Introduction

The fundamental purpose of Marine Accident Investigation and Shipping Security Policy Branch investigations is to determine the circumstances and the causes of the accident with the aim of improving the safety of life at sea. The second purpose is the avoidance of accidents in future. Findings of the investigation published are not intended to apportion blame or liability. If all stakeholders of transport know the problem of marine safety why do maritime accidents occur? Research and statistics show that human error is to blame in over 70% of marine accidents. These include trips and falls, fire, pollution and collisions, and are invariably due to a failure in safe working practices. Such incidents often result in crew injuries or fatalities, with the ship being consequently delayed or damaged. Exemplified, well known incident was the partial sinking of the Italian cruise ship Costa Concordia in 2012 - Figure 1.

After accident people always asking “Why does this happen?”. Crew complacency and fatigue can often be a factor in accidents. The prudent ship-owner or master will ensure that these are addressed by way of additional manning or rotating the ship staff more regularly if the ship is employed on a demanding trade route. There are, however, owners and managers who are unable to do this, which could in part be due to a shortage of available trained seafarers, but is more often attributed to commercial or operational considerations. Good or perfect equipment can cost more, but safety should be accorded a higher priority, because a ship cannot be operated safely without the well educated seafarer.

Next reason of sea incidents is ship design procedures and regulations. In the modern world of shipbuilding the vessels design team usually incorporates the suggestions of seafarers who are familiar with or have sailed on the type of ship that is being designed.

Proper supervision during the building process ensures that discrepancies and potential problem areas can be addressed. Senior officers are also able to join the ship during the final fitting-out process in order to familiarize themselves with the ship and, especially, the increasingly complex equipment they will be required to use.

Further problems are Operating Standards. Improved technology in ship building does not completely address the problem, as the seafarer then has to decipher the operating manuals that are supplied with the equipment. Language on board can often be a major problem. The manual may not be written in the language of the crew on board, and is often merely a generic document. Given that adequate facilities are available for translation of manuals into just about any language, this is unacceptable.

Standardization of marine safety

Even when there has been a mechanical or electronically failure, human error can play a role either by way of a lack of maintenance or monitoring, a lack of suitable equipment or protective devices, or a breakdown in communication or necessary procedures. It is a reason that marine transport should be recognized as problems of education and training system.

Maritime transport, often calling shipping trade, is the most international of all the world’s great industries - and one of the most dangerous. It has always been recognized that the best way of improving safety at sea is by developing international regulations that are followed by all shipping nations. Safety of sea transport can be divided on following three branches international law regulations (convention), seafarers education and training and technical development.

Taking into consideration the global character of maritime transport as well as the identified need for standardization in the processes which would lead to increased levels of safety and security, a number of
International Organizations have been established aiming to create a regulatory framework for maritime transport. The most important of those is the International Maritime Organization, IMO; however it must be mentioned that there are also other associations involved in this field such as the International Labour Organization (ILO), International Organization for Standardization (ISO), Secure Trade in APEC Region (STAR), United Nations Economic Commission for Europe (UN-ECE), Container Security Initiative (CSI), Custom-Trade Partnership against Terrorism (CTPAT) and Smart and Secure Tradelanes (SST).

In the shipping, including maritime transport, there are number of players that have influence and responsibility on safety on the sea. The most important position have:

- shipbuilder, which has responsibility for construction and technical standard of vessel,
- ship-owner, which decides level of technical standards of project above minimum requirements, employ crew and organize safety policy of vessel operation,
- cargo-owner, which pays and presses for the transport service regarding quality, time of transport,
- management company, which has responsibility for technical state of vessel and quality of crewing,
- insurer, which takes the risk of crew, cargo, vessel and results of potential accidents,
- classification society, which undertakes independent control on technical state of vessel on behalf of ship-owner and insurer,
- local maritime administration, which controls safety standards in the harbour, port and navigation infrastructure and confirms quality of local educated crew,
- flag state, which control all standards connected with maritime transport,
- local ministry of sea affairs and defense, which are response for military safety (e.q. maritime piracy, fishing area, etc) and cooperation between vessels, warships and maritime authority.

There are no doubts that for achieving an acceptable safety standards of maritime transportation companies should systematically training vessels personnel, introducing new, higher technical standards of vessels and permanently checking crew routines. That policy needs founds and time so without administrative pushing none will not made it. Moreover it is strongly depend on political and economical stabilization. Each military conflict, trade collapse or economic crisis brings new higher insurance rates what changing the structure of expenditures including cutting the cost of a safety.

