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WATERBORNE TRANSPORT

Project 6.4.4, Task 44

SEAGULL

(Seafarers Global Use of Long-distance Learning)

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WORK PACKAGE 8
Final report and overview of deliverables within the SEAGULL-project

Final Version

Task 44/JJ/MSCN/031001

SEAGULL

Seafarers Global Use of Long-distance Learning

An overview of baseline requirements of Maritime Long Distance Learning; Technical and educational

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The objective of this task is to provide an overview of the proceedings and completed work within de SEAGULL-project.

Keywords:

- Maritime Long-distance Learning
- Maritime Education and Training
- Management Information System Use
- Maritime Simulation and Training
- Multi-media Education
- Assessment of MLDL

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0 Executive Summary

Work Package 8 is defined in the following way:

- A description of the SEAGULL-project;
- Overview of the work;
- Summary of each Work Package;
- Summary of conclusions and recommendations of each Work Package.

0.1 Introduction

This report, being the WP8 deliverable, is divided into seven chapters. Each chapter of this report will be a summary of a specific Work Package, which has been delivered within the SEAGULL-project TASK 44.
TASK 44 of the EC Waterborne Transport 4th Framework Programme is concerned with impacts of long-distance learning in the maritime environment e.g. on board vessels and in port areas. The title of TASK 44 is SEAGULL, an acronym of **SEA**farers **G**lobal **U**se of **L**ong-distance **L**earning.
The participants of TASK 44 are:

• MSCN	Maritime Simulation Centre the Netherlands/MARIN	**NL**
• CETEMAR	Centre for Technical/Maritime Investigation	**E**
• DMI	Danish Maritime Institute	**DK**
• BIT	Bureau Interactive Training	**NL**
• HW FSW	Hochschule Wismar, Fachbereich Seefahrt Warnemünde	**D**

TASK 44 has been subdivided into seven (7) work packages (WP's).
The main topics of WP 1 – 7 are:

- A concise definition of a baseline communication system for the application of MLDL (WP 1);
- A concise overview of existing educational programmes, expertise databases for maritime professionals and the definition of the on board learning possibilities
- (WP 2);
- Baseline requirements of Maritime Long Distance Learning; technical and educational;
- The organisation and realisation of a workshop for nautical institutes and priorities in MLDL concerning educational concepts and co-operation. The workshop finishes with a written report on the workshop findings (WP 4);
- The development of demonstrator courses (WP 5);
- The development of a demonstration tool (WP 6);
- The assessment of MLDL
  (1) the evaluation of the transfer of knowledge
  (2) the evaluation of the costs involved with MLDL against the estimated costs for the current education schemes (WP 7).

1 Summary Work Package 1

LIST OF ABBREVIATIONS

SEAGULL	Seafarers Global Use of Long-distance Learning
MLDL	Maritime Long Distance Learning
GMDSS	Global Maritime Distress and Safety System
LEO	Low Earth Orbit Satellites
GSM	Global System for Mobile communications
CAPSAT	Compact and low cost Maritime Satellite Telephone for world-wide transfer of telephone calls, fax prints, and data or e-mail messages
ISDN	Integrated Services Digital Network

1.1 Target groups

Within the context of Maritime Long Distance Learning, we can nevertheless recognise three important target groups:
1. Trainees who take part in training courses of maritime training institutes;
2. Individual (seafaring) learners who want to spend available time on following education;
3. Personnel ashore who take maritime courses (which is of no effect to the difficulties of long distance learning).

On the offering side one can recognise the following target groups:
- The trainer / facilitator of the learner;
- Commercial institutes who would like to offer training courses to seafarers.

Finally, there are some other stakeholders within the Maritime Long Distance Learning context:
- Ship owners;
- Colleagues;
- Facilitators on the work spot.

1.2 The context

Within the context of Maritime Long Distance Learning there are some important aspects.

1.2.1 Surroundings of the learner

Point of departure is a seafaring learner or maritime trainee (on sea or in a harbour) who is equipped with (interactive) self-learning material and who has the possibility to get in contact with his teacher/facilitator and/or with fellow learners. For this situation there are a few critical variables:
- Ocean or coastal shipping;
- Number of people and functions on the ship;
- Work situation on the ship (working load, shifts etc.);
- Access to PC's and communication equipment aboard the ship;
- Attitude of the employer on Maritime Long Distance Learning;

1.2.2 Surroundings of the teacher/facilitator

On the side of the teacher/facilitator the following aspects are of importance:

- Available capacity on schools to monitor individual learners;
- Experience in tutoring students in distance learning situations;
- Readiness of the teacher to gain experience in this situation;
- Commitment from the school management for distance learning;
- Technical experience of teachers/schools with Internet and telecommunication.

To what extent these aspects are taken care of, will be of great importance for the success of the implementation of a Maritime Long Distance Learning situation.

In WP3 further attention will be paid to this subject.

1.3 Overview relevant actual systems

The data in the following scheme are indicative because the prices (Fall, 1998) strongly fluctuate.

System Property	Inmarsat- C	GSM-data	Mobitex
type of connection	satellite, store-and-forward	onshore mobile, point-to-point	onshore mobile, store-and-forward
coverage/ geographical availability	world wide	Europe, plus some areas outside, only coastal harbours	parts of Europe, only coastal harbours
necessary hardware	Inmarsat-C transmission, antenna, PC/terminal	GSM-telephone, data-adapter, PC	Mobitex transmitter/receiver, PC
availability on ships	often	often	hardly
application possibilities	all right, but high costs (only mail)	all right, (Internet/mail)	reasonably/well (mail, limited Internet usage)
costs communication hardware	EUR 3,500	EUR 600	EUR 1,000
monthly subscription	EUR 0	Variable, indication EUR 45	from EUR 35,100 KB volumerate EUR 55 [1])
costs communication (indicative)	EUR 0.21 per 256 bit (32 byte)	+ EUR 2/minute, depends on country and service provider	+ EUR 0.30/kb, depends on subscription [1])
usage outside distance learning	GMDSS, messages to office	calls	messages to office

Table 1 Review actual systems [1]) Exclusive international surcharges

1.4 Maritime Long Distance Learning overview

In figure 1 the different communication channels are reflected schematically.

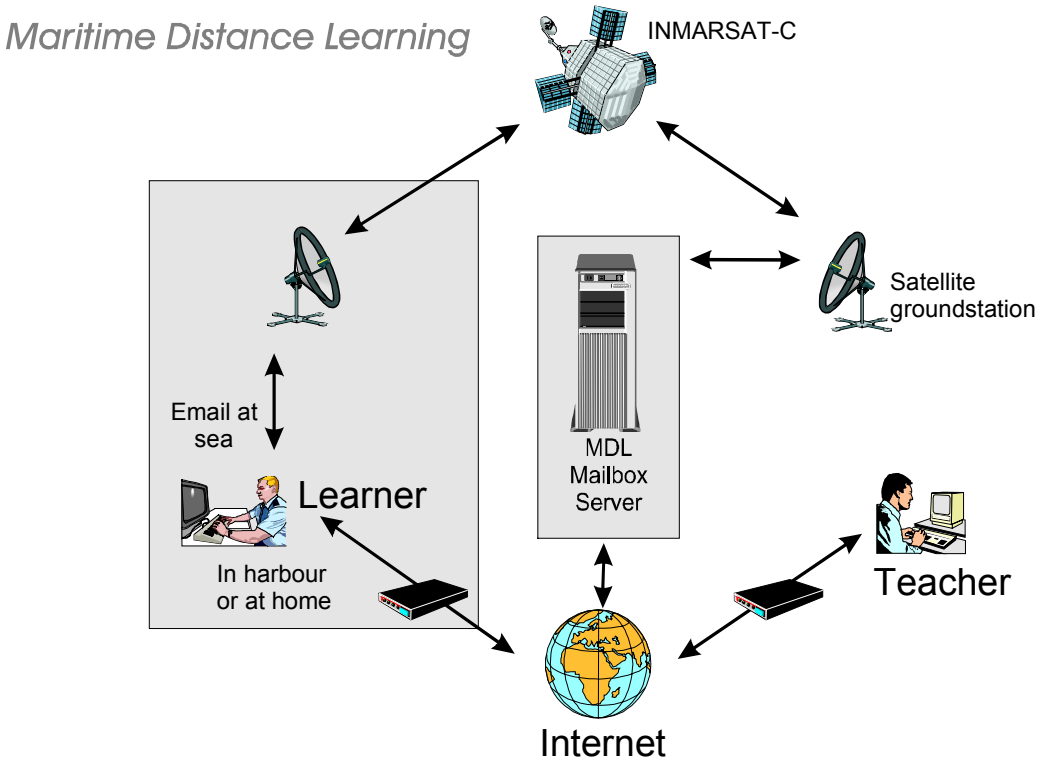


Fig. 1 Communication channels

By introducing compression protocols, the data traffic can be reduced by a factor 2-4. By reducing data traffic communication, the communication costs (especially for the Inmarsat-C connection) will be considerably reduced. This is of course also very interesting for the standard Inmarsat-C communication between the shipowners' office and the ship.

1.5 Choice of communication channels

Our starting point is that Maritime Long Distance Learning should use the actual existing means of communication. In the following table the most important communication channels available are listed on availability and usability for Long Distance Learning.

	Fax	Speech	E-mail	Internet Web	Costs	At sea	Geographical Application	Available in work field	Didactic/ distance learning
Inmarsat-A	yes	yes	yes	Yes	--	yes	++	-/+	+
Inmarsat-C	no	no	yes	No	-/+	yes	++	++	-/+
Inmarsat-P	yes	yes	yes	yes	-	yes	++	- -	+
Inmarsat-M	yes	yes	yes	Yes	-	yes	++	- -	+
Mobitex	no	no	yes	No	+	coast	-/+	-	-/+
GSM-speech	no	yes	no	No	+	coast	-/+	-/+	-/+
GSM-data	no	yes	yes	Yes	+	coast	-/+	-/+	++
Telephone	yes	yes	yes	Yes	++	no	++	++	++
LEO sat	yes	yes	yes	Yes	?	yes	++	not	++
Postal	no	no	no	No	++	no	++	++	-
Mariphone	no	yes	no	No	-/+	coast	-/+	++	-/+

Table 2 Overview means of communication and their utility

Inmarsat-C, telephone, mail and mariphone are the only systems that are often used and available to the working field. Inmarsat-C in combination with data communication by telephone in the harbour is the best system to use for distance learning at sea.

1.6 MDL-mailbox

An extension at the idea of the Inmarsat/Internet gateway is using the electronic mailbox concept. This means that all the received mail is not forwarded immediately but is stored in an electronic mailbox until it is to be collected by the addressee. Every user has its own personal mailbox that he can administer. The electronic mailbox principle is very common on the internet but not a standard facility for satellite communication where messages in general are immediately forwarded.

Using the MDL-mailbox gives important advantages:

- The addressee decides for himself when he wants to pick up his mail. He can do it at times it is convenient for himself or times it is no disturbance to use the communication computer. The sender does not have to be aware if the addressee is on shore or at sea and on which ship he is on.
- It is possible to let registered mailbox users pay for the communication costs and services they use. A registered user can be a student but also a ship-owner. Important is that a user on a ship gets information about the amount and size of the waiting messages so that he can select the messages that he wants to download at Inmarsat-C costs. The user can also put a limit on the size of a message or the monthly communication costs.
- The addressee chooses for himself how he approaches his mailbox, this can be by Inmarsat-C or Internet connection while in a harbour or ashore. In this way the a student has direct control at the communication costs.
- By using an automatic Forward Service a mailbox-user can, if desired, automatically forward his mail to other addresses. This can be a solution if a ship-owner already has an end-to-end electronic mail system with the ships. This service can be realised for individual mailbox-users.

- Contact between users(learners) can be realised in a simple way with this system. One only has to know each others mailaddress.
- An electronic mailbox can also be used for distributing a digital magazine of news-bulletin.

1.7 A suitable experience in MLDL context

(The final Work Package 3 describes the MLDL context, its solutions as given through a didactical system and its necessary fulfilment of requirement in order to make it work.)

All the components mentioned before gave a reliable impression of there own performance each, but not in a MLDL situation.

During the start of the project the next situation was shaped: a trainee maritime officer stays several weeks on board to fulfil his practical. During that period he has to carry out required assignments, and send the reports of this assignments to his coach at the training institute. The reports must contain required, well described, items. The quality of the final report plays a major role in the assessment of the trainee maritime officer. Since it's difficult for the trainee to improve his final report after he ends his trainee period and left the ship (some specific information is only available on that vessel) it's necessary to receive a timely feedback from his coach. The present-day communication technology on board offers this possibility.

In order to make a safe start, a combination of components is chosen which are familiar to the participants. In case of the Trainee record book we assumed that the selected shipping company Wagenborg was familiar with sending e-mail from a vessel to the shore, the selected trainee maritime officers are acquainted with a few ways of studying, and the Maritime training institute knows how to handle the student-reports send periodically to the coaches.

It seemed that the Wagenborg vessel made use of Inmarsat B and AMOS Mail. AMOS is an easy-to-use data and message communication system, designed to handle all the ship/shore satellite links in a cost-efficient and optimised way (e.g. error correction, message compression).
The personal computer of the trainee was connected to the system to send and receive the reports and other messages without difficulties.

All the reports from the trainee and feedback from the coach were collected and send to each other through the so-called MDL-mailbox server. It is a server on shore were all the documents are kept, and send to the right person. When it is necessary (e.g. with complicated reports containing very different subjects) a second coach can gain access into the mailbox server to open the required documents.
In this way a track-record of achieved assignments is build. Clear report and message titles effectuates in a digest of rounded assignments and 'to do's'.
The coaches store the evaluations of the final reports in the training institute's judgement administration. This new internal developed system is compatible with the MDL-mailbox server.

1.8 Conclusions

- Inmarsat-A is too expensive and limited in usage;
- Inmarsat-P, Inmarsat-M and Mobitex are not always available;
- Telephone, GSM-speech and mariphone can be used for verbal contact with the
- Teacher;
- Traditional mail will always be a way to exchange material, for instance sending material to the home address or the ship owner office. For Maritime Long Distance Learning the slowness of the delivery and the risk of messages not being delivered to the student are negative points;

- Inmarsat-C is the best alternative to provide a data communication system with students at sea;

Telephone data connection (modem) and mobile GSM-data connection with Internet are the best alternatives for data communication onshore or in the harbour. Although GSM is becoming more standard every day, it is not yet available in all harbours.
The U.S.A. use different digital mobile telephone standards.

2 Summary Work Package 2

LIST OF ABBREVATIONS

CBT	Computer Based Training
IMO	International Maritime Organisation
MET	Maritime Education and Training
MLDL	Maritime Long-distance Learning
STCW Convention	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
STCW Code	Seafarer's Training, Certification and Watchkeeping Code

2.1 Executive summary

Work Package 2 is defined in the following way and is consequently in compliance with the aim described in the proposal of the SEAGULL-project:

- A concise overview of existing courses per area (navigation, safety, environment, ports and others) will be given;
- To get an insight into the on board learning possibilities and requirements for online data collection on board and technical prerequisites on board to execute Maritime Long Distance Learning (MLDL);
- To give an overview of reliable and relevant expertise databases for the maritime environment (performance report).

Questionnaires and discussions/interviews with representatives of various maritime institutions and the use of publications as well as the World Wide Web/Internet were methods of investigation to collect data.

The following results are presented in the report:

- Existing courses per area
- Methods of investigation

2.2 Existing courses per area

The existing courses found through an inventory in European maritime education centres and other institutes as well as in maritime industries involved in maritime education and training was arranged according to the following structure:

- Safety and Technical Training;
- Managerial Training;
- Advanced Training;
- Commercial Training;
- Computer Based Training (CBT) programmes offered by various companies to support maritime education.

Onboard learning possibilities and prerequisites
As a result of using questionnaires and discussions/interviews with representatives of some shipping companies it could be seen that multitude of ships are equipped with PC, but only few vessels are able to execute data transfer between ship and shore vice versa via satellite communication. Therefore the interaction between trainee and tutor could not be realized in a high degree yet. But it is to expect that the availability of such equipment will increase to a high extent in the next years.
At present it is very difficult to conclude to what extent these results can be generalised, because the number of replies to the questionnaires were not so high.

Overview of relevant databases for the maritime environment
This part contains some databases relating to the maritime environment.
INTERNET information is used to find some examples for instance Ports Guide from
Fairplay Publications Ltd. available on CD-ROM and designed for use by the ship master and also in the operations department. This guide provides all the details that are required to manage the vessel's stay in port. Furthermore the electronic publications of IMO and others are used.

2.3 Methods of investigation

Questionnaires have been sent to:
- European maritime education institutes;
- shipping companies;
- producers of CBT programmes.

In order to get information for an overview of existing courses about the on board learning possibilities and technical prerequisites and for existing databases for the maritime environment.
The data shall be obtained not only from the above mentioned institutions, but also from other facilities in Europe mainly involved in maritime education, in shipping and adjacent areas.
Furthermore the following methods of investigation were practised:
- Interviews with representatives;
- Search in databases of the World Wide Web/Internet;
- Evaluation of international publications.

In order to carry out this inventory, HW FSW has sent questionnaires to several European educational institutes as well as shipping companies and has elaborated interview questions for the same aim.
The questionnaires were sent to 19 maritime education institutes (18 European and 1 Australian institute).
Furthermore we have sent questionnaires to 14 German shipping companies and 3 international companies offering CBT programmes as well as assessment tools. Unfortunately only five institutes react on our inquiries.
Therefore additional individual discussions were arranged with representatives of shipping companies and intensified the search in World Wide Web and publications.
After that a co-operation was possible with 4 shipping companies only.
All the producers of CBT programmes and assessment tools are very interested and informed us about their products. For this reason it is very difficult to generalise the results.

2.4 An overview of existing maritime courses

The overview in this Work Package does not contain the normal courses of study. Only the short training courses are specified offered by selected European maritime education institutes and other facilities involved in maritime training.
Furthermore the report contains such courses, which are or could be realised as distance learning or correspondence courses by the education institutes.
It was often impossible to get further details regarding to the course content for the courses, because the institutions did not reply to this questions and in the publications no detailed description was given.

2.5 Conclusions

There are several problems which potentially the successful introduction and use of MLDL techniques in the maritime environment especially on board vessels.
Which are those?

1. Insufficient modern technical equipment on board vessels;
2. Necessity of installation of appropriate networks;
3. Provisions of programs appropriate for MLDL;
4. The time available for study on board is much reduced;
5. The qualification and needed motivation of the crewmembers;
6. A possible lack of qualified tutors in education institutes for that kind of education;
7. A modification of present training programs considering the new technology and training requirements;
8. Internet and e-mail access for seafarers on board;
9. Insignificant co-operation between shipping companies, training institutes, authorities, software suppliers etc;
10. Development costs (for qualified study material and data transfer).

What must be done?

1. Crew motivation and qualification in order to increase the skills in use of communication means and PC operation;
2. Opening up E-mail and INTERNET links for seafarers;
3. Training time should be guaranteed for on board studies;
4. Vessels should be equipped as well as retrofitted with appropriate communication means, PC and libraries;
5. Development and provision of qualified study material for Long Distance Learning:
   New courses have to be developed based on MLDL or parts of existing course has to be modified to be used for this teaching method respectively
6. Measures and activities to promote long distance learning in the Maritime Community
7. Establish better co-operation between shipping companies, training institutes, authorities, software suppliers etc;
8. Examination boards to assess the competencies of students and crews has to be familiarised to accept theses new tools as official means for training and assessment

Maritime institutes has to prepare themselves to establish MLDL where its benefits are obvious, teachers / tutors have to

2.6 References

- [1] EC Task 44 METHAR Research Project, WP 4.4, Assessment of the potential in the use of new teaching and training and methodologies in MET; distance learning through on board training. (Ed. P. Muirhead), August 1998.

- [2] Guide to Worldwide Maritime Training (a supplement to Lloyd's Ship Manager, April 1988).

- [3] Publication Catalogue of IMO (http://www.imo.org).

- [4] Homepage Institut Francais de Navigation (IFN) last update 98/07/14

3 Summary Work Package 3

3.1 Executive Summary

The evaluation is defined in the following way:

- Selection criteria for MLDL learners.
- Selection criteria for shipowners
- Selection for vessels and trade
- A comparison of results with regard to traditional teaching in a nautical setting versus long distance learning.
- Proficiency checks of seafarers during their assignment on board
- Summary of factors to be considered before developing Long Distance Learning programs.
- A summarisation of technical and organisational barriers to MLDL.
- MLDL possibilities on the World Wide Web.
- Summary of conclusions and recommendations.
- An overview of MLDL possibilities for end-users

3.2 Introduction, Objectives and Definition

After the completion of the desk-study within Workpackage 3 of the SEAGULL project a Maritime Long Distance learning (MLDL) project was set-up on one of Wagenborg Shipping B.V. deepsea vessels (ms Voorneborg). This project has been set up in order to compare the findings of the desk-study with a real life MLDL test project.
This final report intends to be an evaluation of the entire work done within SEAGULL WP3 and will furthermore provide recommendations for the reader who considers to set-up a similar project within his own organisation.

3.2.1 Definition

Now the SEAGULL project has come into a final state one could ask for a definition on Long Distance Learning. This is however difficult because there are many techniques that can be used to transmit a didactical message from a sender to a receiver and vice versa. One could say Long distance learning is any form of learning without face to face contact between learners and teachers but then there is nothing said about interaction between learner and teacher and the way how this interaction is achieved. Therefore the word telematics has to be introduced into the long distance learning definition. Telematics are any form of technical devices which can be used as a means to transport of a didactic message from a sender to a receiver and vice versa. This is because good learning comes from knowing how and if and when telematics can support some aspects related to learning better than to do it without telematics. But also how telematics can be combined or replace to a certain extend good pedagogy, good thinking, good debate, good books, and good working and learning habits to improve the quality of a learning experience. By "better", more efficient, or more enriched, or more flexible is meant.
When combining all these different aspects which emerge when discussing Long Distance Learning one comes to the following definition;
Long Distance learning is any form of using interactive telematics for learning-related purposes.

3.2.2 Objectives

The objectives of the practical test on board Wagenborg Shipping B.V. ms Voorneborg are obtained from an extensive desk-study within WP 3 of the SEAGULL project. When the findings of this study are summarised the following list of objectives arose before initialising the practical program.

- The set-up of the program and the installation on board should not disturb or hamper normal daily ship computer operations or working schedules but should on the contrary easily fit into normal daily routine.
- Learners should not need extensive computer knowledge to operate the program.
- The software should guide the learners through the learning program.
- Sending and receiving messages should work easily.
- The software program should provoke frequent interaction between learner and distant teacher
- The software needs to be protected against fraud.
- All components of the computer have to be tested before installation by the shipowners' helpdesk ensuring a smooth installation process and preventing company network clashes.
- The program itself needs to be completely free of any bugs and can easily be reset to its default values.
- The entire course should not exceed more than three months to be completed because of additional personnel cost. (extra officer was placed on board)
- The learners should be guided by experienced (maritime background) teachers to minimise delays in the project.

3.2.3 Selection criteria for the Learners

For this test "Hogeschool Zeeland" ,which is a nautical institute, selected two learners. Because the software program was still in a test phase, it was decided to select two learners with previous sea-time and sufficient computer experience. The reason for these criteria were that for learners with previous seatime it would take less time to get acquainted with the vessel and life at sea ensuring as little as possible delays in completing the project. A positive side effect of this choice was that both learners had been previously educated by "the old system" using regular mail in various ports to sent in the results of their tests. So the learners were able to compare both learning systems, " traditional versus non-traditional learning" and provide first hand experiences to the project management and contributing organisations. During the project this strategy proved to be an advantage.

