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FINAL THESIS

INSTRUCTIONAL DESIGN OF ONBOARD TRAINING COURSE ON GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM

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CHAPTER I

INTRODUCTION TO THE PROBLEM

1. Introduction

The present chapter aims at acquainting the reader with the peculiarities of the maritime education and training – MET (section 2), MET's relation with the recent trends of the shipping market (section 2.2.1) as well as with the development of the distance MET worldwide (section 2.2) and in Bulgaria (section 2.3). Attention is paid to the applicability of onboard distance learning (section 2.2.1) and the Bulgarian practice in delivering distance MET (section 2.3.2). A short familiarization with the core of the Global Maritime Distress and Safety System (section 3) is provided with respect to clarifying the content of the course to be designed. The problem is defined (section 3.3) and relevant conclusions (section 4) are laid out at the end of the chapter on the basis of the analyses provided in the previous sections.

2. Maritime Education and Training (MET)

Because of the international nature of the shipping industry, it has long been recognized that strict standards concerning qualification and training of the seafarers must be complied with to ensure safety, efficiency and effectiveness of the seaborne trade and the protection of the marine environment. The International Maritime Organization (IMO) as a specialized body of the United Nations dealing with maritime affairs imposes regulations and standards through codes, conventions and other instruments so that uniform criteria are complied with of all member states.

IMO's "Standards of Training, Certification and Watchkeeping for Seafarers" Convention'78 as amended in 1995(STCW) defines the standards for the seafarers for obtaining higher degree certification and sets the acceptable minimum standards to its member states for carrying out training, examination and certification. MET on a worldwide scale is concerned with meeting the requirements of STCW.

The training in MET institutions is guided and facilitated by specially designed IMO model courses. The purpose of the model courses is to assist maritime training institutes and their teaching staff in organizing and introducing new training courses or in enhancing, updating or supplementing existing training material where the quality and effectiveness of the training courses may be improved.

2.1 Trends of the Market

It has always been difficult to make a long term forecast for the future development of the shipping market because many variables have to be taken into account. MET is certainly just one of them.

In the context of globalised and liberalized market, the shipping industry strives more than ever to achieve greater efficiency. The competitive market forces shipowners to optimize ship's crew. The empirical data shows that only on European registered vessels there was an overall decline of 31,5% in seafarer employment during the decade from 1985 to 1995

(Dirks,1998). Obviously, the reduction of crew size imposes intensifying of the shipboard operations and activities which in turn, together with introducing new technology and equipment, require highly qualified personnel.

Nevertheless the difficulty in making prognoses, most experts expect a further increase in seaborne trade. Jan Dirks (Dirks, 1998) in his investigation on employment opportunities for European seafarers concludes that:

- due to globalization trends, there will be a long standing increase in the world trade leading to higher demand for seaborne transportation;

- due to extending of ship sizes, the costs for the transportation of cargo by sea will decline;

- due to overloading in other transport modes, seaborne transport will become more attractive;

- due to development of greater transport intermodality, shipping is becoming increasingly important in traffic networks;

- due to modernization of the ports and the creation of regional networks – especially in telecommunications and telematics - industry will tend to rely more heavily on shipping.

The above trends and predictions indicate that the shipping industry will continue growing in highly competitive environment which will lead to greater demand for qualified commanding staff. The distinguished trends indicate also that MET in a worldwide scale is to correspond accordingly.

2.1.1 MET and the Market

The last two decades have seen a sharp decline in the supply of well-trained seafarers, especially officers. BIMCO/ISF2000 Manpower update (2000) revealed a worldwide shortage of 16 000 officers in the year 2000 corresponding to 4% of the total workforce and predicted a 12% shortfall by the year 2010 which is equal to 46 000 officers.

The problem of employment of qualified ship personnel does not affect shipowners only. Many land-based occupations require former seagoing experience. In 1996, the British economists B. Gardner and S. Pettit (1996), in their study on the requirements of the UK economy for people with a sea-working experience, identified nine groups of industries, where employers prefer to employ former seafarers. The total number of jobs for seafarers who fit into these categories (such as port services, marine equipment, shipping companies, dredging, surveyors etc.) in the UK was assumed to be roughly 17 000 and in 70% of these jobs, seafaring skills were considered to be *essential*.

BIMCO/ISF2000 Manpower Update states clearly that there are shortages in those positions that require long-term education. Jan Dirks (Dirks, 1998) in his investigation summarizes that the duration of MET for first class officers appears to be very long in most EEA states when

compared to non-maritime professions. According to a study made by BC Consultants (1996) concerning MET in the EU, the minimum MET duration for a master unrestricted Certificate or chief engineer unrestricted Certificate is between 6.66 years and 13 years.

The project Harmonization of European Maritime Education and Training Schemes (METHAR) carried out a survey in 1996 on numbers of persons who chose MET for a temporary or permanent seafaring career. The findings revealed a decline in interest in seafaring in METHAR countries and that the supply of seafarers is further reduced by loss of students during MET.

Dirks (Dirks, 1998) comments that the current situation in the European labor market offers very few options for young people and in many cases a seagoing career is a very attractive alternative to unemployment. So, he suggests that the drop-outs may either consider the MET standards too high or too low, or may be the young people cannot afford such a long education, especially in view of their future life style, salary, career opportunities, etc.

2.1.2 MET Perspective in the Market Context

It is obvious that to match the growing demand for qualified personnel MET should be intensified. The term from enrolling into a nautical college till obtaining a certificate should be as short as possible. At the same time STCW requires certain standards to be met as well as some training and re-training procedures to be carried out. There is no doubt that the recent trends in MET are mainly directed at meeting the requirements of STCW and the International Safety Management Code (ISM).

The above analysis indicates that MET should be optimized so that the problem with the drop-outs is eliminated. Modern distance instruction, matching the busy schedules of young people, could be a solution. Thus, distance MET complying with IMO requirements deserves detailed consideration.

2.2 Distance MET

Like other educational spheres, MET has a distance learning tradition. People at sea have studied using correspondence courses for generations and the maritime societies and Open Universities have offered seafarers routes for distance learning for many years. Christopher Haughton (Haughton, 2002), deputy-managing director of the software company “Videotel Marine International”, states that seafarers represent something of a challenge for those involved in distance learning although, just as modern communications encouraged Victorians to learn, the move across to a system of Vocational Qualifications for maritime education has made the accumulation of the necessary knowledge for professional certificates possible in a way that was just not possible under the old system where “writtens” and “oral” were the only two fences to be jumped. He points out that the field of distance learning offers both practical and economical contribution to college time and “chalk and talk” sessions (ibid.).

Technology and e-communications has made a huge contribution to the development of the modern forms of distance learning. In Australia students can already enroll on postgraduate learning programs in port and shipping management utilizing instructional material, Internet and tele-conferencing, without having to step inside the institution.

2.2.1 Onboard Distance Learning (ODL)

Kucharzewski points out that until recently only in other industries new methods for training and education have been created. Now also in the field of seafaring new methods are being introduced under the names of "life-long learning" and "long-distance learning" (Kucharzewski, 2000). The main advantage of the latter is that the learners study in realistic environment. Actually, lasting preparations for accident-prevention and accident-elimination require continuous training that does not work in schools, but only on board. Indeed in ancient and pre-modern times training at sea was the only way in which maritime knowledge was imparted. Christopher Haughton considers the growth of establishments ashore came, as the knowledge base required by seafarers increased significantly (Haughton, 2002).

There is no doubt that huge changes have taken place in the educational technology. This inevitably has led to introducing innovative forms of training delivery, such as Computer Based Training (CBT) and e-learning. The technology innovations and the fast development of the seaborne trade imply also periodical retraining and upgrading of the responsible personnel. Knowledge should be proliferated among those concerned and this became possible with the introduction of the satellite communications.

"Videotel Marine International" has developed a CBT Course for shipboard Safety Officers and since last year the onboard delivery is a fact (Haughton, 2002). The Nautical Institute in London has agreed to accredit the course and to certify the successful candidates. Communication, assistance and tutorial support is encouraged via email. Independent assessors are appointed to examine candidates and the successful officers are granted a Certificate of completion issued by the Nautical institute. It is too early to report back of the obtained results but it is worth considering the applicability and practicality of ODL.

2.2.2 Perspectives of ODL

Communicating instructions to the mariner concerning particulars about the future voyage is a usual practice. Thus the deck officer "learns" the specifications of loading and discharging port, particulars of the cargo, weather forecasts, etc. New international and national regulations concerning the shipping business as well as safety information are also sent to the mariners via various means of communications.

Pressure to reduce costs has led to a drive for greater efficiency. While modern bridge systems and computer networks have made running a ship easier, the impact of smaller crews (see section 2.1) means that one person has to do the same job that two or three people used to share between them. The deck officers are entrusted more duties as, for example, maintaining communications (instead of the radio officer) and rendering medical assistance (instead of the medical officer). They spend much time from their shore leave for obtaining additional qualification concurrently with attending the required courses for obtaining the conventional certificates. For the above-laid reasons the first attempts for introducing ODL are made (see section 2.2.1) and a lot of international conferences dedicated to ODL, such as the CBT@sea conference and The Digital ship (2001), are being held.

2.3 MET in Bulgaria

Bulgaria, being a member state of IMO, has to comply with the requirements of IMO's STCW convention, particularly with part "A" that is mandatory for all member states. Bulgarian MET is governed by the requirements of STCW convention and by the national requirements, set in the national Ordinance No 6 concerning the competences of seafarers in the Republic of Bulgaria. The Ministry of Transport and Communications and the Ministry of Education also take part in setting the criteria for the content, duration and the quality of the Bulgarian MET.

2.3.1 Bulgarian MET Establishments

Bulgarian maritime vocational training exists on two educational levels – secondary and higher education. There are two secondary schools dedicated to training human resources for the maritime industry. They are located in the two major ports of the Bulgarian Black Sea coast – the towns Varna and Bourgas. The higher institutions are located on the territory of the town of Varna only. These are the Naval Academy and the Technical University, the latter being represented by the faculties of "Shipbuilding", "Transport and Navigation" and "Ship Engineering". Both institutions comply with the stringent IMO requirements regarding MET and are included in IMO white list for the recognized MET institutions.

The only recognized national training center accomplishing postgraduate training for higher degree certification is the Bulgarian Maritime Training Centre (BMTC) also located in Varna. There the seafarers carry out all trainings required by STCW Convention for obtaining conventional certificates. The trainings are carried out according to syllabuses, composed on the basis of the corresponding IMO model courses, approved by the Maritime Administration of the Republic of Bulgaria (BMA) and submitted to IMO. Modern simulators, audio-visual equipment and rich library supplement MET services at the BMTC.

2.3.2 Bulgarian Distance MET

Bulgarian distance MET is available only in the higher MET institutions of the country. It is of extramural form. This includes 10 days compulsory attendance of lectures each semester which are two in number for an academic year. The distance students study according to the same syllabi as the full-time students and have to execute the same amount of seagoing service as the full-time students before obtaining a diploma. The distance learning by Internet has not been developed yet at the higher Bulgarian MET institutions.

BMTC as a postgraduate institution is in a process of developing short distance learning programs to be delivered onboard ships. The spark of the idea of introducing ODL in the Bulgarian MET was ignited in October last year at the Black Sea 2002 conference. In section "Marine Education and Qualification" variants of distance MET systems were considered. The paper "Design and Perspectives of Maritime Distance Education" (Gechevska, 2002) provoked disputes concerning the feasibility of introducing distance learning onboard ships. A few months later a meeting was conducted between the author, representing the BMA, and the BMTC Director aiming at considering the pros and cons of developing ODL programs within the BMTC. It was decided as soon as a suitable distance-mode delivery instruction is designed a pilot to be launched. A focus was given on the practicality of developing a course on Global Maritime Distress and Safety System to be delivered onboard ships flying Bulgarian flag.

3. The Global Maritime Distress and Safety System (GMDSS)

The definition of the GMDSS is as follows:

The GMDSS is an automated system that uses ship-to-shore/ship-to-ship alerting by means of terrestrial radio and satellite radio paths for alerting and subsequent communication.

3.1 The GMDSS Context

As described in sections 2.1 and 2.2.2, the enhancement of the bridge system in technological aspect has lead to reduction of the crew staff and with the development of satellite communications the profession of radio officer has become obsolete. The old Morse telegraphy system and the Radiotelephony system that comprised the communication system onboard ships have proved ineffective and unreliable over the years.

Since the main concern of IMO is to enhance constantly the safety at sea by adoption of the highest practicable standards, which includes also exploiting the advances made in communication technology, it was natural in 1988 the contracting governments to Safety of Life at Sea Convention (SOLAS/74) to adopt amendments to SOLAS/74 concerning radiocommunications for GMDSS. These amendments entered into force on 1 February 1992 and the GMDSS was fully implemented on 1 February 1999. Thus, the introduction of modern technology, including satellite and digital selective calling ensures safer shipping by enabling distress alert to be transmitted and received automatically over long range with significantly higher reliability.

Chapter IV of the SOLAS'74 convention is dedicated to GMDSS matters, including the conditions for installation of the GMDSS equipment onboard ships. SOLAS'74 states that the GMDSS applies to all cargo ships of 300 gross tonnage and above and to all passenger ships, regardless of size, on international voyages (SOLAS, 2001).

3.2 The GMDSS Concept

The basic concept of the GMDSS is that search and rescue (SAR) authorities ashore, as well as the shipping in the immediate vicinity of the ship in distress, will be rapidly alerted to a distress incident so they can assist in a coordinated SAR operation with the minimum delay. The system also provides for the urgency and safety communications and for the promulgation of maritime safety information – navigational and meteorological warnings and forecasts and other urgent safety information to ships.

Figure1 represents the GMDSS concept (source: GMDSS handbook, 1996).