Keeping a high level safety of seaborne is a main task of many ratified safety conventions. However it is difficult to determine an acceptable level of safety but there are no doubts that safety regimes are necessary. The milestones of conventions and maritime organization which have strong influence on safety of sea transport are presented below chronologically:

- Safety of Life at Sea (SOLAS) -1914,
- The International Maritime Organization (IMO) - 1948,
- The International Association of Classification Societies (IACS) - 1966,
- Tonnage Convention (TC) - 1969,
- International Convention on the International Regulation for the Preventing Collisions at Sea (COLREG) - 1972,
- Marine Prolusions Convention (MARPOL) - 1973,
- International Convention on Standards for Training, Certification and Watchkeeping for Seafarers (STCW) - 1978,
- International Convention on Maritime Search and Rescue (SAR) - 1979,

**Education and training system**

The main activities and tasks of IMO since its establishment have been to develop and maintain a comprehensive regulatory framework for international shipping. Its mandate was originally limited to safety-
related issues, but very soon it has been expanded to include other issues closely interrelated with shipping such as environmental, legal matters, technical cooperation and many topics affecting the overall efficiency of shipping – such as for example how to deal with stowaways or how a cargo manifest should be transmitted to the authorities ashore; piracy and armed robbery against ships. Most recently IMO has focused its activities in the security topic which has obtained a key importance nowadays, following the recent terrorist attacks of 2001 [1].

The main responsibility of IMO is to ensure the highest practicable and globally acceptable standards aiming to improve maritime safety and security and, help prevent marine pollution takes on a new dimension. The direct output of this work is a comprehensive body of international conventions, supported by guidelines and recommendations addressing almost all activities taking place within the shipping industry. The measures of IMO fall into three categories [2]:

1. Measures aiming at the prevention of accidents, casualties and environmental damage from ships in the first place. This category comprises of conventions setting standards for ship design, construction, equipment, operation and manning.
2. Measures which try to mitigate the negative effects of accidents such as for example rules concerning distress and safety communications, the provision of search and rescue facilities and oil spill clean-up and response mechanisms, all fall into this category.
3. Measures concerned with the aftermath of accidents and, in particular, with establishing a mechanism for ensuring that those who suffer the consequences of an accident – and this refers, in particular, although not exclusively, to pollution victims – can be adequately compensated.

The training of seafarers plays an important role in sea safety and in the protection of the marine environment. It is therefore essential to define a minimum level of training for vessels crew in the Community having regard to training standards agreed at international level. Minimum standards of training, certification and watchkeeping for seafarers serving on board are fixed by the International Maritime Organization Convention - IMO, on standards of training, as revised in 1978 (STCW Convention). This Directive applies to seafarers serving on board seagoing ships flying the flag of a Member State, with the exception of:

- warships or vessels only in governmental, non-commercial service;
- fishing vessels;
- pleasure yachts not engaged in trade;
- wooden ships of primitive build.

The Directive sets out the standards and the rules on training of competence to be met by seafarers who are candidates for the issue of certificates that allow them to get the functions for which the relevant certificate of proficiency is issued [3].

The categories of seafarer to which these rules relate are: masters, chief mates, deck officers and engineer officers, chief engineer officers and second engineer officers, certain categories of ratings (i.e. those working in an engine-room, forming part of a watch or serving on certain types of ship), and personnel responsible for radiocommunications. For officers there are two, main levels of education: operational and management.

For certain categories of vessel, such as tankers and ro-ro passenger ships, the Directive lays down special training provisions (required for this type of vessel). It sets out the mandatory minimum requirements concerning qualifications and the training of seafarers serving on board these specific categories of vessel. The Directive also lays down rules on education and training in management of emergency situations, fire-fighting and the provision of medical aid, and for crew members responsible for catering services.

Certificates shall be issued by the competent authorities to authorize the holder to serve as stated in the document. These documents are issued to candidates who meet the national standards for physical fitness and who satisfy certain basic requirements regarding identity, ages, service at sea and skills.

