

INNOVATION IN MARITIME EDUCATION AND TRAINING

Prof. Dr. Reza Ziarati, Capt. Ergun Demirel, Dr. Taner Albayrak
TUDEV (Turkish Maritime Education Foundation) Institute of Maritime Studies
Tuzla İstasyon Mah., Hacıoğlu Sok., 34940. Tuzla, İstanbul, TR
Tel: 0216 581 00 30 Fax: 0216 446 70 05
e-mail: rziarati@tudevedu.com , edemirel@tudevedu.com , albayrakt@yahoo.com

Abstract

The extensive amendments to the STCW Convention agreed in 1995 only came into effect in 2002 with some additional changes in January 2003. The provisions concerning the need for governments to submit quality standard reports to the IMO, concerning their national training and certification systems, were only required to be met as recently as 2004. The paper argues that sufficient time has elapsed to assess the impact of the changes introduced particularly the prime objective of the changes i.e. whether confidence is stored in the validity of seafarers' certificates of competency regardless of the country of issue. The paper further argues that since 1995, there have been rapid changes in the design of ships and the equipment used in the navigation and propulsion systems and yet there has been no serious attempt to revise the STCW and/or the IMO model courses in these connections. The changes introduced in 2003 were not extensive and the expected changes in 2010 while they are expected to address several important issues the paper argues that there remains a number of deficiencies in STCW even if all of the proposed changes are implemented. New regulations and conventions in the majority of cases have been reactive and have each come about after a major disaster at sea. The introduction of some of these new regulations such as ISM and ISPS codes, together with commercial demands, has increased the workload on-board. Considering that certain sectors of the industry have experienced very severe shortages of officers and this together with the continuing growth of the world fleet raises several serious questions for instance, does STCW and the expected changes address the automation problems or identified communications failures and would they address difficulties resulting from manning problems which have often manifested themselves into long working hours and fatigue, which in turn has resulted in several accidents at sea and in ports. Under the above considerations, the paper questions if STCW and the expected changes are sufficient to address the MET requirements and the problems faced by the industry and are these changes in short fit for the purpose. Special references are made to the work of Yongxing (2009) and Ziarati (2010) regarding the expected changes to STCW and their consequences.

This paper gives a background to TUDEV and its contributions to the development of MET programmes and practices and summarises TUDEV's initiatives to harmonise the maritime education and training in Europe and to address the deficiencies of the STCW.

Key Words: STCW, Maritime Education and Training, European Maritime projects

1. Introduction

Shipping is perhaps the most international of the entire world's great industries and some of the most dangerous. Safety of life at sea and the marine environment as well as over 80% of the

world's trade depends on the professionalism and competence of seafarers. It has been reported that the over 80% of accident and incidents are due to human error IMO (2005), Ziarati (2006 and 2007) and SOS (2005-2007).

To identify the main problems and their causes and more importantly where these failures occur, it has been vital to look at some relevant and recent papers and reports. One interesting and informative paper is a recent study by Torkel (2004). He reports that 25% of the world fleet was responsible for more than 50% of shipping accidents around the world. The study notes that the top 25% of the safest ships were involved in just 7% of all accidents. The outcome of the study by NYNU (2005) published by the University of Technology and Science (NTNU) in Norway, reports that by improving the quality of the world fleet to the same level as those in the safest 25% category, there might be an overall reduction of 72% in shipping accidents. The paper states human error rather than technical matters are the most common cause of accidents. The study also reports that smaller ship owners have a poorer safety culture and they do not often have the resources to implement STCW or ILO requirements. These smaller companies could benefit from national and European funding to improve their management and operation of their shipping business.

There are also severe shortages of well qualified seafarers at different levels of seniority (Urkmez, 2005; Pourzanjani et al, 2002; Schroder et al, 2004 and IMO, *ibid*) and yet there are many young people unemployed in Europe (Ziarati, *ibid*). Since young people do not find seafaring professions attractive there are arguments (Urkmez, 2005) for increasing the number of non-EU seafarers of different ranks in the European flag countries. There are attempts by major MET partnerships, institutions and organisations such as MarEdu (see for instance www.maredu.co.uk, www.egmdss.com), Strathclyde University, ARKAS, Lloyd's Register of Shipping, TUDEV (Project ATTRACT-ME, SOS, etc), C4FF (Projects SURPASS, M'AIDER – see www.c4ff.co.uk) and so forth to make MET more accessible and/or seafaring more attractive to young people in Europe.