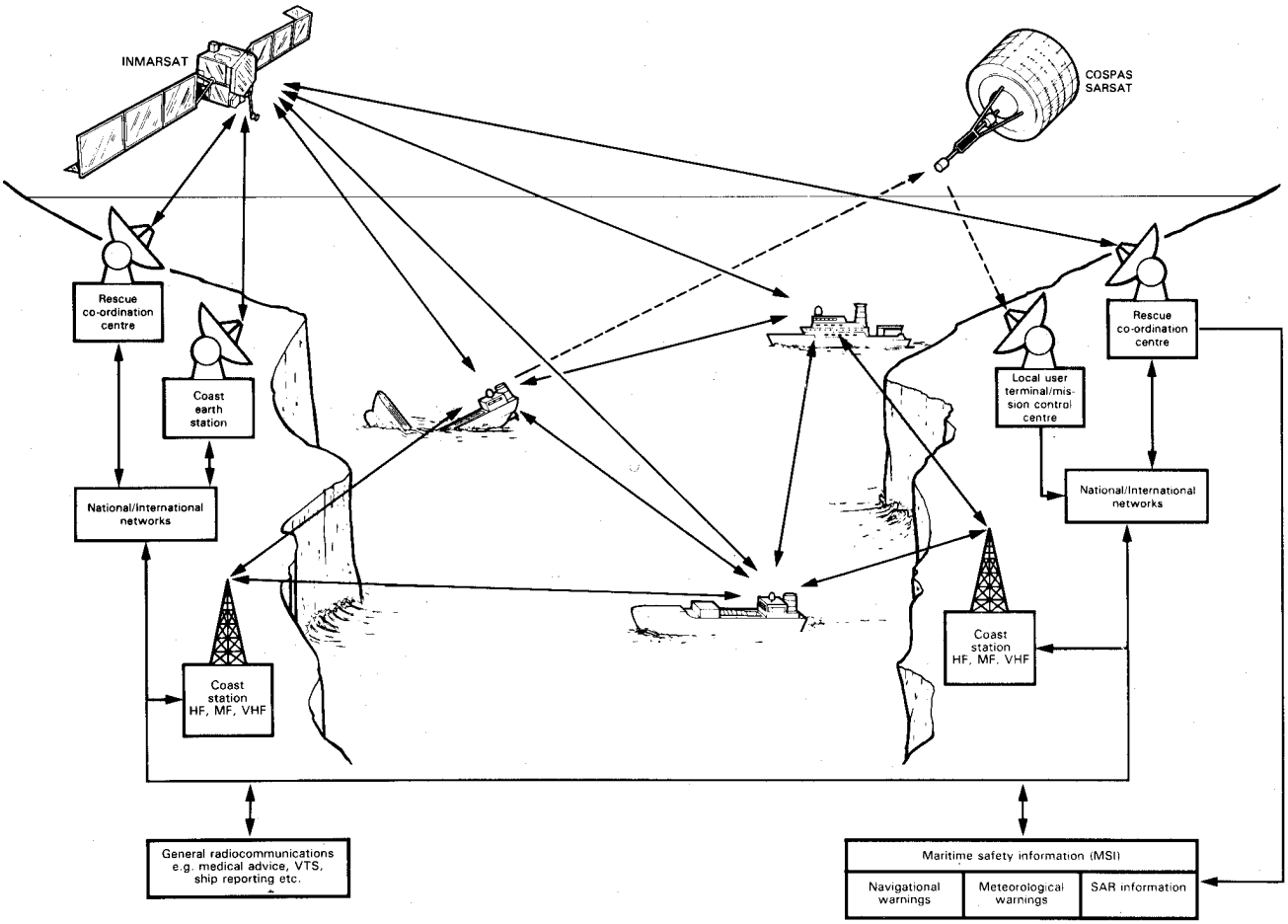

Fig.1

3.3 The Problem

3.3.1 Introduction to the Problem

As described in section 3.1, the GMDSS has become mandatory since February 1999 for all IMO member states on the one hand, and on the other hand the deck officers are entrusted more duties as a result of the market demands for smaller crews (see section 2.1). They are required to hold General Operator Certificate on GMDSS (GOC-GMDSS) as required by the GMDSS Convention.

Complying with the new requirements, the deck officers should spend three weeks from their shore leave to attend a GOC-GMDSS course. This also leads to additional study load because the officers are often concerned with preparation for higher degree certification which is a mandatory requirement for obtaining a higher rank promotion on board ships. GMDSS training ashore often could not reach the objective it is aimed at: to train officers capable of operating the GMDSS equipment onboard ships since the onboard equipment differs from the simulator equipment available at the training centre.

MET on a worldwide scale responded to the new IMO requirements and started introducing the subject GMDSS in the MET syllabi. The deck officers, who have completed their MET

education before the GMDSS was enforced, are obliged to undergo a GMDSS training course in a recognized MET institution for obtaining a GOC-GMDSS.

3.3.2 Definition of the Problem

The subject matter of this thesis is based on the following problem:

After successfully passing the examinations and obtaining a certificate, the trainees have to learn by themselves how to operate the real onboard GMDSS equipment since it is different from the GMDSS simulated equipment available at the BMTC. This leads to increased frustration and anxiety that further reduces the effectiveness of the shore-based course.

4. Conclusion

The context description of MET system worldwide and in Bulgaria provides a clear background and frames within which the GMDSS course can be designed. The familiarization with the trends of the market and their influence on the demand of trained human resources for the shipping industry serves as a needs analysis for the direction and demands of MET in the globalized and liberalized world economy. Introducing ODL will either provide for the development of the human resources in the seaborne industry and will shorten the duration of MET as well. And in the case of postgraduate courses, ODL could substantially facilitate the life of the seafarers.

In the context of worldwide shortage of qualified personnel for the seaborne trade, the Bulgarian MET is able to respond to the recognized demand by optimizing its MET system. The willingness and readiness of BMTC to cooperate in introducing ODL in the form of GMDSS course proves the adequacy of this Bulgarian MET institution in responding to the modern trends in providing MET. By introducing an onboard variant of the GMDSS course, the BMTC will update its teaching practices and will keep in pace with the latest trends in the educational field.

CHAPTER II

CONCEPTUAL FRAMEWORK FOR THE INSTRUCTIONAL DESIGN

1. Introduction

Before the actual design work, the designer should decide on which of the fundamental concepts he/she will build the new instruction. This chapter aims at revealing the conceptual framework of the instructional design of the onboard GMDSS course through investigation of the interrelation of the basic concepts of instruction and their relevance to the course to be designed (section 2). The distance learning is defined (section 3) paying due regard to the peculiarities of adult distance learning (section 3.1) and to its methodological aspects (section 3.2). Dick and Carey Systems Approach Model to Instructional Design (section 4) is considered in detail with regard to defining the methodology of the instructional design of the GMDSS course.

2. Instructional Design Concepts and Their Interrelation

2.1 Instruction and Learning

The term "instructional design" refers to the systematic and reflective processes of translating principles of learning and instruction into plans for instructional materials, activities, information resources, and evaluation (Smith and Ragan, 1999:2). Smith and Ragan (Smith and Ragan, 1999:3) define instruction as an intentional facilitation of learning toward identified learning goals. The term "facilitation" inevitably implies application of certain didactic methods aimed at making the learning easier.

What is learning? Bass and Vaughan state that learning is a relatively permanent change in behavior that occurs as a result of practice or experience (Harrison, 2000:238, cited Bass and Vaughan, 1967, p.8). Considering this definition, Rosemary Harrison (2000) emphasizes on the importance of experience and provides two-fold interpretation of the term. On one hand she regards "learning" as a state to be achieved, and on the other hand she treats "learning" as a dynamic process aimed at achieving permanent changes in behavior. Revealing this assumption in MET circumstances, it is worth noting that while the stringent IMO requirements and standards clearly define the state to be achieved, the dynamic process of achieving this state can be largely facilitated and accelerated by introducing carefully designed onboard distance mode instruction.

2.2 Motivation and Learning

It is a well-known fact that one of the biggest challenges the seafaring companies face is not recruiting seafarers but encouraging them to stay once they have been recruited. Motivation, therefore, is of crucial importance for staying in the seafaring field. Introducing ODL can bring diversity in seafarers' life style and can attract young, well-educated seafarers. However, the prerequisite for success of any ODL is to be tailored to the needs of the prospective learners. Hence, the GMDSS course needs to be designed in such a way that fully satisfies the incentives of the seafarers for engaging in learning activities.

There are different definitions of the term "motivation". Pintrich and Schunk consider motivation a process whereby goal-directed theory is instigated and sustained (Pintrich &

Schunk, 2002: 5). Vanessa Arnold (Arnold, 1988) investigates the meaning of the word motivation and indicates that it suggests energetic behavior directed toward some goal. From behaviorist point of view motivation is defined by the rate or likelihood of behavior (Pintrich & Schunk, 2002: 20). According to systematic behavior theory (Pintrich & Schunk, 2002: 30, cited Hull, 1943, p.226) motivation is "the initiation of learned or habitual patterns of movement or behavior directed towards some goal." Psychologists define motivation as internal process that activates, guides and maintains behavior over time. The distinguished psychologist Abraham Maslow in his Pyramid of Needs (Pintrich & Schunk, 2002:105-106) considers the hierarchy of needs that have influence on human behavior. Thus, the concept of motivation is in close relation to human behavior and indicates the innate disposition that causes the initiation, direction, intensity and persistence of human action.

On the other hand, motivational processes have a lot to do with learning since they are both concerned with changes of the human behavior. While learning is a relatively permanent change in human behavior (see section 2.1), motivation is subject to change. Motivation can influence what, when and how we learn (Pintrich & Schunk, 2002:6). "Students who feel self-confident about learning …seek challenges, expend effort to learn the new material and persist at difficult tasks "(ibid.). Thus, the learning is dependent on motivation, no matter whether intrinsic or extrinsic one. Intrinsic motivation speeds up learning and drives people to better learning achievements. People choose to learn because of extrinsic reasons such as salary increase, better career prospects, etc. In the process of learning, extrinsic motivation may change into intrinsic when certain needs are satisfied.

2.3 Motivation and Instruction

While designing whatever instruction, one should be aware that the design of the instruction should be appealing to both, instructors and learners in order to be deemed successful. This assumption is certainly valid for MET where traditionally a huge number of drop-outs is observed (see Ch. I - 2.1.1).

The concept of motivation is necessary in a model of teaching. The role of the teacher as facilitator of learning requires a thorough understanding of learners' needs and incentives. To succeed in that undertaking, the teachers themselves must be motivated. According to Katz (Reigner & Stang, cited Katz, 1988) teachers need to be curious, imaginative, empathetic, interesting, friendly and hardworking in order to be effective in the classroom, thereby, creating a learning environment that enhances and strengthens the learning deposition of the students. Smith and Ragan (Smith & Ragan, 1999:3) state that to be effective the instruction should be appealing to the students.

Smith and Ragan (Smith & Ragan, 1999:3) note that the aim of instruction is achieving learning goals. Identifying the learning goals has to do with goal orientation theory (Pintrich & Schunk, 2002), which has direct applicability to classroom and student motivation. The theory proposes that there are two goal orientations that students can adopt toward their academic work: mastery orientation with the focus on learning and mastery of the content and a performance orientation with focus on demonstrating ability, getting good grades and rewards. Acquiring seafaring skills and further using theses skills in a competent manner has relevance to their performance that is subject to the goal-orientation theory.

2.4 Motivation and Achievements

The relation between motivation and achievement is worth considering with regard to understanding the inner incentives that drive to/ prevent from obtaining learning achievements. The concepts of overachievement and underachievement should be taken into account since they concern the level of difficulty of the instruction to be designed.

The concepts of overachievement and underachievement can be linked with the achievement motivation and can be considered as a function of students' personal efforts and abilities. Students who choose to engage in a task, expend effort and persist are likely to achieve at a higher level (Pintrich & Schunk, 2002:14). Covington (Pintrich & Schunk, 2002:306, cited Covington, 1992) notes that in our society, worth for school age children is often determined by their academic achievements, and is often assessed in competitive ways, i.e doing better than others. The construct of self worth, combined with the personal interest can contribute to clarifying the reason for overachievements. As to the underachievement the lack of motivation together with the negative effect of anxiety can explain the sources for underachievement. Empirical research confirmed the negative effects of anxiety on academic performance. Hembree (Pintrich & Schunk, 2002: 301, cited Hembree, 1988), in a meta-analysis of 562 studies that related test anxiety and academic achievement, found that test anxiety does cause poor performance, is negatively related to self-esteem, and is directly related to students' defensiveness and fear of negative evaluation.

People at sea are subjected to hard life being away from their families and homes. If the onboard instruction is difficult or boring there is a high risk that the mariners will lose their motivation and hence will get low achievements. The anxiety caused by not performing well could even worsen their life on board. To maintain reasonable self-concept and motivation, the onboard instruction should be designed in a comprehensible, user-friendly manner and based on various case studies and real-life problems.

3. Distance Learning

As mentioned in Chapter I, distance learning in MET systems has a long history. In the past when MET establishments did not exist, the navigational skills were acquired during sea apprenticeship on board. However, the development of communication technology fundamentally changed the methods of learning in the maritime field (see Ch. I - 2.2.1).

Distance learning is defined as "the practice of educating learners who are separated from the teacher or trainer and each other by space, time, or both" (Moller, 1998:115). Distance education occurs in a non-class room setting when students participate in course discussions, exercises, and receive assessment from the instructor by utilizing technology such as video conferencing, audiographics, CD-ROM, and web-based media (Welsh, 1999:41). Distance learning programs are becoming increasingly popular at academic institutions and corporations. They are valued because they offer learning opportunities for people that are normally restricted by class time and space (McHenry & Bozik, 1997:21).

Serious financing is required for the design and implementation of suitable distance learning in the GMDSS onboard. The shore-based GMDSS, however, is also expensive. The main

question, therefore, is not the cost, but suitability and effectiveness of onboard GMDSS course.

At present, the mariners can get all the training materials they need on a CD-ROM that can be used on almost any computer on board. The point, however, is whether a training package alone is enough for achieving sufficient learning results. Observations show that training without pressure or help of a teacher is in general cases not successful (Kucharzewski, 2000). Therefore, competent instructors should be involved in the delivery of ODL.

The distance learning is making a positive impact in education. Marie Salter and Dr. Liz Falconer (2002) from the Centre for distance education from the University of Bath affirm that education that recognizes the need for Continuing Professional Development (CPD) qualifications is of increasing importance. They address issues of transferable skills and improving the flexibility of the workplace. A differentiation is made that adult or continuous education has tended to focus on local short courses for communities geographically close to the education provider while distance learning programs have tended to be longer CPD or award-bearing programs that cater for a widely distributed population of learners (ibid.). The GMDSS course could be determined as CPD qualification course and should be intended at first only at training the officers onboard ships flying Bulgarian flag and, if successful, to be offered as distance learning program for a wider range of learners.

3.1 Adult Distance Learning

Since the GMDSS course ashore proves in many cases to be ineffective, other variants for organizing learning, suitable for adult learners, should be looked for. The onboard GMDSS course could be a solution. As the onboard GMDSS course is aimed at delivering training to adults, the peculiarities of adult learners should be carefully considered. Moreover, the circumstances onboard the ships are quite different from those ashore with respect to diversity. Special attention is needed to be paid to the design of instruction for adult individuals who are subjected to live in limited space and community. Hence, the focus of attention of the designers should be on finding out the specific features of behaviour of the adults as learners, their preferences and motives for undertaking a learning enterprise.

According to Malkolm Knowles, a recognized leader in the field of adult education, "adults tend to be more motivated toward learning that helps them solve problems in their lives or results in internal payoffs" (Knowles, Holton & Swanson, 1998:149). The motivators for adults are both external and internal (see section 2.2). The external motivators are better jobs, promotion, higher salary and the like. The internal motivators are job satisfaction, self-esteem and the like. Both external and internal motivators influence adults inside or outside companies and organizations. Adults are more responsive to internal motivators because they have a self-concept of being responsible for their own decisions. Thus, according to Tough's research findings (Knowles, Holton & Swanson, 1998:56, cited Tough, 1979) some learning benefits are immediate – satisfying curiosity, enjoying the content, enjoying the activity, social contacts, enjoying practicing new skills and the like. According to the above research there are long-run benefits as well – producing something, imparting knowledge or skills, understanding future situations. The above findings clearly indicate that pleasure and self-

esteem are critical elements for adult learners' motivation. Obviously, the element of pleasure and self-esteem is applicable to activity-oriented and learning-oriented adults.

Teaching adults is different from teaching children and is subject to the science of andragogy. The andragogical model focuses on the education of adults and is based on several assumptions that are different from those of the pedagogical model. **Table1** (after Knowles, Holton & Swanson, 1998) represents the assumptive differences between pedagogy and andragogy.

Assumptions		
About	**Pedagogical**	**Andragogical**
Concept of the learner	Dependent personality	Increasingly self-directed
Role of learner's experience	To be built on more than used as a resource	A rich resource for learning by self and others
Readiness to learn	Uniform by age level and curriculum	Develops from life tasks and problems
Orientation to learning	Subject-centered	Task or problem-centered
Motivation	By external rewards and punishment	By internal incentives and curiosity

Table 1

Distance education is primarily directed to adult learners who are often considered as non-traditional learners. Historically, non-traditional learners have been defined as persons over age 25 (Gibbons & Wentworth 2001, cited Whisnant, Sullivan and Slayton, 1992). Self-motivation of non-traditional learners is frequently stated as one of the most significant factors influencing academic achievements (Gibbons & Wentworth, 2001, cited Kuh &Cracraft, 1986; Wolfgang & Dowing, 1981). Considering the online instruction, Gibbons and Wentworth (2001) assert that the online instructors must fully understand, beside the differences between onground and online delivery methods and the conversion of onground material to an online format, also the unique needs of the non-traditional learner. Thus, the nature of the online learner suggests that the online instructor training be based on the andragogical theory.

