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Transactions on Maritime Science (ToMS) is a scientific journal with international peer review which publishes scientific papers in the following areas:

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~ Hydrography,
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~ Transportation and Modes of Transport,
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The views and opinions expressed in the papers are those of individual authors, and not necessarily those of the ToMS editors. Therefore, each author will take responsibility for his or her contribution as presented in the paper.

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From Editor-in-Chief

Ivica Kuzmanić

Dear Readers,

You have before you the seventh issue of the internationally reviewed scientific journal *Transactions on Maritime Science*, published by the Faculty of Maritime Studies of the University of Split. As always, the Journal is published in printed and electronic, open access form. Our desire is for our readers to have an easy access at minimum expense.

This issue brings you papers from several scientific areas. The paper from maritime law gives an in-depth analysis of a seemingly uncomplicated legal relationship. The relationship between two very significant acts: the Obligatory Relations Act and the Maritime Code, out of which the Obligatory Relations Act certainly falls under the category of general and Maritime Code of special acts. The paper of authors from Houston and Doha presents a concise review of extant literature on threat detection in the maritime domain, with specific emphasis on solution methodologies, sensing technologies and regional affiliations of authors. The paper of authors from Bosnia-Herzegovina and Croatia examines the influence of different environmental factors on refractive indices in fiber optic cables. Paper describing the building and testing of a 2.4 GHz antenna which can be used for WLAN is brought to you from Zagreb, Croatia. The Journal also contains a paper providing a detailed analysis of the annual statistical report on the performance of Croatia's Maritime Safety Inspection.

The "Contribution" section brings you news from the International Maritime Organization from London, from the pen of our associate Tatjana Krilić. All news from the last six months are given. In the "Maritime heritage" section we have prepared a new contribution by a renowned journalist and publicist Marijan Žuvić on the last days of Adriatic coastal steamships titled "White Ships, Black Smoke". You will also find news from different maritime branches.

We have also remained faithful to another area we wish to promote: the Croatian cultural heritage. Again a poem, this time written in the dialect spoken by the inhabitants of the island of Vis. This contribution is presented in bilingual form: in the picturesque language of author Vinko Kalinić, borrowed from his collection of poems "Oltor nasri mora". And, as a special treat, in the electronic version of course, we have a unique opportunity to hear the author recite his own poem. This time, we also bring you a contribution, likewise in Čakavian dialect and in English: a memory of an old ship which met its end on the Marjan shore, in Split, after gale force Bora.

We still hope that the papers we publish will urge you to cooperate.

The Application of the General Provisions of the Obligatory Relations Act to Maritime Contracts

Blanka Ivančić-Kačer, Vitomir Raić

This paper is an in-depth analysis of a seemingly uncomplicated legal relationship. The relationship between two very significant acts - the Obligatory Relations Act and the Maritime Code, out of which the Obligatory Relations Act certainly falls under the category of general and the Maritime Code of special acts. The complexity stems from the fact that the Maritime Code although, in essence, determined by international agreements, is likewise relevant for establishing whether a provision of the Obligatory Relations Act, although unregulated either by the Maritime Code or binding international agreements, is acceptable for application in maritime contracts. In other words, it is a matter of the application of a provision of the Obligatory Relations Act to maritime contracts "in an appropriate manner".

KEY WORDS
~ Law
~ Conflict of laws
~ Interpretation
~ Agreements
~ Maritime contracts

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1. INTRODUCTION

The Obligatory Relations Act[1] is one of the most important acts in Croatian positive law. This by no means implies that any acts are irrelevant, but merely puts an emphasis on its objectively great significance. The same is true of the Maritime Code[2], especially since the Republic of Croatia is characterized by its exceptionally indented coast with over 1000 islands and a multitude of seafarers sailing on Croatian (unfortunately fewer and fewer) and foreign ships.

The thesis that there are no irrelevant acts requires almost no further explanation, it suffices to say that every legal system is a single consistent whole influenced by every, even the smallest change in any of its parts. It is not uncommon for a poorly conceived and/or ill-prepared amendment of a legal document to give rise to significant problems with the application of one or more other acts. In some instances, the legislator recognizes the oversight and reacts by adopting an amendment, sometimes the legislator does nothing but leaves everything up to court practice (which is unfortunately frequently the case) and sometimes the problem is resolved by the nullification of entire or parts of some acts by the Constitutional Court of the Republic of Croatia.

1. Obligatory Relations Act, OG 35/05., 41/08., 125/11. – hereinafter: ORA or Obligatory Relations Act. An act of the same name was previously in force and assumed on 8 October 1991, originally adopted in 1978 in the former FRY - Official Gazette of the FRY 29/78, 39/85 and 57/89, OG 53/91, 73/91, 111/93, 3/94, 7/96, 91/96, 112/99 and 88/01 – hereinafter: ORA 78/91 or Obligatory Relations Act 78/91.
2. Maritime Code, OG 181/04, 76/07, 146/08, 61/11, 56/13. – hereinafter: MC or Maritime Code). Code of the same name was previously in force - Maritime Code, OG 17/94., 74/94., 43/96. – hereinafter: MC 94 or Maritime Code 94.

Since the Republic of Croatia (in contrast not only to a great majority of EU member states, to which it belongs as of 1 July 2013, but also to other constituent parts of the former federation which officially announced the adoption of their civil codes in 2015-2016) not only does not have a civil code (containing all the necessary provisions representing an objective redundancy in special acts, which they unnecessarily make cumbersome), but is not even planning to adopt one, the Obligatory Relations Act functions as its substitute with all the advantages and disadvantages of such a solution. Therefore, recognizing the ORA as a surrogate of a non-existent and non-envisaged civil code, the topic of this paper is the relationship between the ORA and maritime contracts, i.e. the ORA and the part of the Maritime Code regulating maritime contracts. In this paper, maritime contract is defined as any contract regulated by the Maritime Code as a nominate contract, as well as any contract concluded in accordance with the principle of the autonomy of will and in the absence of the numerus clausus principle in contract law, which is in essence a maritime contract. Maritime contract law is actually a part of maritime private law, which, depending on its origin, can be classified as a) national and b) international. National law contains norms - collision rules determining the applicable law for international private-legal relations[3]. The maritime property law is most accurately described as consisting of maritime proprietary law and maritime law of obligations, with further subdivisions, *inter alia* into maritime law of contractual obligations and maritime law of extra-contractual obligations. The subject matter of maritime contracts, naturally, belongs to the domain of maritime law of obligations.

2. LEGAL SOURCES

Bearing in mind the topic of this paper, legal sources are any sources more or less directly dealing with contracts and especially maritime contracts. Of course, the highest legal source (as implied by the term *non plus ultra*[4]) is the Constitution of the Republic of Croatia[5] to which all legal and sublegal documents must conform (and if incompatible, put out of force and as a rule nullified in proceedings before the Constitutional Court of the Republic of Croatia or the High Administrative Court of the Republic of Croatia). In so doing, we must recognize the relativity[6] sometimes present in the treatment of international contracts as regulations which not only have supra-statutory legal force (as expressly acknowledged by the Constitution), but must simultaneously be compatible with the Constitution. However, international contracts are especially valuable for the topic of this paper, with emphasis on the possible relativization of integral relationship. Or to put it differently, international contracts have the legal force of supra-statutory laws and are frequently implemented into concrete legal texts containing references to such contracts. If and when this is the case, a possible consequence is that the documents cease to be on the same level, with one remaining at the level of the law and the other assuming the characteristics of a supra-statutory law.

As it happens, it is in the domain of the maritime law that there exists an exceptionally large number of international conventions which, providing they are ratified and published, acquire the status of supra-statutory laws. For example, maritime transportation is regulated by the International Convention for the Unification of Certain Rules of Law relating to Bills of Lading (Hague rules), 1924, with protocol modification in 1968 (Visby rules) and 1979, the United Nations International Convention on the Carriage of Goods by Sea (Hamburg rules), 1978, the United Nations Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea (Rotterdam rules), 2009.[7]

As for contractual issues, the main Croatian law (*sedes materiae*) is the Obligatory Relations Act. Since this paper does not deal (only) with contracts in general, but with maritime contracts specifically, the legal source status is also accorded to acts not primarily dealing with contracts, but with the maritime problem area, including maritime contracts, i.e. primarily to the Maritime Code. In a way, legal sources are also regulations which were in force prior to the above, especially when bearing in mind the rule that the regulation in force at the time of acquisition is applicable to a concrete situation, even if a later regulation contains changes either convalidating something that was initially invalid or regulating something that was initially valid differently, with the effect on earlier acquisitions.

Customs likewise have the meaning of a legal source, especially based on a very clear express provision contained in Article 12 of the Obligatory Relations Act. The Act differentiates

3. The division to private and public law is relevant for maritime law because, e.g. the relations between two countries pertaining to sea boundary demarcation are a public law issue. See in Drago Pavić, Pomorsko imovinsko pravo, Književni krug Split, Split, 2006., pg. 30.
4. Nothing further beyond, higher of the highest .....
5. Constitution of the Republic of Croatia, OG 56/90, 135/97, 8/98 – final draft, 113/2000, 124/2000 – final draft, 28/2001, 41/2001 – final draft 55/2001 - corrigenda, and Amendment to the Constitution of the Republic of Croatia published in OG 76/2010, 85/10 – hereinafter: the Constitution.
6. A rare occurrence which must nevertheless be noted to arrive at the adequate conclusions. Real-life examples are the European Union and NATO Treaties of Accession - can anyone envisage, realistically, those treaties being modified to conform to the (Croatian) Constitution. A clear-cut example of the opposite is the amendment of the Constitution to allow for an EU accession referendum to be held under conditions (not in the sense of a guaranteed outcome, but in the sense of fair game, allowing the outcome with not only the higher, but sufficient number of votes to "win") allowing for both the negative and the positive outcome.
7. Ivo Grabovac, Odgovornost prijevoznika u prjevozu stvari u Pomorskom zakoniku Republike Hrvatske i u međunarodnim konvencijama, Književni krug, Split, 2010, pg. 9.

between trade customs, legal customs and customs, all with their own specific characteristics, but without questioning that all three categories are to be considered legal sources having precedence over dispositive legal norms[8].

Naturally, apart from the regulations having legal force, sublegal regulations also have the meaning of legal sources. Apart from the above, any other regulation at the legal or sublegal level directly or indirectly dealing with the problem area which is the topic of this paper, also has that meaning.

Court practice and legal science are also commonly considered legal sources[9]. However, after the accession of the Republic of Croatia into the European Union, court practice obtained an entirely new significance. Namely, although Croatia had an obligation to observe European court practice and interpret the Croatian regulations in accordance with the so called *community acquis or acquis communautaire* during the accession negotiations, after 1 July 2013, that became an obligation equal to the observance of the Constitution. A Croatian judge became a European judge, although not by name, but rather by being obligated to apply European legal norms and interpret them in accordance with *acquis communautaire*.

As for legal science, one of the effects of formal EU membership is the absence of interstate borders inside the EU, meaning that the scientific papers of German, Italian, Austrian and other scientists from the EU compete with those of Croatian scientists on equal terms, with the only criterion being the force of argument. Otherwise, as things go, science and only science can provide real answers to an array of questions regarding the relationship between a general (Obligatory Relations Act) and a specific regulation (Maritime Code) in essence marked by a number of international agreements having supra-statutory force regardless of the manner of their implementation into the Maritime Code. More precisely, as a rule, legal texts do not regulate this issue, but leave everything up to someone else and that someone else can only be science. This allows for the recognition of possible modification of scientific attitudes in advance, without any intervention by the legislator.[10]

3. THE HISTORY OF THE OBLIGATORY RELATIONS ACT AND THE MARITIME CODE

3.1. The History of the Obligatory Relations Act

Examining the Obligatory Relations Act is almost impossible without paying some attention to its relatively long history dating back not only to the former act of the same name (ORA 78/91) originally adopted in the FRY and taken over, along with some other acts, by the Republic of Croatia after it gained its independence, but also to the great European civil codes or codices out of which one (ABGB or OGZ or the Austrian General Civil Code[11]) is still applied before Croatian courts and generally accepted as the basis of the Croatian civil law. Although the other great European civil codes (the Austrian General Civil Code - Allgemeines Burgerliches Gesetzbuch / recognized in our law as the OGZ / from 1811, the French Civil Code - Code civil from 1803, the Montenegro General Proprietary Code - OIZ from 1888, the German Civil Code - Burgerliches Gesetzbuch - BGB from 1896, which entered into force and effect on 1 January 1900, the Italian Civil Code - Codice civile from 1938), do not have such a (direct) effect, they are still significant as a part of the continental European legal circle to which the Republic of Croatia doubtlessly belongs. The most important characteristic of that legal circle is exactly that the central position belongs to the civil law, or more precisely private law system around which the entire legal order is formed.[12]

The development of private law brought about the division into separate legal branches and the formation of a single, and certainly most comprehensive, set of legal rules regulating certain proprietary and some non-proprietary relations. That set continued being referred to as civil law, the term, in a way, used as a synonym for the entire private law[13]. The most relevant civil code for the Republic of Croatia is beyond doubt the OGZ, because the legislator of the former state[14] and the legislator of the current state expressly allowed for the application of the legal rules of the OGZ[15]. Based on the general rule that disputes are resolved

8. Learn more: Vilim Gorenc in: Zlatko Ćesić, Vilim Gorenc, Hrvoje Kačer, Hrvoje Momčinović, Drago Pavić, Ante Perkušić, Andrea Pešutić, Zvonimir Slakoper, Ante Vidović, Branko Vukmir, Comment on ORA, RRIF plus d.o.o., Zagreb, 2005., pg. 24-27, Vilim Gorenc in: Vilim Gorenc, Loris Belanić, Hrvoje Momčinović, Ante Perkušić, Andrea Pešutić, Zvonimir Slakoper, Mario Vukelić, Branko Vukmir, editor: Vilim Gorenc, Comment on Obligatory Relations Act, Official Gazette, Zagreb, November 2014, pg. 26.-29.
9. It must be pointed out that (quality) professional documents which are sometimes more useful and better than scientific papers (but lacking some formal elements which would make them scientific) can also have this meaning.
10. Similar to the recognition of the position of the medical science on the issue of the criteria for the establishment of death as a natural and legal fact, which is unregulated by law. Learn more: Blanka Ivančić-Kačer, Smrt kao pravna činjenica i dostignuća suvremene medicine kroz prizmu krionike, Godišnjak 15-2008., Aktualnosti hrvatskog zakonodavstva i pravne prakse, građansko, trgovačko, radno i upravno pravo u praksi, Organizator, Zagreb, 2008, pg. 487.- 499.
11. The Austrian Civil Code was published by the imperial patent of 1 June 1811, providing that it entered into force first on 1 January 1812 in Austrian northern provinces and then in the other provinces as they were freed from the French occupation. - Mihajlo Vuković, Pravila građanskih zakonika s naknadnim propisima, sudskom praksom, napomenama i podacima iz literature, Školska knjiga, Zagreb, 1961, pg. V-VI.
12. Nikola Gavella in: Nikola Gavella, Mira Alinčić, Petar Klarić, Krešimir Sajko, Tanja Tumbri, Zlatan Stipković, Tatjana Josipović, Igor Gliha, Hrvatsko pravno uređenje i kontinentalnoeuropski pravni krug, Zagreb Law School, Zagreb, second unrevised edition 1994, pg. 7-8.
13. Petar Klarić, Martin Vedriš, Građansko pravo, Official Gazette, Zagreb, July 2014, pg. 11.
14. Act on the Irrelevance of Legal Regulations Adopted Prior to 6 April 1941 and During Enemy Occupation - Official Journal of the FRY 86/1946.
15. Act on the Manner of Application of Legal Regulations Adopted Prior to 6 April 1941 (Official Gazette 73/91).

in accordance with the regulations in force at the moment of occurrence of the disputed events (because regulations, as a rule, do not have a backward or retroactive effect, although the Constitution exceptionally allows for such a possibility), many disputes are still resolved by the application of regulations which are no longer in force (by the merit of their being in force at the moment of the occurrence of the disputed event), including by the application of the OGZ. If relevance for Croatian law (and science and legislation and general) was measured by the merits of the person or persons generally credited with the authorship of sorts of a large legal project, an honorary position would certainly be awarded to the great Croatian jurist, Baltazar Bogišić[16] who practically crowned his exceptionally large legal opus with years of successful work on the drafting of the text of the General Property Code for the Principality of Montenegro[17], in which he held the position of the Minister of Justice. Among other things, the simplicity and comprehensiveness of the language he used in that text are held in especially high regard[18].