Innovative concepts of marine education, a shift from knowledge-based to a competency-based training, and the need for constant professional updating and recertification have brought maritime training institutions out from under the shadows of the maritime administration and industry; now they must assume an equal partnership rather than simply reacting to the others' demands. Maritime institutions must implement their programme content efficiently and effectively in accordance with the STCW's requirements and the contents of the IMO Model Courses; they must improve standards of teaching staff, facilities and equipment and proactively support the efforts by the IMO and agencies such as the European Maritime Safety Agency (EMSA) to develop and implement STCW and have a feel for ILO, SOLAS and MARPOL requirements with clear understanding of importance of ISM, ISPS. Simulators used for training or assessing competence are required to comply with provisions contained in Section A-I/12 of the STCW Code, which is especially devoted to the use of simulators. Use of simulators in STCW implementation is relatively recent and MET institutions are becoming proactive in their applications. The Leonardo projects SURPASS (2009-2011) and MAIDER (2009-2011) are two examples of several MET institutions and progressive maritime enterprises forming consortiums to primarily and proactively develop simulator scenarios for inclusions in MET programmes based on accidents and incidents at sea and in ports but also relating to causes of accidents due to the identified gaps in education and training provisions.

2. Review of STCW Convention and its codes

The review, which commenced with several minor changes in 2003, reflects the trends in the need for more specialisation to address the higher-level maritime operations onboard through a wider coverage of knowledge and skills and competency required as results of the changes summarised earlier. The development of advanced navigational technologies, specialised and professional transportation technologies and pollution prevention technologies and regulations were considered important for inclusion into the seafarers' competency standards.

2.1. Agreement on STCW Changes

A recent review by Ziarati (2009) of the paper by Yongxing (2009) indicated that the STW Sub-Committee has agreed to:

- Retain the structure and goals of the 1995 revision;
- Address the inconsistencies, misleading interpretations, outdated provisions, MSC instructions,
- Address requirements for effective communication;
- Provide for flexibility in terms of compliance and for required levels of training and certification and watch-keeping arrangements due to innovation in technology;
- Address special character and circumstances of short sea shipping and offshore industry;
- Address the maritime security more effectively by inclusion of specific provisions in the convention;
- Not down scale existing standards;
- Amend the articles of the Convention;

2.2. Security training and related issues

The IMO is determined to design a more systematic maritime security training scheme. This was agreed with a set of three-level security training and knowledge requirements for the Ship Security Officer, for shipboard personnel having specific security related duties and for all other shipboard personnel. It is stipulated that all shipboard personnel should be subject to the basic skill training and guidance for maritime security as required by the Regulations VI/1 and VII/1 of code A; All shipboard personnel having specific security related duties shall receive professional training related to the Shipboard Security Plan and that when onboard all employed personnel undergo familiarisation training to develop the required security skills. Authors of this paper argue that recently emerging piracy issues should also be seriously dealt with in this context in order to provide more assets for the ship's crew for their own defence. Recent incidents have clearly shown that neither the naval operations nor the legal arrangements were sufficient to prevent piracy attempts which are not only hampering day to day maritime trade but are also making the profession even less attractive to young people.

2.3. Simplifying navigation calculations

The competency standards relating to celestial navigation calculations has been reviewed and strengthened. The regulation B –IL/1 of the code will be amended. The application of computerised celestial navigation calculation method will be included in the relevant provision of code B. Use of computers and hand held calculators for celestial navigation calculations may

yield substantial reduction for dedicated class hours which may be used for extended simulator practice.

2.4. Adding training requirements for VTS

This is primarily included to secure the understanding of the masters, chief officers and officer of watch on the types and the limitation of VTS, and prepare them so that they apply specific procedures for the VTS maritime safety with regard to table A-II/1, A-II/2 and A-II/1 of the Convention, and 3-1 of A- VIII/2 and B-I/12 and their expected updates. This can be achieved in short courses on VTS applications designed both for VTS operators and ship officers in a simulator environment. Also including pilot trainees in these courses may provide full training for all involved in entry/departure operations.