3.2 Methodological Aspects

A finding of METHAR concerning the use of new technology in MET in the observed countries, is that there is "a clear lack of training in the use of CBT being made available to

instructors" (METHAR, 2000). This indicates that MET on the old continent is still rather conservative.

Some educators believe that distance learning requires a new pedagogy. Educators promoting the new pedagogy in distance education state that the class needs to be student-oriented. They claim that distance education requires a "personalized and empathetic rapport with the students in both verbal and printed communications" (Markel, 1999: 212). Moreover, some educators maintain that the use of electronic media necessitates new teaching strategies (ibid.). Conversely, other educators maintain that regardless of the instruction medium, the training course must be student-centered.

Seemingly, MET teachers are used to the proven "chalk and talk" method and feel comfortable with the traditional instructional approach (TIA). With TIA learners rely heavily on instructor's knowledge, which is disseminated in a unilateral (teacher to student) lecture - based method. Learners are expected to accept without question the information disseminated, "learning" the material and delivering it back to the teacher in the same manner it was presented to them. Thus, learners develop mainly their reproduction skills.

It is a great temptation to extend the existing MET onboard ships applying TIA to the distance students via modern communication technology. However, Dr. H. Gibbons and G. Wentworth (2001) from Brenau University in Gainesville warn that the attempt to bring traditional onground techniques to the online classroom can be *detrimental* to the motivation of the online learners. They state (ibid.) that the online instructors must fully understand the differences between onground and online delivery methods, the conversion or development of onground material to an online format and the unique needs of the non-traditional learner (see section 3.1).

Student-oriented learning requires a new approach. Jan van der Akker (1999) outlines the changes in pedagogy/didactics as:

- activity based and independent learning;
- development of high order skills;
- variation in resources and environment for learning;
- teacher's role shifting from instructor to facilitator.

Regarding the above, the onboard instruction should stress on elaborating solutions to specific problems, case studies, and real-life situations rather then reproducing learning contents. The distance instructor, therefore, should be in charge primarily of keeping the students active and motivated and of encouraging their independent learning.

Distance learning supported by modern communication technology can provide variation in resources and environment. The instructor can either provide hints and directions to every

student depending on the particular learning style or to provide communication link with another student with similar tasks or problems.

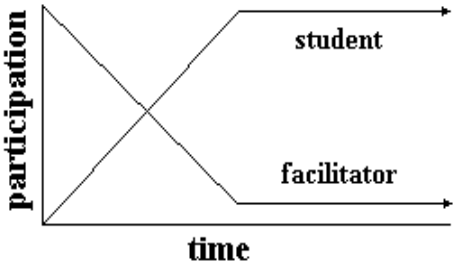

Fig. 2

All of the above-laid outlines the necessity to change teacher's role from instructor to facilitator. Initially, the instructor has main responsibility to attract and retain activity and motivation of the students. The increased activity of the students then changes the proportion of participation. This shift from instructor to guide and facilitator should be transparent to the students who begin to serve as the primary source of learning in an open and collaborative environment. **Figure 2** (after Gibbons & Wentworth, 2001) illustrates the level of participation over time of the main actors in the learning process.

4. Dick and Carey Systems Approach Model to Instructional Design

In order to be successful, the instructional design should rely on the appropriate design model. A contemporary view to the instructional process is that instruction is a systematic process. A prominent model in the instructional design domain is Walter Dick and Lou Carey Systems Approach Model to Instructional Design (1996).

Dick and Carey systems approach model is based on the idea that there is a predictable and reliable link between a stimulus (instructional materials) and the response that it produces in a learner (learning of the materials). The designer needs to identify the sub-skills the student must master that, in aggregate, permit the intended behavior to be learned and then select the stimulus and strategy for its presentation that builds each sub-skill. The Dick and Carey model prescribes a methodology for designing instruction based on a reductionist model of breaking instruction down into smaller components. Instruction is specifically targeted on the skills and knowledge to be taught and supplies the appropriate conditions for the learning of these outcomes.

Dick & Carey also adopted Cagné's (Cagné, 1977) hierarchical approach to analyzing goals. The hierarchical analysis technique suggested by Cagné consists of asking the question "What must the student already know so that, with a minimal amount of instruction, this task can be learned?" By asking this question, the designer can identify one or more critical subordinate skills that will be required of the learner prior to attempting instruction on the step itself. This hierarchy of skills is helpful to the designer because it can be used to suggest the type of specific subordinate skills that will be required to support any step in the goal" (Dick & Carey, 1996).

Figure 3 represents the Dick & Carey Systems Approach Model to Instructional Design.

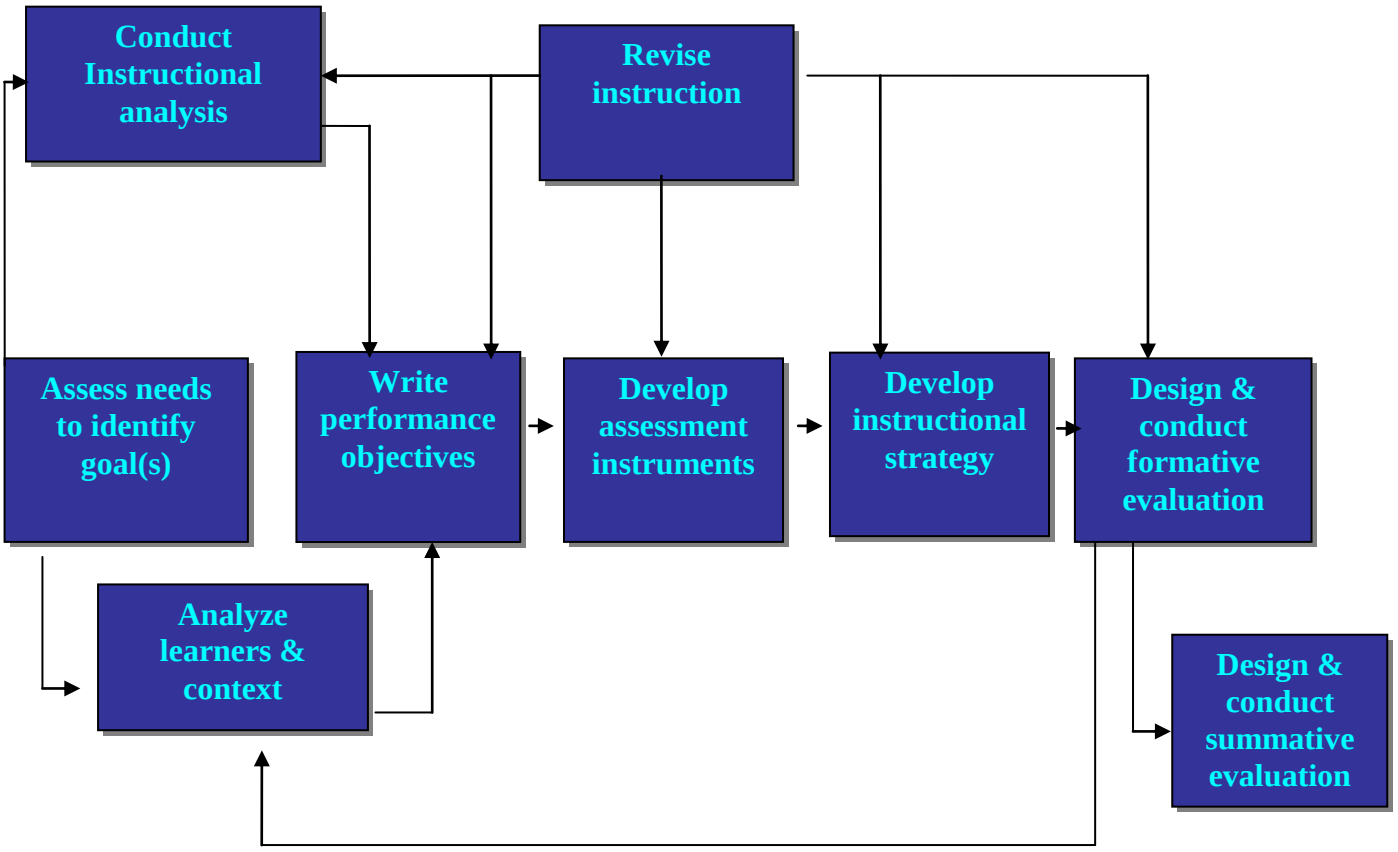

Fig.3

4.1 Elements of Dick & Carey Systems Approach Model

The basic elements as seen in **Figure 4** can be listed and described as follows:

- *determine instructional goal* – what do you want learners to be able to do when they have completed the instruction;

- *analyze the instructional goal* – a step-by-step determination of what people are doing when they perform the goal and what entry behaviors are needed;

- *analyze learners and contexts* – context in which the skills will be learned and the context in which the skills will be used;

- *write performance objectives* – specific behavior skills to be learned, the conditions under which they must be performed and the criteria for successful performance;

- *develop assessment instruments* – based on the objectives;

- *develop instructional strategy* – identify strategy to achieve the terminal objective; emphasis on presentation of information, practice and feedback, testing;

- *develop and select instruction* – using the stated strategy produce instructional materials;

- *design and conduct formative evaluation* – testing of instructional materials in one-to-one, small groups or field evaluations so that the materials can be evaluated with learners and revised prior to distribution;

- *revise instruction* – data from the formative evaluation are summarized and interpreted to attempt to identify difficulties experienced by learners in achieving the objectives and to relate these difficulties to specific deficiencies in the materials;

- *summative evaluation* – independent evaluation to judge the worth of the instruction.

4.2 Key terms

The key terms used in Dick & Carey instructional design approach are as follows:

- *needs assessment**:*** the formal process of identifying discrepancies between current outcomes and desired outcomes for an organization

- *performance objectives:* a statement of what the learners will be expected to do when they have completed a specified course of instruction, stated in terms of observable performances;

- *sub-ordinate objectives:* an objective that must be attained in order to accomplish a terminal objective;

- *terminal objective:* an objective the learners will be expected to accomplish when they have completed a course of instruction;

- *instructional analysis:* the procedures applied to an instructional goal in order to identify the relevant skills and their subordinate skills and information required for a student to achieve the goal;

- *instructional strategy:* an overall plan of activities to achieve an instructional goal; includes the sequence of intermediate objectives and the learning activities leading to the instructional goal;

- *hierarchical analysis:* technique used with goals in the intellectual skills domain to identify the critical subordinate skills needed to achieve the goal, and their inter-relationships;

- *formative evaluation:* evaluation designed to collect data and information that is used to improve a program; conducted while the program is still being developed;

- *summative evaluation:* evaluation designed and used after an instructional program has been implemented and formative evaluation completed; the aim is to present conclusions about the worth of the program and make recommendations about its adoption or retention.

5. Conclusion

The conceptual framework and the Dick and Carey Systems approach model elaborated in this chapter are of practical value for the design of the onboard variant of the GMDSS course. The concept of motivation that is subject to thorough consideration (sections 2.2-2.4) is of prime importance while designing the GMDSS course. The concept of adult learning related to the concept of motivation highlights the key issues that should be taken into account in order to ensure effectiveness of the new instruction.

The peculiarities of the distance education, especially the via-internet variant should be observed and it is of crucial importance to follow the methodological advice given by distinguished scholars in the field when choosing the instructional strategy of the course to be designed. The complete understanding of the student-oriented approach, especially when it comes to adult learners who are self-directed learners can guarantee the practicality of the instructional design.

The Dick and Carey Systems approach model provides the path to be followed when carrying out the design process. Steps in the model need to be followed the way they are given by the authors, but this alone cannot be the only prerequisite for the success of the instruction. Deep insight concerning the coherence of the key elements of the design model should be gained to ensure consistency of the systems approach, thus, providing for achieving sufficient learning results.

CHAPTER III

INSTRUCTIONAL DESIGN ANALYSES

1. Introduction

This chapter follows the Dick and Carey systems approach model to instructional design when designing the onboard variant of a GMDSS course. The needs assessment (section 2) is revealed in detail following all the stages as prescribed by Smith and Ragan (1999): problem-finding, problem-solving model (section 2.1), innovation model (section 2.2) and implications for design (section 2.3). The front-end analysis (section 3) encompasses thorough analyses of the learner (section 3.1), the context (section 3.2) and the task (section 3.3) with the relevant implications. Due relevance is paid to the IMO model course[*] and STCW Code where the minimum standards of competence for GMDSS radio operators are specified (sections 2 & 3). General classification of objectives is laid out (section 3.3.2) paying due regard to the performance, sub-ordinate and terminal objectives. The objectives are considered in detail as per the Dick and Carey model (1996), including the setting of the criterion for successful performance. Information processing analysis is justified (section 3.3.3) and IPA of one of the objectives is provided.

2. Needs Analysis

2.1 Problem-Finding, Problem-Solving Model

Thorough analysis of the needs for synchronizing MET practices with the new trends of education and training is revealed in Chapter I. One of conclusions is that introducing ODL can shorten the duration of the shore-based education and will also provide for diversity in shipboard life style. Thus, the working conditions and the career prospects for the seafarers will become more attractive and will appeal to young, well-educated people.

The need for instruction in developing onboard GMDSS course is acknowledged by the staff of BMTC. The lecturers of the navigational department who conduct GMDSS courses, feel that the growth of popularity of Internet-mediated communication and education have made manifest the need for developing Internet-based courses in order to ensure that the educational needs of the mariners are met in the most efficient manner. They realize that this should be achieved by applying the most effective, efficient and up-to-date delivery methods possible. Moreover, they have the grounds for endeavoring such an undertaking since the Internet variant of distance education is subject of many MET conferences held in the Black Sea region and worldwide. Furthermore, there is a relevant IMO instrument promulgated by IMO Sub-committee on Standards of Training and Watchkeeping (STW). This is a guidance for the development of CBT for seafarers created after the Nautical Institute's first annual CBT@Sea conference at the end of the year 2000.

The problem of developing onboard GMDSS training is pervasive. As outlined in Chapter I, since 1 February 1999 the availability of GMDSS equipment and qualified GMDSS operators are mandatory for all IMO member states. Following the above requirements and seeking for more flexibility and efficiency, the crew manning agencies and shipping companies imposed

[*] IMO Model Course 1.25 – *General Operator's Certificate for the GMDSS,* issued by IMO, 1996

the requirement for all navigating officers to be holders of GOC - GMDSS and optimized their crews by dismissing the position of the former radio-operators.

The producers of communication equipment have also responded to IMO requirements and have offered variety of approved equipment with different hardware and software configurations. It is natural that the companies prefer to educate their staff in using the equipment installed onboard their ships. With respect to the above-described circumstances an ODL course would be a good solution since it will be conducted in real-time and in real-life environment.

Other factors, which exacerbate the problem, are the inconsistency of the training and the inconsistency of the technical support available. Frustration often occurs since the GMDSS equipment onboard most often differs from the GMDSS simulators at the training centre ashore.

IMO subcommittee STW circulated a nautical briefing on Information technology and the Training needs of seafarers in STW33/INF.2. There David Patraico from the Nautical Institute in London (STW33/INF.2) justifies the shore training on IT. He observes that the instructor-led training ashore brings the benefit that job distractions are limited, and greater attention can be given by the seafarers to the task at hand, however, there are costs incurred for travel, subsistence and often wages. He claims also that shore based training suffers from lack of retention and that it is estimated that after a month's time only 30% of knowledge is retained. If this time period coincides with a seafarers time on leave, the retention can be even less (ibid.). Seemingly, for that reason there is a tendency big shipping companies as the Japanese K-line for example, to engage their officers with the simulator training right before boarding the vessel, so that the retention of knowledge is higher and directly applied on real equipment.

