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| IALA Guideline |

G1027

Simulation in VTS Training

Key aspects of the review:

* In line with revised G1156 and C0103 model course program
* Assure guidelines are accessible and applicable world wide
* Awareness of future developments in VTS (simulation) training
* Include classification/certification of simulators (e.g. <https://www.dnv.com/services/certification-of-maritime-simulator-systems-2862/>): could be required by the CA but simulators are too different to have them standardized. Standardization on VTS equipment in general would be useful, especially condisering the change of status of IALA.

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# INTRODUCTION

A major factor in the operation of VTS is the competence of their personnel. VTS personnel should only be considered competent when appropriately trained and qualified for their VTS duties. VTS providers are encouraged to adopt the IALA model courses as part of the basis for mandatory training. In delivering VTS training simulated excercises offer an excellent technique which complements other training methods. Simulation is a training tool which provides realistic training of practical skills, knowledge and competencies which can be transferred into the operational environment.

Simulation training is the systematic development of competencies associated with given functions in a simulated and controlled environment, aimed at enhancing operational performance and assessing the associated levels of competence.

Therefor the purpose of simulation training is:

* To train VTS personnel in a realistic environment as part of operator training, OJT or refresher training; and
* To assess the levels of competencies of new and existing VTS personnel.

Since it emerged the use of simulation has become a widely adopted and globally spread technique for training and assessing VTS personnel, making training more effective, realistic and consistent. It is recommended that simulation training is delivered in a standardized and harmonized manner in accordance with the guidelines and model course developed by IALA. It is also recommended that simulation training is developed,delivered, reviewed and updated by instructors who meet the requirements as identified in IALA G1156 Recruitemnt, Training and Certification of VTS Personnel and who are suitably experienced and appropriately qualified.

G1156 7.3 and 7.4 qualifications and experience (...)

# DOCUMENT PURPOSE

The purpose of this document is to provide guidance to training organizations and VTS providers on implementing simulation in their VTS training. It aims at the harmonization of practises associated with designing and implementing simulation training, instructional techniques, assessment of the competences of VTS personnel through simulation, …. Simulator function and capabilities/criteria.

*This Guideline is associated with R0103 and is associated to IALA Standard 1050 Training and Certification and its associated recommendations, guidelines, and model courses.*

# PRINCIPLES

## SimulatIoN TRAINING

Simulation training aims at enhancing operational performance and assessing the associated levels of competence of VTS personnel. It should provide an interface through which personnel can interact with the equipment, the simulated environment and as appropriate, the instructor. It should permit an instructor to control, monitor and record exercises for effective debriefing.

Simulation may be conducted by using one or more of the following techniques:

* Table top exercises – Paper based training, using drawings, models, traffic charts, etc.
* Communications simulator – such as verbal, face-to-face, telephone, VHF and/or electronic communications, etc.
* Computer based simulation
  + the creation of realistic situation by an instructor (based on experience of the instructor)
  + Scenario derived from digital data of situations that actually occrode
  + Full-mission VTS simulator – comprising most of the above (multiple vessels)
  + Cloud-based or virtual simulation – online or remote
* Simulation on the working floor – e.g. simulating poor visibility circumstances. Using real equipment in simulation mode (separated from the actual VTS operations – safe environment!)
* Joint operational training environment – connection between VTS simulator and tugs/pilots/… .

## Benefits of VTS simulation training

Benefits are gained through the achievement and enhancement of the equipment operation, procedural knowledge, reactive capabilities and responses in emergency situations.

In this respect, personnel can achieve the practical skills, knowledge and competence necessary to operate in a professional manner without every possible situation having been experienced in actual daily operations.

## Levels of simulation training

The level of simulation training selected is dependent on the tasks being performed by personnel and the supporting knowledge, skills and abilities necessary to perform those tasks. The levels of simulation training that could be employed range from simulation of individual tasks to full mission simulation that create any or all tasks performed in the VTS. Different methods of simulation could be applied to teaching or evaluating performance on any individual task. Some Training Institutes might use a full VTS mission simulator to teach all modules in the relevant IALA model course. Individual VTS centres might elect to use simulation techniques that are appropriate to the particular tasks their personnel perform and is within the limits of the available resources.

## Realism in VTS simulation

VTS simulation should provide sufficient behavioural realism to allow personnel to acquire skills appropriate to the training objectives.

VTS simulation can also be augmented with equipment to enhance realism and provide experience of the operating capabilities of the VTS equipment concerned. The level of physical realism should be appropriate to training objectives and include the capabilities, limitations and possible errors of such equipment.