2.5. Introducing electrical-electronic officers

To respond to the complexity of high voltage electricity, electrical operations, computer operations and electronic devices onboard, the competency standards for electrical and electronic officers will be set up. One important aspect of this issue is to be the clear definition of the job description of these new officers. Are they going to be pure engineers dealing only with the maintenance of the shipboard systems or are they supposed to assume navigational watch responsibilities as well? This will be one of the main issues for developing/updating MET curricula in accordance with STCW amendments. For example if such officers are going to be responsible for all shipboard systems, then a single watch officer both for deck and engineering may become more feasible in the future which eventually will lead to a uniform/line OOW training curriculum.

2.6. Making BRM and ERM training compulsory

The courses were developed and encouraged by the shipping industry. Considering the similarities between Bridge Resource Management and Engine-room Resource Management principles the two courses will be transferred from section B- V III /2 to A- VIII/2 and hence made compulsory.

According to Yongxing (2009) the new convention is expected to come into effect in the year 2012 and be applied in the next 8-10 years. It is expected that the new revision will play an important role in improving maritime safety and pollution prevention through its effective implementation world-wide. For MET institutions, Ziarati (2009) states that the revised Convention will require a revision of strategies for teaching, learning and assessment as there will not only be new content but greater and wider use of high technology navigation and hence computer simulations. The simulators will play a major role in learning and competence development and assessment. The need to develop transparent quality assurance and control as well as management becomes more urgent for reputable METs particularly considering the new and more determined role by authorities such as EMSA in externally verifying the implementation of STCW in member countries by visiting MET institutions. The revision of STCW in 2010 is as significant as the changes introduced in 1995 and the implementation of the new STCW will be very challenging for MET institutions and the national administrations. The new STCW is expected to create opportunities for progressive MET institutions to take a lead and offer leadership for development and transfer of innovation world-wide.

3. ILO Maritime Labour Convention 2006

A summary of the ILO Maritime Labour Convention (2006) is given in a recent paper by Yongxing (2009). The Convention provides comprehensive right protection for more than 1.2 million seafarers in the world. The new labour standard consolidates and updates more than 65 international labour standards related to seafarers adopted over the last 80 years. The Convention sets out seafarers' rights to decent conditions of work on a wide range of subjects, and aims to be applied globally, easily understandable, readily up-datable and uniformly enforceable. It has been designed to become a global instrument known as the "fourth pillar" of the international regulatory regime for quality shipping, complementing the key IMO conventions such as STCW, SOLAS and MARPOL. The Convention is expected to come into effect in 2011 and be fully implemented by 2013.

The new Convention will enable the industry to attract more young people to join the seafaring profession and will provide an opportunity for the MET institutions to attract more high quality students and consequently the quality of MET will be improved. The improved quality could lead to safer seas and ports and allow for further mobility of seafarers (TRAIN 4Cs I and II, 2008 and 2010). However, there is still a need to improve social security related issues for seafarers to attract young people to the profession. This must be dealt together with the revision of the ISM and new safety measures. One important aspect of this issue is the criminalisation of seafarers for the accidents and incidents which was expressed as the top issue by the cadets who participated in the young seafarer's forum. As it is often difficult to find the owners of a vessel, arresting and charging the captain and officers on duty seems an easy way out. But it is often desperately unfair and could hamper the attempts to attract more young people to the profession. So what is the solution? Should the officers of ships be jailed for being on the bridge during an accident? Or are the owners liable? Or those who pay for the clean up – classification societies, insurers, owners? It is believed that both new convention and STCW amendments should bring clear resolutions on these issues.

4. SOLAS, MARPOL and other Maritime Conventions

Today there are many new topics and issues in maritime safety that require the attention of the IMO and maritime community worldwide such as emergence of automation, importance of reducing pollution and improving safety and security which required a careful review of the LRIT, GB3S, GISIS, FSA and initiatives promoting the assessment of risk management, E-Navigation, and port of refuge regulations.

The protection of the environment has now become a topical issue and recent IMO initiatives with regards to reducing waste and pollution such as 'Ships Recycling, Green-House Gas Emissions from Ships (GHG), Special and Particularly Sensitive Sea Areas, Control and Management of Ship's Ballast Water and Sediments, etc.' will provide ample opportunities and catalysts for MET institutions to review their provisions while at the same time incorporating the changes in STCW requirements.