Lack of comprehensive training relates directly to the problem. There are many training packages including CBT programs on GMDSS available but still mariners as adult learners are demotivated to put efforts in learning the simulating equipment since the reality onboard could be quite different. Comprehensive instruction designed to encourage mariners as adult learners to take part in a learning enterprise and to facilitate developing skills using GMDSS real-life equipment is not presently available. Efforts are seen from IMO to develop standards for CBT. The Nautical institute in London also organized a conference in 2001 at the Inmarsat headquarters to bring together seafarers, ship operators, training colleges and software developers to debate the future of CBT and to try and develop a standard to assess the enormous range of packages available (Forward, 2001).

2.1.1 Problem Statement

Current state: After successful completion of GMDSS course based on simulator training ashore and obtaining GOC-GMDSS, the certified seafarers are not able to operate real GMDSS equipment onboard the ship they are assigned.

Desired state: After completion of approved GMDSS training and obtaining COG –GMDSS, the seafarer to be able to operate real GMDSS equipment on board.

2.1.2 Possible Solutions

Apparently using training equipment that simulates real onboard equipment is the solution. It can be done in two ways.

The first one is to order simulators that match real onboard equipment. That means every GMDSS equipment producer to provide also simulating equipment for training. Another way is to use the real onboard equipment for training by using ODL.

The second solution is widely but inappropriately practiced. Senior officers often organize follow-up instructions for junior officers – "just do as I do" type. The result is that the learner memorizes operation procedures and in fact is able to operate the real GMDSS equipment onboard. The shortcoming is that the learner has no effective control while operating the equipment.

2.2 Innovation Model

The need for onboard instruction for GMDSS can be considered a response to changes and innovations that are taking place in education and technology. The instructors of the "Navigation" department at the BMTC are aware of the impact, which technology and the Internet are having on teaching and learning and are increasingly interested in promoting ODL courses. Since the teaching staff of BMTC are used to introducing innovations in their work, such as simulator training, their influence can be considered a factor in the quest for innovation.

The introducing of the onboard variant of GMDSS course complements the mission of BMTC that is concerned primarily in providing the best maritime training possible in the region. The innovation model will stress on the application of the student-oriented approach, thus it will match the needs of the adult learners whose motivation is characterized by self-directedness and is sustained by solving real-life problem.

At the end of the instruction, a trainee successfully completing the onboard GMDSS course should be able to efficiently operate the GMDSS equipment and properly to conduct radio communications during distress situations. As specified in IMO GMDSS model course, one of the objectives is, given the severe problems being experienced in the GMDSS as a result of a large number of false distress alerts, trainees to be provided with techniques to avoid the unintentional transmission of false distress alerts and to know the procedures to use in order to mitigate the effects of false distress alerts following unintentional transmission. The innovation is that skills will be acquired onboard using real equipment. Achievement of the learning objectives as specified in the IMO model course, with the onboard variant is considered beneficial to the department of "Navigation" at the BMTC. The expected overall result of the new instruction is facilitating the trainees' skills acquisition in handling the real-life GMDSS equipment onboard the ship they are assigned.

2.3 Implications for Design

The needs assessment revealed above indicates the following implications for the design of onboard GMDSS instruction:

- The value of having officers who are competent in the use of the GMDSS equipment is found in their ability to use the real-life equipment at real time effectively;

- The Onboard GMDSS addresses the seafarers' needs for CPD and fully complies with their needs as adult learners;

- The advantage is that the real equipment and the software that the seafarer will be required to operate can be used and the instruction will be held in be in a real environment using topical scenarios;

- The cost of travel and subsistence, the time from shore leave for the seafarers is removed;

- The assessment of competence is more accurate;

- The instructors themselves will enrich their knowledge in actual problems concerning GMDSS equipment;

- The commercial argument is that the shipping companies will benefit from educating their staff without having to spend time and resources for simulator training courses, which in some cases prove to be ineffective.

3. Front-end Analysis

Understanding of how the learner, the learning task, and a particular technology interact is limited. Smith and Ragan (Smith and Ragan, 1999) point out that before developing an instruction a front-end analysis should be made. During the front-end analysis, designers analyze three basic components: the prospective learners, the instructional context, and the learning tasks.

3.1 Analyzing the Learner

Learner characteristics are a major factor in the achievement and satisfaction levels of the distance learner. Information regarding students' preferred learning style would influence how the course is designed and the type of technology to be used. Additional research could result in more information regarding why different technologies might be better suited for specific learning tasks.

The new instruction should be directed mainly towards the commanding staff, since this is the target group where the GMDSS requirements of STCW apply. Moreover, the officers comprise the better-educated part of the crew. Three aspects of the officers as prospective learners deserve to be paid relevant attention with respect to the suitability of the design and implementation of the onboard GMDSS instruction: peer relationships, cognitive development and motivation.

3.1.1 Peer Relationships

Many researchers consider learning a social process. IMO instruments, namely STCW in the section of Bridge Resource Management (BRM), encourage peer interaction in the in-service

training. BRM recommends senior officers to help in the training of junior officers. In its essence BRM promotes teamwork and all kind of cooperation among the deck officers.

Well-known fact is that crews nowadays are often multinational. There are religious, racial and ethnical differences among the crewmembers. Affective characteristics of the officers vary widely, depending on the individual adaptation abilities. Peer relationships are often competitive since the crews usually comprise of only male individuals. However, the discipline is of high level, since a strict hierarchy of ship's life organization is observed.

3.1.2 Cognitive Development

Cognitive development of the prospective learners is important for defining the entry requirements. Investigation on the prospective learners' cognitive development is relevant to identifying the level of difficulty of the instruction to be designed.

As per the IMO model course on GMDSS, the entry standards require little knowledge of radio communicating practice, but a working knowledge of English as a second language. Elementary computer skills are presumed in the recommended course timetable.

All mariners have undergone some initial education and training that is subject to common international standards. The cognitive development of the officers is high since they graduate from nautical colleges or academies. The officers are required to periodically retrain and upgrade their professional knowledge through attending various training courses in MET institutions recognized by the national maritime authorities. Being commanding officers, they are used to undertaking training courses and subsequent exams and have, in general, a positive attitude towards the learning process.

3.1.3 Motivation

Intrinsic and extrinsic reasons drive seafarers in undertaking learning activities. Motivation to learn is related to promotion opportunities onboard, as well as with preparation for exiting seafaring and settling with shore-based occupations. Self-motivation of learners is considered as the most significant factor influencing their academic achievements (see Ch. II - 2). Learning is also affected by motivation (Bandura, 1986).

Nowadays mariners usually come from comparatively poor countries. Through their sailing experience they achieve a positive attitude towards gaining knowledge as means of improving life standard. Being holders of GOC-GMDSS seafarers have better prospects for employment and salary increase as well as better chances in finding work ashore.

3.1.4 Implications for Design

The learner analysis revealed above indicates the following implications for the design of onboard GMDSS instruction:

- High cognitive development, discipline and motivation to learn suggest that the officers will be able to benefit from the onboard GMDSS instruction.

- Competitive relationships and motivation are linked in the chain of officer's promotion. This indicates that it is likely officers to evaluate knowledge obtained through onboard GMDSS course as means for achieving shipboard promotion.

3.2 Analyzing the Context

As per Dick and Carey model, analyzing the context means considering the context in which the skills will be learned and the context in which the skills will be used. In the case of distance instruction, twofold context analysis is relevant to be made for the purpose of justifying objectively the suitability of the new instruction – onboard the ship where learning is to take place and ashore from where the instruction will be delivered.

3.2.1 On board

Fortunately, under the urgent market demands for optimizing the work onboard and under the growing safety requirements of IMO, most of the ships nowadays are equipped with computers and are provided with email via satellite. So, the prerequisites of the technical part are fulfilled. Yet the biggest barrier to effective e-learning services onboard ships is the high cost of ship-shore communications, which makes Internet surfing onboard impossible and dedicated shipboard applications extremely expensive. Still the e-mail is the most efficient and reliable means of delivering training onboard.

Nowadays ships are equipped with computers and satellite communication facilities. There are software packages and hardware systems that enable transmitting and receiving wide range of file formats at speed up to 64 Kbit/s through Inmarsat networks. Various communication software packages support POP3/SMTP based clients on ships and provide access to the Internet.

Since the cost per month for a single mailbox is about $100, the cost per Inmarsat connections is still very high. For that reason the latest innovations in education, such as video-conferencing and on-line discussions, will not be introduced on board for the time being. However, well-structured CBT, with e-mail assignment and feedback exchange, may prove effective and efficient.

3.2.2 Ashore

MET institutions carry out all the training that needs to be done in accordance with STCW requirements. Up-to-date facilities, such as "Poseidon" GMDSS simulator, computer networks and a language lab, are available at the BMTC. The teaching staff complies with the requirements of STCW for marine instructors, examiners and assessors (STCW'95, Reg. I/6, Sec.A-I/6 para 3). The requirements to the GMDSS instructors as given in IMO model course are as follows:

"All training and instruction should be given by personnel properly qualified in the subject matter. Instructors of practical training should be in possession of valid General Operator's Certificate. In addition to having considerable experience in maritime radio-communications, including the GMDSS, all instructors should have good general knowledge of ships, maritime safety and search and rescue matters."

The maritime instructors on the GMDSS subject at the BMTC comply with all IMO requirements concerning qualification and practical experience. Moreover, they are apt to use innovations in their work since they are concerned with qualifying personnel for a fast developing international industry.

3.2.3 Implications for Design

The context analysis revealed above indicates the following implications for the design of onboard GMDSS instruction:

- The availability of teaching facilities ashore and access to computers and e-mail onboard ships indicate that introducing ODL in GMDSS is feasible.

- The opportunity of the mariners to learn in realistic environment links knowledge with experience. In real-life situations the newly obtained knowledge will have impact on performance onboard. These unique contributions of ODL prove its adequacy.

- The positive attitudes of the instructors towards innovations suggest that they will be capable to design and deliver distance-mode instruction. Moreover, there is a shore-based prototype of the training course to be designed.

3.3 Analyzing the Task

Every instruction is task specific. Following the routine procedure in the Dick and Carey model, the task should be decomposed into goals and objectives which should clearly state what every learner is expected to be able to do or to know at the end of a given instruction. Taking into consideration that the shipping industry tends to shift towards procedure controlled operations as per the ISM Code, the task of onboard instruction should be directed towards obtaining concrete skills, especially those related to complying with the STCW and the ISM Code requirements for competency.

The task of GMDSS is specified in IMO documents. Formulation of the task of the course to be designed is as follows:

The onboard GMDSS instruction should be aimed at providing and imparting all knowledge and skills, necessary for the trainees for undertaking the duty of the GMDSS operator on board the ship.

3.3.1 The Learning Goals

In Chapter IV of the STCW Code, the standards regarding radio personnel are considered. Section A-IV/2 gives the mandatory minimum requirements for certification of GMDSS radio personnel. The standards of competence summarized in the STCW are as follows:

"The minimum knowledge, understanding and proficiency required for certification of GMDSS radio personnel shall be sufficient for radio personnel to carry out their radio duties.

The knowledge required for obtaining each type of certificate defined in the Radio Regulations shall be in accordance with those regulations."

This excerpt of STCW Code provides an opportunity of different interpretation of the word "sufficient". This is an evident shortcoming because the different member states may impose different criteria for sufficiency. Table A-IV/2 of STCW Code (*Appendix 1*) is more precise, though words with unclear meaning still pop up.

Table A-IV/2 provides the specification of minimum standard of competence for GMDSS radio operators. The goals of onboard instruction should meet the requirements for knowledge, understanding and proficiency postulated in column 1 of the table (see *Appendix 1*). In order to work as a GMDSS operator, a seafarer should be able to transmit and receive information using GMDSS subsystems and equipment and to provide radio services in emergencies.

The goals of onboard GMDSS training do not differ from those found in table A-IV/2. The learning goals of the onboard instruction are two in number and are formulated as follows:

Goal 1: *At the end of the instruction learners to be provided with knowledge and skills necessary for operating the GMDSS equipment onboard ships.*

Goal 2: *At the end of the instruction learners to be provided with knowledge and skill necessary for adequate response to emergency situations with ships in distress.*

3.3.2 The Learning Objectives

As Dick and Carey point out, the next step after identifying the instructional goals is to write down the performance objectives. This involves determining the specific behavior skills to be learned, the conditions under which they must be achieved and the criteria for successful performance.

Concerning the performance objectives, the STCW states: "The knowledge, understanding and proficiency for endorsement under the Convention of certificates issued under the provisions of the Radio Regulations are listed in column 2 of table A-IV/2. The level of knowledge of the subjects listed in column 2 of table A-IV/2 shall be sufficient for the candidate to carry out his duties". Column 2 of table A-IV/2 states that the candidates for certification shall have knowledge, understanding and proficiency in:

1. Search and rescue radiocommunications, including procedures in the IMO Merchant Ship Search and Rescue Manual (MERSAR)

2. The means to prevent the transmission of false distress alerts and the procedures to mitigate the effects of such alerts

3. Ship reporting systems

4. Radio medical services

5. Use of the International Code of Signals and the Standard Marine Navigational Vocabulary as replaced by the Standard Marine Communication Phrases

6. The English language both written and spoken for the communication of information relevant to safety of life at sea

In fact, the above-listed items comprise the objectives originating from the first goal. Since every GMDSS course has to comply with STCW, no matter whether it is a shore or onboard variant, the objectives of the onboard GMDSS course are the same as those found in column 2 of table A-IV/2. **Figure 4** shows the graphical representation of decomposition of the Goal 1 into the defined objectives.

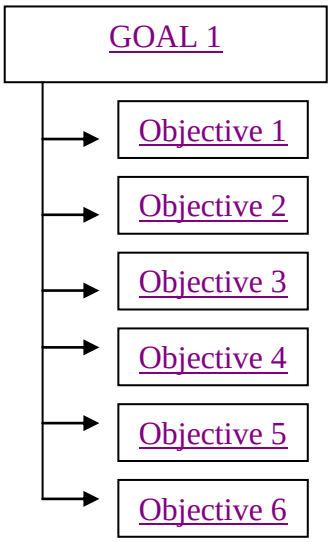

Fig. 4

Again as per Column 2 of TableA-IV/2, the second goal is decomposed into objectives related with gaining proficiency in provision of radio services in emergency situations as:

1. Abandon ship

2. Fire on board ship

3. Partial or full breakdown of radio installations

4. Preventive measures for the safety of ship and personnel in connection with hazards related to radio equipment, including electrical and non-ionising radiation hazards

Figure 5 shows the graphical representation of decomposition of the Goal 2 into the objectives outlined above.

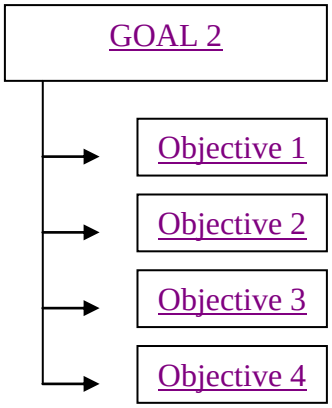

Fig. 5

The statements in column 2 of table A-IV/2 could be considered as per the Dick and Carey model, the performance objectives. Writing a performance objective involves forming a statement of what the learners will be expected to do when they have completed a specified course of instruction, stated in terms of observable performances**.** Since the performance objectives in column 2 of table A-IV/2 are rather broadly formulated and encompass a great amount of learning material, each performance objective has to be decomposed into sub-ordinate objectives. As given in Chapter II section 4.2, the sub-ordinate objective is such an objective that must be attained in order to accomplish a terminal objective. The terminal objective as per the Dick and Carey model is defined as an objective that the learners will be expected to accomplish when they have completed a course of instruction. Verification of achieving the terminal objectives is the examination. As per the IMO model course -1.25, the terminal objectives of the GMDSS training are:

1. Read and understand written distress and safety messages received via NBDP and Inmarsat-A/-B/-C;

2. Compose written distress and safety messages for transmission via NBDP and Inmarsat-A/-B/-C;

3. Conduct distress traffic and participate actively in SAR communication via radiotelephony;

4. Read and understand the information given in all relevant service documents, including the technical part of the technical documentation;

5. Carry out all relevant and necessary general radiocommunications using radiotelephony, NBDP and DSC.

When writing the performance objectives, the instructors at the BMTC should be aware that the standard statement for an objective should contain three components - the skills to be

learned, the conditions and the criterion for successful performance (Mager, 1962). So far, the first two components are considered.