Learners:
Both learners previously completed a medium level Maritime Officer training including sea-time and now both wanted to apply for a higher level Maritime Officer training enabling them to sail as Master on any vessel (Master all ships). An additional reason to select learners applying for the higher level Maritime Officer certificate was that they have to graduate in the English language preventing that the program can only be used in the Netherlands.

3.2.4 Selection criteria for shipowner and vessel

Based on the findings of SEAGULL WP1 and WP3 the primary criteria for selecting a shipowner are technical. The vessel needs to be fitted with extensive and up to date communication equipment e.g. (but not limited to) SATCOM C/B. In addition, there needs to be a computer network as well as a computer helpdesk available on the shore side. These technical requirements can be solved by any shipowner. The secondary and certainly not less important reason for selecting Wagenborg Shipping B.V. was their willingness and open mind to participate in this distance learning project which also required additional funding from their side. (personnel cost, helpdesk facilities)

The selection of the necessary computer equipment and interfaces was done by BIT-IC in co-operation with the Wagenborgs helpdesk.

At the start of the project it was decided to select a vessel serving on a regular trade in Europe. If any not anticipated computer problems would be encountered these could be solved without the need to travel to

different continents. For this reason at first the ms. Spaarneborg was selected but for operational reasons this was later changed to the Voorneborg. Wagenborg Shipping B.V. stated that the crew serving on the newly build Spaarneborg, which sails short coastal voyages and also on a new trade route, would have to spend all their time on the operation of the vessel. This means that to complete the MLDL project the crew has to make overtime which could be a safety risk. Furthermore, also the Dutch law requires that officers should have had sufficient resting time before going on duty.

The ms Voorneborg is a deep-sea tramp vessel sailing at non-regular routes between continents. At the start of the project this caused some concern (none anticipated computer bugs). During the project, however it turned out be an advantage because the vessel spent more time at sea both learners were more able to implement their "MLDL activities" into their daily routine at more regular time intervals.

3.2.5 The training program

The training program has been set-up for apprentice officers.
The Dutch law requires each cadet applying for a higher level Maritime Officer certificate of competence to complete an apprentice record book. The apprentice record book is divided in two parts: part A, being a checklist of tasks that have to be completed on board like e.g. the operation of the ballast system. Part B contains more open questions that refer to e.g. voyage preparation. To ensure frequent communication and interaction between the learner and distant teacher part B of training record book was selected to be digitised and moulded into a MLDL program in the English language.

Completion of tasks by learners:
As soon as the learner completed a task this task was "signed off" by the learner's mentor on board as well by the shore-based teacher (distant teacher). The Chief Officer / Master was given a password only known to him to access the "signing off" part of the program to prevent fraud.

3.2.6 First aid on board medical test demonstrator

Separately from the apprentice record also a short medical test demonstrator has been developed and embedded into the program. This test has been installed in the program as an additional feature in MLDL. The primary objective was to demonstrate that it is possible to complete proficiency checks onboard a vessel. In the future, however this test could be extended with additional case studies to provoke frequent communication.

A secondary objective was to find out if a long distance learning self-assessment test is feasible on board of a vessel. In this case LDL becomes an additional tool enabling the learner to prepare him/herself for the shore-based medical exam.

This extract from an existing medical test has been developed in co-operation with MTC in the Netherlands. The results of the test were sent to the distant teacher by the embedded e-mail program.

Results

Primary objective:
Both learners completed the test without any problems. In the future such a test could be completed easily in the presence of the Master of the vessel. To prevent fraud the Master of the vessel can be given a password to start up the test that has to be completed within certain time frames and can only be accessed once.
Secondary objective:
Doing a self-assessment test would very well fit in Maritime long distance learning course because a long distance learning course has to be learner centred. The learner has to study at his own time and pace and the teacher is only acting as a facilitator. On the other hand the test will provide a clear signal to learner if he / she is ready to face the final exam on the shore side.

3.2.7 Set-up on Shore

Before the program was installed on Wagenborg's network, it was tested at their helpdesk facilities ashore. This testing proved to be worth while because of the various existing computer software formats and versions. The worst thing that can happen to shipowners is a network clash caused by a not tested software program in use by a vessel at sea. On the other hand this meeting was also utilised to give both learners, the Human Resources Department of Wagenborg and the Project Management the opportunity to meet, which enhances mutual bonds and motivation. Furthermore, this meeting was used to check the computer skills of the learners which is a very important factor especially when older officers are involved. (WP 3: one cannot assume that all learners posses the necessary course and computer skills).
During the meeting passwords were established, mailboxes were set-up and satellite links were tested by using a simulated ship computer station in the shipowners office.
Before this meeting another meeting was held at the nautical institute "Hogeschool Zeeland" to evaluate all learning material and to check whether the material was suitable for distant learning. Informing the distant teachers and mentor what to expect from the project is also an item that requires careful attention.

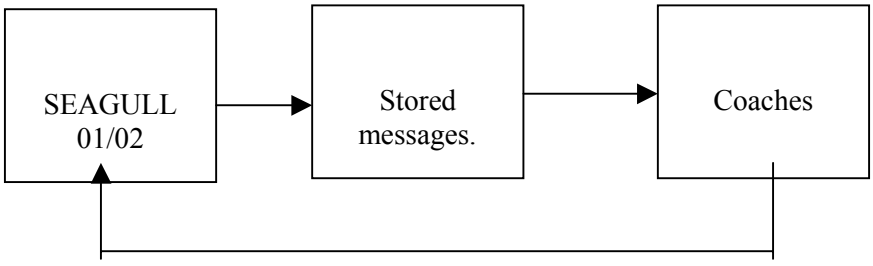
Structure of the project

SEAGULL 01= Learner 01
SEAGULL 02= Learner 02

SEAGULL 01 ⟶ Assignments concerning engine-room.

SEAGULL 02 ⟶ Assignments concerning deck.

Assignments were sent to the distant teacher who examined the assignments before sending the corrected version of the assignment back to one of learners. The learners could at his turn again edit the assignment. The embedded software automatically changes the colour of each alteration in the text enabling the learner and distant teacher to see each other's alterations.



3.2.8 Set-up on board

The program was installed by a computer expert on Thursday, 3 February 2000 in Istanbul (Turkey). The computer used for the project was situated in the ship's deck office and linked by a switch to the satellite terminal enabling the learners to send and to receive mail.
The Chief Officer/ Master both were given a password so only they were able to access the "signing off"part in the record book (see paragraph 1,5) .

Encountered problems:
At the time of the installation the vessel was in full operation, so both learners were not able to attend the complete installation of the program. After the installation, the computer expert left the vessel, leaving a note how to start up the program. The programmer assumed that both learners knew how to get around inside the "bowels" of Windows NT, which was unfortunately not the case. The programmer had to fly back and forth to Istanbul once more. After he left the second time a new problem occurred which could only be solved in Antwerp a week later by BIT-IC.

It is also recommend to find out beforehand if any special custom declarations have to be filed before sending computer equipment and to check whether the storage is open outside regular office hours. This item is deliberately mentioned because it might cause an additional workload onto the shore side organisation.

3.3 Project proceedings; evaluations of learners, distant teachers and shipowners

In this chapter the reader will find a summarisation of the evaluations of learners, distant teachers and shipowners.

3.4 Evaluation of learners

Experiences are generally positive, both learners are satisfied with the almost immediate response from their teacher. Both stressed the importance of setting up a communication protocol to ensure that messages are received by the distant teacher. A distant teacher does not have to answer each question immediately, but sending a short message that the file has been received does not leave the learner with demoralising feelings of uncertainty. This item can be solved by an "auto reply" from the nautical school.
Learners were very positive about the program which is "fool proof" although there were some problems during the start-up phase which gave them a little bit the feeling of being left alone at sea. During the remaining project time there was frequent communication between learners and distant teacher and both learners were satisfied about the immediate response which speeded up the completion of their assignments on board.
The learners had one complaint about scanning picture/drawing files which was not possible during the project. This is due to the fact that picture files are quite large to send over, which increases costs considerably but also occupies the network hampering regular data transmission. Therefor, they were not able to forward entire tasks in one piece from the vessel to the distant teacher. The administrative problems at the distant teachers side caused by this inconvenience were time consuming. In the nearby future this problem will probably no longer exist because communication costs are reduced continuously.
In comparison with the traditional face to face way of learning both learners said they could save out time by distant learning. This was largely due to the fact that the (almost) immediate available guidance by the Distant teacher prevented that they got lost in the training course by losing the total picture and not knowing what to do.

3.4.1 Impact on Working Schedule

Studying on board will certainly have its impact on working schedules especially when a project is in an experimental phase. To be ahead of any crew problems in relation to exceeding working hours Wagenborg decided to place two apprentices (both our learners) on board the ms Voorneborg. Both learners had to fulfil the job, which is normally carried out by one Maritime Officer. Because the learners have had previous sea-time they are both in possession of a valid certificate of competence.
The Master of the vessel was not always happy with this solution because he expected to see certain officers at certain times on the bridge. Due to the occasionally shifting working schedules learners were now at different times on watch which was sometimes inconvenient in relation to their watchkeeping experience and the safety of the voyage.
The conclusion of the project is however that setting up a distance learning project does not automatically mean that learners (apprentice officers) will have to do more work than they would have done by learning the traditional way (sending regular mail and waiting for answers in the next port).
For experienced officers at management and operational level and other crew also at support level studying on board means extra working hours. However, these extra working hours are not related to distant learning or the size of vessel but solely to the fact that studying always asks for extra hours. A company should therefor make sure that the learning program is embedded in the daily working routine of the seafarers.

Both learners were very positive regarding the possibility to ask questions to a distant teacher and to receive almost immediate answers (feedback). Also the structural way the program has been set-up leading a learner through all the different tasks was being received positively and less time consuming.

3.4.2 Study environment on board the Ms Voorneborg

The computer was placed inside the vessel's deckoffice which turned out to be not the best study environment. For ship operations, it was sometimes necessary to calculate e.g. the stability of the vessel forcing the learner to leave the deckoffice and to wait outside for the calculations to be finished. Also in relation to rolling motions this office was not really suitable due to its high position on the vessel and the learner facing towards the starboard side of the vessel. Recommend is to place the study computer in the cabin of the learner this however asks for preplanning during the new-building of the vessel.

3.4.3 Communication protocol

The company rules forbid direct communication to other radio stations outside the vessel without the master checking the contents of the mail. After the learner completed his task the mail was forwarded to the E-mail station of the master who would again forward the mail toward a shore side server. The distant teacher at his turn also sends in the corrected work to the server which auto forwarded it to the vessel. It is however important to discuss the communication protocol in advance to prevent feelings of doubt among learners and distant teacher. Another important reason to have a clear communication protocol is that is more easy for a learner and distant teacher to adapt their working schedules ahead as mail is e.g. always transmitted on Thursdays.

3.5 Evaluation by shipboard Officers

To evaluate the opinions of the officer's in a structural way a questionnaire was introduced.
Results questionnaire:

- The common idea was that the SEAGULL program was not implemented very well and that more information was needed in advance from the company. This is however due to the fact that the crew recently had been changed.
- Many of the officers doubted if it would still be worth while to sail on a vessel with al cabin doors closed and the few remaining crew sleeping or studying.
- Officers who are working full shifts do not have sufficient time to work, sleep, socialise and study because there are not enough hours in a day to do all.
- Working overtime hours also involves safety risks.

It might however still be worth while to investigate if this is true for every trade and company. It also worth while to investigate if officers and crew are willing to study at home when on leave by distance learning. On the other hand one should not forget that both learners finished the program satisfactorily and that a start-up phase always brings its specific difficulties. But when a training program is well integrated into the ship operation, even if this means that an additional officer has to be placed temporarily on board of the vessel, the outcome could be entirely different.

3.6 Evaluation by distant teacher

Interim summarising commentary to the project SEAGULL , a graduation projects of two students of the Hogeschool Zeeland, on board ms Voorneborg.

learners : B.W. Baan
M.A. van Ast

Supervising lecturers :
L. van Osch seamanship
J. Kaljouw technical science
J. Luteijn navigation

Introductory remarks:
Our first impression is that of a reasonably good system, but various matters need to be discussed and arranged before a larger group of students can use this system during their practice and send in a report this way.

The project:
After some initial problems, both technical and mailwise, the email got under way. In the beginning both students were somewhat doubtful, so arrangements have to be very precise and detailed to avoid unnecessary email. This is also the major drawback, the supervising lecturers noticed. Any small problem results in email, sometimes not even related to the task-specification (source of information-function of the lecturer / coach). Such questions (whether or not related to the task-specification) are simply and quickly asked, but often rather difficult to answer via email. Furthermore, we often have to judge reports three times, plan, draft, sometimes improved draft and then the final report (which, so far, we have not been able to judge). This is time consuming.
Also, regularly various appendixes of drawings and sea charts are mentioned in drafts, but not included until the final report (financial / technical limitations). This makes a draft report rather poorly organised and difficult to judge as a complete report. Unfortunately, it also happened that parts of the attachment arrived garbled; this technical problem will probably be solved in time, but is highly time consuming for the lecturers.

Internal situation:
The technical situation in our building, where all received reports, draft etc. need to be printed, both for a proper reading and for our archives. My personal opinion is that this is too heavy a claim on our lecturers and facilities when in use for a larger group of students.
Summarising:
A system with possibilities, which will need extra facilities (laptop, or CD-ROM) before being put into operation. With extensive laptop facilities the lecturers can relate directly to a page, chapter or drawing when answering questions and thus save time. Clear and detailed instructions are needed in relation to email, e.g.

- Always mail a complete draft (no incomplete parts, as this is time consuming and almost impossible to judge)
- The draft is judged by the lecturer and then returned to the student with instructions
- Final and complete report from the student, including all appendixes can be handed over in person or be sent by mail, whichever is faster.

3.7 Evaluation by Wagenborg Shipping B.V.

Hereunder the reader will find a summarisation of the evaluation written by Mr. W. Meier human resources officer at Wagenborg Shipping B.V.
The limiting factor for Wagenborg was that the crewmembers are not allowed to make any excessive overtime due to the Dutch law and by company policy for reasons of safety for vessel its cargo and crew. We therefore decided to place an extra crewmember (learner) on board to prevent any problems in relation to exceeding normal working hours. Within these working hours and staffing constraints, we see no possibility to introduce Maritime Long Distance Learning on board of any of our vessels for:

- Experienced officers at management and operational level
- Other crew also at support level
- For apprentices onboard our vessel the system might be a solution as long as following requirements are met.
    - E-mail facilities have to be present on board
    - The network-infrastructure on board is suitable for the program
    - E-mail transmission protocol has to be set between company, Captain and school
    - Clear policy regarding transmission of certain type of file in relation to cost

We really enjoyed being invited to take part in this project so we were able to see and to learn from the latest e-learning developments.

3.8 Requirements, Recommendations and Conclusions

For the end-user the conclusions and recommendations of this evaluation are listed below and where necessary supported by a motivation.

3.9 Requirements Shore Party

When setting up learning programs, the shore party has to realise that learners who are obliged to do a certain course will have much more problems finishing it than learners who will voluntarily agree to do a course. For this reason there should be an intake interview before the learner starts his assignment on board there. This is to determine the learners' level of knowledge and e.g. his particular interest in a certain field. This interview can also be utilised to establish contact with the learner to show him or her that the company is interested and wants to support him/her. Last but not least the interview might show the need for a different set-up or approach of already existing programs.
Furthermore:

- There should be a system (e.g. ISO) which checks and monitors the quality level of the available training courses. Only this ensures the constant monitoring of the quality of a training course. It also ensures regular updating of courses, which is of vital importance to the outcome of a MLDL project. A not updated course in the fast moving world of shipping will quickly lose its relevance.
- Distant teachers have to be available.
  will also have its impact on the availability of experienced teachers at nautical colleges not to mention experienced nautical distant teachers. This item needs to be carefully monitored.
- Procedures and guidelines have to be developed in co-operation with the ships staff and crew and this is of vital importance for the desired outcome. Procedures and guidelines have to be adapted in such way that they fit into the daily life on board of the vessel in question.
- After completion of the course, the learner should be granted a certificate.
  This will enhance motivation.
- Promotion policy has to be reconsidered.
  rise. If learners develop a feeling that it does not matter anyway how many courses they will go through, there will never be a reward anyway then they are lost.
- Gaps between the learner's level of knowledge and the training course have to be identified. In case a computer is used with e-mail facilities one can not assume that learners have developed the for necessary computer skills. Before starting up an MLDL project there should be an intake level interview with the learner. This interview should be utilised to check if the learner maybe needs a course which prepares him/her for the onboard learning program.
- Funding must be available, allocated and planned.
  This item needs no elaboration; setting up and developing training courses is expensive and needs to be carefully planned within the companies financial planning. When setting up training courses one has to think of extra personnel. The workload on the administrative department may increase with the introduction of distance learning and they may require financial incentives to ensure its smooth running. Additional costs are computer equipment, satellite equipment on board and on shore.
- Evaluation is necessary and in co-operation with the ship crews.
  After completing a training course there should be an evaluation to check if everything went smooth and if there should be an update of the course contents or communication procedures. This evaluation will also enhance the bond between the learner, the company, and the distant teacher.

3.10 Recommendations

1. Recommendations for end users to set-up a successful MLDL project:

- The first try out of an MLDL project should be in a classroom situation to solve all none anticipated bugs in co-operation with learners.
- Developing courses is expensive. It might therefore be wise to develop a training course which can be used for large group's of learners. Another option is develop training courses in co-operation with another shipping company to share cost creating a win-win situation.
- As shipowner one could consider to set-up short MLDL learning projects which can be extended into the leave period of a seafarer at home by using a multi-media computer with a telephone connection (modem).

2. Recommendations for end-users regarding suitable training courses for MLDL:

Below a few possible examples are given of training courses suitable for MLDL.
A shipowner is of course free to decide if it is necessary for his personnel attending any company or equipment related courses.

a. Experienced officers at management and operational level

Deck officers:

- Ship related training courses: RORO, Tankers; Chemicals Oil, Crowd Control etc.
  For this type of training a hybrid CD-ROM can be used at home or on board using virtual reality techniques. This virtual reality technique is already in use at certain nautical institutes. The learner can e.g. walk by virtual reality through the vessel she or he will be assigned on. On board no time is lost with additional on the job training. As already mentioned the WWW online possibilities are not yet feasible due to high cost but this is only a matter of time.
- GMDSS system operation.
  Also in this area there is a need for additional refresher training. Computer simulator techniques can be used. The results of every simulation can be sent by e-mail to a distant teacher for evaluation.
- Radar navigation/radar navigator courses.
  Learning how to operate a new radar or preparing one- self with radar simulations for the shore-based exam.
- Management training courses
- Self assessment tests.
  Self assessment test theory modules of any course can be completed on board the results can be sent to the distant teacher by the embedded e-mail program. The learner only has to return for a one-day practical training course instead of a three-day course at the training institute. An exam could be taken on board. Within the SEAGULL project a medical (demo) test has been designed and tested. The results of this test are described in chapter 1.4.1
- Ship equipment operation related training courses.

Engineers:

- Ship related training courses: RORO, Tankers; Chemicals Oil, Crowd Control etc.
  See deckofficers
- Self assessment test theory modules of any course can be completed on board the results can be sent to the distant teacher by the embedded e-mail program. The learner only has to return for a one-day practical training course instead of a three-day course at the training institute. An exam could be taken on board. Within the SEAGULL project a medical (demo) test has been designed and tested. The results of this test are described in chapter 1.4.1
- Management training courses
- Ship equipment operation related training courses.

b. Apprentice officers

- Apprentice officers can complete their Onboard-Training Record-books but also participate in dedicated company training courses

c. Other crew

- English language course.
- Health and Sanitation
  On board passenger vessels this item is a big issue. New hotel officers and personnel can study on board. Virtual reality techniques can e.g. be used by designing a virtual galley or dishwashing area.
- Lifeboat handler/ survival at sea/ fire fighting (theory part and self assessment tests)
  Theory (refresher) exams can be organised on board (e.g. passenger vessels) .
- Self assessment tests
  (chapter 1.4.1)
- Ship related training courses: RORO, Tankers; Chemicals Oil, Crowd Control etc.

See deckofficers.

3.11 Conclusions

1. Regarding didactical aspects of MLDL

Seafarers can not be regarded as a different "breed" when looking at long distance learning didactical aspects. Every didactical principle, which applies for any Long distance course, is also valid for MLDL. What makes MLDL different from any shore-based project is the environment were the learner has to study. Setting up the right interactive study environment without to many study time interruptions caused by technical and operational issues is the real challenge of a MLDL project. Implementing a learning culture within a company is one of the basic necessities before starting up MLDL.

Hereunder the requirements and findings from practice and within WP3 are listed:

- It is important to keep the learner motivated during learning.
  Learning arises from the *active engagement* of the learner.
  This engagement involves interactive roles of both instructors and learners.
- Giving the possibility to learners to discuss the learning material with each other and with experts is of utmost importance for the learner.
- It is important to provide flexibility in study materials, so that the learners as well as the shipowners have a wider variety of resources and modalities of study materials from which to choose from.
- With LDL projects models of good learning are shifting from knowledge-based, instructor-transmission models to models which are process-based and learner-oriented. The most teacher-focused method of communication is the lecture; the most learned-focused method is a facilitating instructor.
- Staff development is critical, both in terms of handling the technologies involved but also in terms of learning how to adapt to new instructional techniques such as learner centeredness and increased interaction.
- Use good combinations of technologies and instructional strategies

2. Regarding on-board circumstances influencing MLDL

- Rolling motions will have a negative influence on learners.
- Vessels sailing on regular longer routes are more suitable for MLDL projects because the workload on these vessels can be more planned ahead and divided over the crew beforehand.
- The study room on board has to meet the following requirements:
  a) Enough physical space, a desk large enough for a computer and the learner
  b) Components like computer, screen and keyboard within easy reach
  c) Illumination
  d) No noise
  e) Atmospheric conditions
  f) Possibility to restrict the influence of motion (e.g. a chair which can be lashed).

3. **Regarding boundary conditions on board ships:**

- Ships operated with a two men watch system of 6 hours on and 6 hours off will probably not be suitable for MLDL because of remaining short resting times.
- Courses have to be short and relevant to the learner's situation but should be designed in such a way that the learning program can be extended when a learner is at home on leave.
- Computer (multi-media), network, satcom equipment available. Choosing and testing if the right software is compatible with the ship's network and the company network is important and should be left to experts of the company's software department.
- Remaining working hours and resting times have to be in compliance with shipping laws and company directives.

4. **Regarding additional measures necessary for a successful set-up of MLDL**

- It is obvious that setting up new distance learning programs requires greater resources for design, development and preparation than when using existing, traditional (face-to-face, classroom based) learning situations.
- Distant teachers must be carefully selected, coached and receive training before setting up courses.
- With regard to learning methods: as long as the course material is relevant to the learners' situation and provides enough feedback to keep the learner motivated and willing to continue, there is no fixed way or approach or educational concept for MLDL.
- Designing computer based learning courses has to be done by a computer literate and a didactical expert.
- The use of satellite, WWW utilities still needs more development especially in the field of cost deduction but can be expected within the next two or three years.