5. Several neglected areas

What is alarming is that sea transportation is growing and with this growth the numbers of accidents, despite having modern technologies, well equipped and seaworthy ships with qualified crew, continue to occur at an undesirable level with unfortunate consequences, which vary from loss of lives, substantial damage to the marine environment and loss of Cargo. Careful study of the accident reports reveals that 80 to 85% of all accidents are either directly initiated by human error or are associated with human error by means of inappropriate human responses to threat situations (SPIRIT, 2007). This is in line with the findings of a recent paper (Ziarati, 2006) that 80% of accidents at sea are caused by human error. This Paper (Ziarati, 2006) notes that mistakes are usually made not only because of faulty, deficient or inadequate regulations, but because some of the regulations and standards that do exist are often ignored. The IMO accident analysis reports (Ziarati, 2006, 2007 and 2009) clearly indicate the causes of many of the accidents at sea are due to deficiencies in the education and training of seafarers or disregard for current standards and regulations.

It is not a criticism of the IMO to say that the IMO is too large and has an immense inertia to be effectively proactive. The majority of conventions and regulations have come about after a major accident. One of the most important duties of MET institutions is to prepare their cadets for the future and not for the past. That is not to say that the past is not important and while the MET institutions need to learn from previous experience and accidents, especially as for every death there are some 500 incidents and for every accident there are some 10 major near-misses (UK P & I), the METs have a major responsibility to initiate and support research identifying the causes of incidents and near-misses and through research find out how accidents can be prevented in the future. The European Union has a history of supporting well-written proposals which promote innovation and its transfer. The following are a summary of identified deficiencies and how several European MET institutions and progressive maritime enterprises have come together to address some of these deficiencies such as those which have led to, automation failure (SURPASS, 2009-2011) and those resulting from communication failures (MarTEL, 2007-2009). Two major consortiums were formed to seek support from the EU and to conduct research with a view to reduce failures in the two identified areas of concern. Several other initiatives were also instigated to make the profession more attractive to young people (ATTRACT-ME, 2010) and harmonise the MET in Europe around the STCW and IMO model courses (SOS , 2005-07) and hence reduce development and maintenance cost as well as projects to make self- and remote- learning a reality (EGMDSS, 2007-09 and EGMDSS-VET, 2008-2010).

The Key questions are as follow: Are the proposed changes based on the lessons learned from accidents such as the Savannah Express (2005) or PROSPERO (2007) accidents due to automation failure, or not? Has the IMO adequately reviewed the view of the International Maritime Lecturers Association (IMLA, 2009) with regard to establishing the basis for regulating the standards for maritime English? The authors are of the view that the changes so far and those proposed do not adequately respond to findings of reputable authorities and professional associations in the maritime community.

The study presented in this paper also surprisingly supports the findings of two reports submitted by the MCA to the IMO MSC82 (reports MSC 82/15/2 and MSC 82/15/3, 2006) regarding

automation failures. Automation has brought with it a new problem and specific types of accidents which need to be fully understood if accidents due to automation failures are to be a thing of the past.

The work reviewed as part of this investigation considered the outcomes of several European Union (EU) education and training initiatives (See bibliography). These include several Leonardo pilot projects, SOS, 1997, HIICOSS I, 1997; SAS, 1998; NORAY, 1999; ORION, 2001; CIVILPRONAVY, 2001; FISHTRAIN, 2001; SECURETAS MARE, 2002; HIICOSS II, 2002; NETOSKAR, 2003. The results of a number of research and development programmes such as METHAR (2002) and METNET (2002) were also taken into consideration exploiting; in addition, the information contained in (SPIRIT, 2007). The work being conducted under the EU funded Leonardo Safety On Sea (SOS, 2007) Project led to a paper (Ziarati, 2006) which identified several causes of the accidents as education and training problem areas for analysis, these are depicted in a the following diagram:

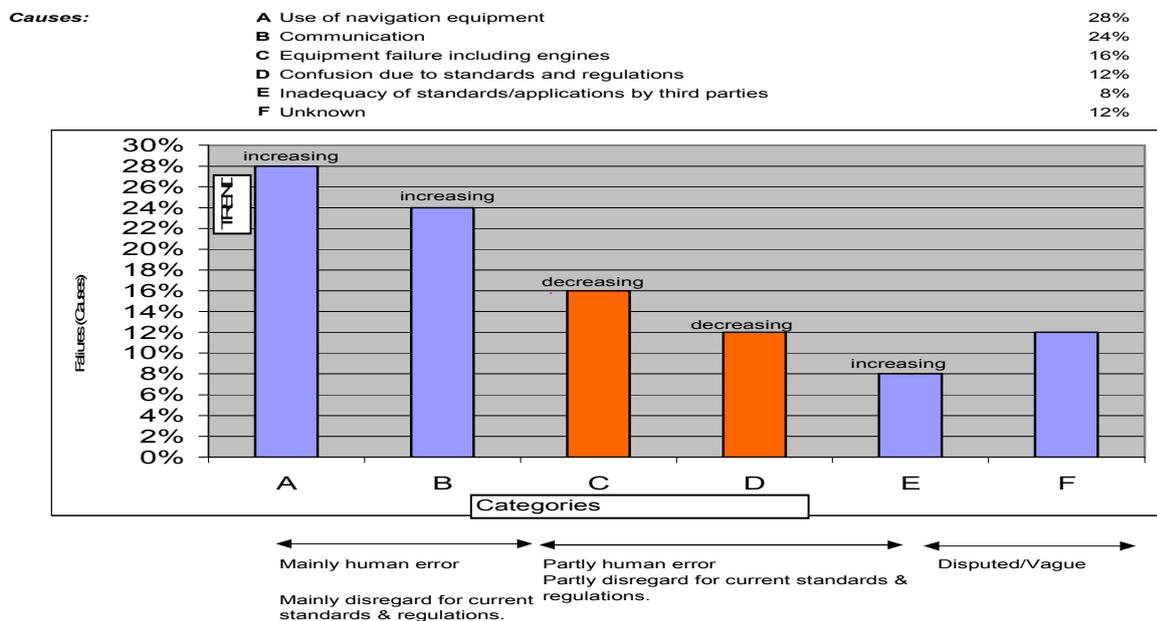


Fig 1 Pareto Chart identifying main sources of problems (Source: Ziarati, 2006)

The SOS project (ibid) demonstrated that for the MET programmes to be more effective it is crucial that they are underpinned by a vigorous programme of research and development; and to share this burden and learn from one another, it is good practice to form a partnership and be willing to solve or analyse a problem or deficiency and incorporate the situation/outcome into the maritime provision. The introduction of BRM, ERM and Ship Handling (SH) by the maritime industry and their inclusions in the MET programme of officers of watch was considered an innovative undertaking by many MET institutions. It is pleasing to note that the proposed changes to STCW will make these courses mandatory. This is just an example to show that innovation can be highly beneficial and that it is possible to work from the outside and then offer opportunities for the regulatory bodies to adapt a given good practice. In the same way the EU funded SURPASS project may lead to a successful course on automation which one day will be

adapted by the IMO or one of the licensing authorities. There was a paper to the IMO (Cole, 2010) and presentation by the MarTEL team (MarTEL, 2007-09) at the IMO's STW meeting on 12 January 2010 to promote the inclusion of more regulated standards for maritime English. Who knows maybe the EU funded MarTEL project and its standards one day are to be seen as the standards for maritime English worldwide. Another example is a new EU funded project called M'AIDER (2009-2011) which is expected to study accident reports and research such as those presented in figures 2 and 3 and in parallel conduct surveys to identify the causes that have led to near misses which are reported but not investigated by accident investigation agencies. The outcome of M'aider is considered important in preparing seafarers for emergency situations.