To achieve realism in simulation, the following should be considered:

* Training in a fictive area … (not similar but has sufficient realism).
* Simulation equipment could differ from the equipment used in the simulator. “simulation mode” of equipment?
* The working environment of the simulated VTS centre should, as far as practicable, be similar to a VTS Operator position in an actual VTS centre that the trainee is expected to work in on completion of training.
* In general, the working environment should include all equipment that is deemed necessary and applicable to a VTS centre in order to fulfil the demands and requirements of VTS simulation.

Such equipment may typically comprise of land-line telephones, VHF, traffic image displays, environmental, meteorological and hydrological sensors, logging and replay equipment, monitoring systems and electronic data systems.

* In order to achieve the most realistic effect in VTS simulation, exercises should be as similar as possible to real events experienced in a VTS environment. Information regarding the creation of exercises can be found in annex A and annex B of this document.
* Role-play is a major aspect of a set exercise and should be undertaken by instructors and trainees.

## Documentation

A training management system (TMS)[[1]](#footnote-2) that includes thorough documentation of procedures should be in place to ensure that the aims of training programmes are being met. Training records are important for personnel management and to document competency. Documentation is also important for accountability, liability, and other legal implications. Records should be kept of all simulator training conducted that include the participants in the simulation, its duration and results.

The documentation process should include an evaluation of the TMS to verify that the training is based on IALA Recommendation *R0103 (V-103*) *Training and certification of VTS Personnel* [2] together with the appropriate model course. There should then be an audit to verify that the training complies with the documented TMS.

## Assessment

Assessment is a fundamental part of the training process as it will indicate to what extent the learning objectives have been met.

Assessment in simulation could be used to:

* Verify to what extent the competence levels have been met during C0103-1 and C0103-3 training
* Evaluate performance as part of refresher training, adaptation training or update training ( as per C0103-5)
* Assess incident training (e.g. case studies)

Assessors should meet the requirements mentioned in G1156 (7.4) and should have sufficient knowledge of the principles of simulation training.

. If simulation is used to assess a person’s competence, the following five levels should be applied to indicate the learning level attained. An average level of 3 to 4 from Table 1 should be considered satisfactory. IALA Model Course *C0103-1 (V-103/1)* [3] contains further details.

1. Training levels

|  |  |  |
| --- | --- | --- |
| LEVEL | CATEGORY | DESCRIPTION |
| 1 | Receiving | The trainee’s willingness to participate in the learning activities. |
| 2 | Responding | The trainee’s active participation in the learning activity. |
| 3 | Significance | The worth that the trainee attaches to a particular object, phenomena or behaviour. |
| 4 | Organization | The trainee’s ability in bringing together different values, resolving conflicts between them and beginning the building of an internally consistent value system. |
| 5 | Value Complex | The value system that has been achieved due to contrary, consistent and predictable behaviour for a sufficiently long time for the trainee to have developed a characteristic life-style. |

# PLANNING SIMULATION EXERCISES

The fundamental input requirements for planning a simulation exercise are the training objectives.

* The training objectives for simulation exercises at Training Institutes are discussed in annex A.
* The training objectives for simulation exercises at VTS centres are discussed in annex B.

The development of simulation exercises from the training objectives is a complicated matter that can usefully be divided into several phases, as shown in Figure 1.

TRAINING OBJECTIVES

PLANNING

DESIGN

DEVELOPMENT & VALIDATION

CONDUCT OF EXERCISES

DOCUMENTATION

Pre-exercise briefing & preparation

Management of exercise

Debriefing

Feedback

Trainee evaluation/assessment

1. Phases of the development of a simulation exercise

When developing simulation exercises, consideration should at all stages be given to:

* the prior knowledge and experience of trainees; and
* limitations of equipment and resources (including staff/student Ratio).

# DESIGN OF SIMULATION EXERCISES

A simulation exercise should be designed with the intention of delivering a specific learning outcome to trainees.

All of the following aspects that relate to the specific learning outcome should be incorporated in the design of a simulation exercise. Additional aspects that are pertinent to the specific learning outcome should also be included in the exercise design.