3.12 Conclusions from the author

There is certainly a need and a possibility to introduce distance learning on board of vessels. It might be interesting to investigate if learners are willing to continue or finish a LDL course at home when on leave.
Before introducing any course on board of a vessel the company should take care that crew working hours are not exceeded because this involves safety risks.
Shipowners and shipping companies will definitely benefit from better educated crews. Knowledge will be contained within a company and passed on to the next generation of seafarers.

Additional Project Information

When the reader would like to have additional information about Workpackages 1 to 8 this can be requested at
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Website: http://www.marin.nl/services/mscn/index.html

4 Summary Work Package 4

4.1 Executive summary

4.1.1 Workshop organisation and development

It was generally agreed that the presence of students from the Gijón Maritime Education and Training Centre was very good for contrasting opinions of people who are currently studying the Nautical career. All people present made useful contributions. Some of the lectures were of particular interest and gave place to intense debates.

Technical points
With respect to technical comments, and as points to be highlighted under the aspects dealt with in the partial conclusions, we should consider that the technical part of the Project was not analysed in-depth for reasons of complexity and for not considering it necessary to do so. However, the financial cost was commented on represented by offering courses using technology such as satellite communications. This implied commenting on certain technical points related to communication methods. Special consideration and comment is worthy of the information provided by Mr. P. Muirhead about long distance courses in Australia and by Mr. Mats Kägstrom related to Norway.

4.2 Objectives of WP4

To disseminate information about the SEAGULL project among seafarers, administration, MET institutions and ship owners by way of a dedicated Workshop.

4.3 Results

Preparations for the workshop were carried out keeping in mind the two phases necessary for its execution:

First phase A draft was prepared where all the factors were taken into account that guarantee the success of an event of this kind in reference to the number of attendees, workshop duration and the quality of Lecturers and Papers.

Second phase Once all the material needed in order to develop all the points under the first phase had been gathered, a scheme was drawn up to be submitted to the Partners for their comments and modifications. This was presented at the meeting in October in the form of a triptych for dissemination purposes. The partners presented their comments and modifications in order to refine the details of the workshop. Finally a leaflet was manufactured and sent to the printers at the beginning of the year, and of which four hundred copies were printed and then sent out by: Ordinary mail. Postal Express. E-mail. Telephone calls

Letters returned
The information sent out by mail and postal express was done on the basis of the addresses sent to CETEMAR by the Partners, except for Spain obtained by CETEMAR. Taking into account the number of letters sent out and the impossibility of confirming the addresses beforehand, the quantity of letters returned was minimal - 2 from Belgium, 1 from Holland and 1 from Spain.

Confirmation of attendance
The majority of people living outside of Spain confirmed their attendance, and CETEMAR aided them with hotel bookings and additional information about transport. People from Spain also confirmed their attendance a bit later than the others. Some of those that showed interest in attending the Workshop did

not come in the end because of the use of English in the lectures and discussion sessions. We comment on this here in order to remember this for future events.

The Workshop
The workshop was organised in Veranes, the centre for maritime training that is dependent on the Spanish Maritime Administration Authorities. It is situated near to the city of Gijón in Asturias (Spain). The organisers at Veranes made available a spacious room with capacity for all participants and Partners. Projection and computer equipment were also made available.

Comments and exchange of opinions among those present confirmed that the partners' lectures were well accepted and considered appropriate and that they were able to obtain a high level of understanding of the SEAGULL project, which was the aim of the workshop.
Everybody was able to express their opinion on the subject matter and this proved to be a very useful time.

4.3.1 Partners and Participants lectures

The series of lectures was initiated by Mr. Carbajosa who acted as moderator for the workshop. He introduced the objectives, contents and programme for the two working sessions. Mr. Johan de Jong., in his role as co-ordinator of the SEAGULL Project, presented a summary of the global overview so that those present might gain an adequate idea of what the aims of the project were. He placed special emphasis on the advantages for seafarers, whether at sea or on shore, of a system that offers continuous and/or specialised training. The most significant question raised was, "Where can we find enough spare time to do this training on board?"

The answer might have several approaches, the lecturer explained. For those people with long periods at sea on very long voyages, there is plenty of time to carry out studies since it is simply a question of planning free time. People without on board experience will consider this very difficult, particularly if they think of their times on shore as periods of total rest. Therefore, time available will depend on planning and the type of ship and voyage. Obviously for a short sea shipping vessel with six hour watches and port calls at short intervals, free time will not be the same as on a ferry.

The lectures/conferences were as follows:

"Existing Educational Programmes In Europe Long Distance Learning Possibilities On Board". (WP.2) **Prof. Dr. Ing. Knud Benedict, Wismar University**
Ship's safety depends much on fundamental and specific knowledge as well as training in emergency management / decision making

Incidence of courses related to safety in general:
Nobody doubted that any training a member of the crew may receive will increase safety for themselves and the ship. However, it seemed to be necessary to refine the subjects to be included in the studies and their application. There were differing opinions related to the different methods and contents of the teaching in certain centres and it was expressed that subjects being taught are not standard. Therefore this is also true of MLDL. It would be necessary to start out with standard courses on shore to establish the methods and contents from those for long distance courses.

"Advanced Fire-Fighting, A Maritime Course Module" (WP.2.
Prof. Dr. Ing. Knud Benedict, Wismar University

MLDL definition, Methods of investigation, Existing courses, Course information, Learning possibilities/technologies prerequisites, Data base for Maritime environment, Conclusions, Expected benefits, Problems hindering successful introducing and use of MLDL, Insufficient modern technical equipment on board vessels.

Are ships prepared in reference to working structure to allow a crew member to dedicate their free time to training or refresher courses? The answer may be affirmative for ships with complete crews where the monotonous jobs have been substituted by computers or automatic systems. Doubts arise in the case of ships with reduced crews.
Do ships have sufficient technological advances necessary to follow the courses? The answer cannot be categorically yes or no. There are necessary elements for carrying out a long distance course and many ship owners already have them available on board their ships.

"The Definition Of Educational Concepts For Long Distance Learning (WP.3)
Mr. Jos Hendriks

Mr. Hendriks, using slides with instructional drawings, made it very clear what were the advantages and disadvantages offered by long distance teaching. He presented certain factors that should be taken into account when developing and preparing long distance courses.

Some of the participants expounded convincing reasons that would bear on the decision to enter a long distance learning programme, such as the belief it would help them reach promotion. One factor that was raised was related to the quality and the education of the teachers themselves who would have to follow up and evaluate the knowledge acquired by the pupils.

"Priorities in MLDL, Educational Concepts And Co-operation" (WP4.
Mr. J. Carbajosa

Awareness of needs is determined by an analysis of the relationship between: Crew member --- Training. He discussed programme development based on crew needs and the content of each course and how they must include all new technology.

The comments made were repetitive and were answered by making reference to the subjects developed in previous lectures. Some questions arose to specify further the aims and advantages of the SEAGULL Project and was so expressed by the lecturer.

"Development Of A Demonstrator Course". (WP 5) **Mr. G. Garay**

He expounded on the development of a Shiphandling course, from an existing PC based manoeuvring training simulator that will allow demonstration of onboard training of e.g. harbour approaches, using forecasts for wind and current and with the possibility to get feedback from a shore based instructor.

"The real spirit of assessment". (WP.7) **Mr. G. Garay**

He discussed how the maritime long distance learning concept would be assessed and what issues it would address. The purpose of this presentation was to outline some particular considerations in regard to the assessment that would be carried out as a corollary to this project which is whether LDL is a valid **alternative** to existing Maritime Education and Training methods. The advantages and disadvantages of MLDL were presented

A.- As advantages of MLDL
Sense of well being (company cares about my future). Less time ashore devoted to courses. Possibility of expanding knowledge at low cost. Helps regulate mental workload while sailing. Develops incentives to remain in the fleet. Vacations not interrupted by courses (and if so, by shorter periods). Better prepared personnel. Time on board used in a more flexible and intelligent way. Possibility of choosing the starting level of a standard course. Possibility of going over basic points as many times as considered necessary and to study at a pace and at times convenient to himself.. Encourages a self motivated approach to study. Allows the student to study while earning a salary. Avoids staff replacement costs for an employer while the employee is studying. Avoids the cost of travel and accommodation for a student to attend a university or college. Continuous assessment of student progress is possible.

B.- As disadvantages
Insufficient modern technical equipment on board vessels. Necessity for installation of appropriate networks. Provision of programs appropriate for MLDL. Not much time available for study on board. A possible lack of qualified tutors in education institutes for this kind of education. A modification of present training programs considering the new technology and training requirements. Internet and e-mail access for seafarers on board. Insignificant co-operation between shipping companies, training institutes, authorities, software suppliers etc. Development costs higher. Requires the student to have a high degree of self discipline. Contact between student and college or university must be continuous.

Part of the information described above, was facilitated and provided by the following institutions among others: *Australian Maritime College; The nautical Institute; The Norwegian shipping co.; Centre for Advanced Maritime Studies; Glasgow College for Nautical Studies; Logistics Training International; Marine & Engineering Training Association.*

"The Cyberspace University and the future for education and training. How will technology change traditional ways, particularly in the maritime world?"
Mr. P. Muirhead of the World Maritime University

Mr. Muirhead discussed general matters relating to education, its progress and what new technology might do for it. He presented the viewpoint of the teacher as opposed to the student and the questions arising as refers to quality teaching.

The two following questions may be highlighted as particularly interesting points:
1. The World Maritime University are very interested since it means the continuation of the guidelines established in the courses they already developed and that are in line with the ruling promoted by IMO with respect to the education and qualification of ship crews.
2. Does the method used **force** one to follow the course on board?. Not necessarily since it is possible to start a course on shore during leave and then continue when on board ship, or vice-versa. It is also possible to consider the possibility of doing a course on board ship and the evaluations (exams) on shore.

Structure of the second day
The second day was dedicated to complementing the explanations of some lectures. Guidelines were offered in order to open up a debate among all the participants present. Mr. Carbajosa started the session explaining the changes that had been made and the pre-disposition of the partners to provide those present with the technical data they had gathered on any of the subjects included in their Tasks.

Partners and Participants conferences

Mr. P. Muirhead, gave a conference which offered information about the programme carried out by the **Australian Maritime College**
One point that may arise is related to the commitment that must exist between the company paying for the course and the person taking it. Otherwise the courses would be interrupted. The duration of the courses should be somewhat reduced. The structure offered should take into account that part of the studies must be done when the person is on shore. According to some of those present, this is a difficulty when trying to follow the units. One participant noted the idea that with the same content, the number of units could be increased and adapted to times at sea.

Sr. Mats Kägstrom en Noruega, presented the FUMAR Project
This presentation provided us with a good idea of some variants on long distance education. It provided those present with a complementary view of all the opinions presented by the other lecturers. Between the participants questions and the answers provided by the lecturer, we may reach certain conclusions: The courses offered could have a wide variety of contents. Diversity may offer an answer to some of the reticence expressed by some of the participants showing their doubts about the possible benefits derived from the courses. If the subjects are wide in diversity it will always be possible to offer courses that are attractive to the seafarer.

4.4 Conclusions

4.4.1 Conclusions to the first day

The structure of the courses should follow the contents of the curricula taught in the nautical schools and education centres on shore. Courses should be programmed following a standard which could well be based on the courses already prepared by the IMO. Courses content must be sufficiently motivating to the pupil from the professional and social points of view to provide them with compensation for participating voluntarily. Some ship owners are not prepared to assume the implantation of long distance courses for their crews - neither technically nor practically - and there is a need for course divulging.

Conclusions to the second day

The new work presented and the ample answers provided by the lecturers make it difficult to summarise or highlight any specific conclusions. However, the following is noteworthy:

The arguments presented by Mr. P. Muirhead and the data provided to confirm his answers were sufficient to underline that a good method for course development and adequate planning are the bases on which any provisions for long distance courses should be founded.

The subject touched on by Mr. Mats Kägstrom was a very well debated and interesting question as he also showed real cases.

As a final summary we might state that the SEAGULL project must take very much into account the type of courses to be set up as well the content and duration, being two aspects that are in many ways more important than the course type.

5 Summary Work Package 5

LIST OF ABBREVIATIONS

CBT	Computer Based Training
IMO	International Maritime Organization
ISM	International Safety Management
LDL	Long Distance Learning
MLDL	Maritime Long Distance Learning
SeeBG	See-Berufsgenossenschaft (German Seamen's Professional Association)
SOLAS	Safety of Life at Sea
STCW Convention	International Convention on Standards of Training, Certification and Watchkeeping
STCW Code	Seafarer's Training, Certification and Watchkeeping Code

5.1 Introduction

International as well as national studies and analysis on the present level of knowledge and skills in the area of ship's safety and also other problems have shown substantial shortages among crewmembers [ref. 5.1]. This applies especially to seamen who have been in their jobs for a long time. Long years of service on board vessels leads inevitable to a relative decrease of knowledge and skills especially concerning the requirements of new conventions, codes, regulations and the latest findings as well as the development of new technique (see also WP7, PART D).
For instance the new ISM Code and the revised STCW Convention have a remarkable impact upon the responsibilities of ship owners and maritime education institutes with regard to the provision of on board training to meet the new requirements.

Especially ship's safety depends much on:
- Fundamental and specific knowledge as well as
- Training in emergency management, bridge procedures, shiphandling, instrument training, collision avoidance in compliance with the Rules of the Roads, etc.

Education of crew members on ship's safety aspects and other faculties is mostly long time ago and differs between educational institutes.

There is not enough time to close these deficits efficiently ashore alone.

These facts and the above mentioned deficits require an upgrading or refreshment of knowledge and skills.
The present situation is characterised by the rapid development of satellite communications, the use of the Internet and e-mail services linked with the growth in the onboard use of computers and interactive multimedia based educational and training software. This is opening up new opportunities in the maritime field to improve the safety standards and skills levels of seafarers especially for those seafarers with long periods onboard vessels in order to upgrade or to refresh their knowledge and skills either within the actual profession or as a preparation for future occupations.

In particular the onboard training of cadets as a part of their education can be enhanced through Maritime Long Distance Learning.

5.1 Objectives

The principal objective of this work package is to develop three demonstrator course modules which demonstrate the potential of maritime distance learning (MLDL).
These three demonstrator course modules shall demonstrate the most important elements necessary for efficient Maritime Long Distance Learning.
Training on board with these tools with support from the shore as a systematic education could prepare efficiently for necessary refreshment, examination/assessment or certification on board and ashore and are suitable for cadet's education.
The computer based course modules with multimedia means are tools which permit respectively demand an interaction between the trainee on board and a tutor ashore. They are the most important modules to enable for self-learning on board in order to reduce communication costs ship-shore to the suitable amount.
These courses are developed preferably based on the new distance learning technologies in order to illustrate the proposed standards and in order to be able to assess the potential and the impact on improved safety and efficiency in maritime education and training.
WP 5 is consequently in compliance with the aim described in the proposal of the SEAGULL-project.

5.2 Technical abstract

5.3.1 Demonstrator course of HW FSW and ISV

General
HW FSW and ISV have developed a demonstrator course which deals with emergency management training especially in fire fighting.
The title of this course is **"Advanced Fire-fighting on Seagoing Ships".**
The bilingual computer-based training system was developed for the theoretical training of seamen in the area of fire prevention and fire-fighting.

This demonstrator course shall ensure the requirements for training in advanced fire-fighting in accordance with Regulation VI/3, STCW Convention (1995) and as set out in Table A – VI/3, STCW Code, Specification of minimum standard of competence in advanced fire fighting.
The "Advanced Fire-fighting Course" enables the user to train systematically on his own on board a vessel with instructional support from ashore, i.e. to prepare for necessary exams or certifications to be taken ashore. The course permits a ship's officers to advise the crew in all matters concerning a fire prevention and fire-fighting.

The course contents two course modules installed on a CD-ROM:
- module "knowledge";
- a combined training (self-test) and examination module.

The communication between the learner on board and the tutor ashore can be done via e-mail sending log files of test results or questions from ship to shore and receive comments/ recommendations back from the tutor ashore to the ship.

5.2.1 Content

The training course contains the following chapters which has been split into subchapters s. According to the requirements of the STCW Code (1995), the following topics are covered in the particular chapters:

Basics of combustion
- three requirements to start a fire or explosion ('fire triangle')burning material, source of ignition, oxygen;
- chemical, biological and physical sources of ignition;
- combustible materials: flammability, ignition temperature, burning rate;
- danger of combustion, spreading of fires via radiation, convection and conduction;
- effects of a fire;
- classes of fire.

Extinguishing agents
- water, water mist, CO_2, foam, powder and halon;
- extinguishing effects, physical properties, possible application according to classes of fire.

Fire-extinguishing equipment
- structure, function and technical details of typical, firmly fixed fire-fighting systems used on board;
- structure and usage of movable fire extinguishers.

Structural fire protection
- duties to be fulfilled and objectives to be met by structural fire protection;
- kinds, design and function of separating walls;
- division of the vessel into main fire areas;
- escape and rescue routes .

Fire detection
- quantities to describe a combustion;
- structure of a central fire control and the way they work;
- structure and function of fire detectors used in shipping and the way they work.

Structure and examples

The following modules have been included:
- Select a topic
- Glossary
- Dictionary
- Exercises module

This enables the user to acquire knowledge either in chronological order or by choosing for particular topics.

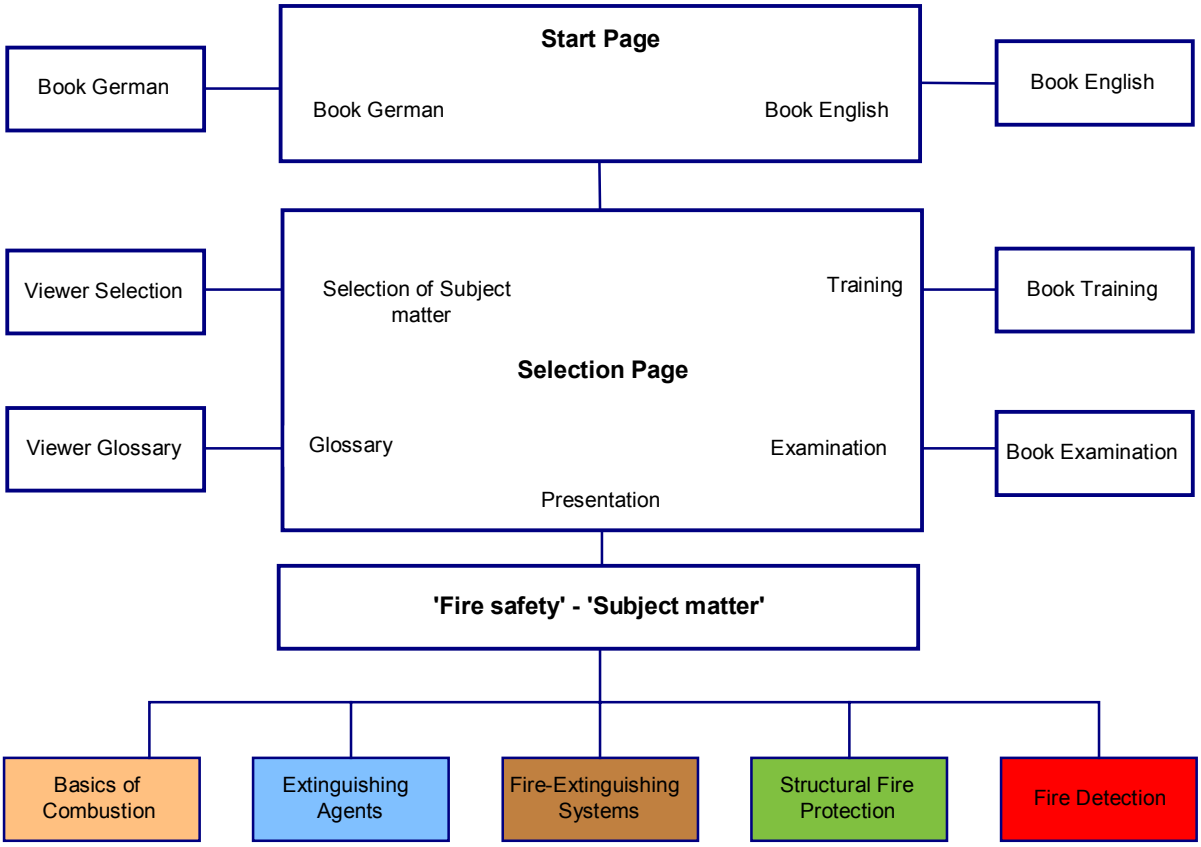

Fig 2. General survey of modules and chapters

The chapters are strictly structured and comprise all elements to cover the complete range of knowledge.

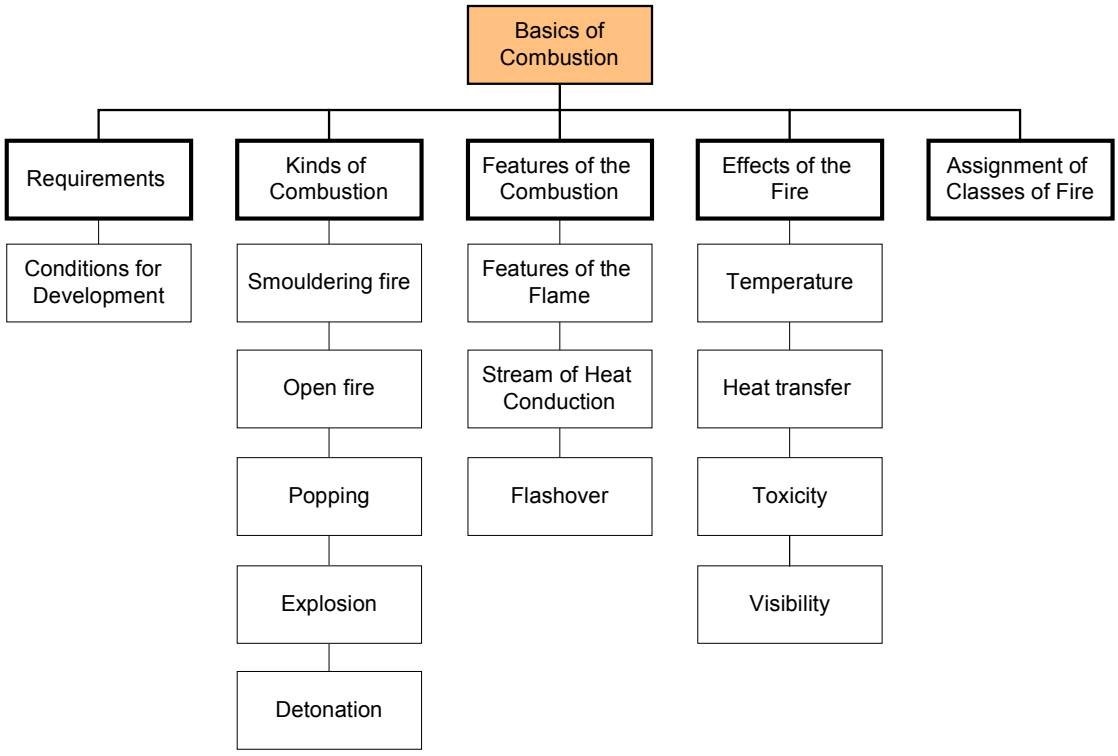

Fig. 3

Structure of a chapter with the complete subject matter

The desired topics can easily be selected by clicking into the window presenting the structured overview of the chapter:

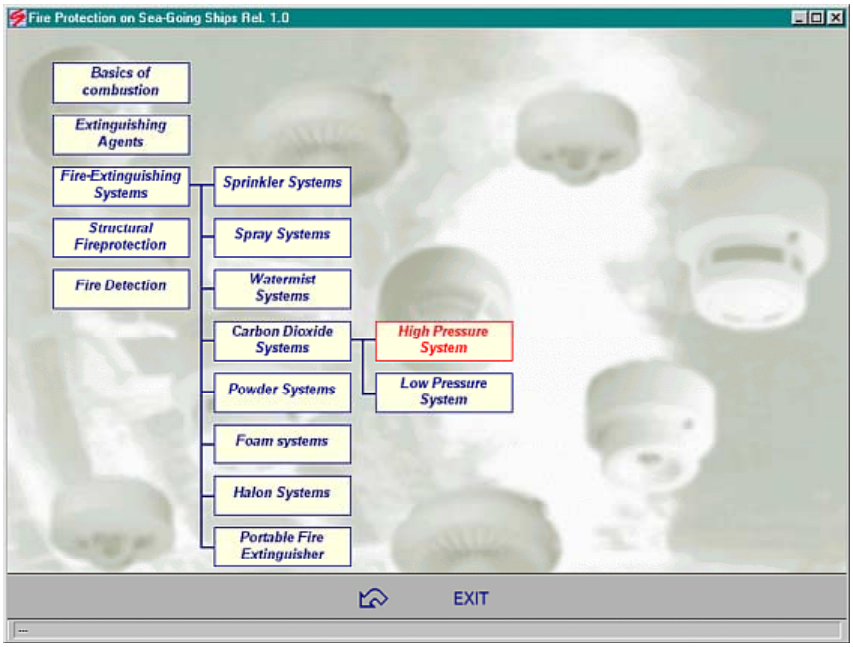

Fig. 4 Selecting a topic

The pages presenting the subject matter have a similar layout (Figure 5): on the left, the subject matter to be acquired by the learner is presented by using video clips, pictures and animated films.
On the right, there is a text giving the necessary explanations. In addition, the user listens to a recorded text (via audio-file) which is played automatically and gives more information about the shown subject matter.