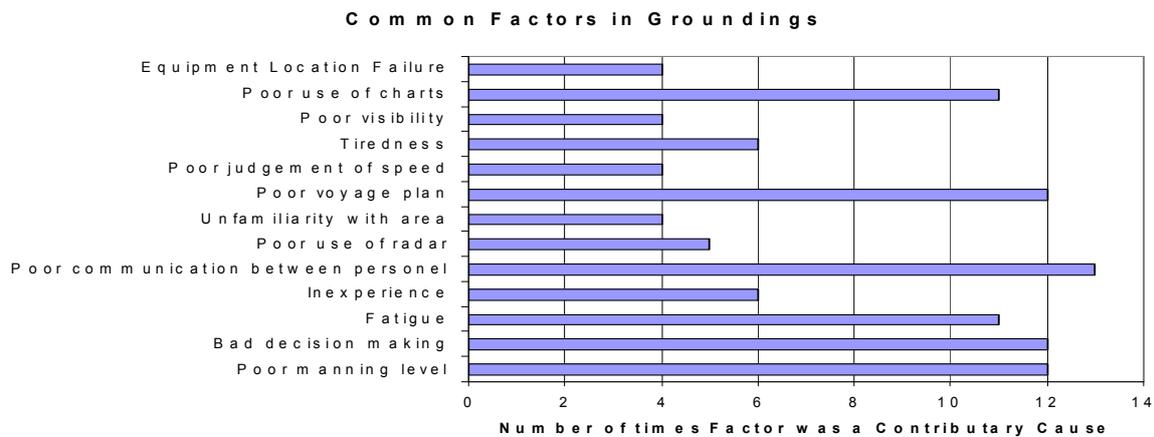


Fig 2 Common Factors in Groundings (Source: Ziarati, 2006)

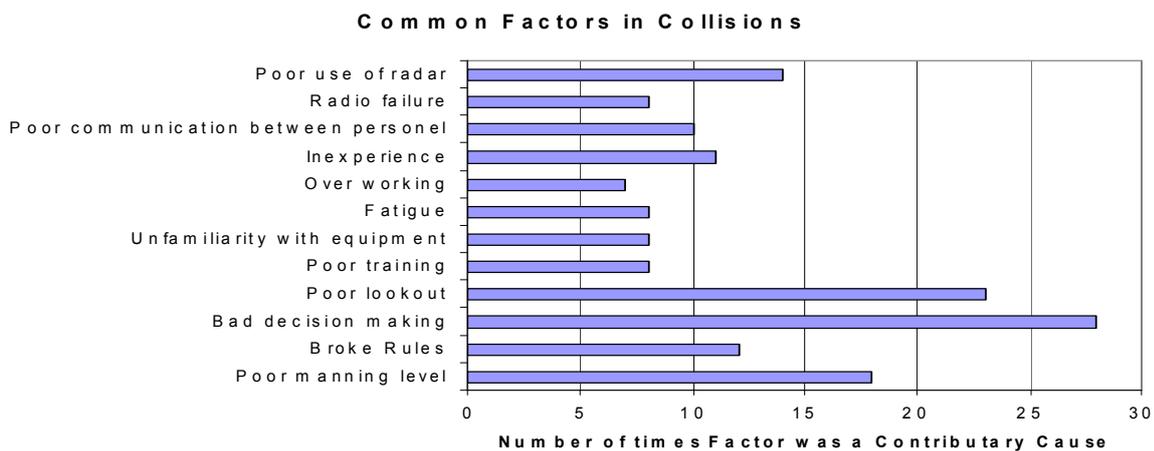


Fig 3 Common Factors in Collisions (Source: Ziarati, 2006)

8. Conclusion

Although several attempts took place to revise STCW-95 in recent years, especially June 2010 Manila Conference, it is believed that implementation of these revisions will take time and there

remains a number of deficiencies in STCW even if all of the proposed changes are implemented. Since 1995, there has been rapid revolution in design of ships and the equipment used in the navigation and propulsion systems on board these ships. One very important development has been the introduction of automation in operating a ship. The modern ships particularly container and fuel carrying vessels are becoming increasingly automated. The automation has brought with it two problems, one concerning the inadequacy of existing seafarers' education and training viz., that if any aspects of automation fails the crew often are not trained to use alternative systems and hence respond to it effectively (IMO MSC 82, 2006; Ziarati, 2006). The second problem has arisen from the review of the arguments from the recent IMO Maritime Safety Committee meeting (reports MSC 82/15/2 and MSC 82/15/3, 2006) namely that the human operators rarely understand all of the characteristics of automatic systems and these systems' weaknesses and limitations which have now been found to be the main causes of accidents. These reports concluded that there is a need to improve the content of all maritime training and that the knowledge, skills and understanding of automation should be included in the basic training of all Chapters of the STCW Code of practice and hence address this very serious issue at source. Furthermore, to address the second problem, it is considered feasible to gather the knowledge for inclusion in the existing seafarer's education and training in a short course format that can be easily introduced for existing seafarers and hence enabling the seamen currently working at sea and in ports to develop the competence to handle and respond to automation failures. To overcome these problems TUDEV has instigated an EU project with several partners from EU called **SURPASS**. The project started in October 2009 and will be concluded in September 2011.