In the early 1960s in the former state, the need for the adoption of an own obligatory relations act was beginning to be seriously considered, which led to the publication in 1969 of the so called Draft of the Code of Obligations and Contracts[19] which was a far cry from the ambition to develop a civil code, but was generally exceptionally well received by the legal profession. The most important (and strangest) thing about the Draft is that for an entire decade after its publication in 1969 until entry into force of the Obligatory Relations Act 78/91, it was practically treated as an act with legal force and effect in court practice, with the courts referring to the legal rules stated in a certain article of the Draft. In 1978, the Draft (with certain modifications imposed by the then current government which, due to the non-proprietary and non-market oriented world view, found some of the solutions offered in the Draft too radical and unacceptable) developed into a legal text. That legal text was very highly thought of in the professional circles and together with the Inheritance Act[20] from 1955, belonged to the very top of the legislation of the former state.

After the proclamation of independence by the Republic of Croatia, among other things, the amending of the taken over Obligatory Relations Act was beginning to be considered. Namely, when the Act was taken over, by the nature of things, only the most essential modifications were made, leaving the bulk of the work for the future activities of the legislator. It became clear shortly after the beginning of work of the appointed task force that an entirely new, integral legal text was required. Exactly because the extant legal text was held in such high regard, nobody questioned the approach to work in which deviations from the basic propositions of the existent text were minimal. The same approach continued to be applied even after the idea of amendment of the Act was abandoned in favour of the decision to work on the development of a completely new, integral legal text.

When the text of the Obligatory Relations Act was finally complete, it was clear that it was not only based on its predecessor, but resembled it very closely. However, it is this approach that additionally ensured that the Obligatory Relations Act would surpass the Obligatory Relations Act 78/91 in every sense, which is even more significant considering that the ORA 78/91 was a very good law. There are many improvements, as in the special part dealing with nominate contracts, as well as in the part dealing with damage as the most relevant part of extracontractual obligatory relations. It is the general part of the Obligatory Relations Act that has the most relevance for the special acts, including the Maritime Code, exactly because this is where the Obligatory Relations Act steps in as a substitute for the civil code we don not and, as things stand, will never have[21]. Two amendments were made (the first in 2008 and the second in 2011[22]) in the tenth year after entry into force of the Obligatory Relations Act, neither of which contains any provisions which would be of relevance for the topic of this paper.

The Obligatory Relations Act has three parts (Part one, Part two, Part three) and 1165 articles (amendments excluded)).

Part one (Articles 1-246) is significant for this paper because this is the general part containing the provisions which make up the standard key part of civil codes. This part contains legal

16. Baltazar (Baldo, Valtazar) was born in Cavtat, on 20 December 1834 and spent most of the time he was working on the Code in Paris, in which he had permanent residence, like elsewhere throughout Europe.
17. See the integral text in the book: Baltazar Bogišić, Izabrana djela, Tom I, Opšti imovinski zakonik za Knjaževinu Crnu Goru.. CID and JP Official Gazette of the Socialist Republic of Montenegro, Podgorica, 2004.
18. A frequently quoted proof is Article 1006 which says as follows: The course of time amends not that which was. This is no revolutionary solution, but merely a version of the old Roman rule: Quod ab initio vitiosum est non potest tractu temporis convalescere. However, it is precisely in the language and expression that the value of this version lies.
19. Draft of the Code of Obligations and Contracts (hereinafter: Draft). See the integral text in the book: Klasici jugoslavenskog prava – Mihajlo Konstantinović, Obligacije i ugovori, Skica za Zakonik o obligacijama i ugovorima, Official Journal of the FRY, Belgrade, 1996.
20. Inheritance Act, OJ FNRJ 20/1955, 19/1965, final draft 42/1965. – hereinafter: IA or Inheritance Act 55.
21. Still, it must be noted that the activities on the development of the European Civil Code are in progress, providing that the date of its completion is unknown and if it is completed, it is not only unknown whether it will be adopted as such, but also how many imperative provisions it will impose and how much will be left up to the national legislators (for the time being this is still a national issue) and how the Code will be implemented in practice. However, even if it is never adopted, the very work on the Civil Code is certainly of great use and every state can (and we believe should) use it without any special limitations to improve its own national legislation.
22. The second amendment is all the more unusual because another act (Act on the deadlines of fulfilment of financial obligations) put Article 174. of the Obligatory Relations Act, out of force and regulated its subject matter.

norms about the basic principles, participants of obligatory relations, establishment of obligations, obligation types, obligations effects, changes in obligatory relations and cessation of obligations. Among other things, it also contains a key provision in Article 14, paragraph 3 of the Obligatory Relations Act stipulating that the provisions of the Act relating to contracts also apply, in an appropriate manner, to other legal transactions. Although it is true that the same effect would be achieved even without such a provision (since the Obligatory Relations Act has the meaning of a surrogate of the non-existent civil code by nature, with or without an express provision) this legal provision nevertheless represents a positive contribution to legal safety. The provision is simultaneously very clear and flexible, the latter owing to the use of the legal standard "in an appropriate manner" which not only allows for, but imposes a creative approach to the problem, rather than promoting an automatic assumption of the solution. The creative approach implies the need to recognize the essence and nature of maritime contracts, including which parts of the Obligatory Relations Act are compatible and which are not.

Part two (Articles 247-1162) contains the so called contractual obligatory relations (general provisions pertaining to contract conclusion, representation, contract interpretation, contract invalidity and effects, individual contracts, extracontractual obligatory relations (infliction of damage, acquisition without legal grounds, agency without mandate, public promise of reward and securities). This entire part is exceptionally significant for this paper, although in a different manner. The general provisions of the obligatory part are relevant because they, as a rule, are either not contained at all or are contained to a limited extent in special regulations, and provisions on individual contracts are important because special regulations (including the Maritime Code), as a rule, even if they contain provisions on a specific contract, regulate it by a smaller number of articles (and insufficiently in terms of contents), meaning that the contractual provisions from the Obligatory Relations Act for specific contracts are applied. The part dealing with extracontractual obligatory relations is exceptionally important due to provisions on damage, with emphasis on the fact that this part also contains Article 349 of the Obligatory Relations Act stipulating that if not stipulated otherwise in the contractual part, the provisions of the Obligatory Relations Act on the compensation of extracontractual damage apply.

Part three (Articles 1163-1165) contains transitional and final provisions which are not especially significant for the topic of this paper, because the moment of entry into force as a criterion for the resolution of antinomies is less relevant than the other two criteria - which regulation is of higher and which of lower order by the criterion of the adopting legislator and which regulation is general and which special by the criterion of the closeness to and manner of approach to the subject matter in question.

3.2. The History of the Maritime Code

Maritime property law, just like maritime law in general, historically developed side by side with the development of the commodity trade and seafaring in the function of such trade. At first, it was merely common law (lex mercatoria), but later on the customs gave rise to the establishment of specific institutes of maritime law, first through the statutory laws of Medieval autonomous towns and later through national codifications. Sea-related property-rights relations are universal and international in character. The regulations of the Austro-Hungarian Empire regulated only maritime administrative law. A draft of maritime commercial law was devised in the Kingdom of Yugoslavia in 1937, but never became law[23].

It should be clearly stated that it was entirely possible for the Maritime Code not to regulate the contractual part at all. This is up to the legislator who can opt for either of the two extreme approaches (first-entirely rely on the general law regulating contracts and second - regulate the entire problem area by a special act, in this case the Maritime Code) or any number of possible compromise or moderate solutions in which the special act relies on the general to a greater or lesser degree, i.e. to a greater or lesser degree contains its special solutions deviating from the general to a greater or lesser degree.

In the new independent state, an integral legal text consolidating the maritime law subject matter (including maritime contracts) was not adopted until 1994. During those three years, the provisions of an array of special acts were in force, which were put out of legal force and effect by the transitional and final provisions of the Maritime Code 94 (Article 1053), in which they are precisely listed[24].

23. Drago Pavić, Pomorsko imovinsko pravo, Književni krug Split, Split, 2006., pg. 30.-34.

24. Act on Coastal Sea and Epicontinental Belt (Official Gazette, no. 53/91), Maritime Domain and Seaports Act (Official Gazette, no. 19/74, 39/75, 17/77, 18/81) in part pertaining to maritime good and with the exception of Articles 67, 68, 69, 71, 73, 76, 77, 79 which will be put out of force after the adoption of the corresponding legal documents from Article 1043 of this Act, Maritime and Inland Navigation Act (Official Gazette, no. 53/91), in part pertaining to maritime navigation, Pilotage Act (Official Gazette, no. 15/74), with the exception of Article 4, paragraphs 2 and 3, Article 6, Article 7, Article 8, Article 9, Article 10, Article 11, Article 12, Article 13, Article 14, Article 15, Article 16, Article 17 and Article 18 which will be put out of force after the adoption of corresponding legal documents from Article 1043 of this Act. Legal and physical persons who performed sea pilotage prior to the entry into force of this Act may continue performing the same job until the adoption of corresponding legal documents from Article 1043 of this Act, Act on the Safety of Sea and Inland Navigation (Official Gazette, no. 55/90 - final draft), with the exception of Article 13, Article 17, Article 18, Article 19, Article 20, Article 21, Article 22, Article 23, Article 24, Article 40, paragraphs 2 , 3, 4 and 5, Article 42, Article 43, Article 44, Article 45, Article 46, Article 51, paragraphs 3 and 4, Article 53, Article 54, Article 55, Article 56, Article 57, Article 58, Article 59, which will be put out of force after the adoption of corresponding legal documents from Article 1043 of this Act, Act on the Establishment of Navigational Ability of Vessels at Sea and in Inland

The Maritime Code 94 is considered *corpus iuris* maritimi because complete maritime law relations were regulated by a special code[25]. Its predecessor was the federal regulation called the Maritime and Inland Navigation Act[26] (taken over as state regulation on 8 October 1991), followed by the Maritime Code 94 and, in little under four years, by the Inland Navigation Act[27]. The Inland Navigation Act 98 survived for less than a decade when put out of force by entry into force of the Act on Inland Navigation and Ports[28].

4. INTERRELATIONSHIP OF THE OBLIGATORY RELATIONS ACT AND THE MARITIME CODE

4.1. General

This paper deals with the interrelationship of two legal texts adopted by the same legislator (the Croatian Parliament), but at different times, differing not only by the criterion of specialization, but also by the role of international agreements applicable to their field of regulation. To make the issue more complicated than it appears *prima facie*, the issue of the so called legal gaps is always present, i.e. of situations in which due to the lack of a concrete legal norm we must derive one using the legal tools and rules, free of any arbitrariness and wilfulness, simultaneously ensuring the maximum of legal safety. Legal gaps are not the same thing as the collision of regulations. As opposed to interpretation in the usual sense, when the legal norm exists, but its interpretation and manner of application are disputed, legal gap implies the absence (non-existence) of the norm. All points of contention relating to the application of an act fall into one of the three typical categories:

a) Legal provisions are unclear, ambiguous or even contradictory. In this case, the provisions are interpreted using recognized techniques;

b) Legal system is not harmonized. In this case, individual acts are contradictory;

c) There are no rules for the resolution of the case at hand.

In case under c), we have a legal gap. Therefore, the establishment of existence of a legal gap means recognizing the need for legal regulation in areas not covered by positive law[29].

As for interpretation, its basic function is the establishment of several possible meanings and the selection of one, most favourable reading of a legal document which is unclear and/or ambiguous in a certain social situation[30]. Apart from numerous other interpretation methods, it is well known and undisputed that in European law, target or teleological interpretation has absolute priority, as well as that such interpretation allows for the establishment of a meaning not covered by the options derived from language interpretation.

Obviously, the interpretation procedure needs to examine whether there exists a collision of regulations (partly requiring and partly not requiring an examination of the contents or essence of the regulations) and what is proscribed by the legal norm given precedence over the other or others. This includes the highly likely possibility of combining several legal norms which are not mutually exclusive, but complete each other.

As for possible collision of any regulations, the rules on the resolution of the conflict of laws or collision of laws apply, as one of the most important issues of the legal orders altogether. The conflict between two incompatible legal norms or the antinomy of legal norms is, as a rule, resolved by the application of the criteria of a) chronology, b) hierarchy and c) specialization[31].

The criterion of chronology or the temporal criterion refers to the moment of the beginning of existence of a legal norm (its entry into force), an easily established fact, at least in the case of ius strictum. Although everything appears crystal clear, we must point to a specificity of Croatian law in which we can even find an example of an act which officially entered into force on 3 April 2003, the transitional and final provisions of which stipulate the beginning of application six months after its entry into force[32], resulting in a situation in which we have an act which is in force but is not applied, raising the question of the purpose of such an act[33].

The criterion of hierarchy is based on the level of the adopting legislator. According to this criterion, the Croatian Parliament has precedence over the municipal council of a local self-governing unit. Judging by the same criterion, county assembly has precedence over municipal or city council. These cases are clear from the standpoint of the criterion of origin[34], but the status of the norm of higher and lower order can also be associated with a) effects (a norm capable of derogating the other is considered higher), b) obligation of the addressee (the lower of

Waters (Official Gazette, no. 18/69), with the exception of Article 15, Article 16, Article 17 and Article 18 which will be put out of force after the adoption of corresponding legal documents from Article 1043 of this Act, Article 12 of the Act on the Establishment of Tasks from the Self-Governing Domain of Local Self-Governing and Governing Units (Official Gazette, no. 75/93).