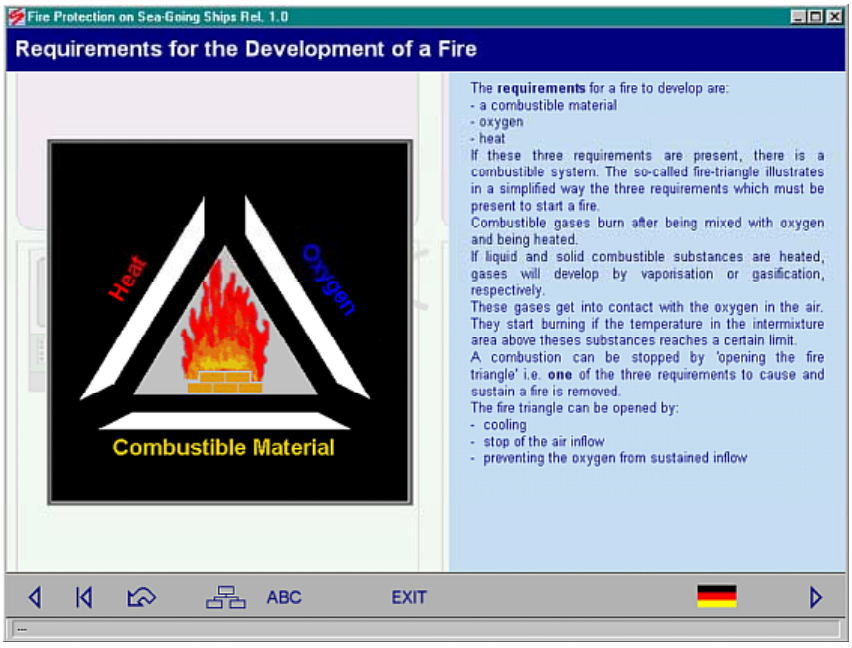

Fig. 5 Layout of a page presenting a specific subject matter

The module 'Practice' (Selftest) is made up of 4 parts containing 25 questions each. After starting the module, the order of the questions to be answered is decided on by a randomiser (Figure 6).
The questions cover all chapters of the training course. The degree of difficulty is the same in every of the four 'Practice' parts. Every answer is discussed in the training course.
The questions are multiple choice questions. It is possible that there is more than one correct answer. Every questions is displayed on a separate page.

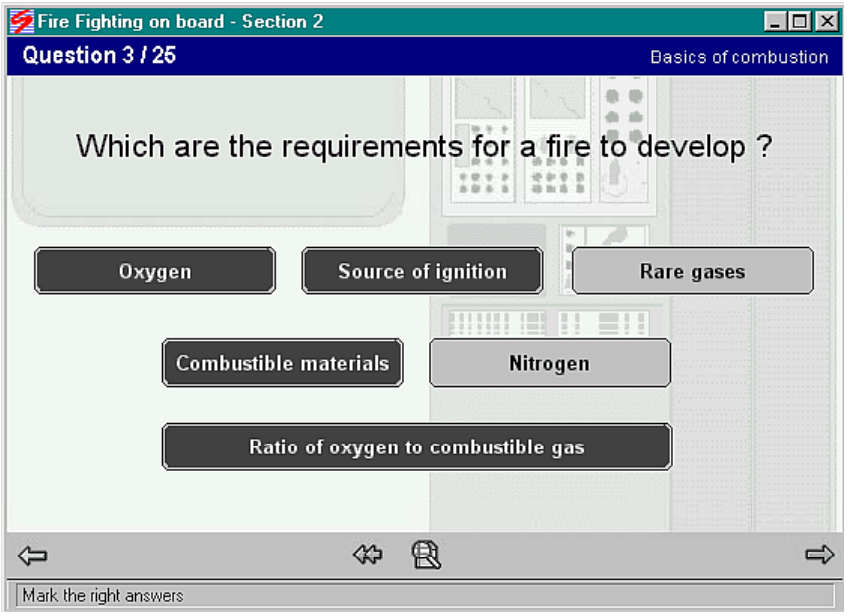

Fig. 6: Example of a question, taken from the module 'Practice'

The practice module permits later corrections of answers which have already been answered. The questions can be called up again.
If the user is in doubt whether an answer is correct or not, he can call up the training system in parallel. He moves to the 'selection page' of the particular chapter and can look for the correct answer efficiently and fast.

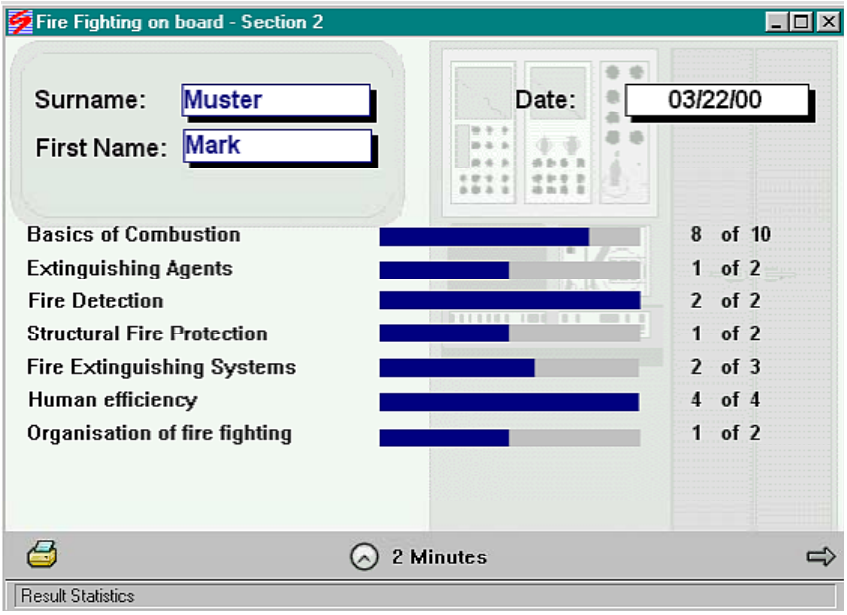

Fig. 7: Printing and storing the results

Before finishing the module 'Practice', a log-file is produced on the hard-disk drive in ASCII-format which is for the exclusive use of the examination institution and not for the learner. The log-file be can sent ashore via means of data transfer.

5.3 Demonstrator course by DMI

5.3.1 General

DMI has developed a demonstrator course which deals with shiphandling training and includes a review set of exercises regarding the International Regulations for Preventing Collisions at Sea, 1972, with the last amendments which came into force in July, 1983.
The title of this course is **"Shiphandling Demo Course".**

The course is primarily intended for seafarers on board up to a level of Master or equivalent. The course will also be an irreplaceable tool at maritime schools, by providing the knowledge and basic skills in shiphandling. In this context, the demo course is aimed at students in their final year. This course is not intended to replace current shiphandling courses using full mission simulators at different training centres. Rather this PC based course should mainly be used as a basic tool, in order to reduce the required time to complete the full courses, as an introductory course in maritime schools or to review and practice basic concepts while sailing. On the other hand, it will also provide the possibility of practising the entrance to specific harbours by using the mathematical model of the real ship and expected weather conditions, for example, the day before the ship is expected to enter a harbour.

Theory and exercises are structured in such a way that they cover some of the basic points of shiphandling. Officers, either experienced or not, as well as beginners (navigational students on board), can take good advantage of this course.

The entire content of the course will be downloaded from a CD-ROM to the PC's assigned to the project, one on board a container ship and at least two (preferably four), at a maritime school.

Participants will be provided with a code name and a password. The purpose of this is to preserve full anonymity of the personnel involved and to prevent participants using the same computer, from checking others' exercises and the feedback provided by instructors.

Communication among participants and instructors will be via e-mail. A high level of interactivity between trainees and instructors is expected: "assessment while on training". It is this particular interactivity that will make this course completely different from traditional "correspondence courses". This course also makes full advantage of dynamic simulations. In addition we stress another difference between mail courses and this course. The only acceptable way of assessing the practical knowledge of ship handling is by steering ships dynamically under different environmental conditions and then analysing every single stage of that action. This is impossible in traditional correspondence courses. The exercises carried out will be thoroughly analysed and detailed feedback will be sent to the trainees. It is expected to maintain a continuous communication (not more than 6 hours delayed in time), with the trainees, in which different points of view will be discussed and "assessment while on training" will be performed.

Participants will demonstrate the knowledge acquired in the different subject areas, by the way they complete the exercises placed at the end of each chapter and by the comments they are expected to include in the documents attached to these exercises. These exercises deal specifically with the subjects studied in each chapter.

Exercises will be sent via e-mail (from the ship and the maritime school), to the instructors at DMI or at their private homes. After analysing the results, instructors will provide feedback by e-mail. This means of communication will also be used for asking or answering any questions that might arise during the course.

Content

The Shiphandling Demo Course comprises seven main subjects. These subjects are:

1. Shiphandling
   - Pivot Point
   - Propeller
   - Rudder
   - Wind
   - Current
   - Planning of Turn
   - Thrusters
   - Man overboard

2. Rules of the Road (review package)

Participants successfully completing the Shiphandling Demo Course, should be capable of understanding and explaining the physical processes giving rise to the controllable and uncontrollable forces, acting upon a ship.

They will become familiar with the practical use of rudder, propellers and thrusters. It should be stressed that the ship models used in this demo correspond to the real mathematical models of ships used in full mission simulators.

Participants will be introduced to the mechanisms that cause a pivot point to change its position when the ship starts moving, to the geometry of a turning ship and to the way hydrodynamic forces influence on a ship's motion.

Finally, they will obtain a better feel for the behaviour of ships, particularly with regard to reaction times of container and tanker ships under different weather conditions.

Structure and examples

According to the concept of this demo course, the idea is to provide the sufficient instruction, so that the participants (while at sea), do not have to use the e-mail system to find out how to use the different tools of the program. In order to achieve this, the course has been structured as follows:

- an introductory part, called "***Courseware Guidelines***"
- the course itself in the "***Shiphandling Demo Course***"
- the "***Rules of the Road***"
- information about the ship models used ("***Ship Models")***
- an operation manual ("***SimFlex Navigator")***

The "***Courseware Guidelines"*** is divided according to the following:

- Instruction on the use of the hypertext browser, e.g., the use of ***key words, history arrows*** and the ***search tab***.
- Description of how theory and training have been structured.
- Description of the practical side of the course, that is the exercises. The explanation here is limited to the locations of the exercises, how to run them, and matters concerning the replay mode and relaying information to the instructor.
- Three "Example Exercises", to familiarise participants with the different ship models used in the course. Links are also included for quick access to the SimFlex user's guide (PC based training simulator) and the ship models.

The "***Shiphandling Demo Course***" is the course itself. This is where the participants will be fully involved. Here the students can find the theory, link words, static and dynamic figures and the exercises.

The "***Rules of the Road***" is subdivided into two parts: The International Regulations for Preventing Collisions at Sea and the practical exercises.

The "***Ship Models"*** contain the technical data regarding the ships used in the exercises.

Finally, in the "***SimFlex Navigator"*** the participants have direct access to the operating instruction manual and a detailed explanation of the instruments utilised.

Some examples are provided here, to give a better overview of the course elements

- "***Shiphandling Demo Course***"

By clicking on the ***Shiphandling Demo Course*** icon, the eight chapters that comprise the demo course, together with a preface, appear:

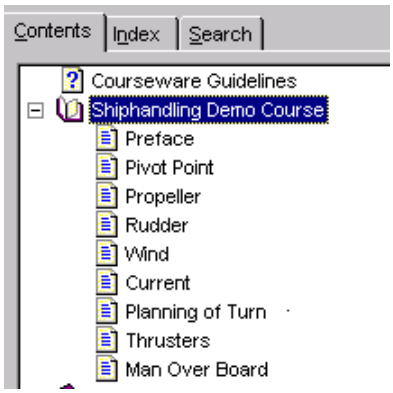

Fig. 8

In the "**Preface**" chapter, an introduction is given regarding the forces acting on a ship, differentiating between controllable and the uncontrollable forces.

In "**Pivot Point**", is explained the different positions the Pivot Point assumes, due to the motion of the ship, and how these positions influence the manoeuvrability characteristics of the ship.

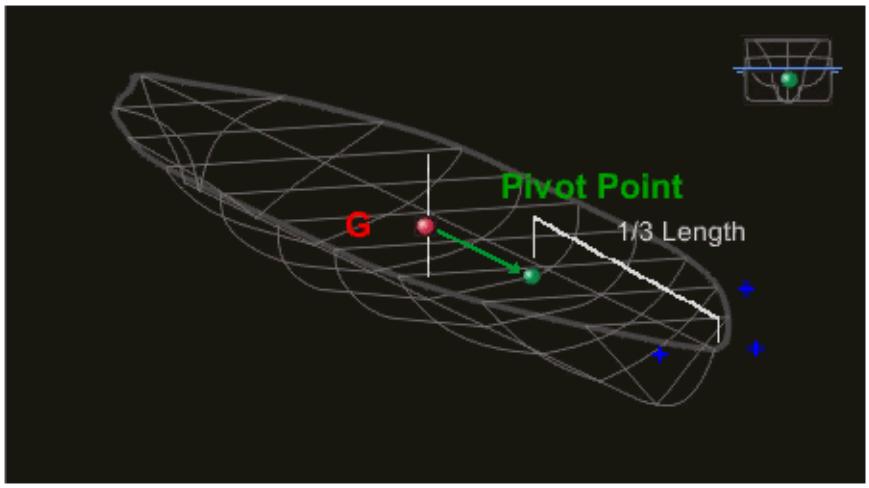

Fig. 9

In the **"Exercise Browser"** can be seen the exercises that were performed and the facility for sending the final logs either to a floppy disk or an e-mail recipient, as well as the facility for replaying a specific exercise:

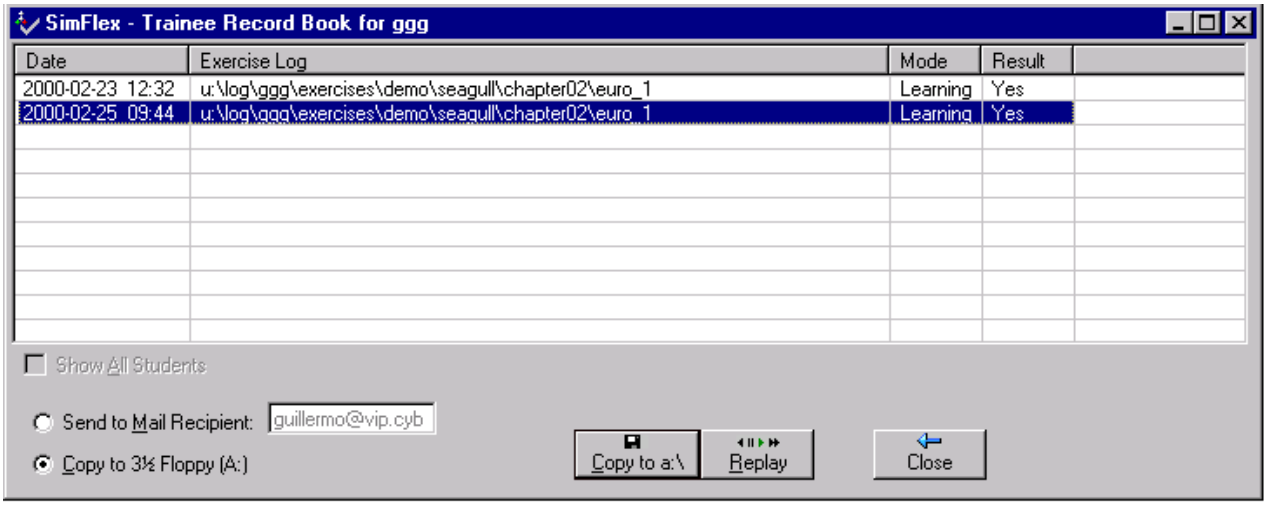

Fig. 10

- ***"Rules of the Road"***

By clicking on the Rules of the Roads icon the electronic version of the latest amended International Regulations for Preventing Collisions At Sea is made available to the student. This enables the trainees to easily compare the results of the exercises with the written Rules if necessary:

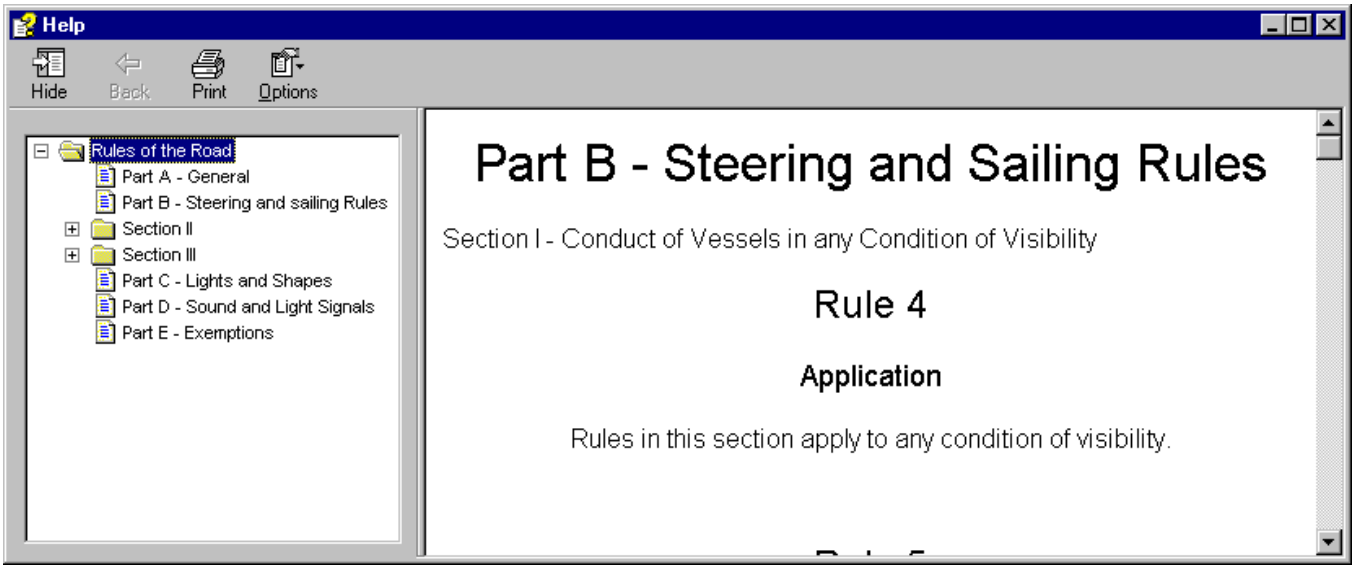

Fig. 10

The exercises regarding the COLREGS appear as follows:

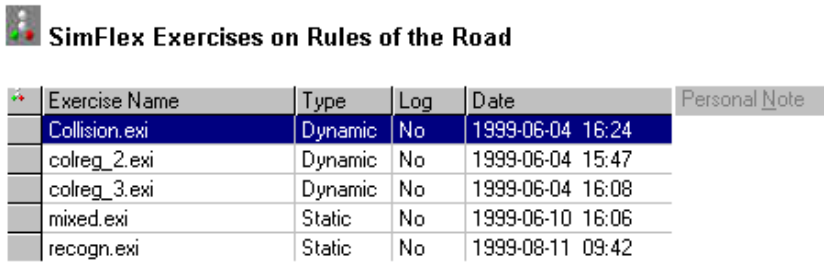

Fig. 11

- ***"SimFlex Navigator"***

In "SimFlex Navigator" the students will get access to the "User's Guide" of the PC based simulator from which they can select a specific area, e.g.:

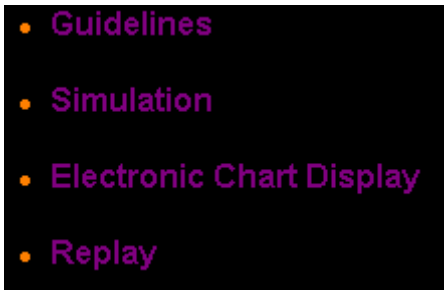

Fig. 12

In "***Simulation***", the trainees deal with all the different constitutive parts of the Simulator Navigator with a particular description of all instruments utilised on the bridge:

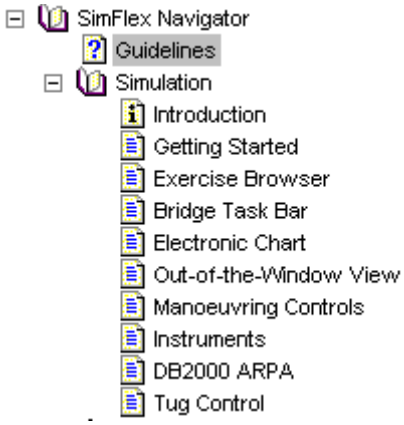

Fig. 13

In "***Electronic Chart Display***" is found information regarding the use and capabilities of the Electronic Chart.

In "***Replay***" a complete description of the facilities of this key debriefing tool.

Electronic Chart Display see also Electronic Chart manual

Fig. 14

The electronic chart displays a 2-dimensional view of the exercise area, the ship's position, track and main parameters like speed through water, turn rate, course made good, etc., as well as all traffic ships.