The main aim of the project is to transfer the innovation already developed in the design, delivery and assessment of short courses in order to fill the gap created as the result of emergence and application of the automated systems in the education and training of seafarers by the provision of a training course enabling them to have a full understanding of automated systems and these systems' weaknesses and limitations and receive International/European-wide recognition for it.

The partnership is composed of two small progressive high technology SMEs and several major merchant navy education and training (MET) institutions supported by their awarding, accrediting and/or certificating authorities. Some of the partners have recently been involved in harmonising and complementing the existing MET programmes in the EU (Safety On Sea, SOS 2005-07) and some have developed an innovative e-learning and assessment platform as part of the current Leonardo Pilot project (E-GDMSS, 2006-2008). The platform has been successfully tested and evaluated using two groups of trainees composed of different people from different maritime education and industrial sectors. The proposal instigator was the representative of IMarEST at the IMO MSC (2006) and at the same time a member of a national delegation at the event.

TUDEV is also involved with a Leonardo pilot project which started in November 2007 named **MarTEL** concerning the transfer of innovation by reviewing the accidents and incidents and identifying causes of these accidents albeit primarily due to language competency. Several other countries would like to become involved with this project.

The two new EU funded project started recently viz., **SURPASS** and **M'AIDER** are expected to be as successful as the recently concluded projects SOS, TRAIN 4Cs, MarTEL and EGMDSS).

TUDEV is also a partner in the EU funded **EBDIG** project which aims to transfer innovation from the automotive sector to smaller vessels and boats.

TUDEV has achieved a great deal in receiving recognition for its Merchant Navy Education and Training programmes for both deck and marine engineering officers through the Leonardo Safety on Sea (SOS) Project. The SOS project also helped TUDEV to become involved with other National and European projects as repeated earlier. There are now over 30 major centres working with TUDEV supporting various European Projects. .

The vision of TUDEV is not only to support the maritime industry in Europe but also look into the future and make an attempt to identify the trends and prepare the industry. TUDEV's training and education philosophy is primarily based on skills and competence preparing the young people not for the past but for the future through self studies, student centred activities, group and individual assignments and a series of other skills essential for a well rounded and confident person.

9. References

1. Project Lucintel, 2009, Global recreational boating industry analysis and forecast 2008-2013.
2. Pourzanjani et al, 'Maritime Education and Training (MET) in the European Union: How Can Maritime Administrations Support MET', Vol.2, No. 2 IAMU Journal, December 2002
3. Schröder et al, 'The Thematic Network on Maritime Education, Training Mobility of Seafarers (METNET): The Final Outcomes', Vol. 3, No. 1, June 2002.
4. Yongxing, J., and Ruan, W., Understanding of the Impacts of the International Maritime Conventions and Rules upon Maritime Education and Training and the Strategies there of, IMLA, 2009, Ghana, 2009.
5. Zade et al, 2002, 'Maritime Education and Training (MET) in the European Union: How Can Maritime Administrations Support MET', Vol.2, No. 2 IAMU Journal, December 2002
6. Ziarati Reza, 1995, "Factories of the Future", Invited paper, EUROTECNET National Conference, Germany, 1995.
7. Ziarati Reza, "Establishing a Maritime University in Turkey", A paper for consideration by Turkish Higher Education Council (YOK), 2005.
8. Ziarati Reza, 2006, "Safety at Sea-Applying Pareto Analysis", Commercial Shipping, Proceedings of WMTC 2006, 2006.
9. Ziarati et al, Leonardo Pilot Project Safety On Sea (SOS), 2005-2007 (www.mareduc.co.uk)
10. Ziarati et al, Ziarati, M. 'SURPASS Leonardo Project 2009-2011 No: 2009-1-TR1-LEO05-08652, www.c4ff.co.uk.
11. Ziarati et al 'MAIDER Leonardo Project 2009-2011 No: 2009-1-NL1-LEO05-01624, www.c4ff.co.uk

Bibliography

- 1.The 1978/95 STCW convention, IMO, London, 1995
- 2.Meeting documents of the 40th STW sub-committee, London, 2009
- 3.Wei, RUAN (2009), Remarks on the full review of STCW, Chinese Maritime Safety Administration, China.