The next step under Dick and Carey model is to set the criteria and develop assessment instruments that are based on the objectives. According to Smith and Ragan (Smith & Ragan, 1999:85) the description of standard or criterion must state how well the learner must do to be assumed that he/she has achieved the objective. The STCW established criteria for evaluating competence, which are mandatory for all IMO member states. They are tabulated in column 4 of table A-IV/2. The criteria for evaluation as stated in column 4 of tableA-IV/2 are:

- Transmission and reception of communications complies with international regulations and procedures and are carried out efficiently and effectively.

- English language messages relevant to the safety of the ship and persons on board and protection of the marine environment are correctly handled.

- Response is carried out efficiently and effectively.

Robert Mager, the author of the three-component objective, states that the standard or criterion may refer to accuracy, number of errors or correct responses, consistency with established or stated standard, and the desired consequences (Smith and Ragan, 1999:85, cited Mager, 1962). In STCW, often the criterion for a certain performance is set by the phrase "*to the satisfaction of Administration*". When used to define criterion or standard this phrase contains rather vague meaning, as do the words *relevant, efficiently* and *effectively*. Table A-IV/2 also contains assessment criteria defined by using the above-mentioned words.

The BMA together with GMDSS instructors at BMTC have elaborated own assessment criteria, clearly stated and higher than the minimum standards of table A-IV/2 (see *Appendix 2* - cover sheet and criterion description for each part on test sheets). Further elaboration from the IMO experts is needed on formulating the criteria so that subjective judgements are eliminated and the objectivity and uniformity of assessment are guaranteed worldwide. Detailed consideration should be given to defining the exact extent of what is accepted to be relevant, efficient and effective.

After writing the objectives in three-component format, the type of every objective should be defined. Then, information processing analysis (IPA) for every separate objective or sub-objective needs to be done.

3.3.3 Information Processing Analysis (IPA)

The instructional analysis is a step in the Dick and Carey model of instructional design. It coincides with IPA since both analyses are concerned with analyzing the procedures applied to an instructional goal in order to identify the relevant skills and their subordinate skills and information required for a student to achieve the goal. Performing the IPA of each separate objective includes step-by-step description what the trainees would be doing in order to achieve the objective. IPA is subject to carefully consideration of the learning content and the structure of the course. The instructors must show thorough knowledge of the principles of

learning and instructional design, so that the type of every objective is defined and appropriate instruction is designed. The objectives as stated in section 3.3.3 could be decomposed to subordinate objectives so that elaboration on the IPA is more precise. An example of IPA to one of the GMDSS objectives is revealed below as an example.

Objective: *Given instruction, learners can perform all procedures for distress alerting.*

This is *a procedural* objective aimed at checking whether the learners are able to apply the GMDSS operating guidance[*] for masters of ships in distress situations (see *Appendix 3*). This guidance prescribes the steps to be followed in distress situations (Admiralty List of Radio Signals-ALRS).

Below is IPA for the objective. See **Figure 6** for graphical representation.

1. Determine whether distress alerting is required
2. Recall and do the following steps if the vessel is sinking or to be abandoned:

2.1 Transmit distress call
2.2 Embark in survival craft with VHF, EPIRB and/or SART
2.3 Switch on EPIRB and/or SART immediately

3. Recall and do the steps if vessel is not to be abandoned but immediate help is needed:

3.1 Transmit distress call
3.2 Communicate RCC and ships if response received
3.3 Switch on EPIRB and SART if response not received

4. Recall and do the steps if potential problem exists

4.1 Notify RCC
4.2 Communicate with RCC and ships if response received
4.3 Continue notifying RCC if response not received

[*] Note that in the GMDSS domain all recommendations and guidances are considered mandatory.

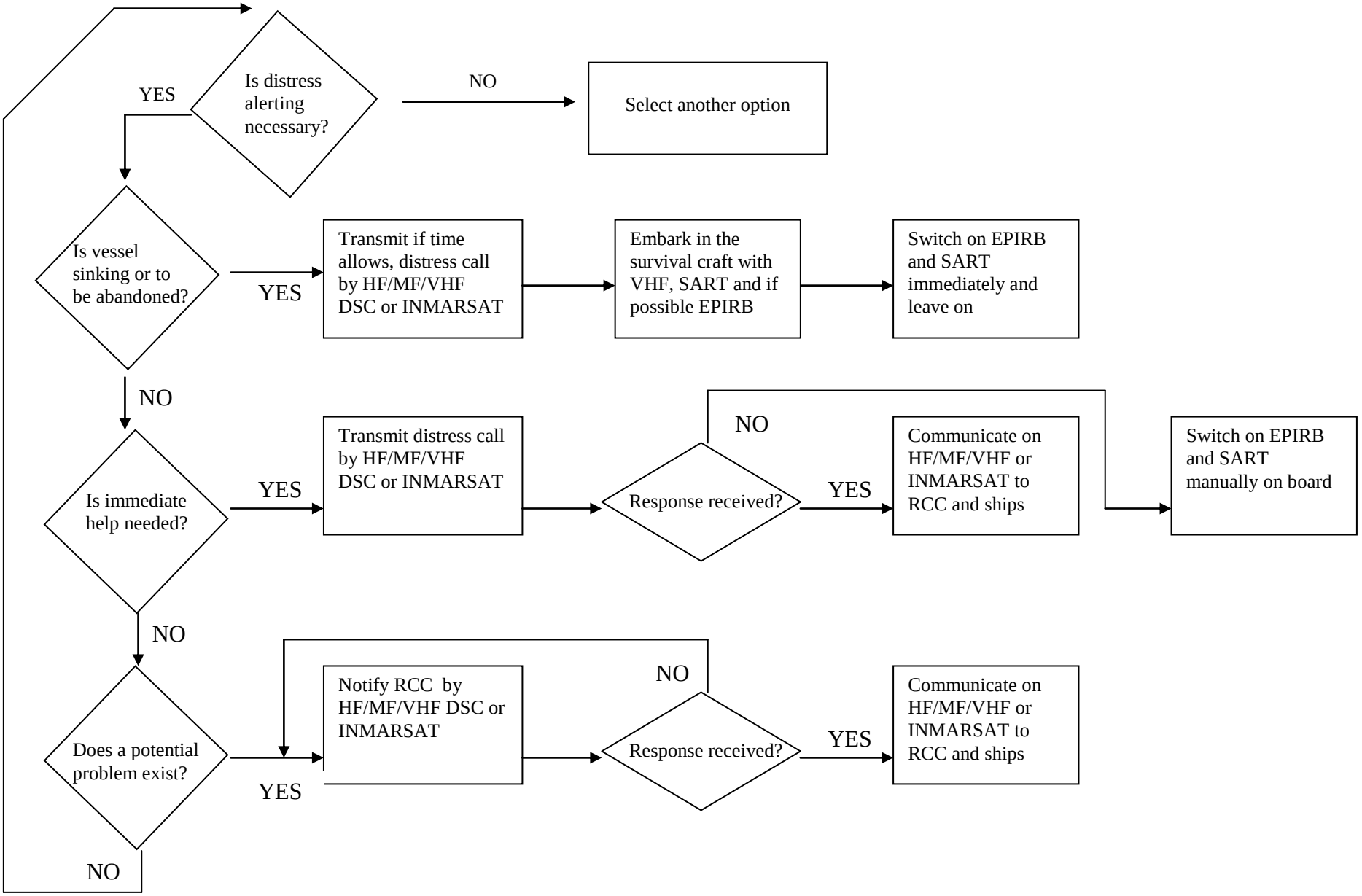
Is distress alerting necessary?
YES
NO
Select another option
Is vessel sinking or to be abandoned?
YES
Transmit if time allows, distress call by HF/MF/VHF DSC or INMARSAT
Embark in the survival craft with VHF, SART and if possible EPIRB
Switch on EPIRB and SART immediately and leave on
NO
Is immediate help needed?
YES
Transmit distress call by HF/MF/VHF DSC or INMARSAT
Response received?
NO
YES
Communicate on HF/MF/VHF or INMARSAT to RCC and ships
Switch on EPIRB and SART manually on board
NO
Does a potential problem exist?
YES
Notify RCC by HF/MF/VHF DSC or INMARSAT
Response received?
NO
YES
Communicate on HF/MF/VHF or INMARSAT to RCC and ships
NO

Fig.6

4. Conclusion

Following the steps of the Dick and Carey systems approach model, this Chapter elaborates on clarifying the needs and the circumstances in which the onboard GMDSS is to be designed. An attempt has been made to carry out the analyses, with the relevant implications for design, the way they are prescribed by Smith and Ragan (1999).

The needs analysis provided in this chapter gives a clear picture of the factors that determine the practicality of the onboard GMDSS instruction. Identifying the real problem and the solution variants contribute to identifying the means by which the problem can be resolved. The introduction of the innovation model is based on the necessity of BMTC to keep in pace with the recent educational trend as well as on the willingness of the staff of the "Navigation" department at BMTC to use innovation as means of improving its work. The implications for design extracted from the needs analysis state the availability of the prerequisites for undertaking the design of the onboard instruction.

Front-end analysis reveals the strengths and weaknesses of the design of onboard GMDSS instruction. Detailed analyses of the learners and the context and the relevant implications provide for building the insight of the designers in concern of the specificity of onboard instruction. These analyses are of crucial importance for the design since the characteristics of the learners and the learning context are very specific and instruction designated for mariners delivered onboard has no precedent in current MET practice in Bulgaria and in the region.

The task of the onboard instruction is revealed in the light of the relevant IMO requirements and instruments. The detailed consideration of the goals and the objectives with regard to their compliance with STCW provides the clear grounds for proceeding with the design work.

CHAPTER IV

INSTRUCTIONAL DESIGN WORK

1. Introduction

The chapter reveals the design and evaluation work of the onboard GMDSS course. Recommendations prescribed by STCW are paid relevant attention through the whole process. Framework (section 2) of the course provides detailed information of the organization of the course material (section 2.1.1), duration (section 2.1.2) and examination (section 2.1.3). Contents (section 2.3) and the objective of the course (section 2.2) are also regarded. Developing the instructional strategy (section 3) is thoroughly considered through presentation of information (section 3.1), practice and feedback (section 3.2), and testing and evaluation (section 3.3). A comparison between the existing shore-based prototype and the new instruction (section 4) is made in terms of type (section 4.1), approach (section 4.2) and context (section 4.3) of both instructions as well as in terms of the motivation of learners involved (section 4.4). Developing the onboard instruction (section 5) is revealed by application of the student-oriented approach (section 5.2) Attention is paid to the conversion of the existing instructional materials on GMDSS to onboard variants (section 5.3). Introduction of a record training book is justified (section 5.4). In the process of implementation, the BMTC role (section 6.1), the shipping company's role (section 6.2) and the BMA role (section 6.3) are considered. As per the Dick and Carey model, evaluation is revealed in its two forms: formative (section 7.1) and summative (section 7.2).

2. The Framework of Course

Table A-IV/2 provides the minimum mandatory standards. This facilitates to a great extent the designer's work since the framework of the study material, the task and goals are defined as well as the assessment criteria are set. The methods of demonstrating competence in fact are the approved standards that have to be complied with when assessing and certifying the candidates for GOC-GMDSS (see *Appendix 1*).

2.1 Course Description

The onboard GMDSS course covers the training recommended in *Annex 3* to IMO Assembly resolution A.703 (17) – Recommendation on Training of Radio Operators related to the General Operator's Certificate (GOC). It follows the IMO model course 1.25 where a detailed teaching syllabus is presented in learning-objectives format with a course timetable of 132 class hours, theoretical and practical, roughly equal in number with a slight domination of practical classes. Provision is made that this course timetable assumes that the trainees have limited knowledge on communicating systems, techniques or sea experience.

2.1.1 Organization of Course Material

The division of the onboard material in theoretical and practical parts will remain the same as it is required by IMO and established in the shore-based course. Provided that the entry level of trainee is higher than that was presumed in IMO model course 1.25, the syllabus and the course timetable could be reduced to match the real needs of the trainees, which is the case with the existing GMDSS shore – based course currently in use at the BMTC

(http://bmtc-bg.com/eng/). This is due to the fact the theoretical part of the GMDSS is often studied during the secondary or higher nautical education and a large part of the trainees are already familiar with the basics of the radio - communication system.

2.1.2 Course Duration

Since the usual length of ship's voyage is longer than the length of the full-time training course, that is, at present, three weeks at the BMTC, the onboard course will be scheduled for twelve-week period. This is due to the fact that the officers are constantly engaged in giving watch without days off and also because the student-oriented approach requires independent learning and this involves more learning time spent on a self-study basis.

2.1.3 Examination

The examination will be carried out ashore at the BMTC together with the candidates who have attended the shore-based course. The examination board consists of independent examiners appointed by the BMA. Before the examination, the onboard trainees will have one-day familiarization and practical experience with the simulator available at the BMTC.

The existing procedure is the candidates for GOC-GMDSS to produce application and relevant documents to the BMA. Additionally, the candidates having attended onboard training, need to produce for inspection at the BMA's "Qualification of seafarers" office, a record training book duly signed by the master and the officer in charge of GMDSS onboard the ship they were assigned to, to verify that the practical part is carried out as per the preliminary set learning plan.

2.2 Objective of the Course

The detailed teaching syllabus of IMO model 1.25 course on GOC-GMDSS clearly describes what a trainee must demonstrate to verify that knowledge has been transferred. The expected learning outcome of the new instruction is: at the end of the instruction, the learners should be able to achieve the learning goals of the course (see Ch. III- 2.3.2).

Since the philosophy of the onboard course is different from the shore-based variant and it is aimed at developing high order skills and at acquiring practical skills in handling real equipment at real time, the formulation of the main objective of the course is as follows:

The onboard instruction through application of the student-oriented approach to provide for translating the basic GMDSS theoretical knowledge into practical skills, necessary for operating any GMDSS, its sub-systems which the trainees may encounter in their experience.

A trainee successfully completing this course and passing the prescribed examination will be enabled to efficiently operate the GMDSS equipment, and to have primarily responsibility for radio - communications during distress incidents. Given the severe problems being experienced in the GMDSS as a result of the large number of incidents that now occur, the

training will also encompass techniques for avoiding the unintentional transmission of false distress alerts and the procedures to be used in order to mitigate the effects of false distress alerts following unintentional transmission (see Ch III.-2.2)

2.3 Content of the Course

The material contained in the course covers all aspects of GMDSS and radio-communications training. The detailed teaching syllabus includes: elementary knowledge of frequencies, characteristics of radio-waves, general principles and basic features of the maritime mobile service and maritime mobile satellite service, radio equipment of the ship stations, digital selective calling, INMARSAT, NAVTEX, procedures for distress, urgency and safety communications, search and rescue operations, MERSAR, theoretical and practical knowledge of the basic communication procedures, composing radiotelegrams and telexes and charging.