Selection of exercise area (real and/or a fictitious sea area or waterway created for the purpose of training and assessment[[2]](#footnote-3)):

* Coastal (including Ship Routeing and/or Traffic Separation Schemes)
* Estuary
* Port
* Inland waterways
* Relevant International, National and Local Regulations and Bylaws
* Geographic limitations of the exercise area
* Typical traffic patterns appropriate to the exercise area

Vessel Types (Real and/or generic). Where practicable, vessel types based on a database of vessels that actually use the area would be advantageous:

* Loaded/Ballast
* Hazardous/Non-Hazardous cargoes
* High speed craft

Environmental Conditions and its influences on the VTS equipment and traffic image:

* Meteorological
* Tidal
* Time

State of the sea area:

* Buoys
* Lights
* Areas of Closure

Allied Services:

* SAR
* Ship safety
* Pilotage
* Tugs
* Agents
* Customs

Other resources to be utilized including publications and simulator facilities.

# DEVELOPMENT AND VALIDATION OF SIMULATION EXERCISES

Realistic outcomes are crucial to achieve the desired exercise-specific training objectives. An exercise should consist of a series of “events” intended to identify, or high-light, the specific learning outcome for which the exercise has been designed. An “event” is an incident or circumstance that is intended to stimulate trainee reaction and can be activated by trainee observation or by communication.

Events can be classified into the following categories by the response generated:

* Significant or Minor or Background
* Interactive or Non-interactive
* Individual response or Teamwork and joint response.

The sequence of events should take into consideration:

* the workload of both trainees and instructors; and
* the increasing level of complexity caused by the event or sequence of events.

The level of activity should achieve the objectives and reflect the stage of training.

On completion of the design and development of an exercise it should be validated by persons with considerable VTS operational experience before being used for training purposes.

# DOCUMENTATION FOR SIMULATION EXERCISES

The following documents should be prepared prior to any exercise being undertaken

* General information and scene setting
* Instructor information/script
* Trainee information/script
* Technical information/script

The documents should relate to the selected exercise area (see section 3) as closely as possible and a standard format for each type of document should be used within a Training Institute or VTS centre.

# CONDUCT OF SIMULATION EXERCISES

Exercises should be conducted in real time and, where practicable, in such a manner that an operational VTS environment is created.

## Pre-exercise briefing and preparation

During the pre-exercise briefing, instructors should provide participants with all relevant documentation, including those that give general information and set the scene as well as the trainee’s information/script document.

It is important the following issues are covered during the pre-exercise briefing:

* Team disposition/roles/equipment status
* Overall aim – (type of exercise: familiarization/training/assessment)
* Relevant objectives
* Broad setting (where, when, environment)
* Detailed setting (traffic list, start positions)
* Communication scenario
* Length of exercise and intended conduct of exercise.

When setting up a simulation exercise, it is important for instructors to:

* ensure all preparations are complete;
* allow adequate time for planning and preparation;
* ensure adequate provision of response cells (instructors and /or students simulating ships, communications, agents or other exercise players.); and
* check recording and monitoring equipment.

## Management of exercises

During the exercise attention should be given to the following matters:

* Work to the script and incident plan.
* Record comments or unscripted additions for exercise review.
* Make notes of key teaching points for debriefing.
* Make notes on individuals for student evaluation.
* Review pace and progress of the exercise dependent on student performance.
* Avoid interrupting participants during the exercise.

However, if a problem arises that affects the continuity of the exercise; the instructor should consider whether the exercise should be paused or discontinued.

* Consider aim of exercise – for training, identify teaching points; for assessment, ensure performance against objectives.

Instructors should also observe the overall participation of trainees in the exercise, where appropriate their contribution to the work of the team, their reaction time and their response to stressful situations.

## Debriefing

Debriefing is as important as the exercise itself and should be carried out by an instructor immediately after each exercise. The exercise should be discussed fully with outcomes and lessons to be learned from them. The instructor should ensure that the objectives set out for the exercise have been met and encourage trainees to provide feedback on the content of the exercise, the instructions given and the effectiveness of the simulation.

The following points are particularly relevant to debriefing sessions:

* Debriefing should be properly controlled and co-ordinated.
* Consider appropriate location and conduct of debriefing.
* Allow time to prepare debriefing:
* identity teaching points and order of presentation; and
* prepare exercise playback.
* Ensure a focus on key outcomes that should be learned from the exercise:
* try to take one point at a time; and
* emphasize the good points.
* Ensure student participation/involvement.
* Record key points from debriefing for exercise review and trainee assessment.
* Sum up and check performance against objectives.