25. Ivo Grabovac, Prijevoz stvari u unutarnjoj plovidbi u Hrvatskoj – de lege lata i de lege ferenda, Književni krug, Split, 2007, pg. 7.
26. Maritime and Inland Navigation Act, Official Journal of the FRY, no. 22/77, 13/82, 30/85, 80/89 and 29/90) was taken over in the framework of the Act on the Assumption of Federal Laws from the Domain of Maritime and Inland Navigation Applied in the Republic of Croatia as Republic Laws, OG 53/91
27. Inland Navigation Act , OG 19/98, 151/03, 138/06. – hereinafter: Inland Navigation Act 98,
28. Act on Inland Navigation and Ports, OG 109/07, 132/07, 51A13, 152/14.-hereinafter: Act on Inland Navigation and Ports.
29. Đuro Vuković, Pravna država, Zgombič i partneri, Zagreb, 2005, pg. 107.-108.
30. Nikola Visković, Pojam prava, second revised edition, Logos, Split, 1981, pg. 292.
31. Norberto Bobbio, Eseji iz teorije prava, Logos, Split, 1988, pg. 125.
32. Inheritance Act, OG 48/03., 163/03., 125/11, 35/05., 127/13. - hereinafter: IA.
33. Learn more: Norberto Bobbio, op.cit., pg. 128.-135.
34. Norberto Bobbio, op.cit., pg. 126.

the two sources is the one whose owner is expressly prohibited from issuing a norm contrary to the norms issued by the other owner), c) consequences (the norm the violation of which by the other norm may result in the initiation of proceedings for the establishment of inadmissibility or invalidity or illegitimacy of the other norm is considered higher).

The criterion of specialization also differs from the chronological criterion or the temporal criterion and the criterion of hierarchy in that its application necessitates an examination of the subject being regulated, while the chronological criterion merely requires the establishment of the date of publication in the Official Gazette and the content of the transitional and final provision regulating entry into force and the criterion of hierarchy an insight into the preamble of the legal norm detailing its adopter, all regardless of the subject being regulated[35].

A simplified approach is usually applied in which antinomies are resolved by simple application of simple rules. Those rules are: a) *lex posterior derogat legi priori* (subsequent law derogates the earlier law) b) *lex superior derogat legi inferiori* (higher law or legal norm derogates the lower) and c) *lex specialis derogat legi generali* (special regulation derogates the general).

Everything is relatively simple as long as the above criteria give the same result, i.e. give precedence to the same legal norm. However, the problem arises when one criterion gives precedence to one and another criterion to the other legal norm. In that case the hierarchy of the three antinomy resolution criteria needs to be established. The standpoint that in the relationship between the temporal and the hierarchical criteria the former is always weaker than the latter, while in the case of the specialization criterion the things are nowhere as clear, can be said to prevail in science. This last criterion can simultaneously be the strongest[36] and the weakest, and the resolution is reached by means of interpretation, the testing of the fairness or by the application of the rule that equals must be treated equally and non-equals unequally[37].

4.2. In Concreto

In the concrete case of the relationship between the general provisions of the Obligatory Relations Act and maritime contracts, i.e. the part of the Maritime Code regulating maritime contracts, the application of all three criteria must be explored to establish whether they arrive at the same solution, i.e. conclusion or not. If they do, everything is clear, otherwise, the collision of the criteria must also be dealt with. In other words, we need to establish which criterion has precedence.

a) criterion of chronology,

Judging by this criterion, the Obligatory Relations Act is later (it entered into force on 1 January 2006) and the Maritime Code earlier act (entered into force on 29 December 2004). Therefore, the Obligatory Relations Act should have precedence as the later law. It should be pointed out that the adoption and entry into force of subsequent amendments, both to the Obligatory Relations Act and the Maritime Code, does not alter the basic position on precedence. The case would only be different if an amendment to one of the acts (temporally adopted after the other act) directly dealt with a concrete area - in that case, their relationship would change for that particular part of the regulation, with the earlier becoming later. However, it should also be pointed out that in the case of a wider legal issue or problem (e.g. a specific contract from the Maritime Code) it is entirely possible for the later regulation to be applied in the part regulated by that regulation (but not completely), with the earlier regulation being applied to other parts, i.e. a combination and application of both regulations.

b) criterion of hierarchy,

Judging by this criterion, the Obligatory Relations Act and the Maritime Code are the documents of the same ranking or level, because both were adopted as laws by the Croatian Parliament[38]. In principle, there are no ambiguities here. However, the fact of being linked with international agreements (which may occur in several ways, by having the content of an international contract fully or in part integrated into the text of a Croatian law, by no formal changes to the legal text being made by the Croatian legislator, but the very fact that a ratified and

35. Norberto Bobbio, op. cit., pg. 127.
36. E.g. in the first years of work of the Constitutional Court of Italy there exists a tendency to affirm the validity of a normal act, i.e. hierarchically lower act / regardless of the date of its entry into force/ if it can be validly proved that that act, regulating temporally and spatially limited cases, derogates very general constitutional principles to meet specific requirements - i.e. if its exceptionality can be proved to be justified in the name of fairness and that its reach is so limited that it neither obscures nor brings into question the validity of the general principle of validity.
37. Norberto Bobbio, op.cit., pg. 134.-135.
38. This must be stressed because the same legislator can also adopt documents of different levels, e.g. the Croatian Parliament adopts both laws and the Constitution, with the Constitution obviously being the document of the higher order. Similarly, the Croatian Parliament ratifies international agreements, therefore, after publication, making them supra-statutory laws (although, the proclamation as the formal act of the President of the Republic is required, although s/he does not have the right of veto, but there are likewise no mechanisms for direct legal struggle against the passivity of the President).

published international agreement represents a document of the higher order, which ex lege derogates the contrary provisions of the documents of the lower order) still changes such relations.

If an international agreement deals only with the so called general provisions (in the context of this paper, the subject matter of the Obligatory Relations Act) not contained by the Maritime Code, there is no collision, i.e. both acts will be applied, each in its own domain, regardless of the fact that the Obligatory Relations Act (by means of the international agreement and its status, regardless of the manner of its implementation) will have the status of the act of the higher level.

If an international agreement deals (only) with the special provisions (the subject matter of the Maritime code), those provisions will have precedence, which would be the case even if there was no international agreement, if the provisions in question were directly and only contained in the Maritime Code.

c) criterion of specialization

Judging by this criterion, the Obligatory Relations Act is general and the Maritime Code special law. Here is where one of the oldest legal principles comes into play, the principle of *lex specialis derogat legi generali*[39] (special act derogates the general), which gives precedence to the Maritime Code. The principle applies in general, as well as specifically to maritime contracts. That means that, e.g. if the Maritime Code proscribes an obligation not proscribed by the Obligatory Relations Act, that obligation exists. Similarly, if the Obligatory Relations Act proscribes an obligations not proscribed by the Maritime Code, such obligation does not exist for maritime contracts. This applies only in principle, since in law, the basic rule is that there are exceptions to every rule. Namely, there is also the possibility that there exists an obligation which is not expressly proscribed, but (as the only or one of several options) is derived during the procedure of interpretation in law[40]. In this event, the interpretation must establish the true meaning of a certain legal norm, which can completely change the relationship which in the beginning seemed likely. The complexity of this procedure, in which even experts frequently err, can be discerned from a significant part of Croatian maritime law literature which quotes another author (clearly agreeing with him, without even a hint of the critical tone)[41]. The author claims that in our civil law (namely in the Obligatory Relations Act, in Article 1067, paragraph 1 and Article 697, pg. 1) a mixed solution is accepted when defining the term of force majeure, namely, the subjective-objective theory of force majeure. Although the confirmation of this position can be found in professional literature[42], the legal problem here is that the claim lacks argumentation (neither in favour, since it obviously has support, nor against the quoted position), which is unacceptable and scientifically completely unjustified. Since we are talking about concrete legal norms from the Obligatory Relations Act, which contain the formulation "which could not have been foreseen, avoided, nor prevented" (Article 697, paragraph 1), i.e. "which he could not foresee and the consequences he could not avoid, nor prevent", argumented analysis is not only inevitable, but very simple. Since the verb MUST appears nowhere in the quoted articles in the appropriate verbal form, but both definitions contain the verb COULD, interpretation is very simple. If the verb used was MUST know, those would be subjective criteria of a subject or subjects (regardless of the extent of examination of that or those persons or the use of average values for a specific category - at least average attention is required of a subject having the ability to work). Since the verb used was COULD, objecitivization is certainly implied (regardless of any one concrete person), if not for any other reason, than at least because exculpation is impossible, since it is impossible to prove, e.g. that someone COULD NOT HAVE KNOWN something (including that it was and still is impossible for some other cognizant person to inform that party, which cannot be impossible and similar). A much less ambiguous legal provision would exclude the need for discussions of this type and contribute to the legal safety and the rule of law.

Establishing whether a special law (in this case the Maritime Code) regulates an entire legal institute (i.e. not only what the Obligatory Relations Act has, e.g. in relation to the contracts of carriage, but also what falls under the so called general part, e.g. invalidity, actio Pauliana, defects of will...), which is a very rare exception, or, which is the rule, specially regulates that which is required by the specificities of the subject matter (in this case the maritime law component), leaving everything else to the general law is important. In such a situation (applicable to the case dealt with in this paper), it only remains to be established whether anything in the nature of maritime contracts "by the nature of things" requires a special approach to a particular issue, i.e. how to apply the syntagm "apply in an appropriate manner" to the application of provisions of the Obligatory Relations Act to individual maritime contracts. Not excluding the existence of the described specificities, it should be pointed out that they are

39. Special law derogates the general. – Dragomir Stojčević-Ante Romac, Dicta et regulae iuris, Latinska pravna pravila, izreke i definicije sa prijevodom i objašnjenjima, fourth revised edition, Suvremena administracija, Beograd, 1984, pg. 262, saying no. 149.

40. According to one definition, interpretation is ".... a spiritual activity revealing the possible meanings of legal provisions and in them the hypotheses, identification, determination of the offence and the sanction, establishing which interpretation is the best" - More: Nikola Visković, Teorija države i prava, Birotehnika, Zagreb, 2001, pg. 243.

41. Ivo Grabovac, Odgovornost prijevoznika u prjevozu stvari u Pomorskom zakoniku Republike Hrvatske i u međunarodnim konvencijama, Književni krug, Split, 2010., pg. 23.

42. Petar Klarić, Martin Vedriš, op.cit., pg. 602.

still exceptions which should be conclusively proved on a case to case basis. After all, that is what the logical premise demands - if the legislator decided to regulate a contract (e.g. on carriage) by a special act (the Maritime Code) although the contract of carriage as a nominate contract is regulated by the Obligatory Relations Act, the logical conclusion is that the legislator included ALL the provisions believed to have precedence over those from the Obligatory Relations Act into the Maritime Code.

5. CONCLUSION

This paper examines the legal issue of the resolution of the possible collisions or antinomies between legal documents, in this instance, on the concrete example of two acts - the Obligatory Relations Act and the Maritime Code, in the part dealing with maritime contracts.

With emphasis on the meaning of the procedure of interpretation of legal norms which is the *condicio sine qua non in law* (including for the resolution of the collision issue), conclusions were reached which give absolute precedence to the Maritime Code based on the criterion of speciality (which is usually considered the most important criterion). However, as stated, that applies only to the part regulated by the Maritime Code, with the Obligatory Relations Act being applicable to maritime contracts in the part unregulated by the Maritime Code. Consequently, as a rule, both acts will be in application - the Obligatory Relations Act in the so called general part and in the special part if the subject matter is not covered by the norms of the Maritime Code.

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Literature Survey on Underwater Threat Detection

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This paper presents a concise review on extant literature in threat detection within the maritime domain with specific emphasis on solution methodologies, sensing technologies, regional affiliations of authors and research contributions related to underwater threat detection. The review attempts to provide an introductory framework on threat detection and surveillance within the maritime domain as opposed to its widely studied terrestrial counterpart. In all, over 200 engineering/science journal papers and conference proceedings were identified. Of these, a total of 136 articles are eventually chosen and reviewed. The analysis of this review suggests that opportunities abound in the research area, especially in Operations Research/ Management Science. Specifically, Sensor placement and deployment for underwater threat detection is identified as a significant sub-research area worth studying.

KEY WORDS
~ Literature survey
~ Underwater threat detection
~ Operations research/management science
~ Sensor placement and deployment

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1. INTRODUCTION

World trade is heavily dependent on maritime transportation (Organization for Economic Co-operation and Development, OECD, 2003). This dependence indicates global distribution of economic goods is mostly done via oceans, seas, estuaries, and other maritime waterways. In fact, it is widely accepted that over 90 % of global economic trade utilizes maritime infrastructures and that the maritime sector remains the cheapest medium to transport goods over long distances (The International Maritime Organization, IMO, 2012). Particularly, the US economy is largely dependent on the maritime sector as 95 % of its foreign trade is moved by ship (United States Department of Transportation Maritime Administration, 2007).

In addition, countries have become increasingly dependent on each other for commercial goods, machineries, mineral resources, agricultural produce, etc. Indeed, the new era of global interdependence (IMO, 2012) via maritime industry has come to stay. To ensure international economic trade is not adversely affected, the continued success of the maritime industry needs to be assured. The unique position the maritime industry holds in the world economy (without even addressing its importance in military warfare) accentuates the need to protect its infrastructural resources from threats and disasters. Apart from the scourge of terrorism which the entire global economy is currently experiencing, the age-old threats of piracy, arson attacks and unfortunate accidents are incidences the maritime industry has to contend with.

Similar to the use of terrestrial sensors in the identification and classification of land-based threats and targets, underwater

sensors are used in the maritime domain for the same purpose. While literature on the use of terrestrial sensors for surveillance is rich and extensive, its underwater counterparts have not been well addressed (Heidemann et al., 2012). In this study, literature related to underwater threat detection is presented irrespective of specific problem domains, solution methodologies or sensing technology. The authors' opinion is that a better understanding of general issues related to underwater threat detection will be an invaluable introduction to the research area, assist in identification of voids in literature and ultimately stimulate future research directions.

For the purpose of this review, literature search is undertaken by examining papers published in year 2000 and onwards with an exception of two closely related papers (published in 1995 and 1999) outside this time frame. Paper classification based on authors' contributions is categorized under Model, Theory and Application developments (Galindo and Batta, 2013; Altay and Green, 2006). Though these contribution categories seem explicit, readers interested in the classification details are referred to these two cited papers. In addition, categories based on authors' regional affiliations, solution methodologies and sensing technologies are included. During the course of this study, the authors identified two review papers (Heidemann et al., 2006; Heidemann et al., 2012) related to underwater techniques. However, neither of these papers considers all available sensing technologies in threat detection.

The remaining sections of this paper is arranged thus: section 2 highlights the scope of the study and search methodology adopted, section 3 presents underlying features identified from articles based on introduced classification schemes and in section 4, the paper is concluded with a discussion on the review's revelations. In addition, a supplementary material (spreadsheet containing a list of all bibliography examined, along with relevant tables and figures) is provided.

2. SCOPE OF STUDY AND ADOPTED SEARCH METHODOLOGY

This section highlights and discusses the scope and the search methodology adopted in this study. The scope is limited to threat detection and/or surveillance within a maritime domain. Although several papers related to general and terrestrial threat detection were identified during the course of the literature search, only those specifically related to the marine domain were included. As indicated in section 1, the search period is from year 2000 onwards, with the exception of two papers published in 1995 and 1999. Inclusion of these two papers is due to the inevitable issue of subjectivity when manual scrutiny is involved in any paper review activity. (Altay and Green, 2006), (Natarajarathinam et al., 2009), and (Galindo and Batta, 2013) are papers known to have also acknowledged this issue.

In addition, the chosen articles are limited to published journals and conference proceedings papers. Book chapters, dissertations, technical reviews, etc. are excluded from this research. In addition, the language of publication is solely restricted to the English medium. Limiting the search to only articles related to science and engineering, the total number of articles reviewed is 136, and key search words include: underwater protection", "protection of maritime assets", "protection of maritime resources", and "underwater surveillance.

