management team with a scenario they may wish to build into their emergency drills for the marine and engineering teams. The scenarios also serve to highlight particular items of concern or areas where due to system upgrades the teams need to re-focus their contingency planning as a result of the recent system modifications.

The practising of emergency control activities through table-top exercises should be seen as a normal part of the operational activity for a high-risk operation such as that undertaken by a DP vessel. It is incumbent upon the teams to ensure they use the allocated period to become fully familiar and proficient with the procedures necessary to maintain the safety of the vessel, all personnel onboard their vessel and any adjacent installation/vessel and personnel.

Table-top exercises should be held frequently, with different scenarios used.

Exercises should be planned so that all shifts cover all scenarios within one year.

The annual trials and revised FMEA documents provide the background of the drills and these should always be readily available for information and reference to the operational personnel.

The drills outlined below can be exercised by either ECR or bridge teams individually or as a combined exercise. The Master, Chief Engineer and client must be in agreement as to the format and timing of the exercise to ensure they do not conflict with critical operations.

### Engine Control Room Team Drills

#### Prerequisites for Drill(s)

- 1 Chief Engineer in attendance.
- 2 Both ECR operators/watch keepers in attendance.
- 3 No other personnel allowed in ECR or switchboard during drills.
- 4 Technical assistance if required/as designated by Chief Engineer to be local to ECR (situated in electricians workshop).

#### Aims of Emergency Drill

- 1 To promote greater operator confidence in own system knowledge.
- 2 To enhance system knowledge across the mechanical/electrical disciplines.

#### Conduct of Emergency Drill

- 1 Day and shift to be posted as pre warning.
- 2 Bridge to be notified five minutes prior to drill.
- 3 Exercise to be initiated without warning by Chief Engineer and chief electrician.
- 4 Actions and conduct of ECR operatives to be logged as an aid to close out and remedial action.
- 5 Drill to be terminated by Chief Engineer on completion of restoration of normal line-ups or in the event of a rig wide emergency or stalled drill due to ECR operator wrong actions.
- 6 End of drill when operators have configured relevant plant system(s) to achieve two goals:
  - i) stabilised in a temporary line-up with relevant plant cross-connections utilised;

- ii) restored plant to normal line-up associated with DP class 3.

### **Preliminary list of available Emergency Operator Drills (EOD)**

- 1 HV blackout – Port side
- 2 HV blackout – Starboard side
- 3 Loss of port or starboard 24VDC system bus distribution.
- 4 Loss of port or starboard 110VDC bus distribution.

### **Emergency Operator Drills**

#### **Prerequisites for Drill(s)**

- 1 Master in attendance at commencement and end of each drill.
- 2 DPOs to be provided with scenario by the Master at a suitable time in the shift.
- 3 Finite time to be allocated by Master for scenario discussion between DPOs.
- 4 No other assistance to be allowed to DPOs, for example by the opposite shift.
- 5 Appropriate electrician to provide additional information/drawings/schematics.
- 6 At end of allocated time, Master to debrief/discuss DPO's written findings/comments.

#### **Aims of EOD**

- 1 To promote greater operator confidence in own system knowledge.
- 2 To enhance system knowledge of the DP and associated control system.
- 3 To promote discussion and awareness of root cause of combinations of alarms
- 4 To aid development of suitable measured approach in event of an actual failure

#### **Conduct of EOD**

- 1 To be conducted as a table top exercise.
- 2 Must not interfere with operational activities.
- 3 To be conducted in spirit of a team approach/activity.
- 4 To be documented for later discussion between all DPOs.
- 5 To provide background for development of additional EODs.

### **Standard Drills**

As part of the routine training the DPO team must practice the scenario of a loss of HV power and the full recovery of the system to all thrusters back in DP and station keeping resumed.

If possible such a drill should be undertaken at least twice a year and considered as a normal training process for DP, engineering and electrical personnel.

Manual manoeuvring of the vessel using both the joystick and independent lever control is also a necessary part of DP training and should be undertaken by all DP personnel as part of their continued demonstration of continued proficiency.

## DP Incident Reporting

### Background

IMCA (and its predecessor DPVOA) has been collecting DP incident reports provided by members and publishing them as annual reports since 1991. During this time, the format of the IMCA report has changed little – using the categorisation of ‘Loss of Position 1’ (LOPI) for major loss of position, ‘Loss of Position 2’ (LOP2) for minor loss of position and ‘Lost Time Incident’ (LTI) for downtime as a result of loss of redundancy but where loss of position has not occurred.

The IMCA Marine Division Management Committee reviewed the system in 2005 and concurred that, since the system at that time could be considered to be somewhat subjective and that there could be some confusion as to when an incident should be reported to IMCA or not, it would be better to replace the reporting categories with those set out below. The aim of the change of format is to help people who are reporting incidents to have a better idea whether to report the incident and in which category it would fall and also to help those reading the annual report as it provides a wider range of incident types.