The content of the course may be reduced if the candidate shows evidence for attending a GMDSS training, obtained in a recognized MET institution. However, there are additional requirements for certification under the STCW Convention listed in column 2 of table A-IV/2 of the STCW Code and it is up to the BMA to decide whether the general theoretical knowledge on the GMDSS obtained in secondary or higher MET institutions is valid for undertaking the reduced program on board ship.

3. Developing Instructional Strategy

The next step of Dick and Carey model is developing instructional strategy. Fenrich states that an instructional strategy describes the components of a set of instructional materials and procedures by which students apply the materials to achieve learning outcomes (Fenrich, 1997:80). Developing instructional strategy involves identifying the strategy by which the terminal objectives will be achieved. Subject to the chosen strategy is the presentation of information, the practice and feedback as well as the testing and evaluation.

3.1 Presentation of Information

The choice of the proper instructional strategy for presentation of information is vitally important for the success of any instruction. As analysed in Chapter II, seafarers as non-traditional learners are characterized with independence of choice what to study and with orientation to problem-solving tasks. As adult individuals they are inclined to learn by self and others (Ch. II - 3.1). Thus, the instructional strategy in presenting the material should be student-oriented with variety of case studies and problem solving assignments so that it suits the preferences of the target group.

Another aspect of the instructional strategy in presentation of information is the use of the English language. Since the STCW requires that seafarers whose duties include communications must have sufficient knowledge of the English language and the Radio Regulations recommend the use of the IMO Standard Marine Communication Phrases, the instructors, therefore, should themselves use the English language in their teaching so that the acquisition of the specific terminology is facilitated.

3.2 Practice and Feedback

3.2.1 Practice

To keep distance learner's motivation is a prerequisite for achieving learning results (see Ch. II - 2.4). Practice onboard should be based on the student-oriented approach. This means that to increase the learning depositions, the students should be given opportunity to solve real problems having direct applicability to their future work as GMDSS operators. Where practical skills are to be acquired, it is important that not only enough practice is provided but also that the learners are encouraged to reflect on their performance and to change ways if other ways are more effective. Provision is made that handling GMDSS equipment should be done under the strict supervision of the officer in charge of the GMDSS equipment on board the ship so that generating and emitting false distress alerts is avoided.

As mentioned in section 3.1, the strategy in presentation of information involves the use of the English language. The instructors also have to make sure that the students can effectively use the maritime English language for communication purposes. The instructor should require that the students reply to his questions, and put their own questions and comments, using the English language.

3.2.2 Feedback

Important part of the instructional strategy is giving prompt and objective feedback. As the instructor's role is considered as that of a guide and facilitator of learning (see Ch. II - 3.2), the feedback should be guiding and motivating. As Gibbons and Wentworth (2001) point out, the onground technique of giving short and standardized feedback should not be applied to distance learning. The role of the instructor involved in distance MET is to keep learners active and motivated and this could be achieved by encouraging feedback paying due attention to the individual learning style of every learner (ibid.). Providing prompt and carefully tailored feedback, matching the individual learning style, is a prerequisite for effectiveness of the onboard instruction.

3.3 Testing and Evaluation

For the onboard instruction, variety of tests should be developed so that the progress of onboard learners is continuously and objectively measured. Adults as learners would appreciate if clear and precise assessment criteria are set before every task at hand so that they are aware of their assessment. Thus, the instructional strategy in testing and evaluation should be based on objective testing, preferably, multiple-choice exercises and real problem-solving tasks, the area where adult learners feel confident in.

3.3.1 Objective Testing

Seafarers as adult learners would prefer objective testing to teacher's subjective judgement. A variety of objective tests have been developed over the years. The response is either right or wrong. The common feature of the objective testing is that the evaluation does not require a judgment by the evaluator.

3.3.2 Scoring

In simple scoring of objective tests, one mark may be allotted to each correct response and zero for a wrong or nil response. With a CBT test, which is the case with the onboard

instruction, the graphical view of learner's score compared to the maximum score will serve as a constructive feedback. The comments in a constructive tone, with a clear indication where to look for improvement, can really foster the learning on board. Scores can be weighed to reflect the relative importance of questions, or of sections of an evaluation.

3.3.3 Evaluation

The effectiveness of any evaluation depends on the accuracy of the description of what is to be measured. The learning objectives provide for sound base for construction of suitable tests for evaluating the trainees' progress. The instructional strategy with the shore-based course examination provides for objective measurement (see as example *Appendix 2*). Since the onground evaluation strategy guarantees objective measurement, it can be directly translated to the onboard variant.

The methods of evaluation range from simple question-and-answer discussions with the trainees to prepared tests requiring the selection of correct or best response from given alternatives, the correct matching of given items, the supply of short answers or the supply of more extensive written responses to prepared questions. Where the course content is aimed at acquisition of practical skills, the test involves practical demonstration by the trainee making use of appropriate equipment, tools, etc.

Subject to evaluation is the trainee's response. The response demanded may consist of:

- Recall of facts or information;
- The practical demonstration of the attained skill;
- The written description of procedures or activities;
- The identification and use of data from sketches, drawings, maps, charts, etc.;
- Carrying out calculations to solve numerical problems;
- Writing of a report.

Since the instructional strategy encompasses a wide scope of methods of evaluation, the onboard variant will have to make the best use of their application to bring diversity in the training. The officer in charge of the GMDSS onboard ship who will coach the onboard trainee in operating the equipment and will make entries into the record training book should be well aware of the instructional evaluation strategy to be applied.

4. Shore-based GMDSS versus Onboard GMDSS

IMO model course 1.25 specifies the learning contents and the learning objectives. It provides guidelines on conducting of training, evaluation and certification in accordance with STCW requirements for competence of GMDSS operators. However, IMO model course neither provides the way instruction is to be delivered nor does pay attention to the new methodological aspects of education and training. The shore-based GMDSS course serves as a prototype of the onboard variant; however, there are several major differences between the two courses which are evident.

4.1 Differences

4.1.1 In Terms of Course Type

The shore-based course is scheduled for three weeks period for reasons of economy (see Ch. III - 2) and can be considered an intensive one. Great amount of study load is delivered for a short period of time. The onboard variant is scheduled for twelve weeks and can be considered an extensive one. Study load is distributed on small portions, within a period, which is four times longer than the shore-based one.

4.1.2 In Terms of Approach Applied

The shore-based course is teacher-centered making use of the TIA. The active role is that of the teacher, while learners play a submissive role. The onboard variant is based on the student-oriented approach. The teacher's role is that of a guide and a facilitator. Thus, the teacher gives the floor to the trainees who have more active role in the learning process.

4.1.3 In Terms of Learning Context

The shore-based course is carried out in formal settings. Learning takes place in classrooms, laboratory and simulator premises. The onboard variant is carried out in informal setting. Learning takes place onboard ship, most often on the bridge where GMDSS equipment is installed.

4.1.4 In Terms of the Motivation

The shore-based course is focused on the extrinsic motivation of the learner. The reward is obtaining GOC-GMDSS for a short time. The onground course does not pay attention to the peculiarities of adult learning where motivation is of crucial importance. The onboard variant is an option to the shore-based variant and is longer in duration and is more time-consuming. The learners enroll there because of intrinsic motivation, driven by the incentive to learn to operate the real GMDSS equipment at real time.

4.1.5 Summary of the Identified Differences

Table 2 represents a summary of the identified differences of the two courses.

ABOUT	SHORE-BASED	ONBOARD
TYPE	*Intensive*	*Extensive*
APPROACH	*Teacher-centered*	*Student-oriented*
LEARNING CONTEXT	*Formal*	*Informal*
MOTIVATION	*Extrinsic*	*Intrinsic*

Table 2

4.2 Advantages of Onboard Instruction

On the basis of the analyses and the summary of the identified differences between shore-based and onboard courses, provided in section 4.1, the following advantages of the onboard GMDSS are worth considering:

- The onboard course as an extensive one provides for greater knowledge retention.

- Student-oriented approach applied to onboard course corresponds to the self-concept of the adult learner as a self-directed personality (see Table1).

- The informal setting contributes to adults' learning which is proved by Knowles observation that adults learn best in informal, comfortable, flexible, non-threatening settings (Knowles, Holton & Swanson, 1998:61).

- Intrinsic motivation of seafarers to learn corresponds to their internal incentives and reflects on their performance on board.

5. Develop and Select Instruction

The next step of the Dick and Carey model is developing and selecting instruction. Developing instruction means using the stated strategy in producing instructional materials. To keep learners motivated, the instruction should stress on developing activity based learning materials. This involves reconsidering the existing instructional materials and also conversing the onground materials into onboard ones.

The instructional materials will be converted from the existing ones by using student-oriented approach. The advances of the multimedia should be most effectively utilized. The onboard learners will be provided with a roster and all instructional material on a CD to be used onboard the vessel they are assigned to. To keep trace of the acquisition of practical skills a record training book need to be developed.

5.1 Books and References Needed

There are many books covering the contents of the GMDSS, or parts of the GMDSS available throughout the world. A number of videos are also available. It is important that the instructor makes use of the official publications where possible, especially those that are required to be carried onboard ships such as ALRS, various ITU lists etc., thus, the trainees will be better familiarized with authentic practical information.

The content of the course and therefore its standard reflects the requirements of all relevant IMO international conventions and the provisions of ITU instruments. Onboard learners will be provided with a compendium, which includes all, or part of the training material required to support the course. In order to design the compendium, the instructors themselves need to have at their disposal the following books and IMO references:

- Inmarsat Maritime Communications Handbook,
- Imnarsat SafetyNET User's Manual;
- Inmarsat-E User Manual;

- Design & installation guidelines for Inmarsat-A, -B, -C, &-E.
- GMDSS Handbook;
- Standard Marine Communication Phrases;
- STCW Code;
- International Convention for the Safety of Life at Sea (SOLAS) 1974, as amended.

As a useful teaching aid to supplement the onboard teaching, the compendium should contain text covering some subjects, which are not adequately covered by other course materials. When using the compendium the instructor should take into account the students' prior knowledge of the subject. It is important that the instructor makes use also of the technical manuals covering the actual equipment provided onboard.

Any useful supplementary course material should be listed and supplied to the participants so that they are aware where additional information can be obtained. The roster will provide for reference to particular text or book.

5.2 Application of the Student-oriented Approach

As already noted, MET at present is still rather conservative (Ch. II - 3.2). Maritime instructors use mainly TIA in presenting the learning material. The new instruction shall be based on the student-oriented approach with emphasis placed on the learner's activity. Since the seafarers belong to the group of adult learners, special attention should be paid to the peculiarities of adult learning (see Table1). The readiness to learn with adult learners develops from life tasks and problems and it is natural. The focus of the new instruction is to be placed on learners' experience and observations. As the role of the learner's experience is considered as the richest resource for learning, the new instruction should be based on the constructivist theory, i.e. the new knowledge to be built over time onto former knowledge through interaction among participants in the learning event.

5.3 Developing Materials for Onboard GMDSS

Distance learners as adult individuals need to know why they need to learn (Knowles, Holton & Swanson, 1998:64). As mentioned above, special attention should be paid to developing instructional materials that match adult learners' incentives to study. The existing materials should be enriched with case studies and assignments based on real-life situations. Since the distance learner is engaged in an independent learning, more tests need to be developed to encompass and objectively measure the level of acquisition of the large amount of the learning content.

5.3.1 Tests

As distance learners are much concerned about their advancement, objective testing should be developed with clear indication of the level of grading. Developing objective test would serve a two-fold purpose: to eliminate subjective judgement of the instructor and to match the adult learner's need for objectivity.

Common types of objective tests are the completion tests and the short answer tests. The former involves supplying an answer, generally a single word, to complete the missing

portion of a sentence. The latter involves supplying a short answer of two or three words to a question.

Another form of objective testing consists of "selective response tests' in which the correct or the best response must be selected from given alternatives. Such tests may consist of "matching tests", in which items contained in two separate lists must be matched.

The most flexible form of objective test is the multiple-choice test, which presents the trainee with a problem and a list of alternative solutions, from which the most appropriate answer must be selected. The distracters (incorrect alternatives) must be realistic and should be based on misconceptions commonly held, or on mistakes commonly made.

5.3.2 Introduction of a Record Training Book

STCW recommends that candidates for GOC-GMDSS undergo training as per IMO Model course 1.25 where theoretical and practical classes are envisaged. The record training book is to prove that the onboard trainee has undergone the practical part of training.

On accepting the record training book, the trainee should enter personal information and data about ship: type, GT, flag. The trainee will be personally responsible for the safe storage of the record training book in the course of the entire training. **Table 3** represents a sample of the content of the inner page of the record training book.

Type of equipment, producer	**Activity**	**Date**	**Attested by: (name, rank)**
1.Navtex receiver NCR300, JRC	Initial setting, Selecting message types Selecting areas ……..	08/03/ 04 11/03/ 04 ……./	Dimitrov (C/O)
2. MF/HF transmitter, Debeg	Self test DSC channel selection ……...	01/03/04 …….	
3. Inmarsat-C, Furuno	Select preferred ocean region ……..		
……			

Table 3

The training officer, designated by the Master, inspects the record training book and plans the exercises on skills, which are to be acquired and demonstrated. The record training book is to be presented to the Master or designated training officer on going onboard and after that every week for planning of the practice work and filling in entries of the performed tasks. The trainees should also work out the designated written assignments provided in the roster.

On applying for examination and certification, the trainee shall produce the record training book to the BMA as evidence for the undergone onboard training and for verifying the conducting of practical experience on the onboard GMDSS equipment. After that, the trainee attends an examination session before assessors, designated by the BMA, to confirm the acquired skills on a GMDSS simulator and to defend a written test.

6. Implementation

There are three institutions concerned with the realization of the onboard GMDSS course - the BMTC, the BMA and the Navigation Maritime Bulgare (Navibulgar) - the national shipowner company. They should act in a synchronized manner so that the objectives of the new instruction are met without interfering with other important tasks, as for example, safety and efficiency of the trade.

6.1 BMTC Role

The main responsibility in the organization, design and delivery of the instruction rests with the BMTC. There, the instruction will be designed using the intellectual capacity of the instructors on GMDSS subject and the technical base available. Since the course will be delivered by BMTC instructors onboard vessels flying Bulgarian flag, the implementation of the course depends on the active cooperation of the instructors and the Navibulgar.

The web site of BMTC (www.bmtc-bg.com) has to incorporate a special section of distance education where the onboard course shall be advertised. Participants of the onboard course will have a special log in name and password to have access to additional information concerning the GMDSS course or the new IMO requirements when they call at ports. For the time being, the exchange of assignments and feedback will be carried via email for reasons outlined in Chapter III, section 3.2.1.

6.2 Shipping Company's Role

The Navibulgar will provide for the arrangements necessary for ensuring the feasibility of the onboard learning through its Safety Management System as per the ISM code so that safety on board is not endangered. The new instruction should be incorporated in the company policy for human resources development and for optimizing work on the bridge in the section of BRM of STCW (see Ch. III -3.1.1).

6.3 BMA Role

The BMA as a controlling authority will approve the new curriculum as such complying with the national requirements set in Ordinance №6 (see Ch. I - 2.3) and the international requirements laid out in STCW. The duration and the distribution of the study load is also subject to approval of the BMA since improper distribution of study load could cause fatigue problem with the trainee and thus could endanger the safety of navigation and life at sea.

Since the requirement for certification for GOC- GMDSS is an approved training (see Appendix 1), the BMA inspectors conduct random checks during the shore-based training for the compliance of the curriculum and for the attendance of the listed candidates. In the case of the onboard training, the BMA will supervise the proper implementation of the approved onboard training.

The GMDSS equipment onboard ships flying Bulgarian flag, as well as the false distress alerts transmitted by Bulgarian ships are subject to control of the Flag State inspections. The BMA will also exercise control on Navibulgar whether the new learning is properly implemented into the company policy and whether it complies with the requirements of the ISM Code.