## Feedback

It is important that simulation exercises provide training that achieves the required learning outcome. To ensure this requirement is met a system of feedback, which includes some or all of the following, should be employed:

* Reviewing exercise performance against required learning outcomes using instructor notes and debrief comments.
* Encouraging visits by customers and practitioners to witness and assess exercise and debriefing.

However, care should be taken to avoid any interference or interruption being caused to an exercise or its participants.

* Reviewing requirement for equipment modifications to meet training objectives.
* Reviewing continuing suitability of equipment to meet advances in technology – visits to VTS centres should be encouraged.
* Considering any formal written feedback.

Appropriate documentation/exercise script should be amended to incorporate changes that result from an analysis of the feedback information which will improve the effectiveness of the exercise.

## Trainee evaluation/assessment

The achievement of trainees against the exercise objectives should be evaluated on completion of the exercise and the result recorded.

The evaluation of trainees at VTS centres should be undertaken only by qualified VTS Supervisors or qualified On-the-Job instructors and the result recorded in OJT Task Books (See Model Course *C0103-4 (V-103/4)*).

# DEFINITIONS

The definitions of terms used in this Guideline can be found in the International Dictionary of Marine Aids to Navigation (IALA Dictionary) at http://www.iala-aism.org/wiki/dictionary and were checked as correct at the time of going to print. Where conflict arises, the IALA Dictionary should be considered as the authoritative source of definitions used in IALA documents.

# ABBREVIATIONS

CBT Computer based training

CD-ROM Compact Disc Read-Only Memory

OJT On-the-Job Training

TMS Training management system

VHF Very high frequency (30 MHz to 300 MHz)

VTS Vessel traffic Service or vessel traffic services (dependent on context)

WBT Web based training

# REferences

1. IALA. G1156 Recruitment, Training and Assessment of VTS Personnel
2. IALA. R0103 Training and Certification of VTS Personnel
3. IALA. C0103-1 (V103/1) Vessel Traffic Service Operators Training

1. SIMULATION AT VTS TRAINING INSTITUTES
   1. INTRODUCTION

The use of simulation at VTS Training Institutes can assist in achieving the levels of competence set by IALA, competent authorities and VTS Authorities for Basic and Advancement training in an effective and timely manner.

Simulation facilities and techniques can also be used at VTS Training Institutes for:

* Demonstrations
* Familiarization of trainees with facilities and equipment similar to those at VTS centres
* Basic procedures and skills
* Emergencies
* Advanced procedures and skills
* Evaluation and assessment of the prior learning of candidate VTS personnel
* Evaluation or assessment of the progress of trainees

Simulation should be planned and conducted by instructors with appropriate training on the use of simulators and, preferably, with experience in VTS operations and activities.

* 1. TRAINING OBJECTIVES

To be effective, simulation training at VTS Training Institutes must be realistic, well planned and have clearly stated training objectives.

These objectives should include the need for trainees to obtain the minimum levels of competence set out in the modules and overview of the appropriate model course. Although these levels of competence can be achieved by different teaching methods, some are best suited to simulation and where this is the case, the specific training objectives must be reflected at all phases of development of a simulation exercise.

The model courses are sub-divided into training modules, each containing a specific topic or subject. Each training module is further sub-divided into “subject areas” that identify the skills, knowledge and level of competence required for the particular subject area and should be used as the basis of developing exercise specific training objectives (see Figure 2).

Exercise-specific training objectives for appropriate subject areas from the module detailed teaching syllabus. (Subset of above)

b

d

a

c

..

Ex1

Ex2

Ex3

Ex4

Ex..

The training process:

Exercises/training phases

a

b

c

d

e

..

Set of overall module training objectives from the appropriate IALA C0103 (V-103) Model Course

1. Overall and exercise specific training objectives and their relation to the training process and its phases

However, training objectives should also be prepared for simulation training that integrates the skills and knowledge acquired from the individual modules. When these training objectives are being developed, the following extract from Model Course C0103-1 (V-103/1), VTS Operator Basic Training should be taken into consideration:

“Practical training

In addition to subject modules; the following are recommended simulated exercises