Consulted database source is divided into two categories: primary and secondary. The former source utilized the "One Search" feature from the University of Houston library systems where unified access is granted to several known databases: SCOPUS, ScienceDirect, ISI Web of Knowledge, etc. The latter source is the online "Google Scholar". In addition, it also serves as the citation source for all bibliography included in the supplementary material. It should be noted that a considerable number of literature related to commercial product developments and reviews are obtained from this latter source. While the authors are aware that not all journal publications have on-line versions, such publications are excluded in this literature search. The justification is that if papers with such an origin related to our review exist; their number will be insignificant, compared to those available online. Moreover, the preferred publication period is from the year 2000 and beyond; thus, it is expected that most relevant papers would be readily available online.

As a basis for literature inclusion, this paper also made use of two distinct screening procedures: primary and secondary screenings. In the primary screening, appraisals of a literature's Title, Abstract and Conclusion sections are carried out. A satisfactory assessment that the article identifies with the problem scope ensures inclusion in the pool of literature; otherwise, the article is excluded. In a situation where doubt is expressed about including or excluding a paper under this screening, a brief perusal of the article's major sections is undertaken. The secondary screening serves as a final filter where a more detailed inspection of the article is executed in order to have a holistic comprehension of the authors' works and contributions. In few instances, papers which were initially included after the Primary screening procedure were ultimately excluded from the review during this latter stage.

3. UNDERLYING FEATURES IDENTIFIED FROM ARTICLES

Out of over 200 papers consulted, a total of 136 papers were eventually included in this review paper. It is acknowledged that there could be a possible existence of other papers meeting the scope of study but which have been inadvertently excluded from this review. However, the authors aver that the included papers are a fair representation of bibliography related to the problem area of interest within the time period under review.

Figure 1 shows the distribution of reviewed papers per journal of publication. The "Others" category include journals with less than two representative journals. As depicted in the figure, a substantial majority (76) of the included papers belong to the IEEE community. All peer-reviewed journals and conference proceedings (including any joint collaboration with other professional associations) affiliated to IEEE are included under this single journal name. Of the main stream OR/MS related journals, only the "Operations Research" journal is represented in this review with a single paper. The other journals with single paper representations can be seen in the supplementary material.

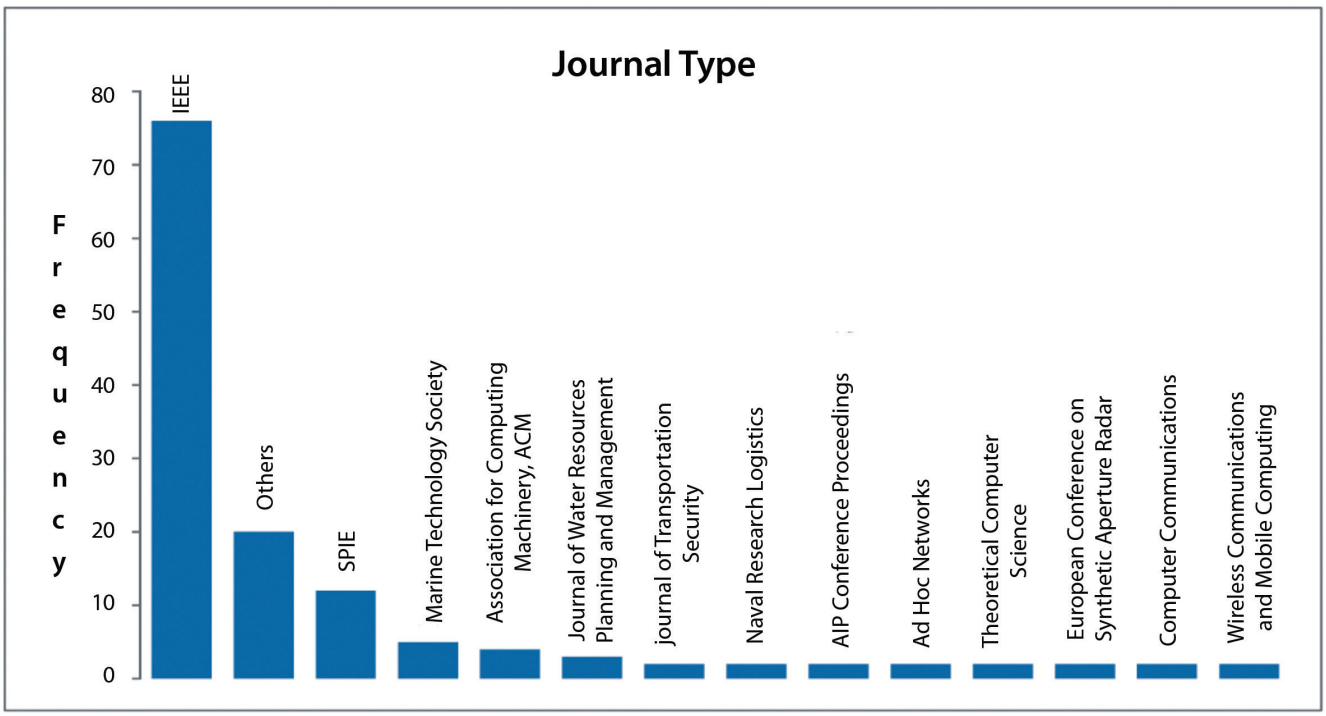

Figure 1.
Distribution of reviewed literature: Journal Type.

3.1. Authors' Regional Affiliations

Table 1 and Figure 2 show distributions of the authors' geographical regional affiliations in the reviewed papers. Regional affiliation is indicative of the authors' affiliated institutions (or organizations) and not necessarily their nationalities. Expectedly, the US/Canada region has the most representation. Within the US/Canada region, the US has 95 % of the reviewed articles and Canada accounts for the rest (see Figure 3). The figure also shows that China and Japan, respectively, occupies 90 % and 10 % of literature from the Asia region. Countries represented within the Europe region are shown in Figure 4, with Italy having the highest visibility at 34 %.

Table 1.
Regional Affiliation: Frequency distribution of reviewed literature.

Region	Frequency
US/Canada	64
Europe	41
Asia	10
Australia	4
International	17
Total	**136**

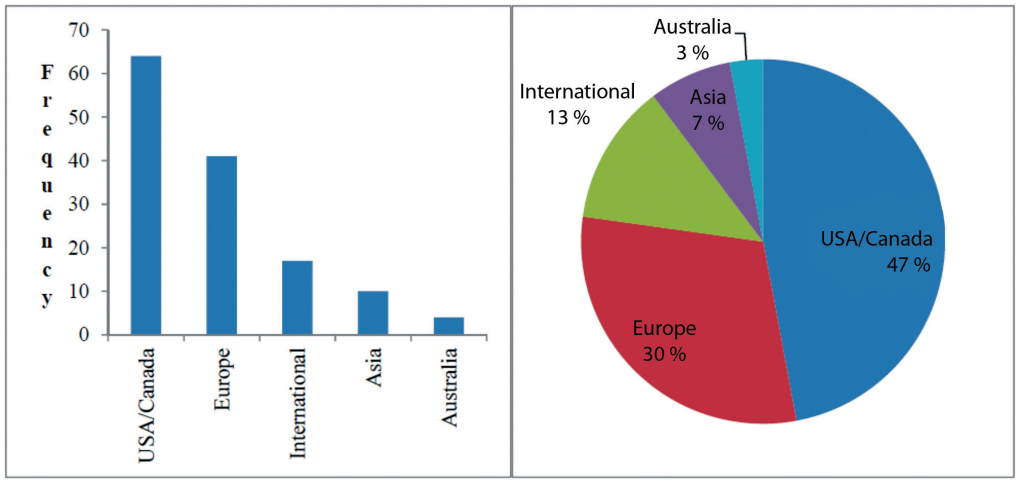

Figure 2.
Regional Affiliations: Distribution of reviewed literature.

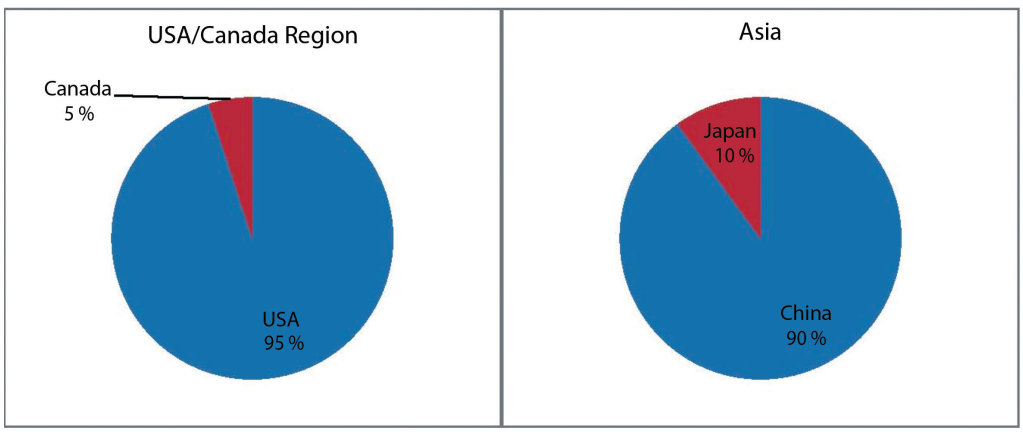

Figure 3.
National Affiliations, USA/Canada and Asia: Distribution of reviewed literature.

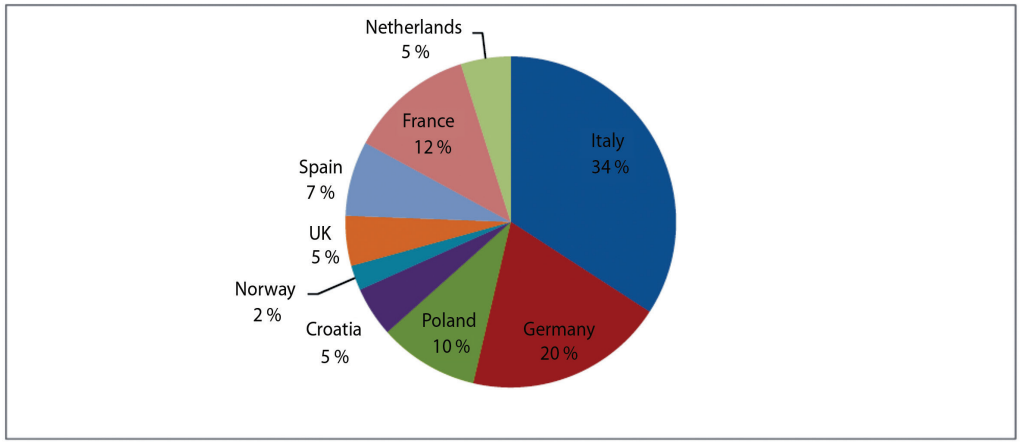

Figure 4.
National Affiliations- Europe: Distribution of reviewed literature.

A large majority of countries from these hitherto highlighted regions are also involved in international collaborations. Apart from these, other countries participating in international partnerships include: Saudi Arabia, Belgium, Mexico, Hong Kong, Portugal, Croatia and Turkey.

It should be noted that the active involvement of the Department of Homeland Security, DHS, and North Atlantic Treaty Organization, NATO, respectively in the US/Canada and Europe regions is a huge contributory factor to the preponderance of literature from these regions. NATO presence and collaborations with research institutions in European countries such as Croatia, Poland, Italy and Norway are worth mentioning in this regard.

3.2. Solution Approach/Methodology

The literature survey suggests the use of optimization techniques as the most common methodology in the reviewed literature. MIP (Mixed Integer Programming), ILP (Integer linear programming), Quadratic programming and Stochastic optimization are some of the OR techniques employed by the various authors. In addition, most literature presents the heuristics and algorithms developed to solve large scale problems. Simulation techniques, especially Monte Carlo simulation and numerical simulation are also widely observed in the literature reviewed. As seen in Figure 5, other solution techniques/ methodologies observed include Statistical/Probability Analysis, Game theory, Acoustic analysis, Signal processing analysis, etc. Often times, these methodologies are usually combined with one another. For example, a frequent combination of both Simulation and Optimization techniques is replete in the literature reviewed and this is in consonance with recent publication trends. Hence, the sum total of the reported techniques does not tally to the total number (136) of literature surveyed.

In addition, this review has highlighted papers related to Application Development of surveillance systems as a classification under the Solution Approach/Methodology category. Some of these papers focused on a specific technology/ application/software suite developed to solve some specific maritime surveillance problem(s) in a specific location. Yet, others focused on developing generic solutions to address some surveillance problems. It should also be noted that the specific methodologies adopted in these categories have been appropriately identified. Thus, a paper based on the specific development of a surveillance system (including protocols, hardware, technology, etc.) that introduces a novel methodology (such as statistical analysis or mathematical modeling) is simultaneously classified under "Application Development" as well as the related methodology.

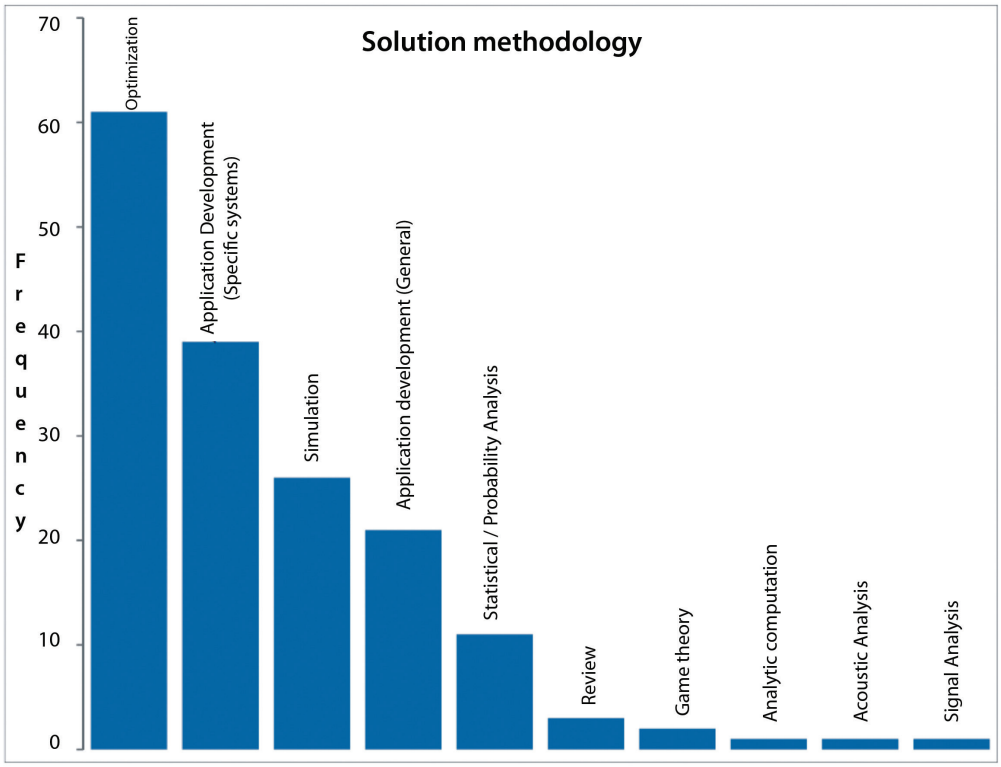

Figure 5.
Methodology: Distribution of reviewed literature.