While using the electronic chart display, the following operations are available: zooming, panning, and use of the Electronic Bearing Line (EBL).

5.4 Out-of-the-window view

Fig. 15

In the Out-of-the-window view, participants have the possibility of selecting the direction of the view, just by clicking in the desire place.

5.5 Radar Presentation

Fig. 16

In the radar presentation participants have the possibility of using the most common radar functions, such as: electronic bearing lines (EBL), variable range markers (VRM), parallel lines, wheel over lines (WOL), etc.

5.6 Tugs

If tugs have been included in a specific exercise, they are controlled from the Tug Control Panel.

Tug Control Panel

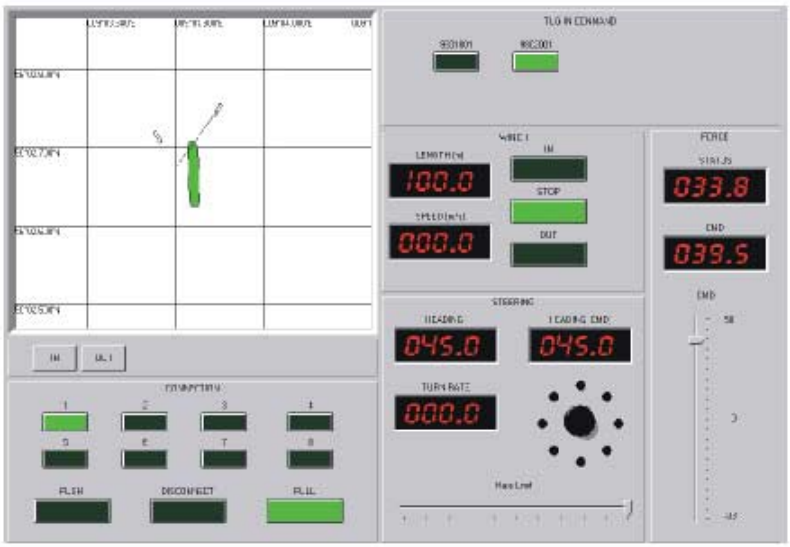

Fig. 17

According to the requirements of the SEAGULL Project, this demo course has been tested and formally assessed. The assessment was performed both on board a large container ship en-route to the Far East and the West coast of US and at Svendborg Maritime School in Denmark. The results of the assessment can be seen in WP 7.

5.7 Demonstrator courses by MSCN , BIT-IC, Maritime Hogeschool "De Ruyter" and Wagenborg Shipping b.v:

General
Have developed a demonstrator course which deals with the reports, which are a part of Training Record Book used by trainee marine officers.
The title of this course is **"Electronic Trainee Record Book for Maritime Officers".**

Further **MSCN, BIT-IC and MTC (Maritime Training Centre bv)** have developed a demonstrator course which deals with the reports, which are part of the medical training merchant navy officers receive.
The title of this course is **"**Interactive examination – **Medical Care on Board".**

The course Medical Care on Board contents one module: on offline multiple-choice test

- After a refresher course (on board) seaman must prove their knowledge with the multiple-choice test. Entering the browser with username and password, the student has two answers multiple choice questions about subject basic life support, transporting injured persons, burns, applying infusion and stitching up wounds. Each subject is provided with an image or movie.
- The result file is sent to supervisor as an e-mail attachment.

Both these courses are a first step towards developing a guide for current and future users and developers of an electronic learning environment for Maritime Long Distant Learning (MLDL).

Within this final report the demonstrator for the **"Electronic Trainee Record Book "** will be described in more detail mainly as an example.
The point of departure is the Trainee Record Book for Maritime Officers. The trainee record book is a 'living' document and consists of three sections.

- Section A, Forms, is a general survey with a fixed size.
- Section B, Tasks at operational level, is a specific report of the obligatory tasks that must be carried out on board under supervision. The size is fixed to a large extent.
- Section C, Assignments, on the other hand, is a 'living' report in which the student describes the practical situation of complex nautical and technical conditions involved in a complete sea voyage in his own words and with the aid of predefined terminology.

During a period of 150 days the trainee performs all the tasks described in the trainee record book. He writes a report of the completed tasks. This report (initialled by the mentor, where necessary) is sent to the coach on land. The student studies tasks returned with comments made by the coach and then completes these tasks.

In the former situation progress control was determined by the frequency with which the ship docked. Documents were exchanged through existing postal network during these rare occasions. In standard situations sufficient feedback could be provided, but deviating schedules or special circumstances involving a student often caused bottlenecks in the assessment. It is not beneficial for either the coach or the student to have to process changes in the report after the traineeship has been completed. Much of the specific source material is present on board the ship on which the traineeship was completed.

The SEAGULL project will improve the quality of the study results during the traineeship by timely checks, which will allow the coach to make any adjustments necessary. Frequent contact will reinforce mutual involvement. Contact with other students also has a positive effect on the student's commitment.

Content

The Workpackage 6 report is the first step towards developing a 'Guide' for current and future users and developers of an E-learning environment.
The key document is the Trainee Record Book for trainee Maritime Officers. The WP 6 report describes the preparation and tasks that must be carried out by all participating parties to ensure successful and efficient support during the traineeship and the Trainee Record Book in particular.

The course Trainee Record Book contents three modules:

Module "Forms" (registration of personal data and ship's data)
Module "Tasks" (report of special tasks carried out under control and autographed by a coach)
Module "Assignments" (reports of several major assignments meant in the Record book)
The following elements are described in this section.

- the SEAGULL Infrastructure;

- The 'Guide for...' sections. Here it is described what the coach, the student and the shipping company must take into account in the preparation and practical implementation of their tasks.

The E-learning courseware uses an E-learning infrastructure as described in WP 6.

5.8 Structure and examples

Infrastructure
The SEAGULL project takes place in a digital learning environment. The basis of this environment consists of appropriate hardware, software and content.
Microsoft Word 97, Paint Shop Pro and scanning software form an excellent combination with which the coach and student can complete the training ship report.
The learning materials are available in digital form on a PC on board, on a portable computer (loaned by the school or the shipping company or personal property) and on CD-ROM. The specifications are given in Workpackage 6. In consultation with the system manager of the shipping company, the correct configuration is selected and a connection is made with the on-board computer network made available for that purpose.

Guides
The course is structured in guides for coaches and for students.
In principle, most of the coach's tasks will not differ that much from the former situation: assessing sections of the training ship report and providing the student with feedback, combined with new tasks when necessary.
The coach will keep track of the student's progress. In the first place, this is achieved by sending status reports indicating which tasks have been completed. The student and the coach define these tasks when the course starts. A set of pre-defined standard messages with which the student can report progress is available.

The **Trainee Record Book** is classified into three groups.
- Forms
- Tasks
- Assignments

These groups are described below. The sections Preface and Directions contain information that is provided during the kick-off meeting.

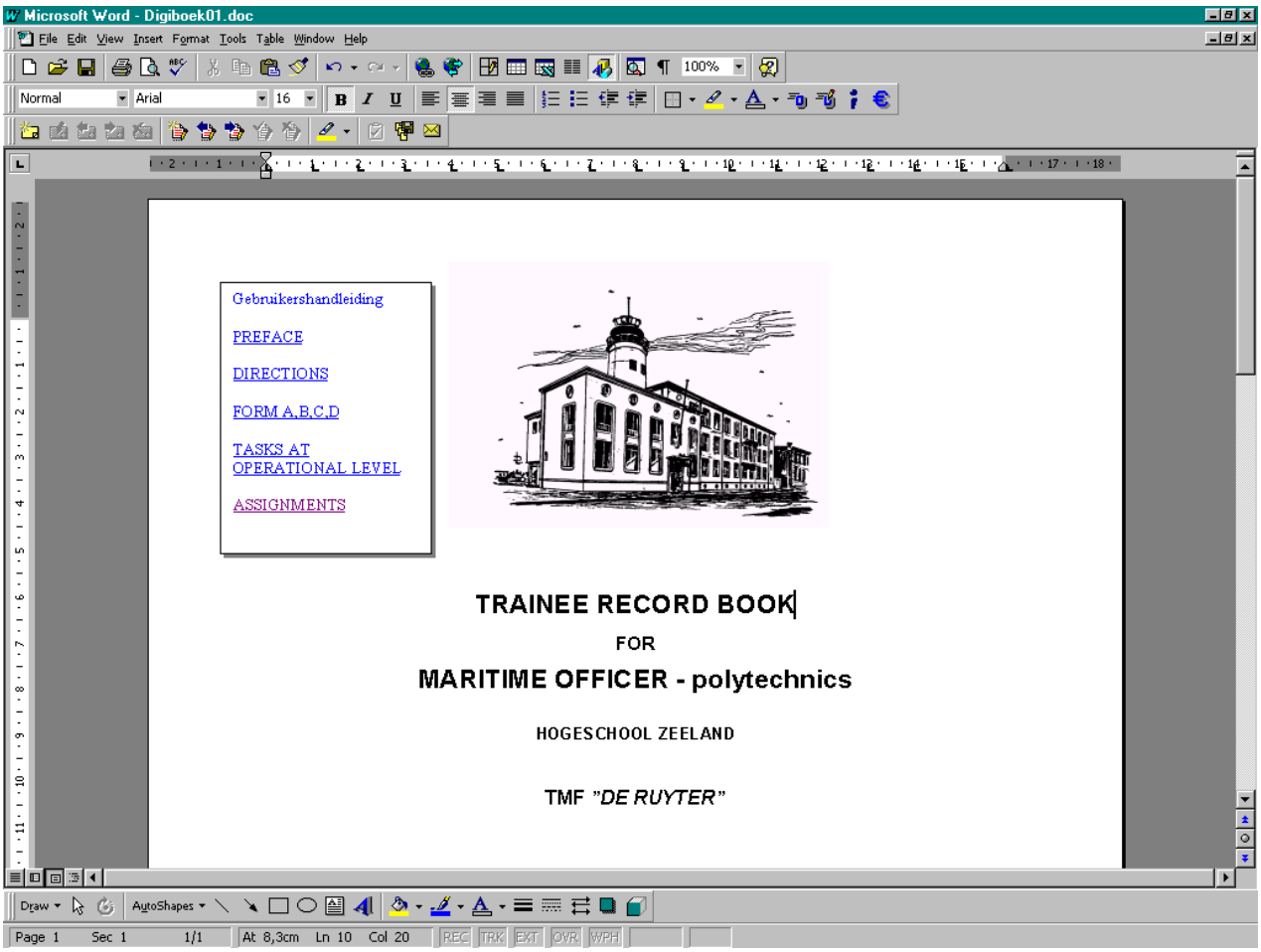

Fig. 18

In this second section, the mentor signs for tasks the student has performed under his supervision. The mentor uses a password to gain access to this document.

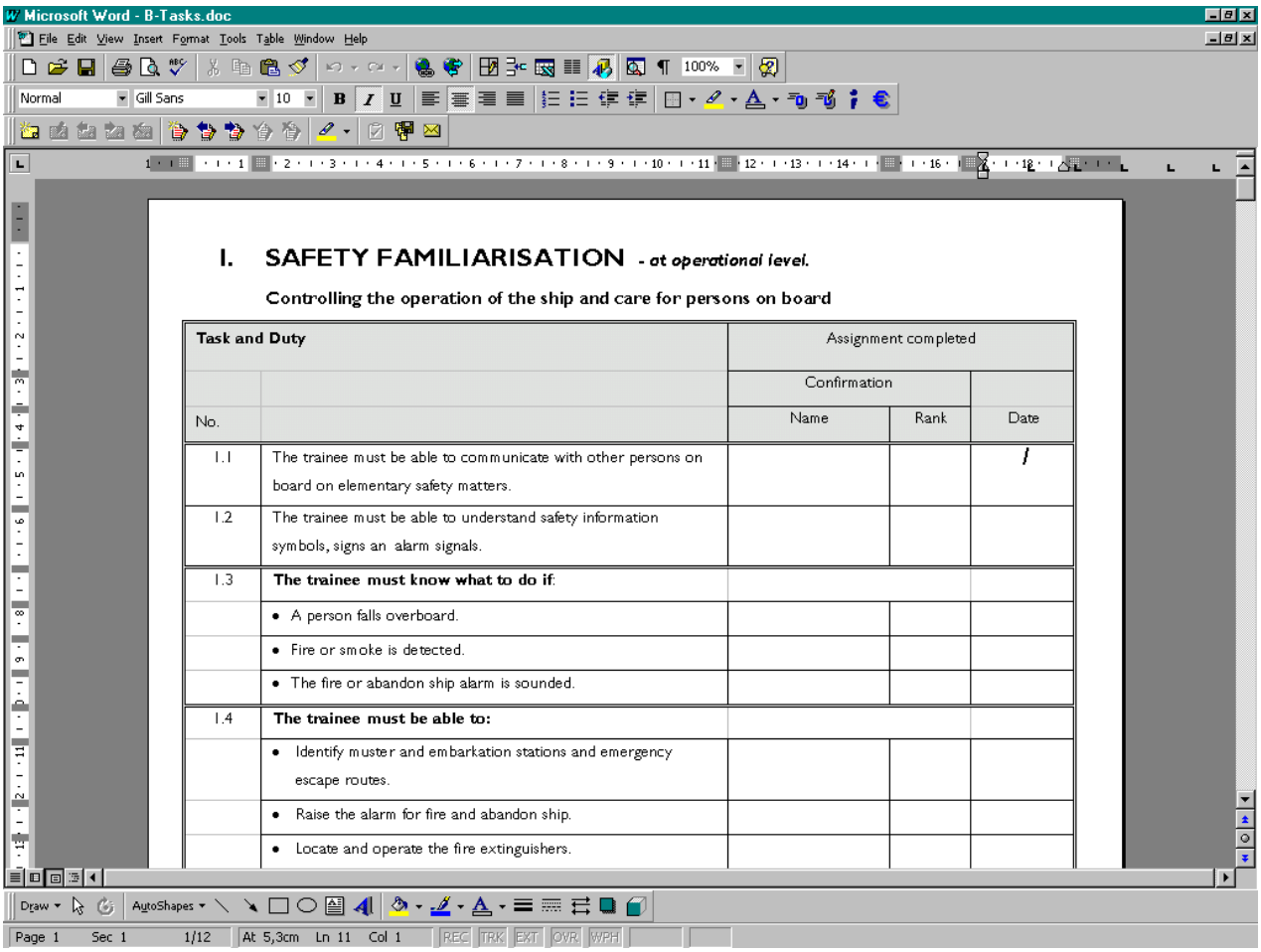

Fig. 19

Parts of an extensive report will be sent and assessed.
Here the student describes nautical processes in his own words. By using predefined templates with keywords, an attempt is made to restrict the size of the documents. Instructions for document identification are given in the user manual.
The coach sends a message confirming receipt and stating whether or not any deviations have been made from the assessment schedule.
In the example below it can clearly be seen that after a text has been highlighted in the appropriate colour, the 'Comment' function was selected. In this case, the coach can use the window to explain what is incorrect about the highlighted text. A unique code is automatically allocated to each comment (here JK2: a second 'comment' by coach J.K.).

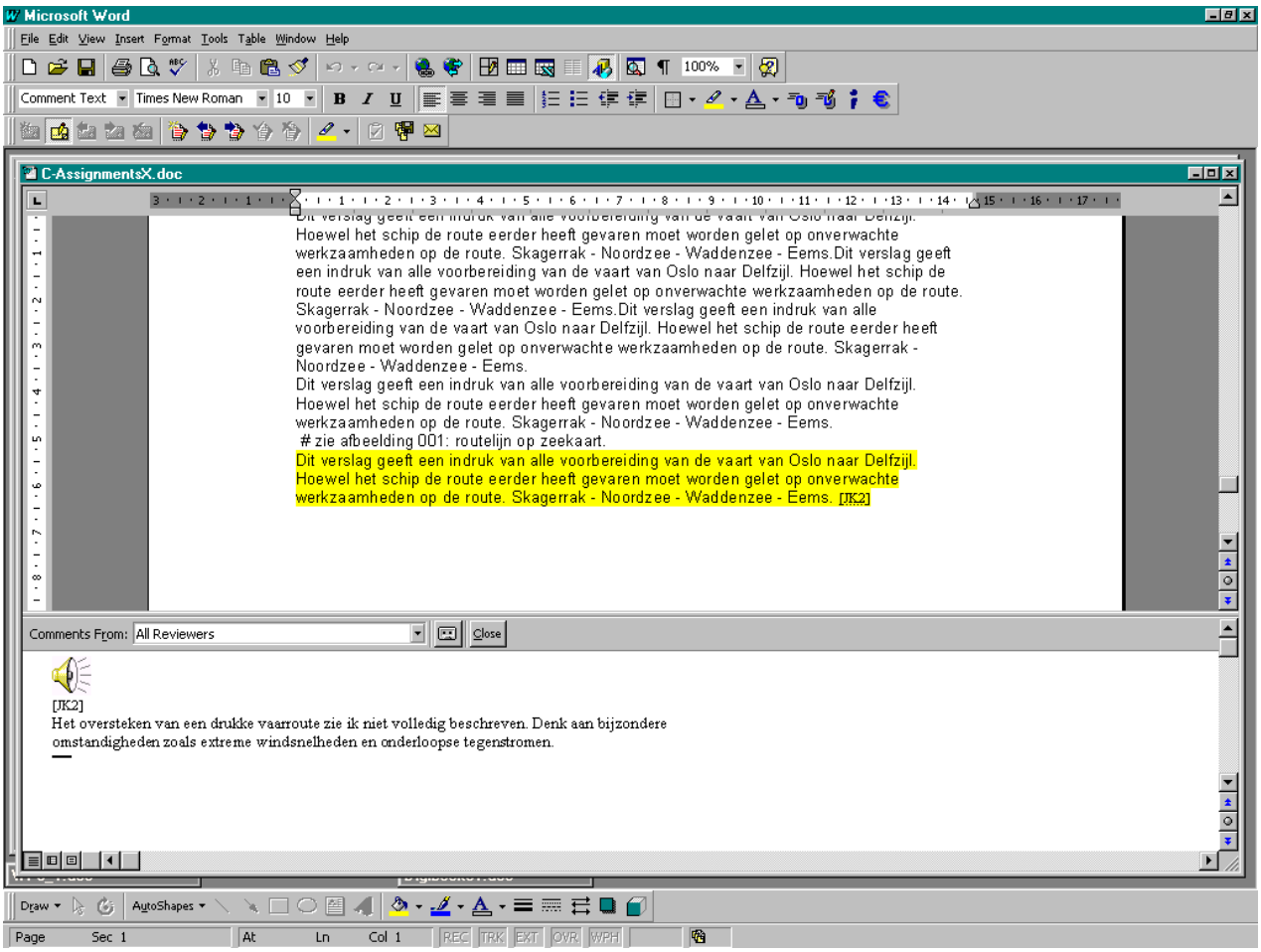

Fig. 20

The coach will draw up and manage an overview of student data using the tools offered by the SEAGULL Infrastructure. The coach must be able to assess the student's progress at all times on the basis of the data sent by the student.

SEAGULL Mail tracking

Course:	Trainee Record Book	Date:	15-5-2000
Student:	Jan Pietersen <jp@wagenborg.com>		
Coach:	W. Gerritsen <coach@rivium.com>		

Date	From	To	Subject	Attachment
20-3-2000	Jan Pietersen	W. Gerritsen	Forms01	Yes
22-3-2000	W. Gerritsen	Jan Pietersen	Comments Forms01	Yes
22-4-2000	Jan Pietersen	W. Gerritsen	Tasks01	Yes
26-4-2000	W. Gerritsen	Jan Pietersen	Comments Tasks01	Yes
10-5-2000	Jan Pietersen	W. Gerritsen	Assignm01	Yes
15-5-2000	W. Gerritsen	Jan Pietersen	Assingm01-Final	Yes

Fig. 21

"Interactive examination – Medical Care on Board"

Separately from the apprentice record also a short medical test demonstrator has been developed and embedded into the program. This test has been installed in the program as an additional feature in MLDL. The primary objective was to demonstrate that it is possible to complete proficiency checks onboard a vessel. In the future, however this test could be extended with additional case studies to provoke frequent communication.

A secondary objective was to find out if a long distance learning self-assessment test is feasible on board of a vessel. In this case LDL becomes an additional tool enabling the learner to prepare him/herself for the shore-based medical exam.

This extract from an existing medical test has been developed in co-operation with MTC in the Netherlands. The results of the test were sent to the distant teacher by the embedded e-mail program.

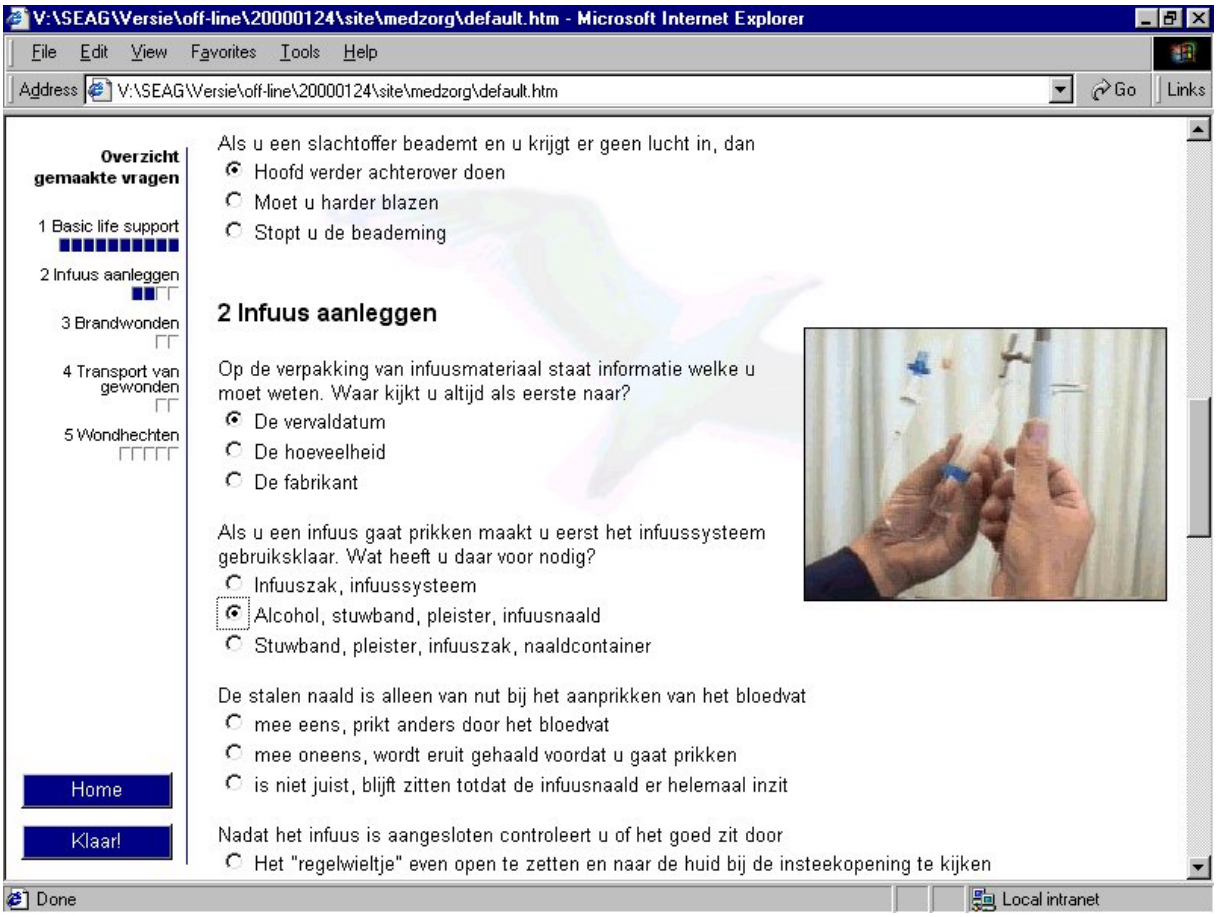

Fig. 22 Screenshot of medical care test

5.9 Results

The main results of this work package are three demonstrator course modules developed within this Work Package:

- **Part 1 / Module 1 "Advanced Fire-fighting on Seagoing Ships"**
- **Part 2 / Module 2 "Shiphandling"**
- **Part 3.1 / Module 3.1 "Electronic Trainee Record Book for Maritime Officers"**
- **Part 3.2 / Module 3.2 "Medical Care on Board"**

Part 1 was developed at the responsibility of **HW FSW**,
Part 2 at the responsibility of **DMI** and
Part 3 at the responsibility of **MSCN**.