1. Recommended overall exercises

|  |  |  |
| --- | --- | --- |
| Subject | Assessment criteria | Duration in hours |
| Basic skills.  Monitoring and identification,  Communication co-ordination,  Evaluation and interpretation of the traffic situation  Log keeping, recording and reporting | Ability to identify, correctly interpret and handle reports from five simulated vessels | 20 |
| Traffic interaction and conflict resolution  Waterway management in multi-ship scenarios,  Anticipation and projection of traffic patterns,  Critical areas  Vessels overtaking and approaching each other  Passage plans, including those for deep draught vessels | Ability to identify, correctly interpret and deal with up to five simulated vessels in complex situations.  Ability to prepare VTS sailing plans, to monitor their execution and amend them due to unforeseen circumstances | 60 |
| Emergencies and special situations  Contingency plans  Adverse weather conditions  Special vessels and those with restricted manoeuvrability,  Internal and external emergencies | Ability to identify, correctly interpret data and handle reports from 20 simulated vessels during emergencies and special situations | 20 |

1. SIMULATION AT VTS CENTRES
   1. INTRODUCTION

The use of simulation at VTS centres can assist in achieving the standards set by IALA, competent authorities and VTS providers or On-Job-Training in an effective and timely manner. Simulation also provides a safe working environment for trainees to demonstrate competency in procedures and equipment through learning from their own experience gained during simulation exercises as well as the experience of qualified VTS personnel gained in operational circumstances and used as the basis for the simulation exercises.

Simulation training can be provided at VTS centres in several ways. One being to provide a simulator at the centre (computer based training or CBT) and another being to make use of the emerging technology of e-learning (web based training or WBT). WBT can be implemented by means of an internet connection with a training simulator located at, or operated by, an accredited training institute. Other developing or emerging technologies, such as interactive CD ROMs also demonstrate the potential of being suitable for some or all elements of simulation training at VTS centres.

Simulation can also be used at VTS centres for purposes other than OJT, including:

* Improving communication skills.
* Identifying the need to change operational practices and procedures.
* Testing and evaluating new operational practices and procedures.
* Revalidation of VTS Operator Certificates (see IALA *R0103 (V-103)* section 5.6).
* Annual assessments of VTS personnel (see IALA *R0103 (V-103)* section 5.5).
* Maintaining proficiency with emergency procedures.
* Operational interaction with adjacent VTS centres.

Simulation should be planned and conducted by VTS personnel with appropriate training on the use of simulators and, preferably, qualified On-the-Job Instructors.

* 1. TRAINING OBJECTIVES

To be effective, simulation training at VTS centres must be realistic, well planned and have clearly stated training objectives.

These objectives should include providing thorough knowledge of the:

* VTS area concerned, including any sub-areas, location and quantity of sensor equipment, geographical, topographical and environmental limitations and constraints, the hydrographical and meteorological conditions and the aids to navigation, traffic routeing schemes and ship reporting systems that are wholly or partially within the area.
* International, national, regional, local laws, harbour byelaws and regulations as they affect the operations of the VTS centre.
* Vessel traffic using the area, including the types and sizes of vessel and their daily and seasonal traffic patterns.
* Theory and procedures of traffic management in the VTS area concerned and the skill to implement the procedures.
* Operation of all operational equipment fitted at or operated by the VTS centre and the skill to use the equipment.

The objectives may also include providing knowledge of the:

* Areas of responsibility and management of the VTS centre.
* Methods of liaising with adjacent and neighbouring VTS Areas, nationally and where appropriate, internationally and the skill to employ those methods.

Learning takes place in distinct steps and the training objectives set out above will, in most cases, need to be split into sub-sets of exercise-specific training aims.

The required learning outcome of each exercise-specific training aim should be clear and concisely planned; they may be focussed on such matters as:

* Individual performance.
* Assessment of competency in the use of equipment and procedures.
* Demonstrating an understanding of the theory of knowledge-based subjects.
* Operational teamwork and the development of team building within the VTS centre and with allied services.
* Identification of traffic management measures.
* The development of new or revised operational routines, and their common interpretation leading to standard operating procedures.
  1. SELECTION OF SIMULATION TOOLS

The simulation tools that are appropriate for the tasks being performed by the VTS centre should be selected. The tasks to be performed are those relevant to the VTS centre concerned that are included within the training modules of the appropriate IALA Model Course. The purposes of a VTS are set out in IMO Resolution *A.1158(32).* They comprise the following:

* the provision of timely and relevant information on factors that may influence ship movements and assist onboard decision-making;
* monitoring and managing ship traffic to ensure the safety and efficiency of ship movements; and
* responding to developing unsafe situations.

1. More information on TMS is given in IALA Guideline *G1014 Accreditation and Approval Process for VTS Training*. [↑](#footnote-ref-2)
2. The exercise area for simulation exercises at a VTS centre should be the appropriate part of the VTS area concerned. [↑](#footnote-ref-3)