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**ISSUES TO BE CONSIDERED WHEN INTEGRATING COMPUTER-BASED
TECHNOLOGIES INTO THE TRAINING AND ASSESSMENT
OF SEAFARERS**

1 The Sub-Committee on Standards of Training and Watchkeeping, at its thirty-third session (21 to 25 January 2002), recognized that advice on integrating computer-based technologies into training and assessment should be developed and given the widest possible dissemination.

2 The Sub-Committee noted the outcome of the Nautical Institute's first CBT@ Sea Conference held in London in October 2000 which had identified the issues that need to be considered when integrating computer based technologies into the training and assessment of seafarers, given at annex, and considered the advice useful for Administrations, trainers and assessors.

3 The Maritime Safety Committee, at its seventy-fifth session (15 to 24 May 2002), approved the circulation of the advice on issues that need to be considered when integrating computer based technologies into the training and assessment of seafarers.

4 Member Governments are invited to bring the guidance at annex to the attention of those concerned.

ANNEX

ISSUES TO BE CONSIDERED WHEN INTEGRATING COMPUTER BASED TECHNOLOGIES INTO THE TRAINING AND ASSESSMENT OF SEAFARERS

Aim

The aim of this guidance is to identify the issues to be considered when integrating computer-based technologies into the training and assessment of seafarers.

Summary

This guidance outlines the key issues that should be considered by maritime administrations, trainers and assessors, and users of computer based technology, such as shipowners/managers and seafarers, when integrating these technologies into maritime education and training programmes.

In an effort to promote and maintain high standards of training and assessment of seafarers, new tools and techniques must be examined for their effectiveness. The Nautical Institute has researched and debated the role of computer-based technologies in the training and assessing of seafarers with a wide cross section of the industry and has identified a number of issues to be considered.

Background

Computers have been used for many years in the training and assessment of seafarers, first appearing at colleges and training centres for the purpose of administering multiple-choice questions. Today, due to accelerating processing speeds, increased memory capacity and the decreasing cost of hardware, computer based training and assessment can be found in training centres, on board vessels as well as in the seafarer's home. The power of hardware and sophistication of software design now allow desktop-based multi-media presentations, simulation exercises and virtual reality solutions to work effectively in individual, local, wide-area and Internet environments.

Computer Based Training (CBT) is a broad, generic term to describe how computer run software can be used in support of training applications. These may include initial training, or for imparting or reinforcing underpinning knowledge. CBT can be used to review a topic or procedure already learned (sometimes referred to as Just In Time (JIT) training), or it can be used as a readily available reference source. Some applications deliver informal self-assessment of knowledge or documented formal assessment leading to statutory evidence of theoretical competence. Computers are popular for their ability to rapidly store and recover data, respond to a user interaction, and integrate multi-media applications which can incorporate visual, audio and physical stimulus.

Computer-based techniques for training and assessment have advantages and disadvantages. These are summarised in the appendix. Other issues of specific interest to maritime Administrations, trainers and assessors, and users of computer-based technologies such as shipowners/managers and seafarers, have also been identified.

Issues for maritime Administrations

Maritime Administrations, in their role of approving training for compliance with the requirements of the STCW Convention, as amended, may be asked to approve CBT packages. Issues to consider when approving CBT for compliance should include all traditional aspects of approving training programmes, such as accuracy and scope of course content and the effectiveness of the assessment, but should additionally include:

- Tutor support load – some organisations have found that the support management load by shore staff training students at sea is enormous.
- Results from CBT assessments – will the program produce its own printed assessment results? What is the procedure for monitoring the assessment process?
- The quality of assessment – the Administration must look at the topic being examined and satisfy itself that the CBT package not only includes a sufficiently comprehensive list of questions to adequately assess student competence but that the mechanism for selecting the questions is appropriate to the level being examined and that the answers are correct.
- Prevention of cheating – the Administration must satisfy itself that the database of assessment questions is of sufficient volume to prevent correct question guessing or other circumvention of algorithms to achieve an undeserved pass, and that the range of questions accurately assesses the student's competence.
- Security - the database must be secure against hackers and should alert supervisors to attempts at tampering.

The following considerations need to be taken into account by Maritime Administrations thinking of using CBT to assist in the assessment of a seafarer prior to issuing a certificate of competency. The advantages to an Administration in using this technique may include reduced running costs, remote assessment of competence, and improved service to the industry through reduced processing time for the certification of seafarers. Other issues requiring consideration include:

- The process for updating questions in the database.
- The need for assessing competence through practical exercises as well as computer assessment. Computer assessment can assess knowledge but not skill.
- Validation - the process for handling assessment results: whether the assessment results are sent in by the seafarer, or whether the assessment will be held in real time, possibly via the Internet.
- The monitoring of assessments: is the assessment to be monitored at an approved location, or can it be taken at any time and location by a lone seafarer. If so, how will the identity of the seafarer be confirmed?
- The security of the database to prevent cheating.