3.3. Research Contributions

Similar to a classification approach adopted in (Altay and Green, 2006) and more recently in Galindo and Batta (2013), "Theory", "Model", and "Application" developments are identified as the categories under the authors' research contributions.

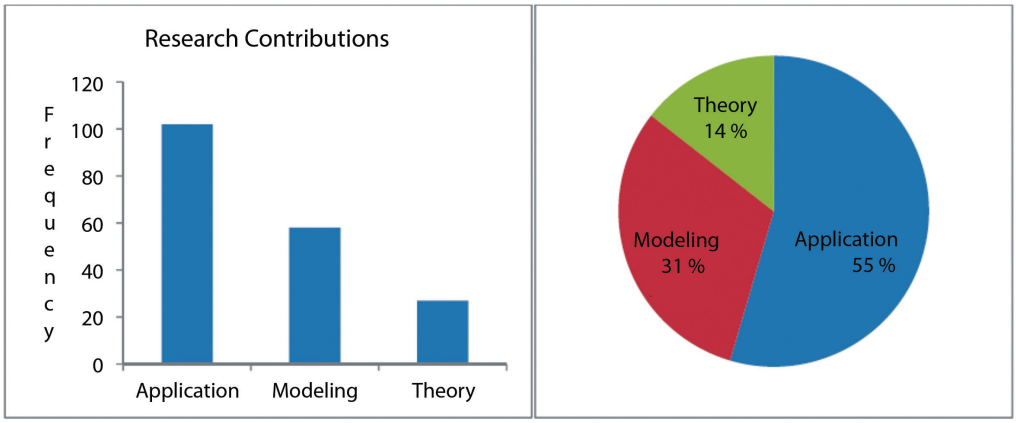

Figure 6.
Research Contributions: Distribution of reviewed literature.

Like the Solution Approach/Methodology classification, the total number of the literature under the Research contribution category does not tally to the total number (136) of literature surveyed. Similar reason as in the former category exists for this observation. The Venn diagram in Figure 7 shows the overlap in the classifications under the Research Contributions category.

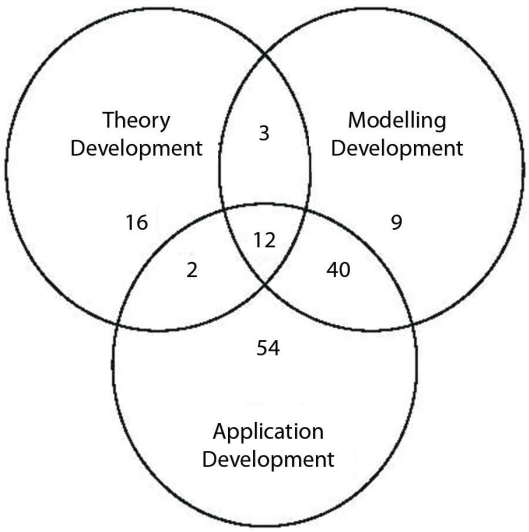

Figure 7.
Research Contributions- Venn diagram: Distribution of reviewed literature.

Of the total number of literature reviewed, only 38 papers (about 28 %) are related to the Sensor placement problem, SPP (either nodal or network placements), a widely studied problem in Optimization theory. Some of these works surveyed include (Ghafoori and Altiok, 2012; Stolkin and Florescu, 2007; Akkaya and Newell, 2009; Ibrahim et al., 2010; Ngatchou et al., 2006; Molyboha and Zabarankin, 2012), etc. Similar to the terrestrial/ generic sensor placement problem, the SPP is often addressed and solved as a coverage problem, with specific underwater environments taken into consideration. Irrespective of the research contribution, the sensor placement problem for threat detection within the maritime domain is identified as an area that requires researchers' attention.

3.4. Sensing Technology distributions

Of all the sensing technologies observed in the surveyed literature 72 (about 73 %) are acoustic-based. The other sensors observed are as shown in Figure 8. As indicated in the figure, some papers studied more than one type of sensors while other literatures simply stated the use of sensors in their works without specifying the actual types.

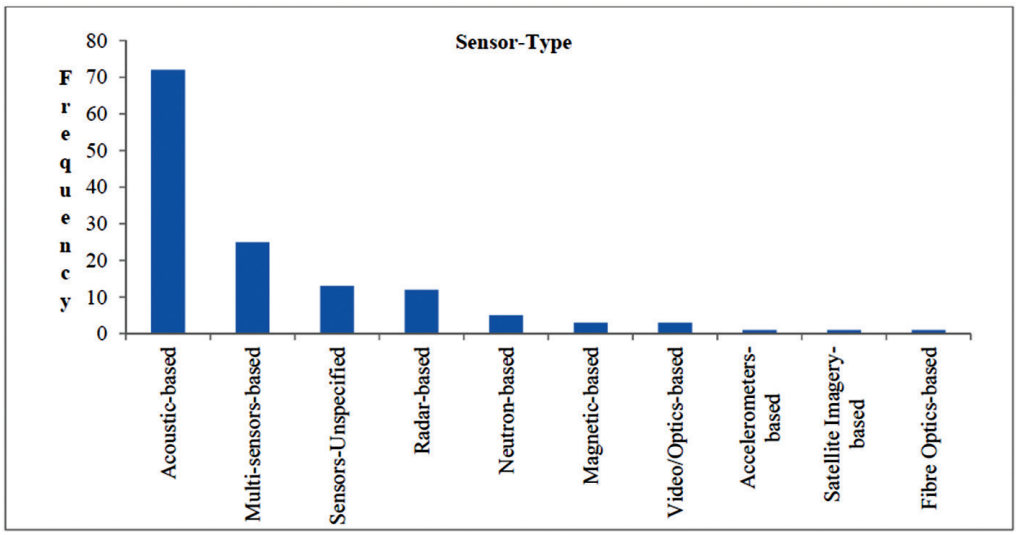

Figure 8.
Sensing technologies: Distribution of reviewed literature.

Of the 72 acoustic related papers, 26 % are associated with active sensors such as sonars, 13 % are associated with passive sensors such as hydrophones and sonobuoys, and 61 % are non-specific about the type of acoustic sensors. Figure 9 shows this distribution.

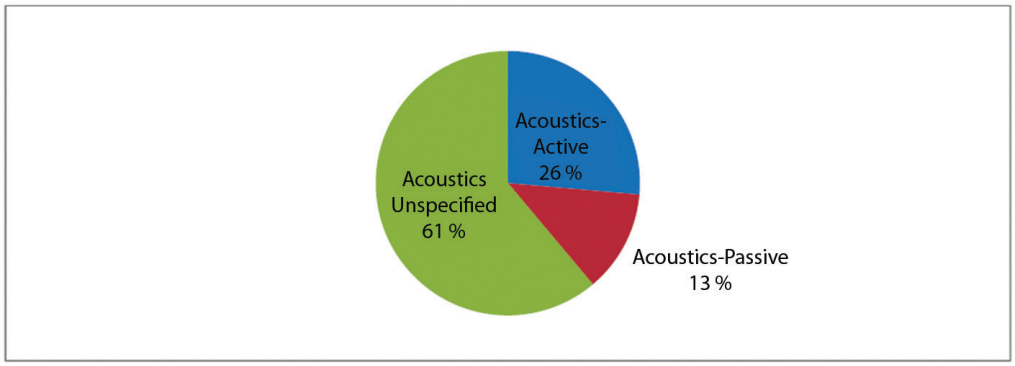

Figure 9.
Sensing technologies-Acoustics related: Distribution of reviewed literature.

It should be noted that for papers related to the deployment of autonomous underwater vehicles, AUVs, we identify the actual sensors used by the underwater vehicles (which are most often multiple sensors, combining two or more sensors), and in cases where the sensor types are not explicit, we include them under the "Unspecified sensor" category.

4. DISCUSSIONS AND CONCLUSION

In this paper, a review of recent works in underwater threat detection is presented. Classifications are shown based on authors' regional affiliations, solution approach/ methodologies, and research contributions. In addition, due to the nature of the review, a classification based on the type of sensing technology involved is also included.

Amongst others, Sensor placement and deployment within underwater/maritime framework is identified as an area requiring researchers' contributions. Compared to terrestrial sensor placement and deployment, underwater/marine sensor placement and deployment has not been widely studied in literature.

Although the authors recognize participation in cross-regional collaborations among regions already active in the research area (especially between Europe and USA/Canada regions), the authors' opinion is that the area can benefit more from international collaborations, especially between these active regions and countries with vibrant maritime activities such as Qatar, Kuwait, Saudi Arabia, etc. in the Middle East region, and Nigeria, Guinea, Somalia, etc. in the Africa region. These two regions, though highly prone to the existing threats of terrorism and piracy have little or no visibility in the literature distribution.

Although this literature survey indicates the preponderance of acoustic sensors in comparison to other sensing technologies, it should be noted that practical implementations of maritime surveillance systems as seen in literatures dedicated to the development, deployment and analysis of these systems indicates that rather than the use of a specific sensing technology, the combination of various technologies with their unique benefits is the reality in most practical surveillance systems.

While acknowledging that the literature surveyed may not be a complete list of bibliography in the research area, the authors earnestly believe the results give an accurate representation of research trends in the period under review.

ACKNOWLEDGEMENTS

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APPENDIX:

Supplemental Material: available on-line.

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Marine Environment Influence on Fiber Optic Systems Operation

Bekir Novkinić[a], Igor Vujović[b], Joško Šoda[b]

Optic communications are increasingly used in many areas, including traffic and maritime nowadays. There is a lack of researches about environmental parameters impact to the operation of fibers in traffic systems, i.e. ships, cars, aircraft or port logistics. This paper investigates environmental influence on three-layer fiber optic system. The two-layer optic system is also analyzed for the comparison purposes. Several environmental factors were simulated, including temperature, pressure, and humidity for all three IR windows. In the three layer optic system, the environmental influence is brought through the air's refractivity index. The final goal is to determine if the change of the environmental factor(s) can change or lose some of the modes used for communication in some specific application.

KEY WORDS
~ Refractive index
~ Fiber optic
~ Ciddor equation

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1. INTRODUCTION

The navy's interest in secure communications was responsible for optical communication implementation aboard vessels (war ships).

The marine environment is of special interest, due to a huge traffic and trade made over oceans and seas (Review of Maritime Transport 2013, 2013). It is also of interest to the navies all over the world. As known, the marine environment is not favorable for many materials and equipment. An increased salinity causes many problems, and corrosion is the most prominent one (Slamova et al., 2012). Salinity is increased not just aboard ships, but also in coastal areas. ISO classification (ISO 9225, 1992) of pollution by airborne salinity (Unknown, 2002; Airborne Salinity, 2015) represented by sodium chloride deposition rate in annual average is categorized by four categories: S_0, S_1, S_2 and S_3. Category S_0 refers to non-coastal areas, where NaCl deposition is less than 3 mg/m^2/day. Category S_1 refers to coastal areas, where NaCl deposition is between 3 and 60 mg/m^2/day. Category S_2 refers to the coastal environment, where NaCl deposition is between 60 and 300 mg/m^2/day. Category S_3 refers to coastal areas within 200 meters from the sea, where NaCl deposition is between 300 and 1500 mg/m^2/day. Airborne salinity is present in so called sea-spray, which consists of marine organic aerosol, salt, and other components, which are pushed from the sea to land or ships over the air (Gant and Meskhidze, 2013).

In this paper, environmental influence was incorporated by the change in the refractive index. Refractive index was researched for air-ocean interface (Frederickson, 2000; Jin and Stamnes, 1994; Friehe et al., 1975; Thayer, 1974), but this is not

exactly the scope of this paper. We are not interested in the refractive index of sunlight at the interface, but in optic fibers, which are usually not at the direct sunlight.

The research in refractive index variations started in the second half of the 20th century (Edlen, 1953; Edlen, 1966; Waxler and Cleek, 1971; Waxler and Cleek, 1973). Researches have been slowing down and almost stopped. It is probably due to a lack of practical interest in the matter. When micro optical fibers appear, the problem has risen again due to the possibility that the environment influences the signal guidance in optic communications (Galindez et al., 2012; Leviton and Frey, 2006; Gupta et al., 1998).

When dealing with optical microfiber, consisting of the untapered ends, tapers, and micrometer-diameter waist, the light is first guided in a standard manner through the core in the untapered part. However, taper regions are problematic, because at some point, the guidance is actually not by the core-cladding interface, but by the cladding-surrounding. The surrounding is usually air, liquids or special coating. The surrounding has the refractive index lower than the cladding. When this happens, due to a small diameter of the core, the core can be neglected and the two-layer model can be used again, bur for cladding-surrounding (Karapetyan, 2011).

The fist proposed solution for the three-layer structure was given in (Belanov, 1976), which is repeated in (Monerie, 1982). The solution corresponded only for the weakly guiding fibers, which have linearly polarized modes. An attempt to obtain the solution for the HE/EH, TE and TM modes was proposed in (Tsao et al., 1989). The solution for cladding modes was published in (Erdogan, 1997). The first full solution of the problem was proposed in (Zhang and Shi, 2005).

This paper is organized as follows. The second chapter deals with possible environmental parameters that could lead to refractivity factor change, and, consequently, to failure in light wave guidance. A special subsection presents a mathematical model for the evaluation of the environmental parameters. The third chapter presents the results of numerical experiments. Finally, conclusions are presented.

2. INVESTIGATION OF INFLUENTIAL FACTORS

The refractive index plays a vital role in light guidance. It determines energy loss and modes of propagation. If the refractive index changes, the reflection from the cladding is changed to another angle. In dramatic cases, total reflection cannot be established and communication is terminated. Energy balance and efficiency is influenced as well. A change in the refractive index can affect reliability of information delivery, change mode, etc.

The refractive index is related to the relative dielectric constant (Kaiser et al., 2010; Helhel et al., 2007; Kasap, 2006; Silans et al., 2009; Vujović et al., 2014a; Vujović et al., 2014b; Kulenović et al., 2014), which is reported to be dependent on moisture or humidity, frequency and temperature. Hence, an indirect method to research environmental impact on refractive index is to follow changes in the relative dielectric constant. Due to temperature dependence, it should be clear that it is not the same if the installation is under water line or somewhere at direct sunlight. At the sunlight, the installation can be warmed up to relatively high temperatures. The question is how and when such change in temperature can lead to communication system failure. It should also be noted that optic materials are also dielectric materials. In the IR range (optic communication range) two types of polarization exist – ionic and electronic, which is not the simplest mathematical model.

2.1. Ciddor equation implementation

The greatest advance in the field of the air refractive index was achieved by (Ciddor, 1996). It is of interest to the problem addressed in this paper, because one of possible surroundings can be air. Research should be different for different materials in a way of index's range. In the case of air, the range can be determined by the Ciddor equation. In the case of a different material, the range can be determined by some other means. The main manifold of this equation is that it does not include the sea salt explicitly into calculus.

The first step in Ciddor equation calculation is to express input parameters in needed units. The first input parameter is wavelength in vacuum in nanometers. In the case of fiber optic communications, there are three windows: 850 nm, 1300 nm and 1550 nm. The second parameter is temperature in degrees Celsius. The standard temperature, denoted as *t*, is 20 degrees. The third parameter is air pressure in Pascals. The standard pressure (*p*) is 101.325 Pa. The forth input parameter is relative humidity (RH) in percentages. The standard RH is 50 %. This parameter is easier to input to the computer program as percentage. However, the computer should recalculate this parameter as mole fraction. The fifth input parameter is the concentration of carbon dioxide (CO_2) in micromoles per mol of parts per million (ppm). The recommended concentration is 450 μmol/mol. CO_2 is in equation input as x_{co2}. Inputs are many constants as shown further.