Member States established the necessary processes and procedures to carry out impartial investigation and penalty in cases of incompetence, acts or omissions that may pose a direct threat to the safety of human life, the safety of trade goods at sea or the marine environment. Penalties or disciplinary measures are mainly provided for and applied where company not holding a certificate as required by this Directive, a master has authorized a seafarer to carry out a function for which a certificate is required. Member States also ensure that:

- all training, assessment of competence certificate issue and the definition of a system of quality standards giving details of objectives and scope is continuously monitored,
training and teaching objectives are defined, and
the equivalence of training levels with the re-
quirements of the STCW convention are defined,
the quality of examinations, assessments and the
quality and experience of assessors is monitored
by maritime authority,

independent evaluations of knowledge, understand-
ing, skills and competence acquisition and
assessment activities are carried out at intervals
of not more than five years.

Moreover, Member States designate the authori-
ties that are to:
• give training;
• organize and/or supervise the required examina-
tions;
• issue certificates;
• grant possible dispensations.

The Directive allows Member States to monitor sea-
farers serving on any ship using their ports, irrespective
of the flag it flies, in particular in order to verify that
all seafarers who are required to be certificated by the
STCW Convention are so certificated [4].

Members ensure that the relevant provisions and
procedures laid down in Directive on port State control
are applied, as amended. In some cases, it is necessary
to assess the ability of seafarers to maintain
watchkeeping standards as required by the Convention
like verification of certificates. This is necessary in
particular where a ship using a Community port flying
the flag of a country which has not ratified the STCW
Convention used in such a way as to present a danger
for persons, goods or the environment, or has a master,
officer or rating holding a certificate issued by a third
country which has not ratified the Convention. In other
cases, crew members may will asked to provide an on-
the-spot demonstration of their competence.

Lastly, the Directive specifies the grounds on which
a vessel may be detained such as lack of training or
working conditions of the crew, where it has been es-

tablished that these inadequacies represent a danger for
goods, persons or the environment.

The Manila amendments to the STCW Convention
and Code were adopted on 25 June 2010, marking
a major revision of the STCW Convention and Code. The
2010 amendments are set to enter into force on 1
January 2012 under the tacit acceptance procedure
and are aimed at bringing the Convention and Code
up to date with developments since they were initially
adopted and to enable them to address issues that are
Anticipated to emerge in the foreseeable future [5].

Amongst the amendments adopted, there are a
number of important changes to each chapter of the
Convention and Code, including:
• improved measures to prevent fraudulent prac-
tices associated with certificates of competency
and strengthen the evaluation process (monitor-
ing of Parties' compliance with the Convention),
• revised requirements on hours of work and rest
and new requirements for the prevention of drug
and alcohol abuse, as well as updated standards
relating to medical fitness standards for seafar-
ers,
• new certification requirements for able seafar-
ers,
• new requirements relating to training in modern
technology such as electronic charts and infor-
mation systems (ECDIS),
• new requirements for marine environment
awareness training and training in leadership
and teamwork,
• new training and certification requirements for
electro-technical officers (ETO),
• updating of competence requirements for per-
sonnel serving on board all types of tankers, in-
cluding new requirements for personnel serving
on liquefied gas tankers,
• new requirements for security training, as well
as provisions to ensure that seafarers are proper-
ly trained to cope if their ship comes under at-
tack by pirates,
• introduction of modern training methodology
including distance learning and web-based
learning,
• new training guidance for personnel serving on
board ships operating in polar waters,
• new training guidance for personnel operating
Dynamic Positioning Systems.

EQF for marine education

The European Qualifications Framework (EQF)
is an acts as a translation device to make national quali-
fications more readable across Europe, promoting
workers' and learners' mobility between countries and
facilitating their lifelong learning.

The core of the EQF concerns eight reference
levels describing what a learner knows, understands
and is able to do – 'learning outcomes'. Levels of na-
tional qualifications will be placed at one of the central
reference levels, ranging from basic (Level 1) to ad-
vanced (Level 8). This will enable a much easier com-
parison between national qualifications and should also
mean that people do not have to repeat their learning if they move to another country.

The EQF applies to all types of education, training and qualifications, from school education to academic, professional and vocational including seafarers training and education. This approach shifts the focus from the traditional system which emphasises 'learning inputs', such as the length of a learning experience, or type of institution. It also encourages lifelong learning by promoting the validation of non-formal and informal learning.