### New Categorisations

The following new categories of DP incidents have been proposed and agreed by the IMCA Marine Division Management Committee. These categories should be used in conjunction with the revised *IMCA Station Keeping Incident Form*. These new categorisations will be used to replace the ‘Loss of Position 1’ and ‘Loss of Position 2’ incident categorisation currently used in the IMCA annual DP incident reports.

#### 1 DP Incident

Loss of automatic DP control, loss of position or any other incident which has resulted in or should have resulted in a ‘Red Alert’ status.

#### 2 DP Undesired Event

Loss of position keeping stability or other event which is unexpected/uncontrolled and has resulted in or should have resulted in a ‘Yellow Alert’ status.

#### 3 DP Downtime

Position keeping problem or loss of redundancy which would not warrant either a ‘Red’ or ‘Yellow’ alert, but where loss of confidence in the DP has resulted in a stand-down from operational status for investigation, rectification, trials, etc.

#### 4 DP Near-Miss

Occurrence which has had a detrimental effect on DP performance, reliability or redundancy but has not escalated into ‘DP Incident’, ‘Undesired Event’ or ‘Downtime’, such as:

- ◆ crane or load interfering with Artemis line of sight;
- ◆ scintillation.

#### 5 DP Hazard Observation

Set of circumstances identified which have had the potential to escalate to ‘Near-Miss’ status or more serious, such as:

- ◆ Fanbeam laser target being placed in a position on handrails of a busy walkway where heavy traffic of personnel wearing PPE with retro reflective tape is identified;
- ◆ crane lift being swung close to Artemis line of sight.

This category should also capture relevant occurrences even when not operating in DP mode, such as:

- ◆ speed and latitude corrections supplied to all gyros from single DGPS by installation engineer;
- ◆ unexpected loss of essential DP components which would have had the potential to result in ‘DP Incident’, ‘Undesired Event’ or ‘Downtime’ if vessel had been operating in DP mode.

## Guidance for Completing the IMCA Station Keeping Incident Form

### Incident Types:

- 1 DP incident
- 2 DP undesired event
- 3 DP downtime
- 4 DP near-miss
- 5 DP hazard observation

- ◆ Incident types 1 & 2 are likely to result in type 3. Identify the option on the *IMCA Station Keeping Incident Form* which represents the greatest potential for harm. All sections of the form should be completed.
- ◆ For incident types 1, 2 & 3, please indicate 'Initiating Event', 'Main Cause' and 'Secondary Cause' where appropriate on the *IMCA Station Keeping Incident Form*, e.g.:
  - i) 'Initiating Event' – Additional thrust required due to increasing environmental conditions
  - ii) 'Main Cause' – Stoppage of thrusters
  - iii) 'Secondary Cause' – Operator error
- ◆ Incident types 4 & 5 can be reported to IMCA by e-mail and should only require a short description of events.

DP incident report forms are available from IMCA – [www.imca-int.com](http://www.imca-int.com)

## Norwegian Regulation 687

See 6-3 (g) for requirements regarding DP

### Norwegian Regulation of 9 May 2003 No. 687 concerning qualification requirements and certificate rights for personnel on board Norwegian ships, fishing vessels and mobile offshore units

#### Chapter 6 Qualification requirements for personnel on mobile offshore units

##### § 6-2

*Positions for which a certificate of competency is required  
on mobile offshore units with propulsion machinery*

The following qualification requirements apply to positions for which a certificate of competency is required on mobile offshore units with propulsion machinery:

- a) *Platform Manager:*
  1. Deck Officer Class 1 certificate; and
  2. successful completion of an approved Platform Manager course with operative simulator training; and
  3. at least 2 years' experience as Stability Section Leader on a mobile offshore unit.
- b) *Stability Section Leader:*
  1. Deck Officer Class 2 certificate; and
  2. successful completion of an approved Stability Section Leader course; and
  3. at least 1 year's experience as Control Room Operator on a mobile offshore unit.
- c) *Control Room Operator:*
  1. Deck Officer Class 4 certificate, or Engineer Officer Class 4 certificate; and
  2. successful completion of an approved Stability Section Leader course or internal training adapted to the position concerned.
- d) *Technical Section Leader:*
  1. Engineer Officer Class 1 certificate (for motor vessels); and
  2. successful completion of an approved Technical Section Leader course; and
  3. at least 1 year's experience as Technical Assistant on a mobile offshore unit.
- e) *Technical Assistant:*
  1. Engineer Officer Class 2 certificate (for motor vessels); and
  2. successful completion of an approved Technical Section Leader course; and
  3. at least 1 year's experience as Engine Room Operator or Engineer Officer on a mobile offshore unit.
- f) *Engine Room Operator:*
  1. Engineer Officer Class 4 certificate (for motor vessels); and
  2. successful completion of an approved Technical Section Leader course or internal training adapted to the position concerned.