In order to prepare humidity for Ciddor, enhancement factor, *f*, of water vapor in air at temperature T, should be calculated (Ciddor, 1996) using $\alpha = 1.00062$, $\beta = 3.14 \cdot 10^{-8}\ Pa^{-1}$, and $\Upsilon = 5.6 \cdot 10^{-7}\ °C^{-2}$:

$$f(p, t) = \alpha + \beta \cdot p + \Upsilon \cdot t^2 \quad (1)$$

If the RH is in percentage, than the RH parameter can be introduced through mole fraction of wave vapor in moist air (Stone and Zimmerman, 2004a):

$$x_v = \frac{RH}{100} \cdot f(p, t) \cdot \frac{p_{sv}(t)}{p} \quad (2)$$

Pressure p_{sv} can be calculated by example code in Matlab (Matlab code 1):

```
% Matlab code 1
% input t
if t > 0
K1= 1.16705214528E+03; K2= 7.24213167032E+05; K3= 1.70738469401E+01;
K4= 1.20208247025E+04; K5= 3.23255503223E+06; K6= 1.49151086135E+01
K7= 4.82326573616E+03; K8= 4.05113405421E+05; K9= 2.38555575678E+01;
K10= 6.50175348448E+02; T=t+273.15;
omega=T+K9/(T-K10);
A=omega^2+K1*omega+K2;
B=K3*omega^2+K4*omega+K5;
C=K6*omega^2+K7*omega+K8;
X=-B+(B^2-4*A*C)^0.5;
psv=(10^6)*(2*C/X)^4;
else
%For saturation vapor pressure over ice
A1=-13.928169; A2=34.7078238; T=t+273.15; theta=T/273.16;
Y=A1*(1-theta^(-1.5))+A2*(1-theta^(-1.25));
psv=611.657*e^Y;
end
```

For the following step, several constants should be included:
w_0=295.235 μm^{-2},
w_1=2.6422 μm^{-2},
w_2=-0.03238 μm^{-4},
w_3=0.004028 μm^{-6},
k_0=238.0185 μm^{-2},
k_1=5792105 μm^{-2},
k_2=57.362 μm^{-2},
k_3=167917 μm^{-2},
a_0=1.58123 · 10^{-6} K · Pa^{-1},
a_1=-2.9331 · 10^{-8} Pa^{-1},
a_2=1.1043 · 10^{-10} K^{-1} Pa^{-1},
b_0=5.707· 10^{-6} K · Pa^{-1},
b_1=-2.051 · 10^{-8} Pa^{-1},
c_0=1.83 · 10^{-11} K · Pa^{-1},
c_1=-2.376 · 10^{-6} Pa^{-1},
d=1.83 · 10^{-11} K^{2}Pa^{-2},
e=-0.765 · 10^{-8} K^{2}Pa^{-2},
p_{r1}=101325 Pa,
t_{r1}=288.15 K,
compressibility of dry air z_a=0.9995922115 (does not have unit, because it is a ratio),
ρ_{vs}= 0.00985938 kg/m^3,
gas constant is r = 8.314472 J mol^{-1}K^{-1},
m_v= 0.018015 kg/mol,
s =1/λ.
Following equations should be programmed to calculate the refractive index of air. The first calculation is to determine intermediate results, gas constants corrections, which depends on *s*:

$$r_{as} = \left(\frac{k_1}{k_0 - s} + \frac{k_3}{k_2 - s} \right) \cdot 10^{-8} \quad (3)$$

$$r_{vs} = 1.022 \cdot 10^{-8} \cdot (w_0 + w_1 \cdot s + w_2 \cdot s^2 + w_3 \cdot s^3) \quad (4)$$

The molar mass of dry air containing x_{co2} ppm of CO_2 in kg/mol is expressed with:

$$m_a = 0.0289635 + 1.2011 \cdot 10^{-8} \cdot (x_{co2} - 400) \quad (5)$$

The inclusion of CO_2 concentration is through expression:

$$r_{aks} = r_{as} \cdot (1 + 5.34 \cdot 10^{-7} \cdot (x_{co2} - 450)) \quad (6)$$

and temperature should be substituted with absolute temperature:

$$T = t + 273.15 \quad (7)$$

The compressibility of moist air under the considered conditions is:

$$z_m = 1 - \left(\frac{\rho}{T}\right) \cdot (a_0 + a_1 \cdot t + a_2 \cdot t^2 + (b_0 + b_1 \cdot t) \cdot x_v \quad (8)$$

$$=> + (c_0 + c_1 \cdot t) \cdot x^2_v) + \left(\frac{p}{T}\right)2 \cdot (d + e \cdot x^2_v)$$

Density components are found with the following equations:

$$\rho_{aks} = p_{r1} \cdot \frac{m_\alpha}{z_\alpha \cdot r \cdot t_{r1}} \quad (9)$$

The density of the water vapor component is calculated with expression:

$$\rho_v = \frac{x_v \cdot p \cdot m_v}{z_m \cdot r \cdot T} \quad (10)$$

The density of the dry component of the moist air can be programmed as:

$$\rho_\alpha = (1 - x_v) \cdot p \cdot \frac{m_\alpha}{z_m \cdot r \cdot T} \quad (11)$$

Finally, we obtain the refractive index of air:

$$n_{air} = 1 + \frac{\rho_\alpha}{\rho_{aks}} \cdot r_{aks} + \frac{\rho_v}{\rho_{vs}} \cdot r_{vs} \quad (12)$$

This is implemented in i.e. Engineering Metrology Toolbox (Stone and Zimmerman, 2004a). Everybody can check the obtained results in the Results section using the calculator (Stone and Zimmerman, 2004b).

3. NUMERICAL EXPERIMENTS AND RESULTS

A great tool for the analysis of the refractive index is Optical Fibre Toolbox in Matlab (Karapetyan, 2011). A set of function can make Matlab realization of simulations and numerical experiments easier.

The final goal of the research should be the conclusion about the change in output constellation due to environmental factors. It is usual to consider that the air's refractive index (n_{air}) is equal to 1. In some cases a more precise number is used - 1.000293. This number corresponds to the standard conditions. Our goal is to vary nair and simulate environmental influence on signal propagation. In other words, how much change in refractive index is tolerable to reliably receive correct constellation.

An important question is how to integrate environmental effects to the three-layer model. It is certain that air characteristics are changed, including temperature and moisture or even salinity. Therefore, the refractive index of air is changing. However, it is not sure what with cladding. The temperature of air is transferred by heat transfer mechanism to cladding, but air temperature and cladding temperature are not the same. Salt can penetrate cladding, but in a nonlinear manner. It is also true for moisture. The problem also lies in the penetration depth through the core, because usual guidance total reflection is in core-cladding interface. It can be predicted that non-linear model for all dependences should be incorporated in the simulation of the influences.

Since the inclusion of all parameters requires the unknown nonlinear multispace model, we analyzed influential parameters separately.

Firstly, we will analyze the refractive index change due to a temperature difference between the standard and the simulated condition. This numerical experiment is for the standard, two-layer fiber optic model. Since the refractive index is different for various materials, we will use silica as an example material. Light wavelength is taken for three windows used in optic communications: 850, 1300, and 1550 nm. Since the expected result is the change of the refractive index, it can be concluded that the wavelength of the reflected light and the propagation speed could be changed. Therefore we simulated also ± 50 nm as upper and lower border of the wavelength variation. Simulation results are shown in Figures 1 and 2. Figure 1 shows comparison of communication windows. Figure 2 shows the trend that the refractive index decreases with increase in wavelength.

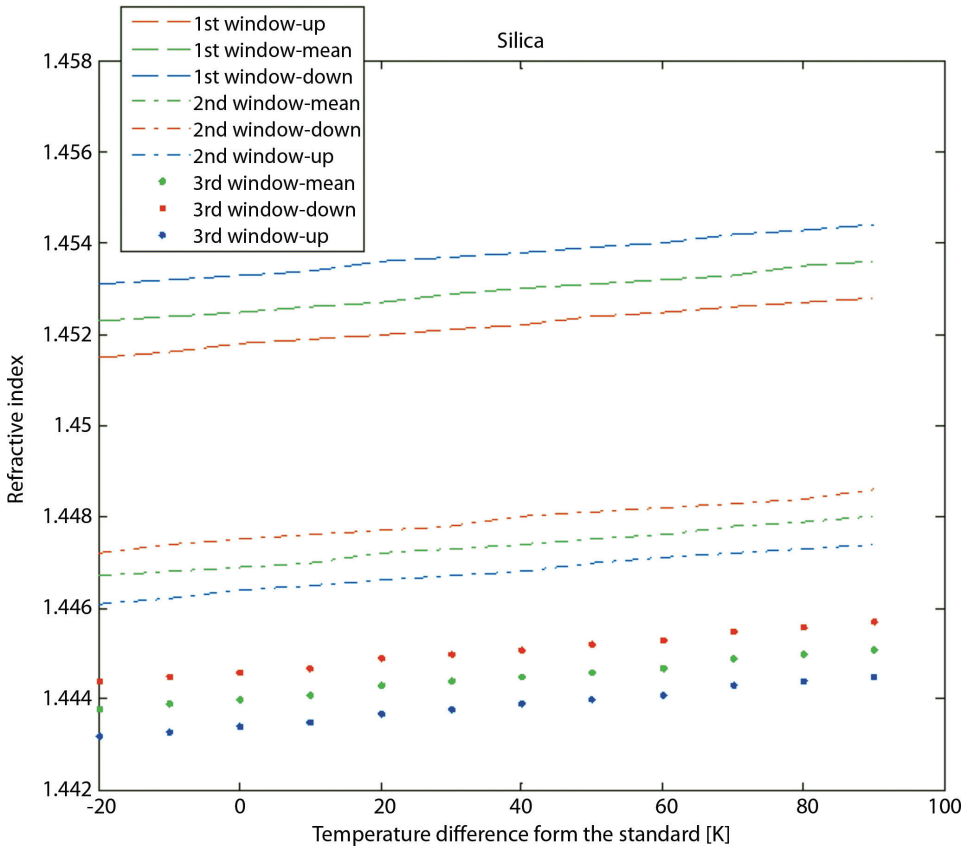


Figure 1.
Variation of the silica's refractive index due to a temperature deviation from the standard temperature for 850 (1st window), 1300 (2nd window) and 1550 (3rd window) ± 50 nm (upper and lower margine).

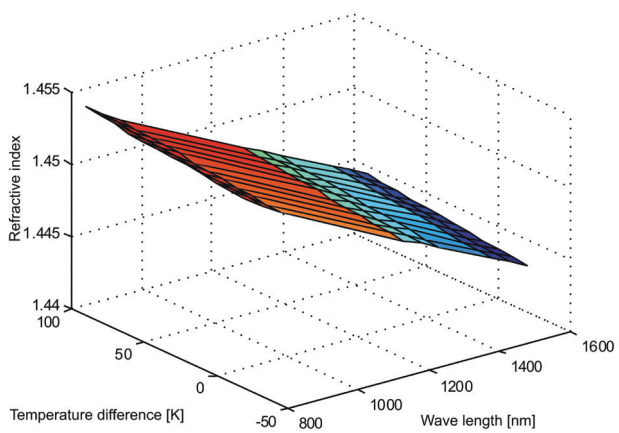


Figure 2.
3D plot of the wavelength – temperature – refractive index dependance.

Figure 3 shows that an increase in air pressure results in an increase of the refractive index for 850 and 1550 nm. We can see indications of the saturation for 1300 nm. The uncertainty of calculation is minimal at the standard air pressure of 101.325 kPa (Figure 4).

Figure 5 shows that the increase of temperature decreases refractive index. The uncertainty of this calculation is the lowest around 15 and 20 degrees Celsius (Figure 6).

Figure 7 shows that refractive index decreases with the increase of relative humidity. The uncertainty of this calculation is the lowest in the case of dry air. A higher humidity results in a higher uncertainty (Figure 8). It should also be noted that the relative humidity over 85 % results in potential formation of water droplets in the air. These droplets can be fatal for mariners.

Figure 9 shows that the refractive index is not dependent on CO_2 concentration except for 1550 nm. Figure 10 shows that uncertainty is constant for all CO_2 concentrations.

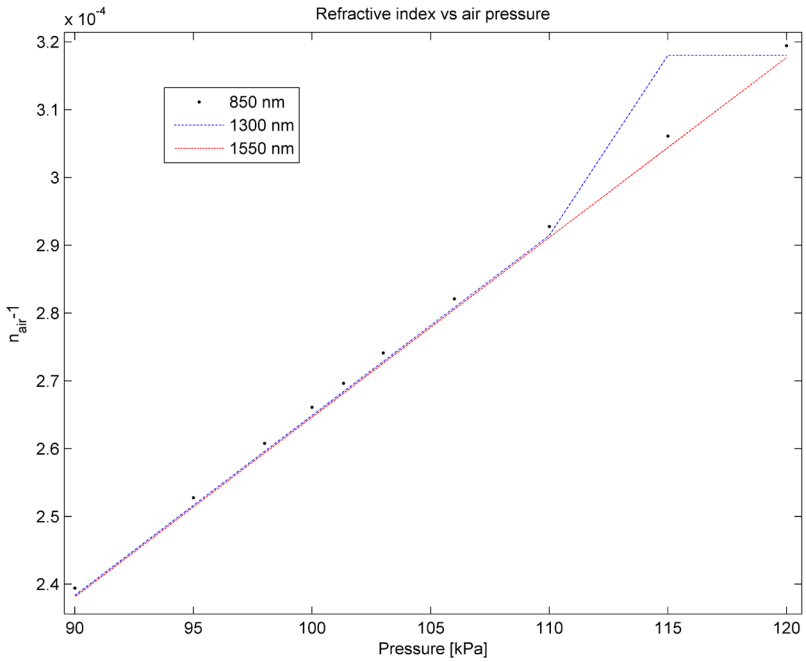


Figure 3.
Refractive index of air dependance on air pressure.

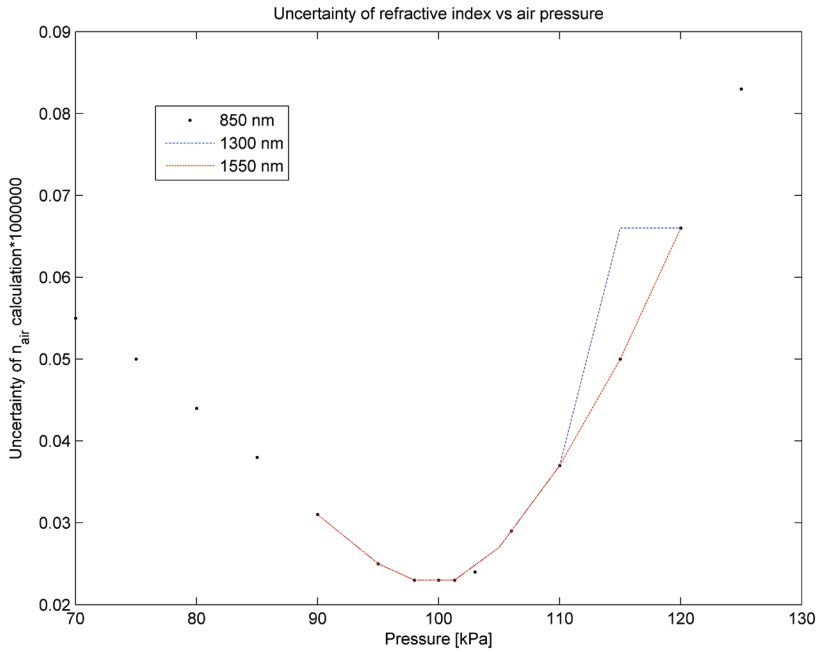


Figure 4.
Uncertainty of calcuation of the refractive index of air dependance on air pressure.