This reflects a wider shift within which the EQF is acting as a catalyst for reforms: most Member States are now developing their own National Qualifications Frameworks (NQFs) based on learning outcomes. The important thing is transfer rules of EQF to the system of NQF and national marine higher education, including STCW requirements and programmes.

What are the consequences of bringing an attempt to while respecting the requirements of the STCW and EQF ? Is simultaneous demands both institutions are can be met in full ? The practice shows that a goal is almost impossible. Main problems to respect both requirements are:

- different levels of ranging of marine education in the EU, from 5 to 7,
- maximum 30 ECTS reflects per semester,
- problems of stakeholders activity,
- problem of practice between levels of operational and management,
- opportunity to gain operational and even management level without a university degree.

Marine accidents statistics

After accident people always asking “Why does this happen?”. Crew complacency and fatigue can often be a factor in accidents. The prudent shipowner or master will ensure that these are addressed by way of additional manning or rotating the ship staff more regularly if the ship is employed on a demanding trade route. There are, however, owners and managers who are unable to do this, which could in part be due to a shortage of available trained seafarers, but is more often attributed to commercial or operational considerations. Good or perfect equipment can cost more, but safety should be accorded a higher priority, because a ship cannot be operated safely without the well educated seafarer.

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Equipment problems are further compounded by the lack of a unified standard for essential equipment like voyage data recorders, oily water separators and lifeboat launching equipment. Lack of common standards cause that the seafarer who will be faced with understanding and operating equipment that is unfamiliar and unduly complex, often in less than ideal conditions.

According to casualty statistics produced by Lloyds Register of Shipping between 1966 and 1985 there were never fewer than 300 ships lost annually, with worst years, 1978 and 1979, when together 938 losses occurred (around 6.7 ships per thousand in the world fleet). Those numbers began to decrease significantly in 1980 and has continued on a downward curve ever since. In 1990, the number of annual losses accounted less than 200, while, by 2004, the overall figure had approached the 100 mark (Figure 2). Nowadays, relatively few ships actually sink at sea. The vast majority of so-called "losses" are actually those which are damaged and "written off" by the hull insurers as being beyond economical repair - described by underwriters as "constructive total losses". Similar reductions in insurance claims for incidents involving personal injury, it is clear that the live lost numbers decreases as well from 2000 - Figure 2.
Figure 2. Total vessels lost 2000 - 2005
Source: IMO Secretariat database, 2005.

Table 1. Human lost at sea compared to total seafarers and passengers

<table>
<thead>
<tr>
<th>Years</th>
<th>2000</th>
<th>2005</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human lost (IMO)</td>
<td>296</td>
<td>214</td>
<td>250</td>
</tr>
<tr>
<td>Total number of seafarers and passengers (*1000)</td>
<td>676.388</td>
<td>1,336.631</td>
<td>2,078.325</td>
</tr>
</tbody>
</table>

Source: IMO Secretariat database, 2011

Regarding the environmental pollution, the numbers of major ship casualties and significant pollution incidents have decreased sharply however accident in the Gulf of Mexico oil spill in 2010 showed that the serious problem is still exist and it is closely related to standardization and training system.

**Conclusions**

It is often said that safety and quality must be initiated and led from the top. Unfortunately, this does not always happen. It is our collective responsibility to ensure that a seafarer is provided with an environment in which it is safe to live and work. The sea has always been a potentially hazardous and dangerous working environment. Yet, ship operators today have new factors and new pressures to contend with. However the Manila amendments to the STCW Convention are set to enter into force on 1 January 2012 but national regulation were only initially adopted and problem still exist.

**Streszczenie**

Podstawowym celem badania wypadków morskich jest dochodzenie ich przyczyn oraz publikacja. Polityka bezpieczeństwa polega na ustaleniu okoliczności i przyczyn wypadku, mających na celu poprawę bezpieczeństwa życia na morzu w przyszłości. Drugim celem jest unikanie wypadków w przyszłości. Artykuł prezentuje regulacje prawne oraz wpływ form i metod kształcenia morskiego na bezpieczeństwo na morzu.

**Abstract**

The fundamental purpose of Marine Accident Investigation and Shipping Security Policy Branch investigations is to determine the circumstances and the causes of the accident with the aim of improving the safety of life at sea. The second purpose is the avoidance of accidents in future. The paper presents standardization regulation and the influence of methods of training and learning for sea safety.
References

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