Figure 7 represents the relations of institutions involved in the organization and implementation of the onboard GMDSS course.

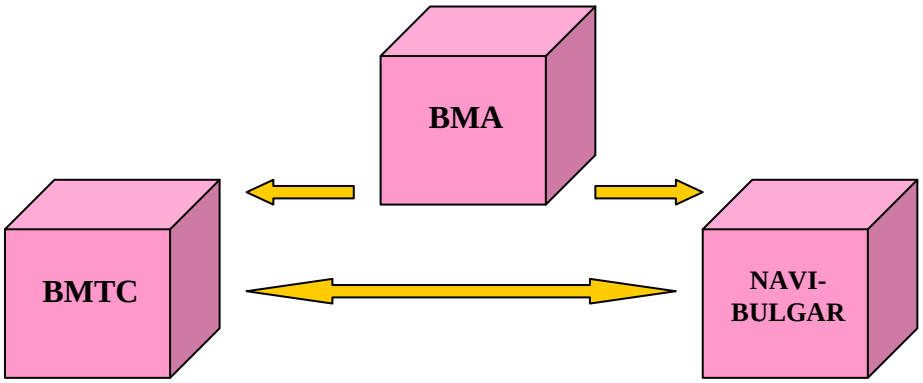

Fig.7

7. Evaluation

The last step of the Dick and Carey model is conducting evaluation. To be reliable, the evaluation procedure should produce reasonably consistent result, truly corresponding to the real effectiveness of the course. The evaluation in its two forms - formative and summative, serves to improve the designed instruction and to determine its real worth.

7.1 Formative evaluation

Designing and conducting formative evaluation means testing of instructional materials in one-to-one, small groups or field evaluations so that the materials can be evaluated with learners and revised prior to distribution. The onboard GMDSS course formative evaluation includes:

- *Evaluation of the goals and objectives*

This involves forming a working group of instructors from the navigation department who hold a meeting within the department and will discuss the compliance of the onboard GMDSS course with the stated goals and objectives and also the compliance of the goals and the objectives with the STCW requirements. Any discrepancy observed and rectified in due time will improve the effectiveness of the instruction.

- *Evaluation of the learning material*

Due attention is to be dedicated to the learning material - its scope and comprehensiveness. The following questions have to find answers on a formative evaluation level:

- Does the learning material correspond to the learning objectives?
- Are the learning materials well structured?

- Does the learning material encompass "knowledge, understanding and proficiency" column of Table A-IV/2 of STCW Code?
- Are assignments designed in a manner that matches the principles of adult learning?
- Is the material presented in a user-friendly manner?

Experts in the GMDSS field working at the recognized Bulgarian MET institutions – the Naval academy and the Technical University, BMA or shipping companies should give their true opinion concerning the content, difficulty and usefulness of the developed learning materials prior to launching the pilot.

- *Evaluation of testing materials*

The evaluation methods of the testing material is experimenting the new tests with the participants of the shore-based training. Attention should be given to identifying whether the distracters in the multiple-choice tests are adequate and whether the tests encompass the greater part of the learning content. Group of experts from the training institutions that have included the GMDSS subject into their curricula will objectively determine whether the designed tests are suitable for evaluating the trainees' progress.

After conclusion of the formative evaluation, the next step of the Dick and Carey model is to revise instruction. The data from the formative evaluation are summarized and interpreted to attempt to identify difficulties experienced by the learners in achieving the objectives and to relate these difficulties to the specific deficiencies in the testing materials.

7.2 Summative evaluation

The summative evaluation of the GMDSS course involves giving objective assessment of the real worth of the course. This is achieved by means of questionnaires, interview and surveys involving the participants of the course, the responsible staff onboard as well as of the shipping company personnel. The reports of BMA of the false distress alerts transmitted from the ships where onboard training is conducted is considered a summative evaluation since they explicitly show the effectiveness/ineffectiveness of onboard GMDSS instruction.

8. Conclusion

This chapter reveals the design and evaluation work of the onboard GMDSS course paying due regard to the national and STCW requirements. The onboard course description including the reasonable framework, justified main objective, content and duration, provides for clear identification of the innovation model introduced into Bulgarian MET system.

The design of the onboard variant using the shore-based one as a prototype focuses on the peculiarities of ODL, especially those related to the application of the student-oriented approach. The principles of adult learning are observed while designing onboard GMDSS instructional materials. The implementation process elaborates on the complexity in synchronizing the work of the three institutions involved – BMTC, Navibulgar and BMA. The efficiency and effectiveness of the onboard design is justified as its advantages to the shore-based variant are pointed out. The formative and summative evaluation applied to the onboard GMDSS course give grounds for improving the value not only to the particular course but also for promoting the benefits of ODL in a worldwide scale.

CHAPTER V

REFLECTIONS AND CONCLUSIONS

1. Introduction

This chapter elaborates on issues related to possible risks to which the onboard GMDSS training may be exposed and on the relevant precautions to be taken in order to avoid these risks (section 2). The impacts of the onboard GMDSS course system are clearly defined with regard to the deck officers, BMTC and Navibulgar (section 3). Reflection on the HRD aspect of ODL is revealed (section 4).

2. Risks to Onboard GMDSS Course and the Relevant Precautions

Onboard training can be very effective if, like all other trainings, is planned well. Instruction carried out onboard can facilitate ship manager's efforts to accomplish more with fewer people yet in a safer manner. However, there are still some limitations for onboard GMDSS course as for example the high costs of Internet services for online instruction, the duration of the voyage itself, etc. (see Ch. III - 3.2.1). Like every innovation, the onboard GMDSS course is exposed to certain risks that if not paid due attention, could lead to disappointing results. The following risks and the relevant precautions are subject to careful consideration before starting any onboard GMDSS training:

2.1 The Risk of Weakening of Motivation

Many subjective factors can influence the onboard trainees' motivation to actively partake in the onboard GMDSS course: problems related to personal organization abilities (ranging from one's inability of efficiently organization of own free time, to one's lack of persistency), family problems ashore, health problems, etc. Two are the objective factors that, if not taken into account, could spoil the motivation of the onboard trainee – the inappropriate design of the onboard instruction and the improper attitude of the onboard instructor(s) involved.

- *Inappropriate design of onboard instruction*

In the beginning, the motivation of the onboard trainee to study in real environment and to obtain practical skills in handling real equipment is usually of high level. However, it can easily fade away due to inappropriate design of the onboard instruction (see Ch. II - 2.3).

- *Improper attitude of the onboard instructor*

The other source of weakening of motivation could be the improper attitude of the officer in charge of the onboard GMDSS equipment who will be entitled by the shipping company to conduct the practical part of the training and to enter records into the record training book.

Since the onboard GMDSS operator is solely responsible for the transmission/receiving information, he could be frightened about increasing the number of false distress alerts in the

process of training. The onboard GMDSS operator may also be unwilling to accept the role of a teacher; it is likely that he considers this new role a burden.

Precaution. The onboard instruction need be based on the principles of adult learning and on the application of the student-oriented approach. Analyses and prescriptions dedicated to design of the onboard GMDSS instruction revealed in Chapters III and IV have to be very well understood and taken into account.

To avoid the second risk, financial stimulus from the company for the onboard teacher is strongly recommended. For elimination of the risk of improper attitude, the principles of BRM (see Ch. III - 3.1.1) need to be fully implemented into the policy of the shipping company involved in delivering the onboard training.

2.2 The Risk of Bad Synchronization

As discussed in Chapter IV, the successful implementation of onboard GMDSS training is feasible only when cooperation is established between the training institution, the shipping company and the national authorized body. The failure to achieve synchronization between the concerned institutions will lead to failure of the whole learning project. On the other side, the synchronizing means also meeting the objectives of each separate institution as well as the objectives of the concerned seafarers.

Precaution. To ensure effectiveness of the onboard GMDSS instruction, the careful planning and synchronization in accordance with the objectives of the seafarer, the shipping company, the training organization and the flag state administration need be carried out.

2.3 The Risk of Fatigue

The problem of fatigue onboard has been the issue of many IMO instruments related to the hours of work, the hours of rest and the overtime allowed onboard the seagoing ships. Although IMO, as well as the International Labor Organization impose strict regulations concerning the abovementioned matters, yet in some cases the shipboard organization depends only on the master's discretion, especially with regard to assigning overtime duties.

Mariners are often tempted to earn additional income by accepting working overtime. The deck officers, as responsible personnel for the cargo handling operations, also have the possibility of additional income by accepting additional work-load related to cargo handling operations such as organizing the securing and lashing, etc. Thus, they neglect the fatigue factor and unconsciously deteriorate the effectiveness of the onboard training.

Precaution. Since the fatigue is a threat to the safety of the ship and the human life at sea, and makes the onboard training ineffective, the shipping company involved in the delivery of onboard GMDSS program should be subject of strict control on behalf of the national authority. The BMA is to strictly monitor the implementation of the company procedures against the fatigue.

2.4 Risk of Distractions

The onboard GMDSS training while the vessel is in port runs the risk of disrupting the crew who are trying to turn the vessel around in a short time and contending with myriad of tasks such as cargo transfer duties, reporting information to the port, etc. Attempting to train in such an environment, if not managed properly, can be very ineffective due to distractions.

Precaution. The roster of the onboard course should exclude dates/periods when the ship is at port. It is preferable that the roster be made in a flexible manner which is tailored to the ship's timetable and which ensures enough free time for each module.

2.5 Risk of Scheduling Feasibility

Training at sea may be more effective due to reduced distractions, but may be prohibitive in terms of scheduling feasibility. If the vessel where the onboard GMDSS training is conducted is employed on liner services on international voyages, the training could be scheduled with accuracy, but if the vessel is engaged in coastal services, with intervals between passages of several hours or 1-2 days, any training can hardly be attempted.

Precaution. The BMA will take care and control whether the shipping company observes its duty to assign the onboard trainees to vessels suitable for the delivery of onboard instruction.

2.6 Risk of Increasing False Distress Alerts

As mentioned in Chapter IV- section 7.2, the success of the onboard GMDSS course depends on the number of false distress alerts. Transmission of false distress alerts is a very serious problem that could lead to negative evaluation of the onboard GMDSS training. This is due to the fact that the consequences of many false distress alerts are a loss of faith in the communication system and in the GMDSS as a concept, especially in the SAR community. False distress alerts also lead to serious waste of resources, both economical and human. So, the generation of false distress alerts must be avoided and every precaution should be taken in order to achieve this goal.

Precaution. In view that the trainees are professionals, i.e. the persons who will, as part of their shipboard duties, be responsible for the operation of communication equipment, the instructors, both onboard and ashore, must make sure that the students understand the importance of thinking before using the equipment, especially with regard to DSC and Inmarsat-C. This means that the students must understand the very serious consequences of generating and emitting false distress alerts and be instructed on how to avoid such incidents, and on what action they should undertake if they inadvertently transmit such an alert.

3. Impacts of Onboard GMDSS Instruction

As discussed in Chapter II, the delivery of distance training programs on board ships has become feasible due to the development of communication technology. From the learner analysis, it became obvious that the cognitive development and the motivation of the officers on board ships are appropriate for taking part in an onboard GMDSS instruction. Bulgarian distance MET is interested in improving its effectiveness and efficiency and will benefit from introducing onboard instruction, moreover the Bulgarian MET strives to keep in pace with the latest trends in the educational development. Thus, paying due regard to the above layout, the following impacts of onboard GMDSS course can be distinguished:

- **For the Deck Officers**
  - Through distance learning onboard ship, the deck officers will acquire a GOC-GMDSS. Meanwhile, they will save precious time from their shore leave. Instead of attending courses ashore and spending their vacation in studying, they will use their leave for what it is intended – recreation and rest.

  - Through studying onboard, the deck officers will benefit most from putting knowledge into practice directly into real-life working environment with real life equipment.

  - The onboard GMDSS course will also provide diversity in shipboard life style. The working conditions and the career prospects for young seafarers will become more attractive and will appeal to young, well-educated people.

- **For the BMTC**
  - The GMDSS instructors will enrich their teaching experience and knowledge on the functioning of the different GMDSS equipment available.

  - Introducing onboard GMDSS course can effectively perform the shift from the teacher-oriented to the student-oriented instructional approach.

- **For the Shipping company**
  - Through the onboard GMDSS course, the Navibulgar will dispose of better-qualified GMDSS general operators capable of handling real life equipment.

  - Better-qualified crews will reach better efficiency at work. The number of the crewmembers will be optimized.

  - Developing the human resource potential of the shipping company will inevitably lead to the company development and profit.

2. Human Resources Development (HRD) aspect of ODL

In general, the task of onboard instruction should be two-dimensional: for obtaining skills and knowledge necessary for enhancing performance onboard ships and for obtaining skill and knowledge necessary for occupying shore-based job positions. Part "A" of STCW clearly defines mandatory standards to be achieved. So, the task of an onboard instruction is aimed at meeting these standards. By far, the safety training is receiving greatest attention. Reputable software companies such as Videotel and Seagull have made considerable investments in developing software packages for MET purposes and have already undertaken first steps for introducing ODL.

Taking into consideration that the shipping industry tends to shift towards procedure controlled operations (Cőte, 2002), the tasks of onboard instruction should be directed towards obtaining concrete skills, especially those related to complying with STCW and the ISM Code requirements for competency. The main goal of MET, however, should be

regarded from a broader view, especially in relation to the development of the human resources in the shipping industry. Learning processes must help employees to move through the key stages of their organizational life – entry, mastery of the job, continuous improvement and development, and preparation for exit (Harrison, 2000). STCW clearly defines standards for entry into seafarer's profession. There are also standards for developing a career as a seafarer. Shipping and manning companies are engaged with the above two key stages. The last key stage, however, is not paid relevant attention.

Where and how do people that exit seafaring find job? This issue may seem out of concern of the shipping companies. However, as outlined in Chapter I, the shipping companies themselves need personnel with seafaring experience for certain positions. Are those that exit the ship-based occupations ready to occupy a land-based job position? Or do they need retraining? If this issue is carefully considered, it will become obvious that both companies and administrations need not only people with experience at sea, but also people with broader knowledge and skills. Therefore, a constant upgrade of seafarers' knowledge during lifetime is essential. Jan Dirks (Dirks, 1998) asserts that this can be done in two ways: either to offer upgrading courses in land-based educational institutions and allowing seagoing personnel to participate in these courses without loss of income; or to develop long-distance learning systems which can be used by seafarers during onboard periods.

It is a common practice for most shipping agencies to promote their marine employees on the basis of good shipboard performance only. Distance learning will provide another aspect for evaluation – the ability to acquire new knowledge and skills directly on the workplace. The shipping companies will be able to conduct better HRD policy and increase their reputation and profit. The manning companies will have the greatest return of investment since they will successfully achieve the aims of HRD, i.e. the personal development, career development and organizational development (Harrison, 2000).

4. Conclusion

The risks to which the GMDSS course is exposed indicate that the success of the onboard course is hinged on the accurate planning and on the full synchronization with the institutions concerned. The underestimation of whatever of the risks will lead to failure of the whole project.

Nevertheless the risks, the impacts of the GMDSS onboard training with regard to the deck officers' performance, the optimization of the work of the BMTC and that of the Navibulgar are eloquent for the worth and practicality of the onboard delivered instruction. Moreover, the impact related to HRD aspect of the ODL will make the seafaring profession attractive to young, well-educated people. Despite technical and organizational difficulties, carefully designed ODL will meet both, the stringent IMO requirements and the objectives of the shipping company's HRD.