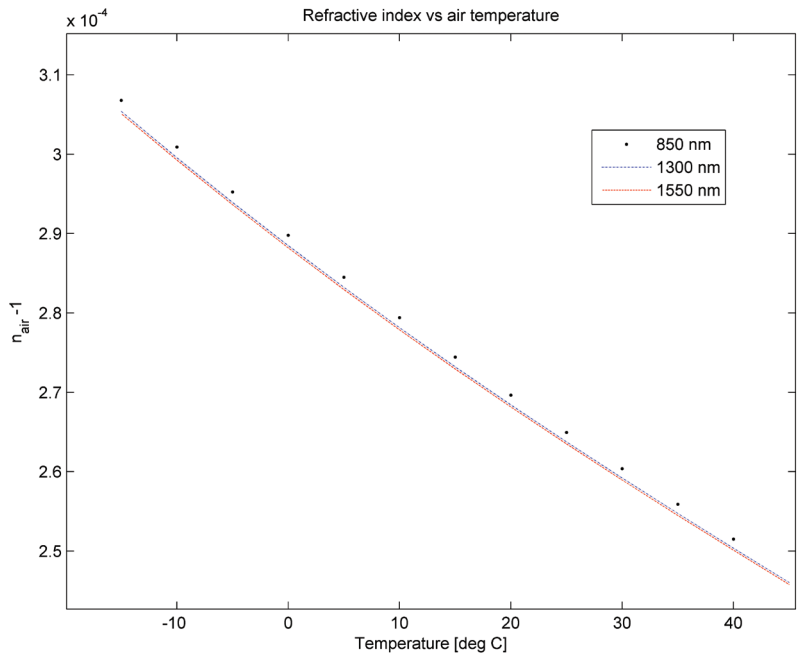


Figure 5.
Refractive index of air dependance on temperature.

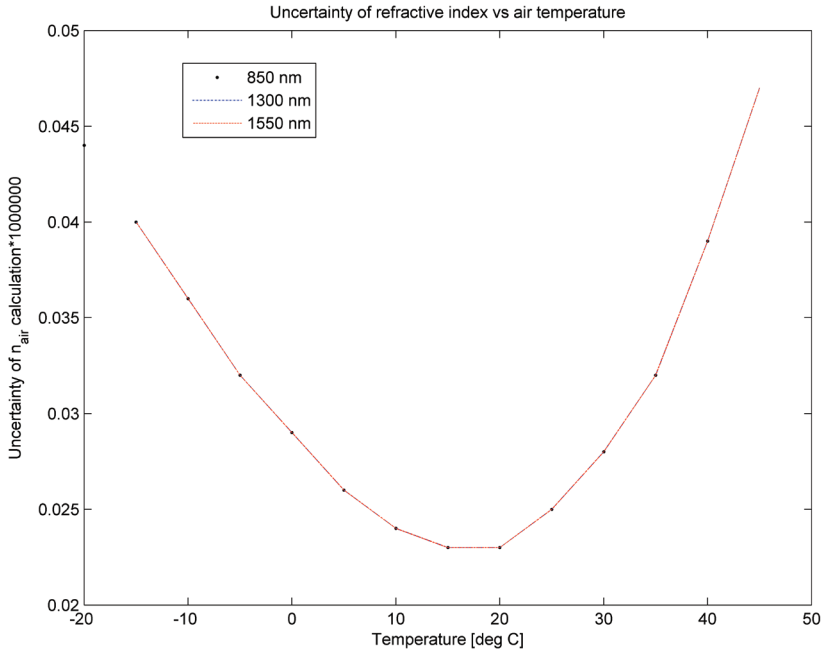


Figure 6.
Uncertainty of calcuation of the refractive index of air dependance on temperature.

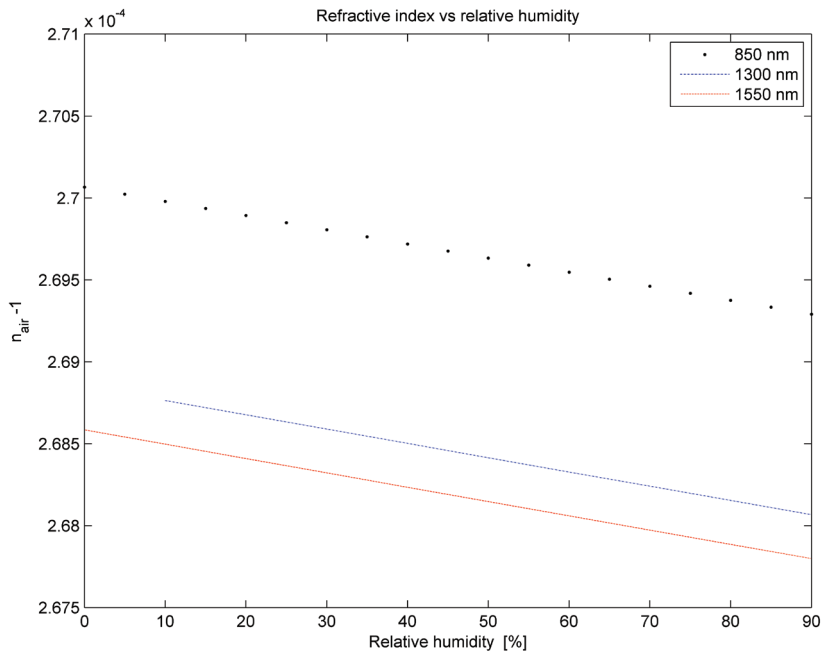


Figure 7.
Refractive index of air dependance on relative humidity.

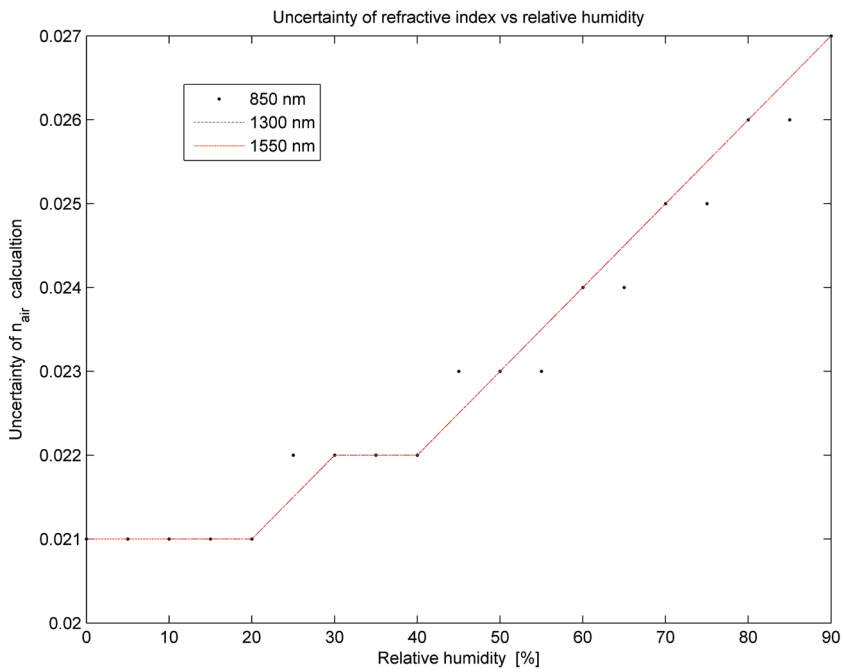


Figure 8.
Uncertainty of calcuation of the refractive index of air dependance on relative humidity.

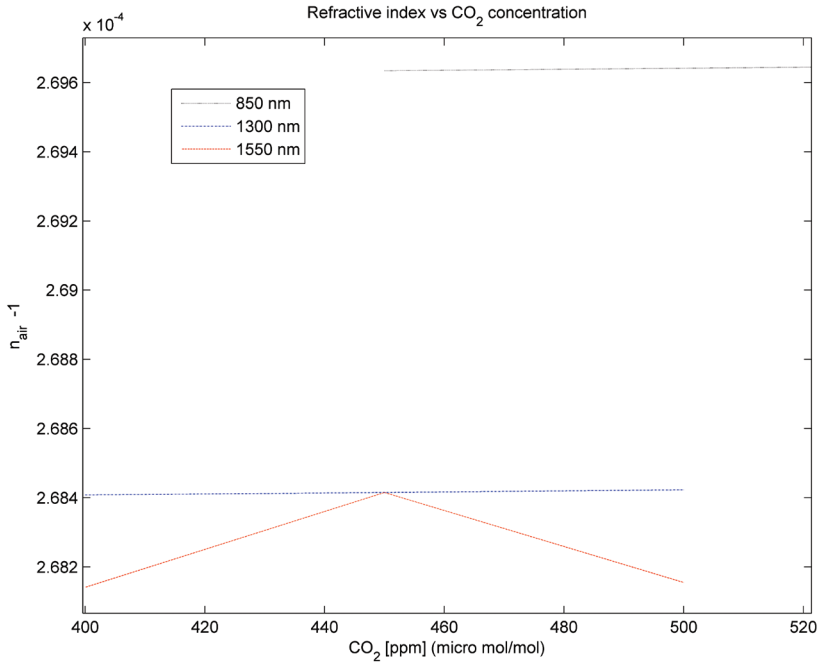


Figure 9.
Refractive index of air dependance on CO_2 concentration.

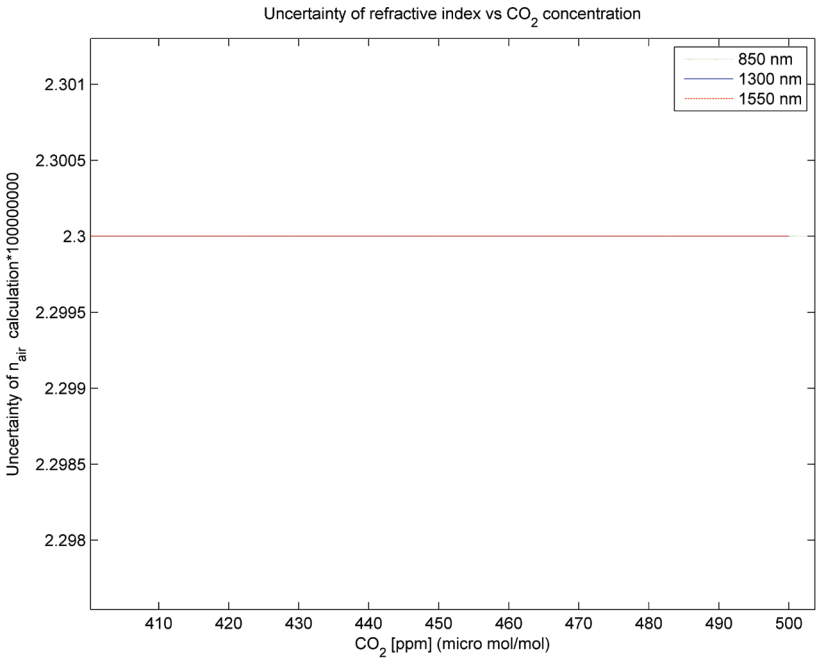
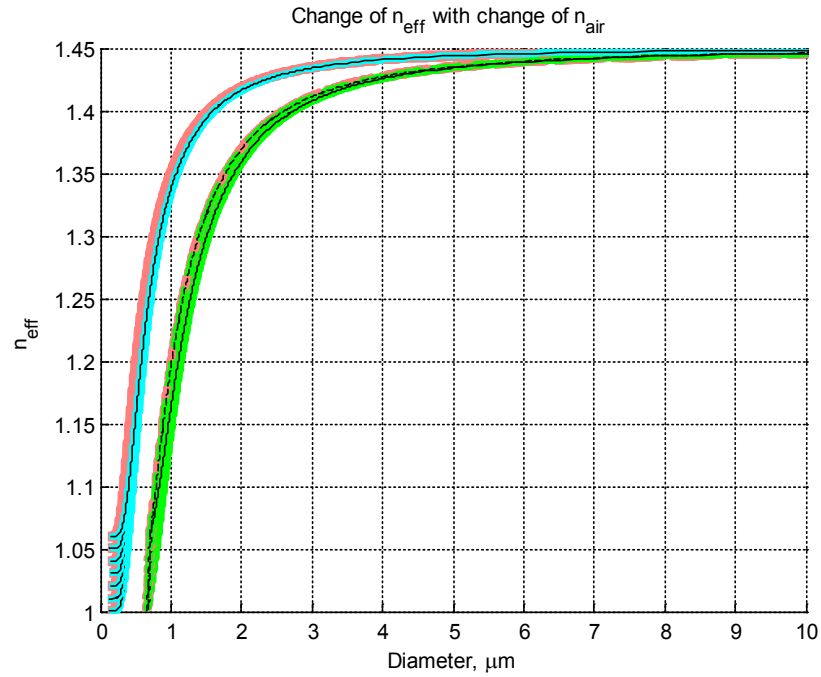
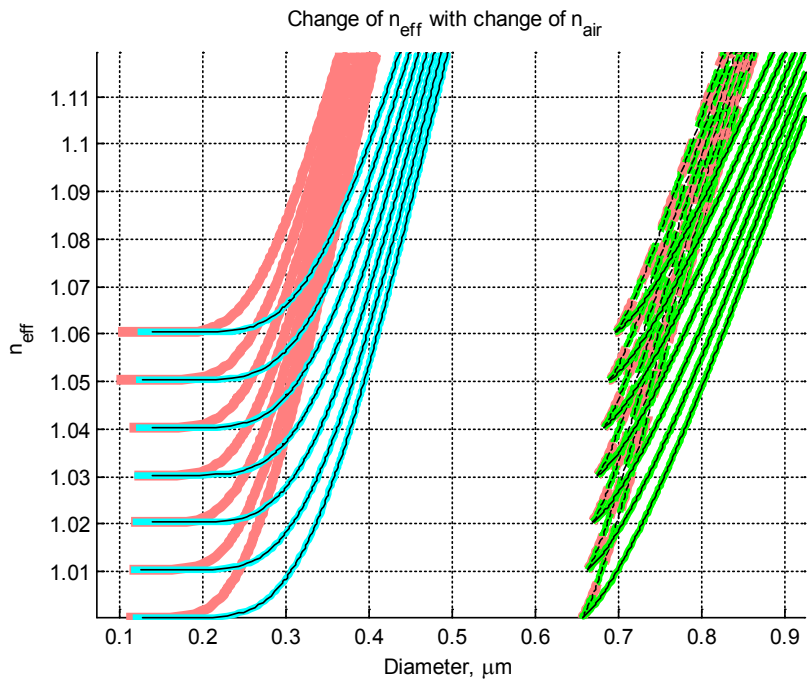


Figure 10.
Uncertainty of calcuation of the refractive index of air dependance on CO_2 concentration.



a)



b)

Figure 11.
a) Change of effective refractive index with diameter, b) zoomed part of a).