### § 6-3

#### *Qualification requirements for personnel not required to hold a certificate of competency and for special functions on mobile offshore units with propulsion machinery*

Personnel not required to hold a certificate of competency are subject to the following qualification requirements:

a) *Control Room Assistant*

A Control Room Assistant shall have undergone an approved Stability Section Leader course or special on-board training with regard to the unit's stability, transfer of ballast and draught, anchor-handling and control room operation.

In addition, the following qualifications are required:

1. Deck Officer Class 4 certificate or Engineer Officer Class 4 certificate; or
2. theoretical education as in subparagraph 1, and 2 years of systematic training relevant to service as marine engineer on board ship or mobile offshore unit; or
3. education from a two-year technical vocational school or college of engineering, engineering or motor subjects branch, and 2 years of systematic training relevant to service as deck officer or marine engineer on board ship or mobile offshore unit.

b) *Crane Operator*

A Crane Operator shall have successfully passed an examination comprising theoretical and practical training in accordance with the current syllabus plan for the operation of offshore industry cranes, approved by other public authorities.

c) *Electrician and Electrician with Special High-Voltage Qualifications*

An electrician and, where relevant, an electrician with special high-voltage qualifications shall be qualified in accordance with § 3-1, seventh and eight paragraphs.

d) *Drilling and Well Section*

Personnel shall have undergone theoretical and practical training and experience in accordance with applicable recognized standards for drilling and well servicing personnel.

e) *Radio Operator*

A Radio Operator shall hold a valid certificate in accordance with the regulation currently in force concerning the installation and use of radio equipment on board mobile offshore units.

f) *Proficiency in survival craft, rescue boats and fast rescue boats*

Operators of survival craft, rescue boats and fast rescue boats shall hold a special certificate in accordance with § 3-2, sixth and seventh paragraphs.

g) **DP Operator**

**Operators of dynamic positioning systems shall be qualified in accordance with the training requirements set out in MSC/Circ. 738 or equivalent requirements.**

h) *Medical First Aid and Medical Care*

Personnel designated to provide medical first aid and medical care shall be a certified public nurse.

i) *Other Qualification Requirements*

Other personnel shall be sufficiently qualified for the position concerned and shall have completed a training programme. The company is responsible for developing such qualification requirements and training programmes for the positions. The company shall issue qualification documents upon completion of training. Qualification requirements and training shall be of clear relevance to the technical and maritime duties and responsibilities associated with the various positions.

## IMO Maritime Safety Committee Circular 738

INTERNATIONAL MARITIME ORGANIZATION  
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MSC/Circ.738  
[24 June 1996]

T4/3.03

### GUIDELINES FOR DYNAMIC POSITIONING SYSTEM (DP) OPERATOR TRAINING

1 The Maritime Safety Committee, at its sixty-sixth session (28 May to 6 June 1996), considered the issue of training of dynamic positioning system (DP) operators in relation to paragraph 4.12 of the 1989 MODU Code and, noted that the International Marine Contractors Association (IMCA) had prepared a publication on the "Training and Experience of Key DP Personnel (Issue 1/Rev.1)" which could be used as a guideline for the training of DP operators.

2 The Committee, recalling the obligations contained in regulation I/14 of the 1978 STCW Convention, as amended, and noting the importance of adequate training of DP operators and the recommendation of the Sub-Committee on Ship Design and Equipment, at its thirty-ninth session (22 to 26 January 1996), invited Member Governments to bring the aforementioned guidelines to the attention of the bodies concerned and apply them to the training of key DP personnel employed on dynamically positioned vessels defined in paragraph 1.3.1 of the annex to MSC/Circ.645.

3 The Committee also agreed to make a reference to the Guideline in the footnote to section 4.12 of the 1989 MODU Code.

4 The Committee noted that the above-mentioned IMCA publication, which identifies training programmes, levels of competency and experience for the safe operation of DP vessels, is available from:

IMCA – The International Marine Contractors Association  
5 Lower Belgrave Street  
London  
SW1W 0NR  
United Kingdom

Telephone: + 44 (0) 20 7824 5520  
Facsimile: + 44 (0) 20 7824 5521  
Website: [www.imca-int.com](http://www.imca-int.com)

5 The Committee invited IMCA to keep IMO informed of future amendments to the IMCA guidelines, as appropriate.

NB Contact details shown above for IMO and IMCA have been updated in comparison to MSC Circular 738 as originally published.