All these modules for Maritime Long Distant Learning were presented at and tested by different groups, trainees, tutors of educational institutes, shipping companies etc. The results are input to WP 7 and will be described in the specific chapter regarding this WP 7.
The software of these courses is available in the institutes which are involved in this investigation project.
Further short information regarding to the specific demonstrator courses can be found in the technical abstract of the WP 5 report.

5.10 Conclusions

- The first three course modules are a first step concerning MLDL.
- By means of these course modules a suitable framework is given and a useful method for module development is provided.
- The development of further course modules is necessary.
- Possible areas to be covered are:
  - Emergency management training for instance flooding, search and rescue, collision, stranding/grounding, man over board etc.
  - dangerous goods,
  - pollution control,
  - engine room – maintenance strategies,
  - stability, damage stability, etc.

5.6 References

1. Bilanz arbeitsorganisatorischer Defizite in der Seeschiffahrt,
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2. International Convention on Standards of Training, Certification and Watchkeeping
   for Seafarers, 1978, as amended in 1995 (STCW Convention),
3. International Maritime Organization, London, 1996
4. International Convention for Safety of Life at Sea , (Chapter II-2), SOLAS,
5. International Maritime Organization , London, consolidated edition 1997
6. Computer based MLDL-Trainingssystem "Fireprotection On Seagoing Ships" Rel. 1.0", 1999; Institut für Sicherheitstechnik/Schiffssicherheit e.V. (ISV)

6 Summary Work Package 6

Technical Abstract

Work Package 6 comprises the technical implementation of a medium or infrastructure for a Maritime Distance Learning (MDL) application. Use has been made of the results of studies undertaken previously in the SEAGULL-project (Work Package 1 to 4).

The following stages are dealt with in succession:
- Technical choice of available communication possibilities;
- Projection of desired functionality on to the available communication possibilities;
- Determining system specifications;
- Building the system;
- Embedding SEAGULL courses.

At last there is a review of the co-operation between HS FSW and Bit-IC. In this test the communication between coach and student was tested, using the application 'Fire fighting on board' and the SEAGULL webserver.

6.1 Executive Summary

Workpackage 6 is defined in the following way:

- A selection of tools regarding to internet, communication, SEAGULL server and E-learning management system.
- A summary of the players in the demonstration.
- An overview of the various components of the SEAGULL demonstration tool and the Demonstration itself.
- A description of the specified hardware and software.
- The development of the SEAGULL Off-line interface and the way how to distribute the software.
- Structure and navigation of the SEAGULL website on the SEAGULL server.
- A recommendation for the Coach Internet PC including the software needed.
- The SEAGULL E-learning Management System cq. Mail Management System
- Possibilities of an User, course and profile administration.
- A technical description of the SEAGULL concept in particular the standards for file exchange.
- A review of the co-operation between Bit-IC and Hochschule Wismar.

6.2 Introduction

This document provides the report on SEAGULL Work Package 6:
Development of a demonstration tool.

All the software and documentation developed is also available on the SEAGULL website.
The URL for the site is SEAGULL.bit-ic.nl. All the documents and software pertaining to the SEAGULL project can be downloaded from this site.

Work Package 6 comprises the technical implementation of a medium or infrastructure for a Maritime Distance Learning (MDL) application. Use has been made of the results of studies undertaken previously in the SEAGULL-project (Work Package 1 to 4).

The following stages are dealt with in succession:

- Technical choice of available communication possibilities;
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6.3 Maritime Distance Learning

Figure 23 shows the model for Maritime Distance Learning (MDL), as developed in Work Package 1.

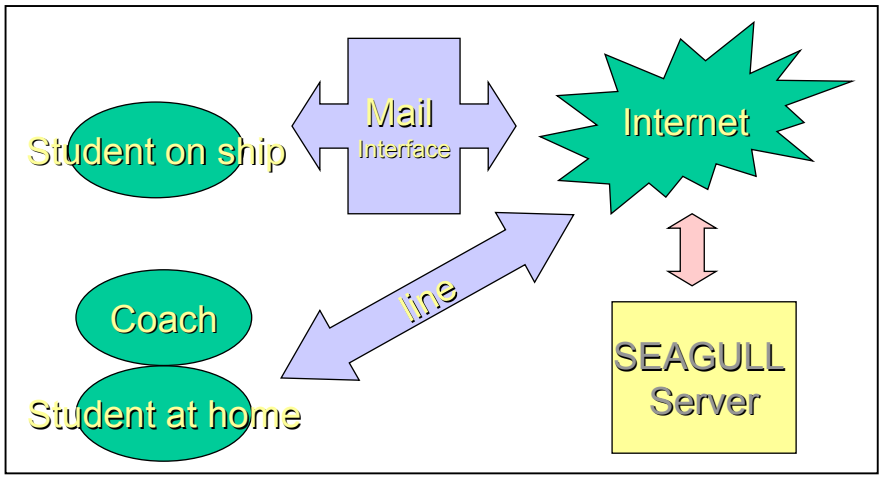

Fig. 23 Maritime Distance Learning

6.4 MDL and E-Learning

It is important for the solutions chosen for Maritime Distance Learning to tie in with the rapid developments in the field of E-Learning. E-Learning, the combination of learning and technology, has been strongly influenced by the extremely rapid spread of Internet and intranet technology. Just as E-Business and E-Commerce are having a major impact on business processes, E-Learning has far-reaching consequences for the learning process in an organisation.

ICT communication resources make it possible to create rich learning environments. The term E-Learning covers a large number of concepts, such as: on-line learning, web-based training, virtual classroom, virtual campus, digital collaboration, Computer Based Training (CBT), knowledge management and Computer Managed Instruction (CMI).

Fig. 24

In the SEAGULL project the emphasis is on a special situation: E-Learning on-board ship. The aim is to develop interfaces for this purpose that tie in with the E-Learning technology, which is based on mobile or landline Internet.

6.5 SEAGULL Demonstration Tool

6.5.1 Overview of components

The various components of the SEAGULL demonstration tool are shown in the following chart.

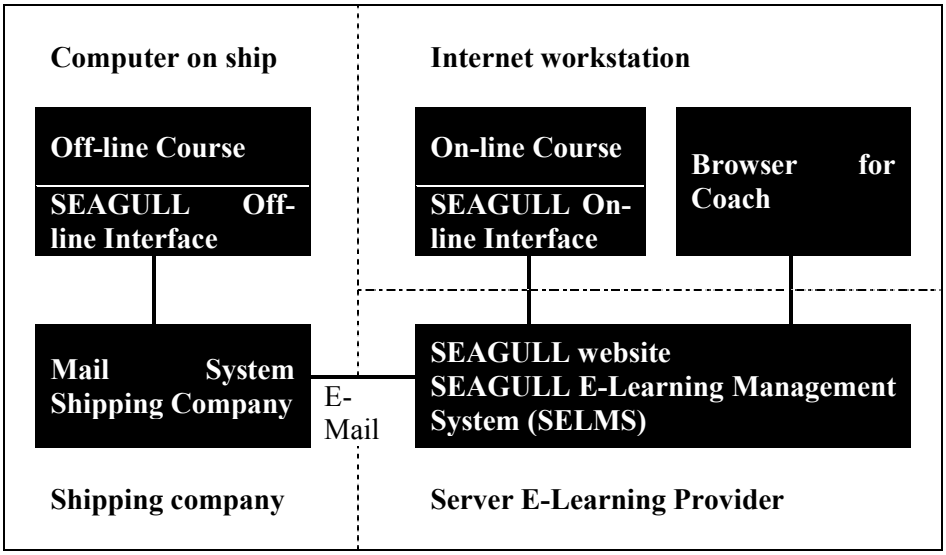

Fig. 25

The SEAGULL Demonstration consists of the following components.

Component	Type	User	System Management
Multimedia Computer	Hardware	Student	Shipping Company
Shipping Company Mail System	Software	Student	Shipping Company
Internet Browser	Software	Student	Shipping Company
SEAGULL Off-line Interface (CD-ROM)	Software	Student	Shipping Company
SEAGULL server	Hardware	SEAGULL	E-Learning Provider
SEAGULL website	Software	Student Coach Developer	E-Learning Provider
SEAGULL E-Learning Management System (SELMS)	Software	Coach Student	E-Learning Provider
Coach Internet PC	Hardware	Coach	Training Institute
Coach E-mail	Software	Coach	Training Institute
Coach Internet Browser	Software	Coach	Training Institute

Fig. 26

6.6 Multimedia Computer

A new multimedia computer is made available to students. A CD-ROM drive is also desirable in order to simplify installation and any subsequent upgrades of the student environment. It is also desirable for the computer to have a modem installed, so that e-mail can be transmitted directly at locations where a telephone is available.

The operating system chosen for the on-board PC is Windows NT. In principle Windows 98 would also be adequate for the student environment. However, by using the options of Windows NT, an individually

protected environment can be created for each student, with the student's own settings, files and documents, thus offering additional benefits when compared with Windows 98.

6.7 Shipping Company Mail System

6.7.1 General requirements

The SEAGULL concept is based on the availability of an e-mail system with an Internet connection.

Requirements for the e-mail package:
- Good compression;
- The ability to send attachments with the mail.

6.7.2 Wagenborg situation

Wagenborg uses the Amos package, version 4.76. Amos provides excellent compression of e-mail messages. It is based on an Inmarsat-B telephone link (9600 baud, comparable with GSM speed). The costs are approximately $3 a minute.

It was ultimately decided to connect the students' computer to the ship's network. This means that it is not necessary to transfer files to another computer using a floppy in order to send them from there. It is now possible simply to mail them from the students' PC directly via the network to the Internet and also to receive mail directly from outside.

6.7.3 Internet Browser

A recent browser is installed on the student's notebook. It is assumed that this will be version 5 of Microsoft Internet Explorer (free). Using the installation program, a choice can be made to install either the English-language or the Dutch-language version of the browser, thereby allowing better integration with the installed operating system.

Using standard Windows NT functionality, the home page of the student who has logged on is automatically opened in a browser window after starting Windows NT. From this home page the student can access all documents, help files and available keys necessary for his tasks. This is because the entire system (course material, working on the report, keys and support) has been developed on the basis of the principle that it has to be possible to make everything available using standard Internet technology.

6.7.4 SEAGULL Off-line Interface (CD-ROM)

A CD-ROM has been developed containing the entire off-line environment in which the students have to work on-board ship. An easy-to-use installation program can be started from the CD-ROM, with which all necessary files can be quickly installed. The various components on the CD-ROM are:

- Installation program (for installing the entire SEAGULL Student Environment);
- SEAGULL shell (software required for the interface with SELMS);
- Instruction for the student on the use of SEAGULL;
- Microsoft Internet Explorer 5 (both Dutch and English versions).

The same CD-ROM can also be used for distributing specific courseware. In the present case, for trial purposes, only a small test on Medical Care on-board ship has been provided on the CD-ROM. This test can also be installed on the students' computer using the installation program supplied on the CD-ROM.

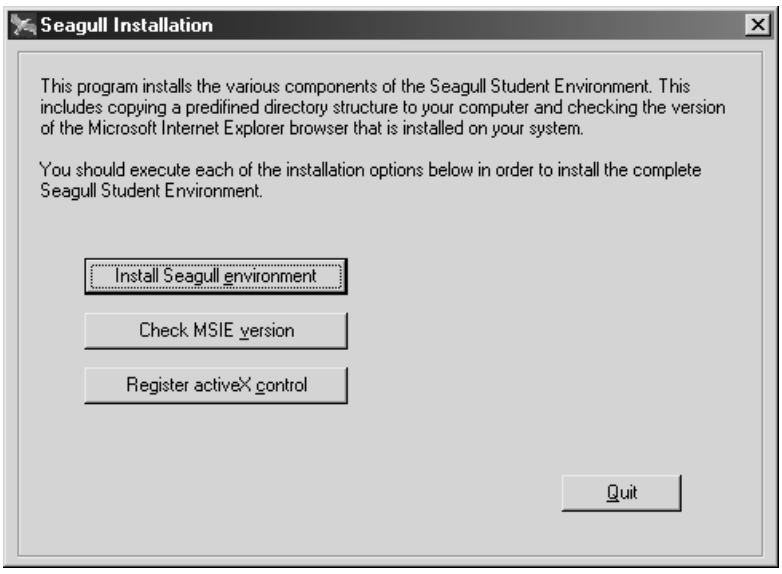

Fig. 27

The installation program allows all the necessary components of the SEAGULL off-line interface to be installed simply and step by step. An individual environment can be created for each student on the local computer, i.e. on the hard disk or a network drive. The installation program then automatically copies all necessary files, including the document templates, help and explanatory files, html files and desired course files.

6.7.5 SEAGULL server

This server is hosted by the E-Learning provider. It is a Windows NT machine, which is linked directly to the Internet. The Microsoft Internet Information Server (IIS) installed enables this server to be used as web host. This in turn enables everyone to access the files available on the server using a browser.

Microsoft SQL-server (database support) has also been installed on the server. This software is necessary in the first place for the E-Learning Management System, which stores all the information on students, coaches and courses in a database. However, this database functionality is now also being used by other SEAGULL applications, for example for managing users who have access to the SEAGULL website.

6.7.6 SEAGULL website

The SEAGULL website is intended as a platform providing all know-how, information and communication regarding Maritime Distance Learning, SEAGULL.bit-ic.nl. The desired documentation or information can be retrieved quickly via a simple menu structure.

Naturally not every part of the website is accessible to everyone. For the mail management system, for instance, a log-in and password combination will be needed, which is issued only to duly authorised users. For the time being this will only be the coach of the two students. In an on-line situation the students can naturally also be granted access to their own e-mail management system, so that they too will be able to obtain a clear overview of all communication that has taken place between them and their coach.

A log-in and password combination is also required for the E-Learning Management System, with differentiation also being possible between various levels of access. It is already possible, for instance, to grant students, coaches and administrators differing privileges within the E-Learning Management System.

The following section discusses the SEAGULL website in detail.

6.7.7 SEAGULL E-Learning Management System (SELMS)

The main purpose of SELMS is to support student and coach in organising the learning process. Functionality implemented in order to achieve that goal comprises central administration of users of the SELMS system, the ability to track and manage all the e-mail traffic passing between the students on the one hand and their coaches on the other hand, the total E-Learning environment and all the functionality created for importing the results of off-line tests and courses into the E-Learning system.

6.7.8 Coach Internet PC

The only hardware required by the coach is a PC with connection to the Internet. Since other software such as Microsoft Word is also needed, a recent computer is recommended (Pentium II or III) with the Windows ’98 or Windows NT operating system.

6.7.9 SEAGULL Website

To ensure effective communication between all the various parties, a website has been established with available information. It is also possible to download the latest versions of necessary software and documentation from the website. In this way the site constitutes a platform for all the knowledge, information and communication relating to Maritime Distance Learning.

On the site the following elements can be accessed:

- the SEAGULL Project
- SEAGULL Courses
- SEAGULL Tools

6.7.10 SELMS: SEAGULL E-learning Management System

In the SEAGULL E-Learning Management System an overview can be obtained of all e-mail correspondence that there has been between students and coaches. It is also possible to input into the system the results of off-line training and tests submitted by students. Finally the overall administration of users and courses can be maintained.

The entire Management System can be operated from a web browser. To enter the SEAGULL E-Learning Management System the user must have a user log-in / password combination. Authorised users can access the SELMS facilities via the log-in screen. Authorisation requests are handled by the SELMS administrator. The SELMS consists of the following elements:

Mail management system	Managing mail between coaches and students
E-mail converter	Importing off-line course results
User, course and profile administration	Administration of users, their profiles, courses, topics and activities, and assignment and enrolment of users

6.7.11 SELMS - Mail Management System

A mail management system has been constructed to allow a good overview to be maintained of all e-mail correspondence that has taken place between students and coaches. This system stores all e-mail with associated attachments, such as a Word document or a graphic, centrally on the server. This means that all correspondence is stored at a central point and that it is possible to obtain an up-to-date overview of all the communication between a particular student and his coach from any location and at any time.

The pages are accessible to both coach and student, although the student usually does not have a direct link with the Internet and will therefore have to receive the mail remotely. Although the coach **can** usually request this mail overview via the Internet, he too always receives a copy of all mail sent by the student. The coach can add comments to documents received from the student and send them back again.

Fig. 28

For every combination of student and coach there is a separate web page with an overview of all the mail that has been exchanged between the student and coach concerned. A log-in / password combination is required in order to look at an overview of such a student/coach combination.

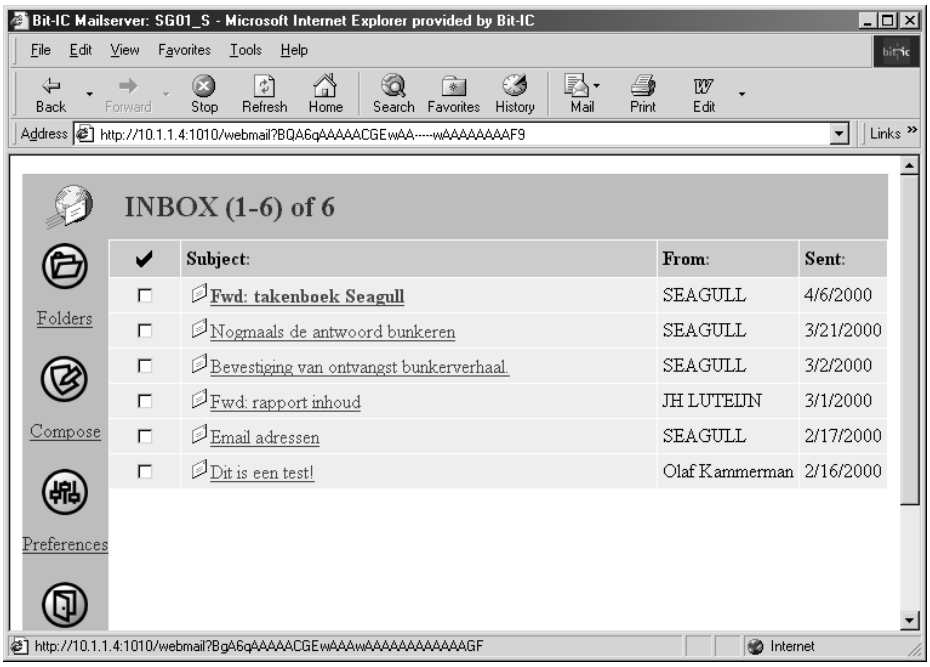

Fig. 29

Student and coach must send mail to the mail address specified by the mail management system. The management system stores the mail concerned and then sends a copy of the e-mail message to the intended recipient. The e-mail addresses to which the e-mail has to be forwarded can be set in the management system, so that in due course other people can be involved in the communication. Even if the ultimate e-mail address of the student or coach changes, the mail management system maintains a complete, up-to-date overview of all communication.

6.7.12 E-mail converter

Users on-board ship do not (yet) always have a permanent link with the Internet. For the time being communication with shore-based computers still takes the form of short e-mail messages. In order despite this to be able to study lesson content and to take tests, the courses can be followed off-line. For this purpose both the lesson content and the tests are installed for the user on a computer on the ship, so that no link with the Internet is necessary as everything is available locally.

In order nevertheless to be able to monitor a student's progress and to obtain a report on the results, it is possible for interim and final results to be sent to the central Management System by e-mail.

For this purpose each student is allocated a unique ID number within the system. Since each course also has such a unique ID, a combination of these two numbers is sufficient to be able to submit the results of a student on a particular course.

For this purpose the course software generates a results file, in which the student ID, his password, the course ID and the interim or final result achieved are stored. The student then has to send this file as an attachment to an e-mail message to central results administration.

These e-mail messages, together with the attached student results, are then processed on the server. For this purpose the results file is read and the result in the system is then input into the system for the relevant student and course. All reports that course coaches for instance can request are then updated automatically.

6.7.13 Information for Developers

This section Information for Developers provides a technical description of the SEAGULL concept, to the extent that this will be significant for courseware developers. In particular the standards for file exchange are discussed.
SEAGULL E-mail
SEAGULL course results
SEAGULL server
Student interface on board

6.7.14 Co-operation between Bit-IC and Hochschule Wismar

During the different stages of the SEAGULL project, the participants/developers worked on programs and infrastructures in order to gain practical experience in the production of and support for MDL.
In addition to the trial with the Trainee Record Book for maritime officers and Medical Care on board, Bit-IC has co-operated with Hochschule Wismar.
The Hochschule department of Maritime Traffic, has produced a CBT entitled: ‘Fire protection on sea-going ships’.

6.7.15 Application

It is a stand-alone application. On the basis of a previously agreed training and refresher programme, the student on board will work on the application independently.
After completion of one or more chapters, the student should be able to/must take a multiple choice test.
There are four sections, each comprising 25 random questions. Immediately after the test, a list of the right and wrong answers is available to the student.

6.7.16 Database

The database with the test results is sent by the student to the coach. In the offline situation on board, the student uses an email program to send the coded file as an attachment.

6.7.17 Feedback

The provision of feedback is essential to achieve optimum course effectiveness. Depending on the results, optimum study advice can be given: the student is recommended to study subjects that have been incorrectly or inadequately studied.

6.7.18 Back-up lessons recommended

Back-up lessons have been created for the student in his own study environment (PC). On the basis of the study recommendations made by the coach, the student studies this specific material.
Finally the student has the opportunity to retake a test in the Firefighting program.

The course structure is repeated here.
If the new assessment is positive, there is no need for the student to follow extra lessons in his spare time on shore.

6.7.19 Summary

During the co-operation the content of courses of both partners appeared to fit well in the infrastructure as designed by Bit-IC. Former experiences gained with the 'Trainee Record Book' en 'Medical care' contributed to an implementation without any major difficulties.

7 Summary Work Package 7

Technical Abstract

The main objective of this work package is to assess the costs and the benefits of introducing Long Distance Learning in Maritime Education and Training.

Maritime Long Distance Learning (MLDL) concept will be assessed in terms of estimates of MLDL costs involving comparisons with costs of standard maritime post qualification training, evaluation of training effects as well as the possibilities of exploiting opportunities for training that are unique to MLDL, seafarers' training onboard and at home during shore leave.