List of Abbreviations

ALRS	ADMIRALTY LIST OF RADIO SIGNALS
BIMCO	BALTIC MARITIME CONSULTATIVE ORGANIZATION
BMA	BULGARIAN MARITIME ADMINISTRATION
BMTC	BULGARIAN MARITIME TRAINING CENTRE
BRM	BRIDGE RESOURCE MANAGEMENT
CBT	COMPUTER BASED TRAINING
CPD	CONTINUOUS PROFESSIONAL DEVELOPMENT
DSC	DIGITAL SELECTIVE CALLING
EEA	EUROPEAN ECONOMIC AREA
EPIRB	EMERGENCY POSITION-INDICATING RADIO BEACON
GMDSS	GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM
GOC	GENERAL OPERATOR CERTIFICATE
GT	GROSS TONNAGE
IMO	INTERNATIONAL MARITIME ORGANIZATION
INMARSAT	INTERNATIONAL MOBILE SATELLITE ORGANIZATION
IPA	INFORMATION PROCESSING ANALYSIS
ISF	INTERNATIONAL SHIPPING FEDERATION
ISM	INTERNATIONAL SAFETY MANAGEMENT (CODE)
ITU	INTERNATIONAL TELECOMMUNICATION UNION
MERSAR	MERCHANT SHIP SEARCH AND RESCUE
MET	MARITIME EDUCATION AND TRAINING
METHAR	MET HARMONIZATION SCHEMES
NAVIBULGAR	NAVIGATION MARITIME BULGARE
NBDP	NARROW-BAND DIRECT PRINTING
ODL	ONBOARD DISTANCE LEARNING
POP3/SMTP	POINT OF PRESENCE3/SIMPLE MAIL TRANSFER PROTOCOL
RCC	RESCUE COORDINATION CENTRE
SES	SHIP EARTH STATION
SAR	SEARCH AND RESCUE
SART	SEARCH AND RESCUE TRANSPONDER
SOLAS	SAFETY OF LIFE AT SEA
STCW	STANDARDS OF TRAINING, CERTIFICATION AND WATCHKEEPING

STW	STANDARDS OF TRAINING AND WATCHKEEPING
TIA	TRADITIONAL INSTRUCTIONAL APPROACH

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Table A-IV/2

Specification of minimum standard of competence for GMDSS radio operators

Function: Radio communications at the operational level

Column 1	Column 2	Column 3	Column 4
COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	METHODS FOR DEMONSTRATING COMPETENCE	CRITERIA FOR EVALUATING COMPETENCE
Transmit and receive information using GMDSS subsystems and equipment and fulfilling the functional requirements of GMDSS	In addition to the requirements of the Radio Regulations, a knowledge of: .1 search and rescue radiocommunications, including procedures in the IMO Merchant Ship Search and Rescue Manual (MERSAR) . 2 the means to prevent the transmission of false distress alerts and the procedures to mitigate the effects of such alerts .3 ship reporting systems .4 radio medical services .5 use of the International Code of Signals and the Standard Marine Navigational Vocabulary as replaced by the Standard Marine Communication Phrases .6 the English language both written and spoken for the communication of information relevant to safety of life at sea *Note:* This requirement may be reduced in the case of the Restricted Radio Operator Certificate	Examination and assessment of evidence obtained from practical demonstration of operational procedures using: .1 approved equipment .2 GMDSS communication simulator, where appropriate .3 radiocommunication laboratory equipment	Transmission and reception of communications complies with international regulations and procedures and are carried out efficiently and effectively. English language messages relevant to the safety of the ship and persons on board and protection of the marine environment are correctly handled.

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	METHODS FOR DEMONSTRATING COMPETENCE	CRITERIA FOR EVALUATING COMPETENCE
Provide radio services in emergencies	The provision of radio services in emergencies such as: .1 abandon ship .2 fire on board ship .3 partial or full breakdown of radio installations Preventive measures for the safety of ship and personnel in connection with hazards related to radio equipment, including electrical and non-ionising radiation hazards	Examination and assessment of evidence obtained from practical demonstration of operational procedures using: .1 approved equipment .2 GMDSS communication simulator, where appropriate .3 radiocommunication laboratory equipment	Response is carried out efficiently and effectively

Appendix 2

Protocol No...../...../.....……..

TEST SHEET
G E N E R A L O P E R A T O R G M D S S
(GOC)

NAME:.....

DATE: ..... PLACE: .....……

Part No.	Score Needed	Actual SCORE	Remarks:
Part 1	8 fm 15		
Part 2	16 fm 30		
Part 3	16 fm 30		
Part 4	6 fm 12		
Part 5	Yes/No		

TOTAL : _____

ADDITIONAL VERBAL EXAM..... (state passed /failed /N.A.)

PRACTICAL EXAM	Start End	Task (ticket) No.	RESULT: (passed/failed)

FINAL RESULT : PASSED / FAILED*

ASSESSORS: 1._____ 2._____

3._____ 4._____

5._____ 6._____

* Strike off the unnecessary

PART 1. Each correct answer scores 1 point. Minimum score 8 points for this part.

1. Shipboard communication equipment required for GMDSS will be specified by:

a) ship's gross tonnage ;
b) geographical operating areas;
c) ship's nationality;
d) all of the above.

2. The EPIRB hydrostatic release mechanism is activated by pressure equal to a depth of:

a) 2 meters;
b) 4 meters;
c) 6 meters;
d) 8 metres

3. Service NBDP Telegraphy, also known as Radiotelex, is used in communications via:

a) Inmarsat SES terminals;
b) VHF radio equipment;
c) MF/HF radio equipment;
d) all of the above.

4. In order to satisfy the SOLAS Convention requirements vessels trading in areas A3 & A4 and provided with no on-board maintenance must carry duplicate equipment of:

a) DSC VHF Radio;
b) DSC VHF Radio and either MF or HF Radio or SES;
c) DSC VHF Radio and either HF Radio or SES;
d) DSC VHF Radio and HF Radio.

5. Which of the following does not affect the range at which a SART will be detected by RADAR:

a) The type of RADAR used and how it is operated;
b) The weather conditions;
c) Method of activating (manually or automatically);
d) The mounting of the SART on the survival craft;

6. Working channels of portable VHF for survival craft (GMDSS approved) **are at least:**

a) Channel 16 and 1(one) additional simplex VHF channel;
b) Channel 16, Channel 13 and Channel 6;
c) Only Channel 16;
d) All VHF channels from International Maritime VHF Band.

7. The SART transmits a signal which appears as a straight line of "blips" on the radar screen. Distance between 'blips' is:

a) 0,2 nm;
b) 0,4 nm;
c) 0,6 nm;
d) 0,8 nm;

8. After activation, EPIRB will transmit locatable and identifiable signals for up to:

a) 12 hours;
b) 24 hours;
c) 48 hours;
d) 72 hours.

9. How many hours before sailing the NAVTEX receiver must be switched on to ensure receiving all Maritime Safety Information:

a) up to 4 hours;
b) up to 8 hours;
c) up to 12 hours;
d) up to 24 hours.

10. What is the maximum transmission time allowed for each NAVTEX radio station?

a) 10 minutes from every 4 hours;
b) 15 minutes from every 4 hours;
c) 20 minutes from every 4 hours;
d) the time is unlimited.

11. A multi-frequency DSC distress call attempt is available on:

a) VHF;
b) MF;
c) HF;
d) all of the above mentioned;

12. Category of GMDSS calls means:

a) Structure of the calls;
b) Degree of the priority of the calls;
c) Sequence for final error checking of the calls;
d) Code for stopping of the calls.

13. Propagation of HF radio waves is done mostly by means of:

a) ground waves;
b) ionosphere waves;
c) direct space waves;
d) all of the above mentioned waves simultaneously.

14. Which of the following is not a radio telegram address:

a) Full address;
b) Registered address ;
c) Radio address ;
d) Telephonic address ;
e) Telex address.

15. Which of the following on-load voltage/specific gravity readings is the best indication of the Nickel-Cadmium cell's state of charge:

a) 1.028;
b) 1.025;
c) 1.28;
d) 1.32;
e) 1.16.

PART 2. Each correct answer scores up to 3 points. Minimum score 16 points for this part.

1. Name the document, which includes all transmitting radio units on board,, who issues it and what its validity is in your country?

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2. What sub-systems does the GMDSS consist of?

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3. What are DSC distress alerting frequencies, mandatory for watching in sea area A3?

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4. State the alerting frequencies or bands of marine EPIRB's (GMDSS approved).

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5. Who can authorize the transmission of an "URGENCY" message and what priority would you assign to a message sent by SES in case of piracy attack?

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6. What does an Accounting Authority Identification Code (AAIC) mean?

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7. Give a brief description of a "Duplex method" of operation.

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8. State the mandatory additional documents for GMDSS ship's station, required in case at-sea electronic maintenance capability is available.

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9. Which currencies are used for radio traffic account? Give their ratio.

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10. Give a brief description of a "First RCC".

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PART 3. Each correct answer scores up to 10 points. Minimum score 16 points for this part.

1.You are on board m/v "WAVE"-9HEL4, MMSI=249345000. At 19:30 UTC, in position to render assistance, a distress call was received on HF DSC from m/v "WIND"-LGGZ, MMSI=121001000, which has not been acknowledged by CRS. What shall you do?

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2. You are on board m/v "Polaris"-JKII, MMSI=212003000 when, although not in position to render assistance, the above-mentioned distress call which has not been acknowledged by CRS has been received. What shall you do?

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3. If, for any reason, your EPIRB is activated accidentally, what shall you do?

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PART 4 Each correct answer scores up to 6 points. Minimum score 6 points for this part.

CALCULATION OF RADIO TRAFFIC ACCOUNT

1.A telex was sent by Inmarsat "C" SES via LES with charges:
LES charge=0.50 SDR/Kbits ; LL charge to destination=0.30 SDR / Kbits ;
Minimum charge=0.25Kbits, Increment=0.25Kbits
Calculate this telex, if its dimension was: mode=5 bit telex; size=150 bytes

CHARGE = _____

2. Following radio telegram was sent via Peaureus Radio

Fm: m/v STELLA/5PICH No.112 w__/__ 04.05.01 10:30UTC
QRC BG02
Bon Marine Bulgaria
POB205 VARNA BITOLA str.2
RE MV STELLA BUNKERING AT BOURGAS
AB VSL'S ETA BOURGAS 11.05.01 WP
PLS ARRANGE TO SUPPLY 95MTS
BRGRDS/MASTER

Calculate this service, if you know :CC=1.25 GF per word
LL=0.75 GF per word

CHARGE = _____

PART 5. Translation.

One meaning mistake allowed. Missing items of information considered meaning mistakes.

§7. 1) The transmission of a distress alert indicates that a mobile unit or person is threatened by grave and imminent danger and requests immediate assistance. The distress alert is a digital selective call using a distress call format in the bands used for terrestrial radiocommunication or a distress message format, in which case it is relayed through space stations.

2) The distress alert shall provide the identification of the station in distress and its positions.

§7A A distress alert is false if it was transmitted without any indication that a mobile unit or person was in distress and required immediate assistance. Administrations receiving a false distress alert shall report this infringement in accordance with Section V of Article **S15**, if that alert:

a) was transmitted intentionally;
b) was not cancelled in accordance with Resolution **349 (WRS-97)**;
c) could not be verified as a result of either the ship's failure to keep watch on appropriate frequencies in accordance with Nos.**S31.16** to **S31.20**, or its failure to respond to calls from an authorized rescue authority ;
d) was repeated; or
e) was transmitted using a false identity.

Administrations receiving such a report shall take appropriate steps to ensure that the infringement not recurs. No action should normally be taken against any ship or mariner for reporting and cancelling a false distress alert.

(excerpt from RRS32)

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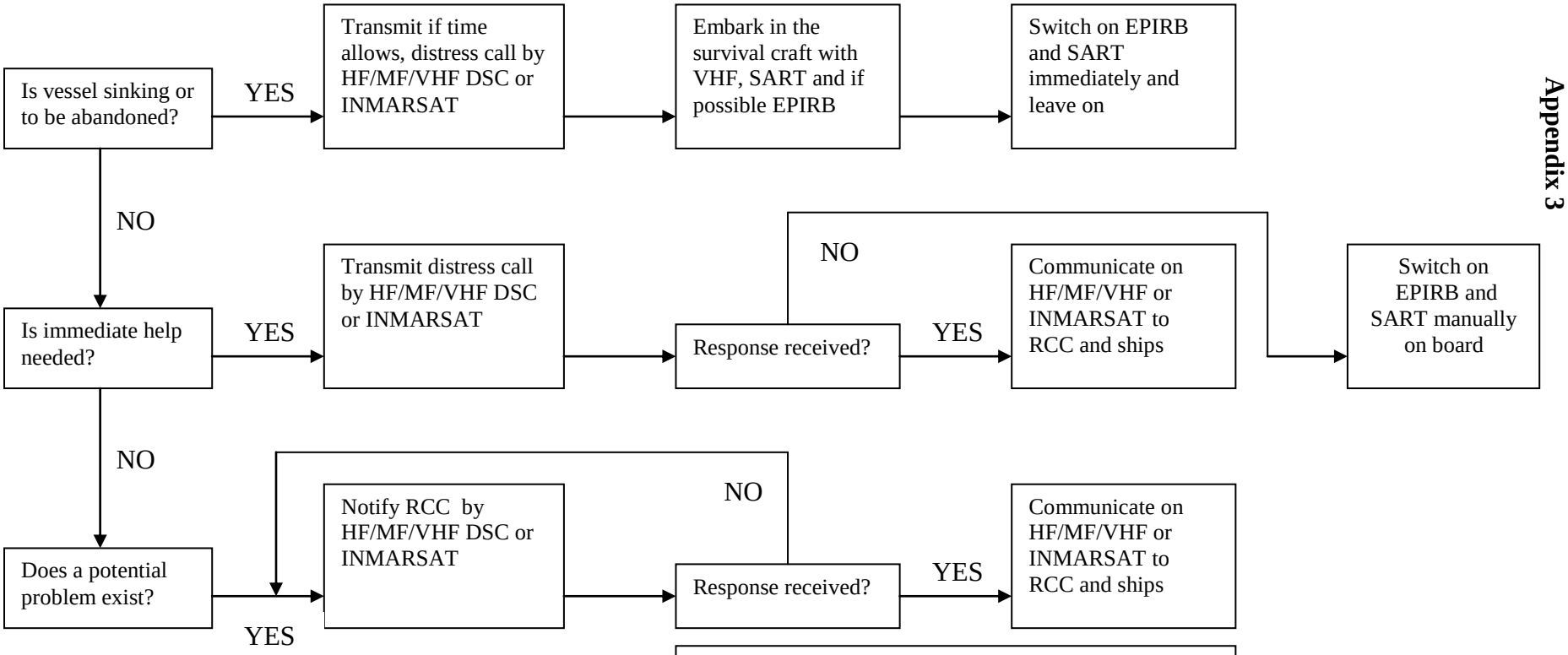
GMDSS OPERATING GUIDANCE FOR MASTERS OF SHIPS IN DISTRESS SITUATIONS



1. EPIRB should float free and activate automatically if it cannot be taken into the survival craft.
2. Where necessary, ships should use any appropriate means to alert other ships.
3. Nothing above is intended to preclude the use of any and all available means of distress alerting.

RADIO DISTRESS COMMUNICATIONS

	Digital selective calling (DSC)	Radiotelephone	Radiotelex
VHF	Channel 70	Channel 16	
MF	2187,5 kHz	2182 kHz	2174,5 kHz
HF4	4207,5 kHz	4125 kHz	4177,5 kHz
HF6	6312,0 kHz	6215 kHz	6268,0 kHz
HF8	8414,5 kHz	8291 kHz	8376,5 kHz
HF12	12577,0 kHz	12290 kHz	12520,0 kHz
HF16	16804,5 kHz	16420 kHz	16695,0 kHz