Issues for trainers and assessors

Traditional training and assessment can be enhanced through the use of computer-based techniques if implemented properly. The right CBT packages, used at the right time, must improve the quality and efficiency of seafarers' teaching and training. CBT offers flexibility in the way teachers and trainees use their time and adds value to the assessment process, being linked to the interactive training programme's content. But if the intention is to replace a well-designed training and exercise session supported by a good trainer with CBT material alone, it should be realised that it is possible to impart a lot of knowledge but individuals may not be able to put it into practice, due to the lack of tangible and physical environment, the lack of team support and the lack of the necessary human interaction.

Issues to consider by trainers and assessors for incorporation of computer-based training and assessment packages into training and assessment programmes should include:

- An assessment of how CBT can improve existing training (See advantages and disadvantages at appendix).
- The implementation and integration of CBT based on the specific target audience and the need to fulfil set learning objectives.
- A consideration of the implications of tutorial support for CBT packages both within the classroom and at a remote location.
- An understanding of the technical parameters and those related to the syllabus or learning programme of the package for training, reviewing, self assessment and formal assessment.
- The security of the information and the needs of formal assessment.

When considering CBT applications the programs should be reviewed in the context of:

- The training objectives
- Legal requirements
- Safe working practices
- A method for verifying the learning objectives
- The relevance of the storyboard/script
- The reliability and compatibility of the software
- The clarity of the instructions on how to use the program
- The integrity of the assessment process
- The way results of tests are held and communicated to the individual and the training or examination centre.

Issues for users

For the purpose of this guidance two types of users are considered: those charged with purchase and implementation of CBT facilities, and the end-users themselves: the seafarers.

Shipowners/managers share many of the same issues as the trainers noted above in terms of selection criteria, support and assessment concerns. However they must also share issues of on board implementation with the seafarers. These issues may include:

- Targeting the type and level of training to those on board. Is it to be used by the entire crew or will it be for a particular level only?
- Whether the crew have sufficient knowledge of computers to make effective use of the training.
- Whether the hardware on board is sufficient to support the training packages, and whether the crew have sufficient access to the machines.
- How the cost-benefit of the training is to be assessed.
- Whether the on-board use of CBT compromises the safe working hours of the crew.
- Whether the on-board use of CBT distracts from other work activities such as watch standing for either the direct user, or those in the vicinity (*i.e.* on the bridge or in the engine room).
- Will there be an impact on off-duty time and therefore, possibly, on manning levels?
- How assessment is managed. Does the user have the ability to submit a result for official record or not?
- Supervision of assessment.
- The role of officers on board - does the system rely on shipboard officers to train or assess and, if so, have they been trained to train or assess?
- The level of shore-side support offered, and the reliability of post, telephone, fax, e-mail, world-wide web (www) linkages and the communication time lag.

Conclusion

This guidance recognises that CBT is a powerful tool which can be applied in support of maritime training objectives. However, because of the complexities and resources needed to develop effective training and assessment packages, careful planning and evaluation should be undertaken when considering CBT solutions. The principles outlined in this paper may prove useful for those contemplating the integration of CBT into seafarer training and assessment programmes.

APPENDIX - THE POTENTIAL ADVANTAGES AND DISADVANTAGES OF CBT

	Potential advantages of CBT	Potential disadvantages of CBT
1	Computer-based training is convenient as it can be available at any time either onshore or at sea.	This can be 'too convenient' leading to a reduced emphasis on making the training event as effective as possible.
2	Trainees can work at their own pace.	There is an optimum pace for most training. If trainees are allowed to progress too quickly they will retain less knowledge. If the course is too slowly trainees will get bored. The pace of training must therefore be a course design feature.
3	Trainees can often go back over course material to reinforce their understanding of the material in question.	Trainees lacking in confidence may not progress as quickly as they otherwise should have.
4	Training material is presented in a far more interesting way than with many other forms of training.	Course designers can be tempted to 'dazzle' trainees with impressive graphics which can detract from achieving the specified learning objectives.
5	Three-dimensional images of equipment and structures e.g. an engine or an evacuation route, can be depicted to very clearly explain matters to the trainee.	The course designer must assume that the target audience can assimilate the information displayed.
6	Professional presentations by highly experienced tutors can be distributed on a world-wide basis using high quality voice over to clearly convey their training messages in many languages.	Care must be taken in translating training material to ensure that the intended message does not become changed through the translation process which poses a significant risk.
7	The training course can be designed for multi-level training so that the same course is suitable for a range of target audiences or to let trainees progress to higher knowledge levels in controlled stages.	
8	Exactly the same training material content is given to each trainee until the content is deliberately revised by the trainer, providing a mechanism for greater control over course delivery than non-automated training.	
9	Training records are very easily stored, transmitted to other locations, and managed for audit and verification purposes.	
10		Trainees can not ask computers questions and so are limited to the pre-determined help facilities designed into the training course.
11		Computer equipment and software can have compatibility problems and some means of providing user support is required.
12	Long-term knowledge retention can be higher with CBT than many other means of training delivery.	
13		Computers can only provide training where the objective is to transfer knowledge, computers can not transfer skills to trainees.
14	Where the trainee is having difficulty the computer can provide additional training input as a function of the trainee's responses to questions automatically.	There is limited ability for group learning.