Keywords

- Maritime Long-distance Learning
- Maritime Education and Training
- Maritime Simulation and Training
- Hyper-media Education
- Multi-media Education

7.1 Executive Summary

This report, being the WP7 deliverable, is divided into four parts, A, B, C and D. In part A (the present volume) an overview is provided of the assessment of the Maritime Long Distance Learning (MLDL) courses that have been implemented and tested during the SEAGULL project, we review "lessons learned" and we present an assessment of costs and benefits of MLDL.
The assessment of the MLDL courses developed and tested during the SEAGULL project have involved four courses:

- Shiphandling Course (see WP7 PART B)
- Electronic Trainee Record Book for Maritime Officers (see WP7 PART C)
- The Medical Care on Board course (see WP7 PART C), and
- The Fire Fighting Course (see WP7 PART D)

The assessment indicates

- that training effects achieved through MLDL appear to be comparable with conventional training
- that MLDL training is typically - but not always - less expensive than conventional training
- that users (trainees) in general accept MLDL
- that typical costs are within levels that are likely to be accepted by European companies who employ seafarers (or companies who employ European seafarers)
- that costs are typically well below costs associated with conventional training when referring to trainee accommodation and travel expenses.
- that MLDL courses offer opportunities for upgrading seafarers' professional skills that typically will require fewer working days lost than comparable traditional training.
- that the greatest training effects of MLDL will be achieved, for a large range of seafarer skills, when MDLD is combined with conventional classroom and simulator based training

7.2 Introduction

In order to obtain useful real-life data about the implementation and the training effects of Maritime Long Distance Learning, the following courses were implemented and assessed during the project (we list the partner name and the course title):

- DMI Shiphandling demo course.
- HW-FSW Advanced Fire fighting on Sea-going ships.
- MSCN Electronic Training Record Book for Maritime Officers and Medical Care on board (test demonstrator).

The Shiphandling demo course: The course was developed by and implemented by DMI. The courseware was tested in two environments, one being post-qualification (or refresher) training for ship navigators (bridge officers) and the other being qualification training in a maritime school.

The post-qualification set-up was made on-board the largest container ship of Maersk shipping company (the Sally Maersk) involving all bridge officers (four persons) for the duration of their voyage, about two and a half months. A number of exercises, debriefing sessions and questions where exchanged between the crew and the DMI instructor thousand of miles away through INMARSAT B/C whilst the ship was sailing between the US West Coast and the Suez Channel. (More than 100 mails were exchanged). User satisfaction responses and objective training effects (collected by multiple choice questionnaires) were assessed.

The Shiphandling course was also tested with a class of maritime students at the end of their first year and following an otherwise standard curriculum (at Svendborg Navigation School, Denmark). The class was divided randomly into a test group and a control group. Students in both groups were initially tested on their knowledge of navigational concepts (Maritime Navigation Questionnaire) in order to establish a baseline. Then the students of the experimental group were given the opportunity to take the Shiphandling course in their spare time while students in both groups were engaged in their normal curricular activities. After the course both groups were measured once again in terms of their knowledge as revealed by the Maritime Navigation Questionnaire (students did not know they were to receive the questionnaire twice and had therefore no specific motivation for preparing themselves for this).
It turned out that the test students outperformed the control students by a very large margin, although the two groups had performed in the same way the first time they received the knowledge test. The test students improved on average their performance to a level where their answers were equivalent with those of qualified bridge officers (before the bridge officers had taken the course). The MLDL training lasted about 2-4 weeks and involved an intensive transfer of data via e-mail between the navigation school and DMI (more than 100 e-mails were sent back and forth).

Advanced Fire fighting on Sea-going ships: The course implemented by HW FSW was tested by 58 participants taking part in several safety related courses in Warnemünde. In addition there were test runs of the software on board the German passenger vessels MV "AIDA" and "ARKONA". The tests were mainly focused on the assessment of the overall increase of knowledge level in using the CD-ROM course to replace the former method of coaching the students or ship
officers by teachers in front of the class.

The Training Record Book and the Medical Care courses were implemented and tested by MSCN on board ms Voorneborg, a ship belonging to Wagenborg shipping company. Both courses were tested by two of the students from Hogeschool Zeeland.
The set up and start of each the three courses turned out to be rather complicated due to a number of technical as well as organisational problems in the institutions and companies that were hosting the demonstration courses and providing voluntary students and, in some cases, instructors. The delays and problems experienced were no doubt due to the fact that each of the courses was a "new" product and therefore, that our host organisations and companies were "launch customers". It is well known from other applications that first-timers require more time and resources.

7.3 Overview

The main objective of the present task is to assess the costs and the benefits of introducing Long Distance Learning in maritime education and training.
In order to be able to provide valuable data to the assessment, all demonstrator courses developed in WP 5 were tested, either on board or on shore. These courses were developed preferably based on the new distance learning technologies.

7.3.1 Summary of the courses developed and tested

DMI has developed a demonstrator course which deals with shiphandling training and includes a review set of exercises regarding the International Regulations for Preventing Collisions at Sea, 1972, with the last amendments which came into force in July, 1983.
The title of this course is **"Shiphandling Demo Course".**

The course is primarily intended for bridge officers at sea up to a level of Master or equivalent. The course may also be used as a tool at maritime schools, by providing the knowledge and basic skills in shiphandling. In this context, the demo course is aimed at students in their final year. This course is not intended to replace current shiphandling courses using full mission simulators at training centres. Rather this PC based course should mainly be used as a basic self-paced tool in order to reduce the required time to complete the full courses or as a self-paced introductory course in maritime schools or, finally, as part of a refresher course to review and practice basic concepts while sailing. At the same time, the course may also provide users the possibility of practising the entrance to specific harbours by using the mathematical model of the real ship and expected weather conditions, for example, the day before the ship is expected to enter a harbour.

Theory and exercises are structured in such a way that they cover some of the basic points of shiphandling. Officers, whether experienced or not, as well as beginners (navigational students on board) will be able to develop their skills in measurable ways
The entire content of the course will be downloaded from a CD-ROM to the PC's assigned to the project, one on board a container ship and at least two (preferably four), at a maritime school.
Communication among participants and instructors will be via e-mail. A high level of interactivity between trainees and instructors is expected: "assessment while on training".

Participants may demonstrate (to their instructor) the knowledge acquired in the different subject areas by submitting completed exercises placed at the end of each chapter and by writing up comments as they are expected to include in the documents attached to the exercises.
Exercises are sent via e-mail (from the ship or the maritime school) to the instructors at DMI or at their private homes. After analysing the results, instructo74rs will provide feedback by e-mail. This means of communication will also be used for asking or answering any questions that might arise during the course.

The Shiphandling Demo Course comprises seven main subjects. These subjects are: Shiphandling; Pivot Point; Propeller; Rudder; Wind; Current; Planning of Turn; Thrusters; Man overboard

Rules of the Road (review package)

Participants successfully completing the Shiphandling Demo Course, should be capable of understanding and explaining the physical processes giving rise to the controllable and uncontrollable forces that act on a ship.

The course has been structured as follows:

- an introductory part, called "***Courseware Guidelines***"
- the course itself in the "***Shiphandling Demo Course***"
- the "***Rules of the Road***"
- information about the ship models used ("***Ship Models")***
- an operation manual ("***SimFlex Navigator")***

The "***Courseware Guidelines"*** provides general introduction and guidance.

The "***Shiphandling Demo Course***" is the course itself. This is where the participants will be fully involved. Here the students can find the theory, link words, static and dynamic figures and the exercises.

The "***Rules of the Road***" is subdivided into two parts: The International Regulations for Preventing Collisions at Sea and the practical exercises.

The "***Ship Models"*** contain the technical data regarding the ships used in the exercises.

Finally, in the "***SimFlex Navigator"*** the participants have direct access to the operating instruction manual and a detailed explanation of the instruments utilised.

MSCN and E-learning provider Bit-IC have developed a demonstrator course which deals with the reports, which are a part of the Training Record Book used by trainee marine officers.
The title of this course is **"Electronic Trainee Record Book for Maritime Officers" (ETRB).**

Further **MSCN, BIT-IC and MTC (Maritime Training Centre BV)** have developed a demonstrator course which deals with the reports, which are part of The Trainee Record Book used by trainee marine officers. The title of this course is **"Medical Care on Board" (MCB).**

Both courses are a first step towards developing a guide for current and future users and developers of an electronic learning environment.

The **Electronic Trainee Record Book for Maritime Officers** contents three modules: offline documents and forms.

- Module "Forms" (registration of personal data and ship's data)
- Module "Tasks" (report of special tasks carried out under control and Autographed by a coach)
- Module "Assignments" (reports of several major assignments meant in the Record Book)

The course can be briefed in the following manner: if necessary, the student is familiarised with the required hardware and software during a kick-off meeting. The coach prepares the students for the programs that will be used during the course. The emphasis will be placed on the specific features of the software required to participate in the course and to sit for the examination in accordance with the applicable guidelines. These guidelines are laid down in a user manual drawn up by the coach and the course manager. A digital user manual is available to the students and can be accessed at all time on the PC.
The coach explains the protocols involved in handling digital documents and the associated e-mail procedure. These are also explained in the user manual.

The coach will draw up and manage an overview of student data using the tools offered by the SEAGULL Infrastructure. The coach must be able to assess the student's progress at all times on the basis of the data sent by the student
The course **Medical Care on Board** contents one module: on offline multiple-choice test

- After a refresher course (on board) seaman must prove their knowledge with the multiple-choice test. Entering the browser with username and password, the student has two answer multiple choice questions about subject basic life support, transporting injured persons, burns, applying infusion and stitching up wounds. Each subject is provided with an image or movie.
- The result file is sent to supervisor as an e-mail attachment.

HW FSW and ISV have developed a demonstrator course which deals with emergency management training especially in fire fighting.
The title of this course is **"Advanced Fire-fighting on Seagoing Ships".**
The bilingual computer-based training system was developed for the theoretical training of seamen in the area of fire prevention and fire-fighting.

This demonstrator course shall ensure the requirements for training in advanced fire-fighting in accordance with Regulation VI/3, STCW Convention (1995) and as set out in Table A – VI/3, STCW Code, Specification of minimum standard of competence in advanced fire fighting.

The "Advanced Fire-fighting Course" enables the user to train systematically on his own on board a vessel with instructional support from ashore, i.e. to prepare for necessary exams or certifications to be taken ashore. The course permits a ship's officers to advise the crew in all matters concerning a fire prevention and fire-fighting.

The course contents two course modules installed on a CD-ROM:
- module "knowledge";
- a combined training (self-test) and examination module.

The communication between the learner on board and the tutor ashore can be done via e-mail sending log files of test results or questions from ship to shore and receive comments/ recommendations back from the tutor ashore to the ship.

The training course contains the following chapters which has been split into subchapters s. According to the requirements of the STCW Code (1995), the following topics are covered in the particular chapters:

Basics of combustion
- three requirements to start a fire or explosion ('fire triangle') burning material, source of ignition, oxygen;
- chemical, biological and physical sources of ignition;
- combustible materials: flammability, ignition temperature, burning rate;
- danger of combustion, spreading of fires via radiation, convection and conduction;
- effects of a fire;
- classes of fire.

Extinguishing agents

- water, water mist, CO_2, foam, powder and halon;
- extinguishing effects, physical properties, possible application according to classes of fire.

Fire-extinguishing equipment

- structure, function and technical details of typical, firmly fixed fire-fighting systems used on board;
- structure and usage of movable fire extinguishers.

Structural fire protection
- duties to be fulfilled and objectives to be met by structural fire protection;
- kinds, design and function of separating walls;
- division of the vessel into main fire areas;
- escape and rescue routes .

Fire detection
- quantities to describe a combustion;
- structure of a central fire control and the way they work;
- structure and function of fire detectors used in shipping and the way they work.

8 Lessons Learned

In this section we provide observations and experiences gathered during the implementation and delivery of the courses as well as the lessons drawn. These observations and lessons are divided into five groups as indicated by the sub-headings.

8.1 Organisational and motivational issues

- It was often difficult for the trainees to fit in time to perform the different activities of their MLDL courses. Both officers and students complained that they found it problematic to fulfil their normal duties and at the same time to devote the required time and energy to their course. The lesson learned is that trainees and their leaders (including on shore management) should have agreed rules for time off for course work.
- Trainees commented that it required a certain amount of self-discipline to spend time on their MLDL course. The lessons learned are (a) that a reward scheme should be considered which expresses the employer's and the relevant leaders' support of the additional efforts by trainees (b) that the long-distance instructor should be generous in expressing encouragement to students and (c) that in general it is very important to provide sufficient motivation to the participants and encourage them to motivate themselves.
- Experience from on board trials of the courses showed that it is not worthwhile considering taking MLDL courses on board ships that are sailing short coastal voyages, the seafarers having too little time on these vessels to spend on taking courses.
- It is widely accepted among seafarers that valuable skills can be taught using Long Distance Learning Technologies. Seafarers appreciate that LDL will permit a more sensible use of the time available while sailing long periods between ports and, at the same time, will allow them to "waste" fewer days when they are at home on for the purpose of attending courses. The latter point was perceived as one of the most important contributors to the satisfaction of seafarers we questioned on this.
- Participants have perceived, as a direct result of this project, that authorities (Shipping company – School authorities) have a deep interest in the preparation and future of their members: company cares about their future!.
- In the closed community on board, various interests will prevail after working hours; some might wish to relax while others prefer to study. Therefore the crew must be informed of whenever colleagues are doing a course.
- When a company starts MLDL on its ships, colleagues who spend time on activities that are not directly related to their work may be regarded with a certain degree of scepticism. This requires the attention of leaders onshore and onboard.

8.2 Study environment - social and physical aspects

- Rolling motions will have a negative influence on learners; small vessels are therefore less suitable for MLDL projects than large vessels.
- The study room on board has to meet the following requirements:
  - Enough physical space, a desk large enough for a computer and the learner
  - Components like computer, screen and keyboard within easy reach
  - Sufficient illumination
  - No noise (or sufficiently low level of noise)
  - Tolerable atmospheric conditions
  - Possibility to restrict the influence of motion (e.g. a chair which can be lashed).

8.3 Structure and procedures for course taking / delivery

- It was very important for the students, to get a rapid response from the instructor in charge, either to the exercises sent or to comments regarding different matters. Participants mentioned that the rapid answers produced by the Instructors, motivated them strongly to keep up with the course.

8.4 Technical issues

- The e-mail communication through the INMARSAT system proved to be highly efficient and the cost involved, turn the system into a quite affordable means for performing courses.
- The computer required for the course must be connected to the on-board network. In some cases this study computer will use the same facilities as the ship's computer. The need to constantly switch cables may cause irritation. If possible, a separate and dedicated PC would be the best solution.
- The student must be able to solve simple software breakdowns. The possibilities to solve more complicated problems are limited. Small repair files (patches) can be sent by e-mail, while other problems will have to wait until the ship docks.
- The limited and expensive telephone bandwidth does not permit the transmission of images. This must be taken into account when compiling a course.

8.5 Requirements to MLDL provider

- Distant teachers must be carefully selected, coached and receive training before setting up courses.
- With regard to didactic methods and techniques: as long as the course material is perceived as being relevant to the learners' situation and provides enough feedback to keep the learner motivated and willing to continue, there is no fixed way or approach or educational concept for MLDL.

9 Estimates of Costs

9.1 Communications

The Inmarsat satellite communication system presents a complex choice of services, pricing and communications variables to the user. This is often referred to as the "Cornucopia of Inmarsat Variables". This wide variation leads to confusion in the proper selection of services to use to give the most cost effective and reliable use of the system. The Inmarsat system is the most reliable and effective method to communicate between remote sea and land based operations available today. However, the cost of this service can be expensive when improperly used and when discounts are not taken advantage of. The primary use of the Inmarsat system is voice traffic, but the system offers also several other methods of information interchange such as Telex, Fax, Low Speed Data and High Speed Data. The most important thing to recognise in the use of the Inmarsat system is not the initial cost of hardware items and software, but how efficiently the overall system is able to use the service.

The new Inmarsat "A & B" High Speed Data (HSD) now available in both Simplex (56/64 kb ship to shore) and Duplex (56/64 kbs both directions), can offer some significant throughput advantages at only a slight increase in cost per minute. The SHSD service can provide a throughput of almost six times the voice service capability at only a small dollar increase in cost. The user who has a lot of data flowing from ship or remote to shore will find this service will pay for its higher initial cost very rapidly. Our initial testing of the SHSD and DHSD shows an exceptionally low error rate for the service speed. The HSD service can be used to run asynchronous data and at 64 kbps one can run asynchronous data up to 28.8 kbps. Most software cannot set bit rates between 19.2 and 38.4 kbps so the max limit may be the communication software. Another technology can be used to speed up the asynchronous data transfer on the HSD link. The Time Division Multiplexer or the Statistical Multiplexer can be used over the HSD link to give both voice and data functions up to 115.2 kbps on a 64 kbps synchronous link, which gives about 50 to 55 kbps of throughput.

According to the Inmarsat sales material, "Inmarsat C GMDSS equipment can be obtained for as little as $7500 and $3350 for non-GMDSS (vessels under 300 tons). Air time at $0.25 (25 cents) per 32 characters". This means that when using such a system for sending e-mails as was made during the trials with e.g. “SALLY MAERSK”, a file of about 100 Kbytes will cost about 750 USD according to the official price list. *However, it has turned out that the unofficial discounted price obtained by larger customers is about 200 times lower!* For instance, when we queried the Maersk company about the actual cost involved in transferring data to and from their vessel Sally Maersk, their data about costs reveals that by using an Inmarsat with high speed data that the cost of sending e-mails of about 150 Kbytes was less than 6 USD per e-mail. Maersk was not able to provide any other detailed information regarding costs except the above mentioned. In addition, we learned that it would not be possible to have the low discounted price confirmed in writing. We conclude therefore that the official price of data transfer is very much higher than the discounted unofficial one.

Inmarsat still has a de facto monopoly on marine data communications. Although there are several other companies offering services (Orbcomm, Eutelsat), none of these companies has yet made any serious inroad into the maritime data communications market.

When more companies seriously enter the field this may lead to a fall in the price of satellite data communication.

Since Inmarsat has a de facto monopoly, it is the investment costs that keep other satellite operators from entering the marine market. In addition, the IMO currently only recognises Inmarsat as the provider of GMDSS qualified marine satellite systems. Inmarsat is the only satellite system that provides no cost safety at sea broadcast bulletins to vessels equipped with Inmarsat A, B and C satcoms (SafetyNet). As far as price, satcoms prices have all dropped more than 25 to 30% in the past two years along with the price of service. Now that Inmarsat has privatised (spring of 2000) one may expect more marine product developments, possibly higher data rates and possibly higher prices.

9.1.1 Costs comparison among different systems

In the following chart we depict the approximative prices of the systems studied in WP1. The amounts are merely approximative because the prices tend to fluctuate.

system property	Inmarsat- C	GSM-data	Mobitex
Type of connection	satellite, store-and-forward	onshore mobile, point-to-point	onshore mobile, store-and-forward
Coverage/ geographical availability	world wide	Europe, plus some areas outside, only coastal harbours	parts of Europe, only coastal harbours
necessary hardware	Inmarsat-C transmission, antenna, PC/terminal	GSM-telephone, data-adapter, PC`	Mobitex transmitter/receiver, PC
availability on ships	often	often	hardly
application possibilities	all right, but high costs (only mail)	all right, (Internet/mail)	reasonably/well (mail, limited Internet usage)
costs communication hardware `	3.176 EU	544 EU	907 EU
monthly subscription	0 EU	variable, indication 40 EU	from 32 - 45 EU KB volume rate 50 EU,- [1])
costs communication (indicative`)	0,19 EU per 256 bit (32 bytes)	+ 1,8 EU/minute, depends on country and service provider	+ 0,27 EU/kb, depends on subscription [1])
usage outside distance learning	GMDSS, messages to office	calls	messages to office

[1]) Exclusive international surcharges

Table 3 review actual systems

9.2 Costs of Implementation

The following costs are the summarised costs obtained while implementing the Shiphandling course on board the container ship “SALLY MAERSK”, the Training Record Book and Medical Test Demonstrator on board the M/S Voorneborg and the Advanced Fire-fighting on Seagoing ships.

9.2.1 Costs and potential benefits of the Shiphandling Long Distance Learning (SHLDL) – module

General aspects

As stated in the description of the Shiphandling demo course, this module is not intended to replace current shiphandling courses using full mission simulators at different training centres. Rather, this PC based course can be used *either* as a stand-alone application *or* as a part of a suite of training tools that include classroom and Full Mission Simulator (FMS) training. Used in combination with the FMS, the SHLDL will reduce the required time to complete the courses as they are normally run in the FMS. .

The advantage and disadvantages of SHLDL training and FMS training are, to put it in simple terms, that SHLDL training is relatively inexpensive whereas FMS training is relatively costly; conversely, FMS training is widely thought to have substantial training effects (given a certain number trainee hours)

whereas SHLDL training is thought to have rather less training effects (as measured by the same amount of trainee hours).

We shall attempt to make a comparison between the costs of the standard FMS based course - for which the price is well known, of course - and the estimated costs of a future type of course that will combine the relatively costly FMS training and the relatively inexpensive SHLDL training.

We shall start with the costs of the Full Mission course. In Europe the average cost for a 5-day Shiphandling course (4 trainees) using a Full Mission Simulator is around 17,000 EUR. This will depend on the complexity of the ship models used, areas, horizontal field of view (120º, 180º, 360º), etc. A typical structure of the course is as follows: participants are assessed at the beginning of the course in order to find out the weaknesses they may have in basic knowledge and to check their general level of knowledge. Around 60% of the course consists of practical exercises in the simulator, thus the remaining time is used to explain theory and to provide feedback of the different exercises to ensure that the required skills are gained. According to the results obtained the first two days, the level of difficulty of the exercises is increased so as to allow trainees to acquire an understanding of the manoeuvrability and operational limits of the ships and harbours utilised.

Taking into account the aspects listed in the table below (table 4), the potential benefits for potential clients of "Long Distance Learning" can be illustrated. For the purpose of a comparison, the elements of a "traditional" Shiphandling course are listed together with elements of what would be a fully developed "New Shiphandling Course" that combines the Shiphandling Long Distance Learning (SHLDL) course and the standard FMS course. Different categories of costs have been defined and subsequently roughly estimated on basis of known costs and tariffs of training institutions in Europe.

Estimation of the potential economical benefit between traditional and LDL possibilities

The expected benefit for the shipping company expressed in commercial terms, can only be inferred by considering how the implementation of SHLDL module would influence shiphandling training for the company (fig. 1).

The implementation of SHLDL will produce the following consequences in a Shiphandling course developed in a Full-Mission Simulator (FMS):

- the development of skills in the FMS will be made much more efficiently by trainees when they have had extensive practice on the SHLDL course.
- an acceptably high minimum level of theoretical knowledge can be ensured for all participants before attending the course in FMS.
- participants will be more familiar with the instruments, the ship model and the simulator in general The entry level for each participant to attend the FMS shiphandling course, will be obtained through the result of the 35 hours LDL course performed either on board at the office or at home. The FMS course may therefore be reduced down to four (4) days.
- the 20% reduction from 5 to 4 days will help the shipping companies in scheduling their seafarers' participation
- possibility of reaching advanced scenarios and a higher level of difficulty quicker during FMS courses.
- the shipping company has the option of getting more training for the same money or the same amount of training for less money (see table 4)

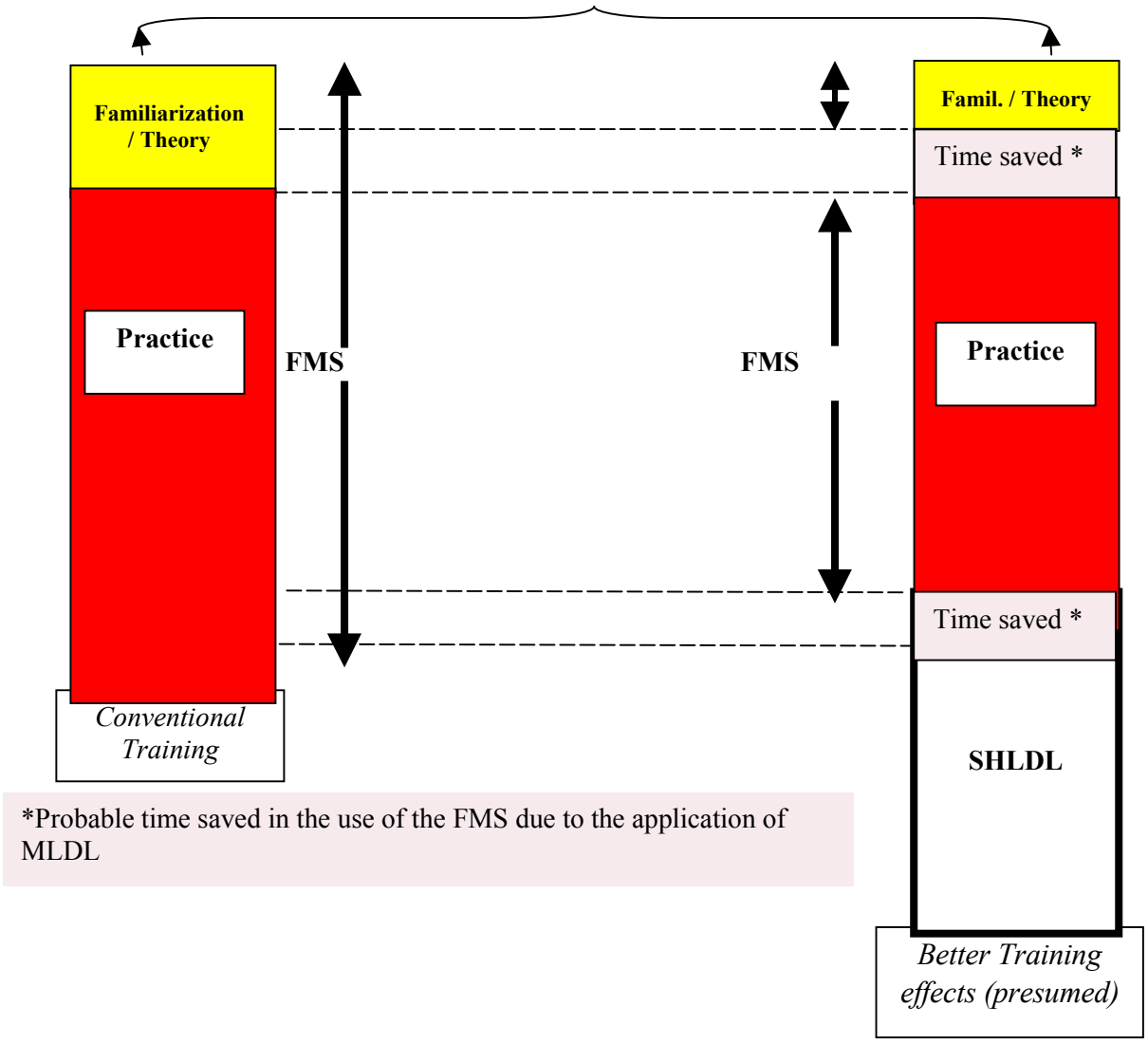

Fig. 30 Same costs, but presumed greater training effects - much longer MLDL course

Recommendation

In order to investigate thoroughly the assumptions presented in figure 30, so that real evidence is available to confirm presuppositions, it will be absolutely necessary to carry out a series of tests once a complete SHLDL course has being developed. The tests must then follow the structure presented in the above-mentioned figure.

The survey should be finalised by testing the participants' theoretical knowledge as well as their practical skills. This test would be a combination of theoretical and FMS tests with clearly defined objectives, e.g. the total energy consumption used for the completion of a given route with main engines, thrusters, steering equipment, etc., compared to the average consumption used by skilled Masters sailing the same route.)

This information must be evaluated in relation to each participant's earlier manoeuvring experience.

Categories	row no.	Shiphandling (SHL) Course		
		Traditional FMS (Full Mission Simulator)-based course	New combined FMS/SHLDL course	
			SHLDL (Shiphandling Long Distance)	Reduced FMS (Full Mission Simulator) course
Duration	1	5 days	35 hours[1]	4 days
Cost of material delivered to participants during and after the course 4 persons / 1 person	2	80 / 20 EUR[2]	80 / 20 EUR	80 / 20 EUR
Average costs of trainees' travel and lodgings etc.[3]	3	650 EUR	0	530 EUR
Total cost of course	4	18.000 EUR[4]	27.000 EUR[5]	16.000 EUR[4]
Costs of instructors	5	included in total course cost	2400 / 600 EUR 4/1 persons[6]	included in total course cost
Total cost per trainee per course	6	4,217 EUR	6,750 EUR	3,427 EUR
Total amortised cost per trainee per course[8]	7	(no amortisation) **4,217 EUR**[8]	**225 EUR** per trainee[7]	(no amortisation) **3,427 EUR**[8]
Time for familiarisation	8	1 day	0,5 day	*[9]
Difference in Minimum Standard Level among participants when starting Full Mission Simulator	9	yes	yes	probably not
Impact in motivation[10]	10	medium	high	high
Known information about the inconveniences the clients experience to send personnel to the course (tight schedules, shifts, vacations etc	11	- staff replacement for ***5*** days - slightly harder planning - co-ordination with training centres	not applicable	- staff replacement for ***4*** days - slightly easier planning[11] - slightly better co-ordination with training centres[11]
Personnel involved at the Training Centre	12	1 instructor and 1 operator	1 instructor	1 instructor and 1 operator
Overall time needed (running the course, assessment, feedback, administrative work etc.)	13	approx. **20 working days** (150 hours)	**40 hours**	approx. **18 working days** (135 hours)
Maximum number of participants per Instructor	14	**4**	**up to 20**	**4**
Location	15	training centre	on the job/home/on board	training centre
LDL communication costs (e-mail, satellite, phone etc.)	16	0	71 EUR per trainee[12]	0
Costs of crewmembers' lost onboard working days during courses ashore (150 EUR per man per day)	17	4 persons: 3,000 EUR[13] 1 person 750 EUR	0	2,400 EUR[13] 1 person 600 EUR
Total cost per crewmember per course	18	rows 2, 3, 7, 17= 20+650+4217+750= **5637**	rows 2,5, 7, 16 20+600+225+71= **916**	rows 2, 3, 7, 17= 20+530+3427+600= **4577**
Total cost per crewmember per course	19	**5637**	**5493**	

Table 4

1. This is the estimated time the course might have.
2. The figure includes manuals and certificates.
3. Accommodation 120 EUR day rate per trainee (120 x 5= 600 EUR). Travel 50 EUR per trainee. TOTAL= 650 EUR.
4. 5 day Shiphandling course 18,000 EUR – 4 day Shiphandling course 16,000 EUR.
5. Assumed cost for the installation of a fully developed SHLDL course (Network module: 2 screens with handles and instruments) for the first time.
6. Price of instructor providing feedback to trainees: approximately 6 hours per student at 100 EUR per hour = 600 EUR per student
7. It ‘s been assumed a typical medium size shipping company with 10 ships, that is 20 crews. Considering a replacement of 50% of the crews during a five years period, it gives a total of 30 crews or 120 deck officers in all.
8. No amortisation, hence the price per trainee per course applies.
9. Thus the SHLDL hard/software will be using the same mathematical models, joysticks and instruments as the FMS course, it is presumed that the time for familiarisation will be reduced to a couple of hours.
10. Officers are affected due to the fact that courses take place during their vacation period. The longer the course the more they are affected. All participants without exception (officers and cadets), agreed that courses lasting more than 3 days during vacation, prejudice them negatively.
11. Easier to co-ordinate and plan courses with training centres when the duration is less than one week.
12. Transmission price for a 70 Kbytes e-mail = 3,55 EUR x 20 e-mails x 1 trainee 71 EUR
13. 150 EUR x 4 x 5=3,000 EUR - 150 EUR x 4 x 4=2,400 EUR.

    Note 1: In case that more than one license for the SHLDL course is required (which in fact is the case), the price is reduced down to 50% for the next two licences and to 33% of the initial cost for the 4th and so on**.**

    Note 2: In order to ensure that students having participated in LDL programme have reached a certain skill level (so that they spend fewer days in the FMS) it is necessary to establish that they have reach such a level through an assessment.

The comparison of Traditional FMS-based course with the new combined FMS/SHLDL course does not show at first sight a remarkable difference economically speaking. Anyhow, if we take into consideration the shipowners point of view, then we find -presumably-, important connotations regarding the SHLDL module that ought to be stressed:

- reduction in accommodation expenses
- reduction in time assigned to courses while on vacation
- reduction in student travel expenses
- takes advantage of a variety of media (increasing likelihood of learning outcomes)
- intelligent use of free time on board
- flexible delivery
- course adjusted to own requirements
- on the job training
- quality material to be upgraded quite easily
- no staff replacement costs for an employer while the employee is studying
- possibility of refreshing/revising concepts as many times as necessary

In terms of knowledge transfer, the results of the assessment of the Shiphandling Course a detailed description is provided in WP7-Part B. Anyhow a summary of the results obtained is presented here:

- the objective measures of the gain in navigational knowledge showed a significant increase for both group of trainees
- the subjective measures in terms of which users expressed their views and perceptions about the course were in general favourable.

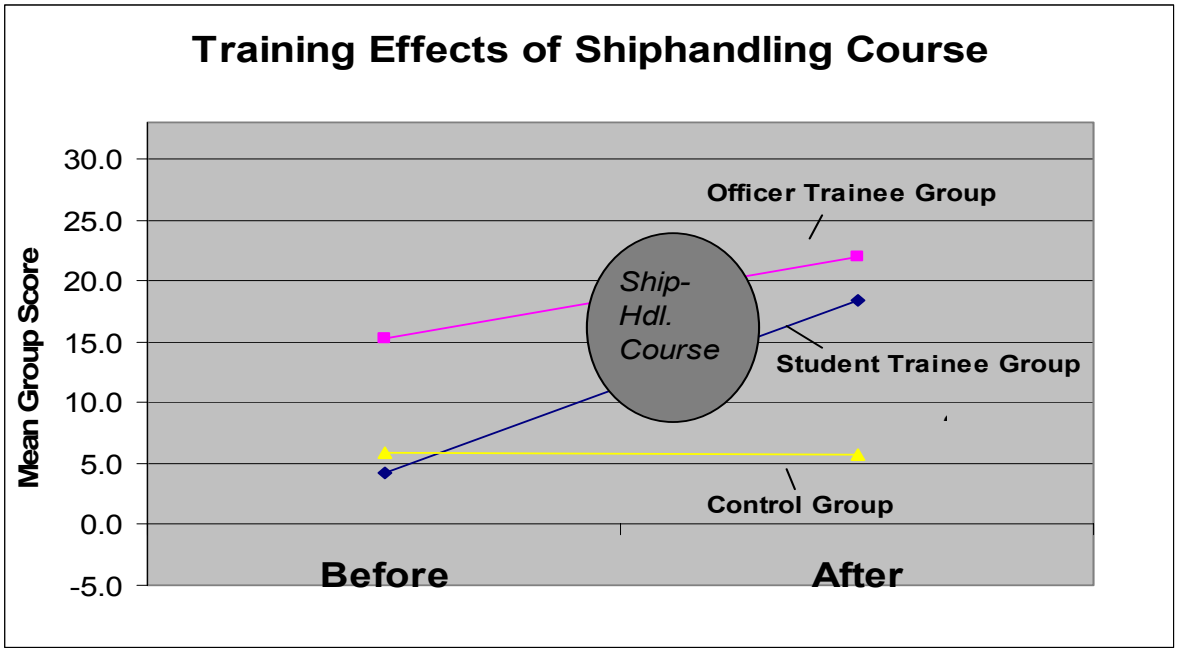

Fig. 31 Training effects charted for the three groups before and after the course: the Student Trainee Group compared with the Student Control Group and the Officer Trainee Group

The objective measures of training effects as measured by the Maritime Navigation Questionnaire were made before and after for the two trainee groups and for one control group. They revealed four major findings.

1. The student trainee group (15 students) increased their knowledge and understanding of navigational concepts from an almost zero level to a level at which they equalled the officers *before* the officers took the course. The student control group showed no increase at all. Hence, it can be concluded that the student trainees had derived all their knowledge from the Shiphandling Course. In fig. 2 the average grading of the three groups is shown.

Recall, that if a respondent had all 33 items correct, he would have received a grade score of +33; if all answers were incorrect, the score would be minus-33, as explained above. As can be seen in fig. 2, the two student groups started out at roughly the same level (equivalent to around four entirely correct answers out of 33 possible ones); the trainee students then increased their score from 4.3 to 18.4 whereas the control group remained at the same level (going from 5.9 to 5.8). The difference between the two group means for the second test is statistically significant (Wilcoxon rank based test, $p<0.01$).

2. The officer group of four persons also increased their average score (from 15.3 to 21.9), although one of the officers actually decreased his score after the course.
3. The variation within the student trainee group was quite high in terms of grade scores before the test. After the test, the variation was reduced (see fig. 3)
4. The number of non-answered ("unfilled") items by the student trainee group was much reduced from the first to the second time of the Maritime Navigation Questionnaire administration (going from an average of 14.9 unanswered questions to 2.7 ones out of the 33 items. The variation was similarly reduced - see the following fig. 4

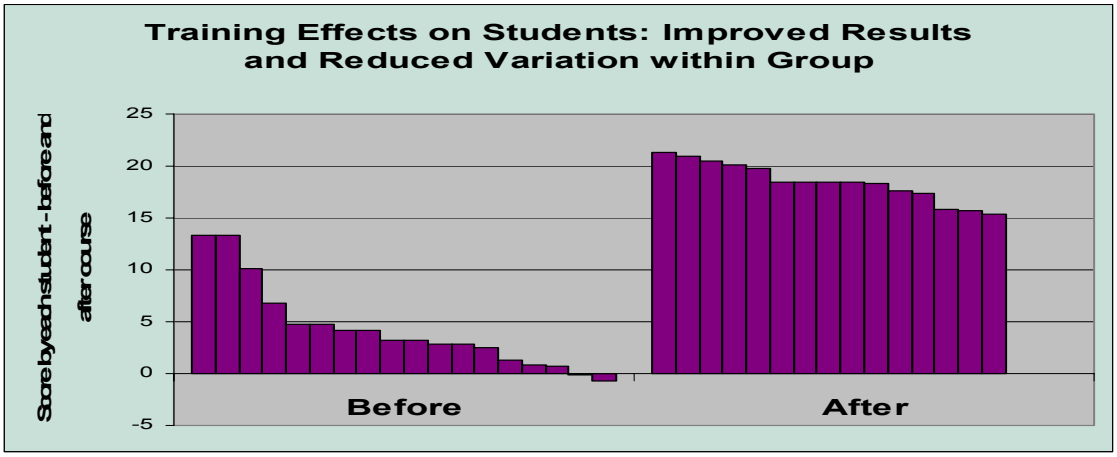

Fig. 32 Grade variation among trainee students before and after Shiphandling Course

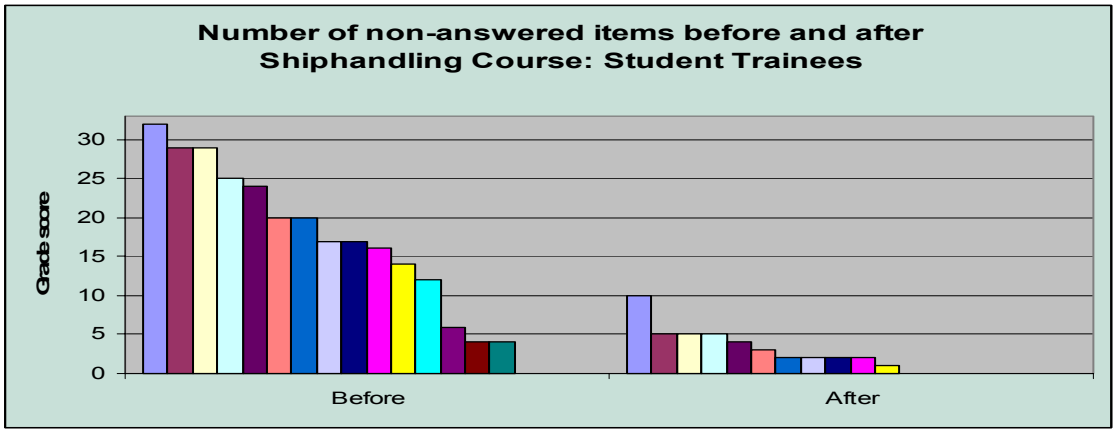

Fig. 33 Number of un-answered items (out of a total of 33) among trainee students before and after Shiphandling Course

9.2.2 On board M/S Voorneborg

The only costs available from the tests carried out between Wagenborg Shipping company and the training institute are communication costs:
SG01_C (mail from student_1 to coach): 12 mails, approx. 450Kb
SG01_S (mail from coach to student_1): 7 mails, approx. 150Kb
SG02_C (mail from student_2 to coach): 16 mails, approx. 850Kb
SG02_S (mail from coach to student_2): 8 mails, approx. 200Kb

The connection by way of satellite costs approx. $3,25 (US Dollar) per minute. An average of 50 to 60 Kb per minute is sent when calculated this becomes:
1650 Kb / 50 Kb per minute = 33 minutes x $3.25 = US $107.25
Additional: 'handshake' at every session (about 10 seconds): 43 x 10 sec =+/- 7 minutes x $3.25 = US $ 22.75
Sum: 107.25 + 22.75 = **US $ 130.00**
This is a specification for the Voorneborg vessel; they use Inmarsat-B and a specific AMOS-mail & compression tool.

9.2.3 Costs and potential benefits of the Fire–Fighting LDL module

The expected financial benefit to the shipping company expressed in commercial terms according to the assumptions mentioned in Part D point 4: Costs and potential benefits for a shipping company when using the Fire–Fighting LDL module, would be approximately DM 2.940 for the training of only 12 crew members but rises to DM 8.390 when the whole staff will be trained and certified (see also table 5).
A further benefit will result if the loss of man-days would be taken into account. If the assumed labour costs will be used for the calculation, then a company may save DM 14.400 (24 crew members available for 2 two working days more) additionally when the LDL module would be used.

Cost elements/ categories	IMO Basic / Advanced - Fire - Fighting Course	
	"Traditional" course"	LDL demo course implemented
Development costs (hardware, software, external aids, etc.)	Rough estimation of the development cost: - Development of course concept by specialists DM 150.000 - definition of technical requirements and realisation (theoretical and practical training) DM 180.000 - administrative planning of one course DM 2.000 - modifications and adjustments of the course DM 10.000 according to current state of the art	rough estimation of the development cost: - course design DM 100.000 - software development DM 150.000 - technical requirements (practical training) DM 80.000 - administrative plannings the course DM 1.000 - modification / adjustments of the LDL course DM 5.000
Running costs (debriefing rooms, fire fighting aids, etc.)	Rate for classroom DM 360 rate for fire laboratory DM 500	rate for fire laboratory DM 500
Cost of material delivered to participants during and after the course	Handouts DM 120	Private license DM 215 Company license: appr. DM 2.500
Average costs participants pay for travelling, lodge etc.	Accommodations DM 140 p day Travelling DM 180 (rough estimation)	Accommodations DM 140 p day Travelling DM 180 (rough estimation)
Known information about the inconveniences the clients experience to send personnel to the course (tight schedules, shifts, vacations etc.	- staff shortage - staff replacement - for 5 days	- staff shortage - staff replacement - but for 3 days only
Fee participants pay	DM 690,00	DM 500,00
Duration of the course	5 day resp. 1 week (40 hours): • 2 days for theoretical training • 2 days for practical training and • 1 day for examination	3 days: • 2 days for practical training and • 1 day for examination
Number of instructors required	Total: 8 instructors / teacher: • for lectures, seminars: 3 – 4; • for practical exercises: 2; • for examination: 3	Total: 3 instructors / teacher: • for practical exercises and examination: 3
Overall time needed (running the course, assessment, feedback, administrative work etc.)	appr. 10 –12 working days, meaning 80 to 100 hours (rough estimation)	appr. 3-4 working days, meaning 20 to 25 hours (rough estimation)
Maximum number of participants	12 in courses ashore	approximately 25 for theoretical training an examination on board 12 for practical training and examination in courses ashore
Costs of communication tools utilised for LDL (e-mail, satellite, phone etc.)	no costs	between DM 250 and DM 400 depending on the used communication system and the organisation of the course
Cost for loss of working days on board for crew members while in the courses ashore (300 DM per man per day)	36.000 DM (5 days x 24 members x 300 DM)	21.600 DM (3 days x 24 members x 300 DM)

Table 5

9.3 Conclusions

The assessment of the MLDL courses developed and tested during the SEAGULL project have involved four courses:

- Shiphandling Course (WP7 PART B)
- Electronic Trainee Record Book for Maritime Officers (WP7 PART C)
- The Medical Care on Board course (WP7 PART C), and
- The Fire Fighting Course (WP7 PART D)

The assessment demonstrates

- that MLDL training effects appear to be comparable with conventional and typically more expensive training
- that users accept MLDL
- that costs are within levels that may be accepted by companies who employ seafarers
- that costs are well below costs associated with conventional training involving trainee accommodation and travel expenses. Anyway, due consideration must be taken to the aspect that Conventional courses and MLDL courses are not comparable, at least at this stage.
- that there is a greater presumed training effect when conventional and MLDL courses are combined.

The assessment which has collected data on training effects, user satisfaction and costs have demonstrated a high potential for MLDL: training effects have been demonstrated during a controlled trial involving a comparable no-training group for the Shiphandling Course and have been shown to obtain at a high level under realistic conditions for the Fire Fighting Course and the Shiphandling Course. At the same time, when users and instructor's levels of satisfaction with their MLDL training is probed, the results show for the ETRB and MCB courses, that this type of training is readily acceptable.
At the same time, lessons learned during the implementation and delivery of the courses point to a number of constraints and requirements on organisational and technical issues that need to be observed if MLDL is to be successful.

The set up and start of each the four courses turned out to be rather complicated due to a number of technical and particular organisational problems in the institutions and companies that were hosting the demonstration courses and providing voluntary students and, in some cases, instructors. The delays and problems experienced were in large part due to the fact that each of the courses was a "new" product and therefore, that our host organisations and companies were "launch customers". It is well known from other applications that first-timers require more time and resources.
Finally, the results of the SEAGULL assessment point to a need for comparing training effects - as measured in real life operations or during realistic, high fidelity simulations - between conventional training and MLDL training.

It should also born in mind that the cost assessment shown in the foregoing tables is based on the premises that MLDL courses are presented as a supporting tool to classical courses. Therefore the cost assessment is not showing economical differences among them, but the economical advantage of their combination.