Figure 11 shows change of the effective refractive index with the diameter of fiber. The comparison is made for two-layer and three-layer cases (Karapetyan, 2011). Air's refractive index is simulated from 1.000293 to 1.07. Our results show that 6.968 % change in the refractive index, n_{eff} is changed for 6 % (i.e. at 0.1 μm). In this simulation, the change of the refractive index of 7 % was not shown fatal, because no mode was lost. The modes before and under environmental influence present in the optic system are Erdogan cladding modes (3-layer case) (Erdogan, 1997; Erdogan, 2000; Karapetyan, 2011). These modes are available only for cladding-guided modes, where the effective refractive index is smaller than cladding refractive index. The three layer stucture can be approximated with the two-layer one in the regions where the third layer can be neglected.

4. CONCLUSIONS

In this study we could not find evidence of mode loss due to environmental impact. However, it is evident that the environmental influences contribute to the variations in the refractive index. In the three-layer system, environmental parameters are directly involved in light wave guidance. In the two-layer system, jacket annulets many environmental influences, but it is obvious that i.e. temperature variation could lead to refractive index change. Temperature variations are realistic aboard ships.

Further work should include the development of models, which include interaction of as much as possible parameters in dependent manner, which is the opposite of the presented independent manner. Furthermore, the theoretical model should be improved by including a correction for salinity, i.e. through density.

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2.4 GHz Horn Antenna

Goran Banjeglav, Krešimir Malarić

This paper describes the building and testing of a 2.4 GHz antenna which can be used for WLAN as well as for other purposes. The antenna was built to have highest gain at 2.4 GHz although it can be used from frequency of 1.7 GHz up to 2.6 GHz. The paper also describes the calculation of the antenna parameters and dimensions as well as the measurements of its parameters. After the numerical modeling and building, the antenna was tested in the laboratory.The numerical modeling was performed with XFDTD software and the testing of the antenna was done at the Microwave Laboratory of Faculty of Electrical Engineering and Computing, Zagreb. The results showed that the highest antenna gain of 9.46 dB was obtained at 2.437 GHz, which is a frequency used for wireless internet. The antenna can be used on ships in the port as well as on the sea for boosting the range and increasing the received power level of a wireless internet signal.

KEY WORDS
~ Horn antenna
~ Antenna gain
~ Numerical methods
~ Wireless internet

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1. INTRODUCTION

For wireless signal transmission, it is necessary to have a sufficient signal level at the receiver end. WLAN (Wireless Local Area Network) usually operates on 2.4 GHz. This frequency is free to use (ISM – industrial, scientific, medical use) and therefore crowded by many technologies (Golmie and Mouveaux, 2001). An antenna with a high gain is often necessary to boost the signal level as well as to have constant connectivity. Today, there is a wide range of the available antennas at our disposal (Zentner, 1999; Balanis, 2005). There is also a possibility to purchase commercial antennas, but sometimes they do not suit the need of the user. Either the antenna gain is too small, or the frequency range of the antenna is not suited for our purpose. Sometimes, the commercial antennas are expensive as well, and building own antenna could be an option. Horn antenna with high gain is hard to find at most electronic equipment shops. Application of horn antenna include satellite communications, radio telescopes, radar systems and wi-fi.

Although horn antenna is a matter of a research for some time (Barrow and Chu, 1939), it is still a subject of research and improvements (Zang and Bergmann, 2014).

2. ANTENNA DESIGN

The first step in building the horn antenna is defining the necessary gain the antenna should have in the desired frequency range of operation. Antenna gain (G) is defined as the ratio of the power transmitted in the direction of peak radiation and of an isotropic source (radiates equally in all directions). This ratio is

usually expressed in dB. A typical dipole antenna (used in many mobile phones for example) has antenna gain of 2.15 dB. That means that the emitted power is boosted approximately by 65 % (3 dB would mean a 100 % increase or double radiated power). The value of 2.15 dB sometimes is not enough, so in this paper the goal was set for 15 dB to be achieved with a horn antenna. The carrier frequency with maximum radiated power was selected to be 2.437 GHz, a 6th WLAN channel frequency.

Waveguide dimensions are determined depending on the frequency of use. Figure 1. shows the rectangular waveguide cross section, where a is the width and b is the height of the rectangular waveguide dimensions. Waveguide aperture should have dimensions equal to WR-430 standard (see Rectangular waveguide dimensions, 2014) giving $a = 10.922$ cm and $b = 5.461$ cm. Depth of waveguide (Figure 1 on the right) for frequency of 2.437 GHz is equal to the half cut-off frequency wavelength λ_g determined by (1), where λ_0 is the wavelength in free space and λ_c is the wavelength of the cut-off frequency for the mode of transmission:

$$\lambda_g = \frac{1}{\sqrt{\frac{1}{\lambda_0^2} - \frac{1}{\lambda_0^2}}} \tag{1}$$

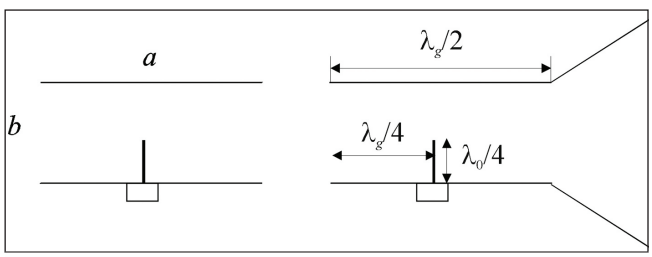

Figure 1.
Waveguide design.

Wavelength in free space λ_0 is determined by:

$$\lambda_0 = \frac{c}{f} = \frac{3 \cdot 10^8 \, m/s}{2.437 \cdot 10^9 \, GHz} = 12.3 \, cm \tag{2}$$

The higher order modes of transmission in a rectangular waveguide depend on its dimensions. The wavelengths of different modes are calculated by

$$(\lambda_c)_{mn} = \frac{2}{\sqrt{\left(\frac{m}{a}\right)^2 + \left(\frac{n}{b}\right)^2}} \tag{3}$$

where m and n are integer numbers. The first mode of transmission is TE_{10} (m =1, n = 0), thus giving $(\lambda_c)_{10} = 2a = 21.844$ *cm*. By introducing λ_0 and λ_c into (1), we obtain λ_g = 14.88 cm. Therefore the depth of waveguide $\lambda_g/2$ is equal to 7.44 cm.

Next, it is necessary to determine the position of a feed antenna as well as its height. According to Figure 1. (right side), the distance of the feed antenna from the waveguide edge is equal to one quarter of a wavelength inside the waveguide, that is $\lambda_g/4 = 3.72$ *cm*. The height of the feed antenna is equal to one quarter of the wavelength in a free space, that is, $\lambda_0/4 = 3.075$ *cm*.

After the waveguide parameters are calculated, the next step is to determine the horn dimension. The horn will have pyramidal shape. The equation for calculating the antenna gain, G is:

$$G = \varepsilon_{ap} \cdot \frac{4\Pi}{\lambda_0^2} \cdot A_{ap} \tag{4}$$

where λ_0 is the wavelength, ε_{ap} is the effective aperture (usually 0,51) coefficient and A_{ap} is the area of aperture (AxB). For desired G = 15 dB (or G = 31,623), it follows from (4) that A_{ap} (that is AxB) = 0,07614.

Figure 2. shows the horn antenna design and required dimension of the antenna. The following equations are valid for rectangular pyramidal waveguide (see High performance horn antenna design (II), 2014):

$$A \cdot B = 0.07614 \tag{5}$$

$$\rho_H \left(1 - \frac{a}{A}\right) = \rho_E \, 1 - \left(\frac{b}{B}\right) = R_H = R_E \tag{6}$$

$$A = \sqrt{3 \lambda a_H} \tag{7}$$

$$B = \sqrt{2 \lambda \rho_E} \tag{8}$$

doi: 10.7225/toms.v04.n01.004

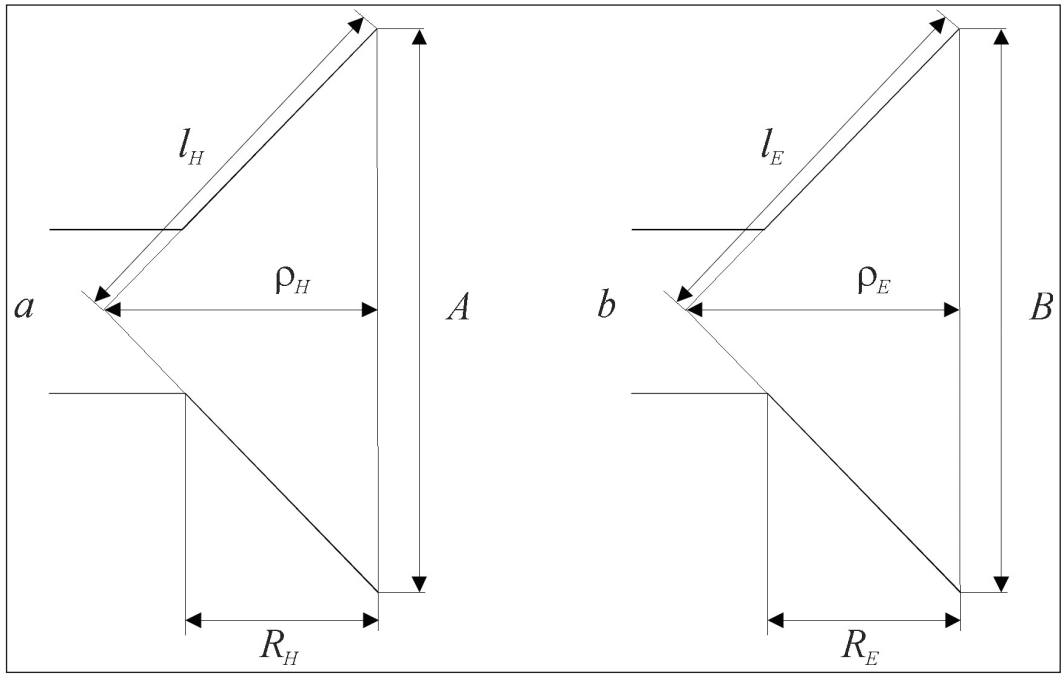

Figure 2.
Horn antenna design.

Thus, we have system of four equations with four unknowns (*A*, *B*, ρ_H, ρ_E). The results of calculation are given in Table 1. In order to determine the remaining dimensions, the following equations will be used:

$$\rho_H / R_H = A / (A - a) \tag{9}$$

$$\rho_E / R_E = B / (B - b) \tag{10}$$

$$l_g = \sqrt{\rho_H^2 + \left(\frac{A}{2}\right)^2} \tag{11}$$

$$l_E = \sqrt{\rho_E^2 + \left(\frac{B}{2}\right)^2} \tag{12}$$

The aperture dimensions must be increased for a copper thickness which is 0.55 mm. All the required dimensions are given in Table 1.

Table 1.
Antenna dimensions.

A [m]	B [m]	a [m]	b [m]	ρ_H [m]	ρ_E [m]	$R_E = R_H$ [m]	l_H [m]	l_E [m]
0.321	0.242	0.1103	0.0557	0.272	0.232	0.1796	0.2074	0.2015

3. SIMULATION MODEL

Horn antenna was simulated using the XFDTD software (Remcom, 2006). Figures 3 and 4 are showing the simulation results of a 3D radiation pattern in space, while Figure 5 shows 2D radiation pattern and gain in polar coordinate system.

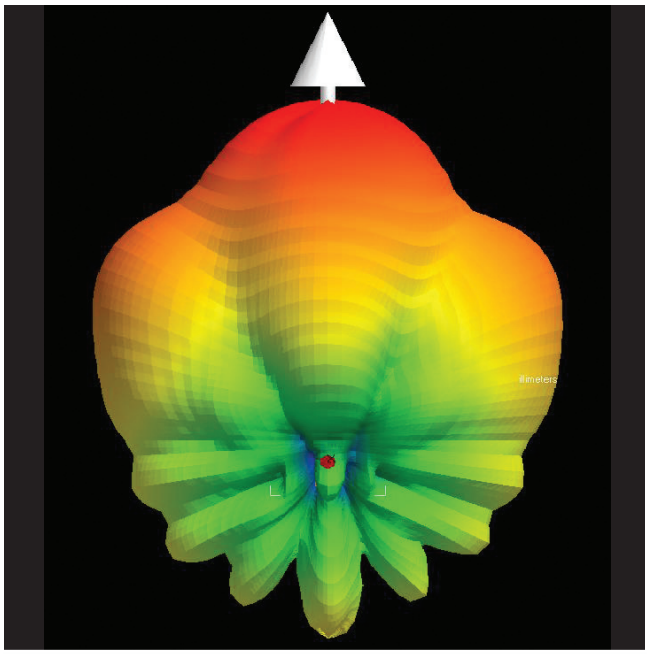

Figure 3.
3D radiation pattern.

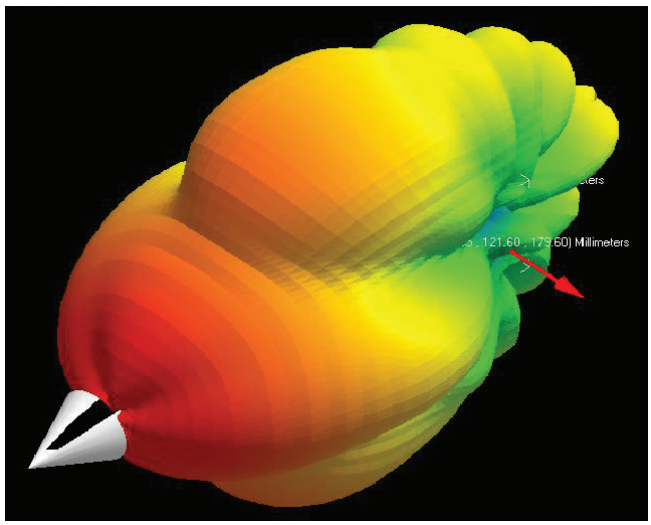

Figure 4.
3D radiation pattern from a different angle.

It can be seen from Figure 5 that modeled antenna has the desired characteristics, that is, the gain of 15 dB at an angle of 0°. The gain stays constant up to ±10° on each side from the direction of maximum gain. On higher angles the gain drops to about 5 dB. The directivity of the antenna is not high because main lobe is quite wide and there are several side lobs present.

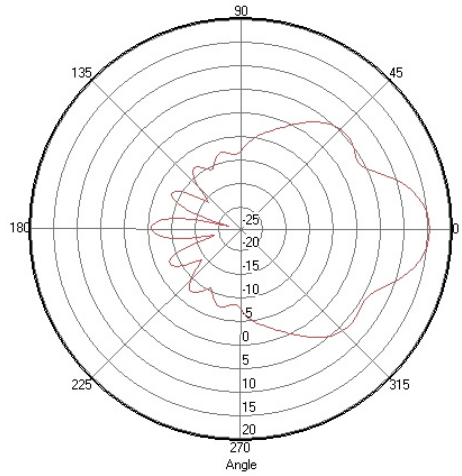

Figure 5.
2D horizontal radiation pattern and gain.

4. MEASUREMENTS

Parameter measurements were performed at the Microwave Laboratory of the Department of Radiocommunications, Faculty of Electrical Engineering and Computing, University of Zagreb. Measurement set-up is shown in Figure 6. The distance of 7m between the antenna and the spectrum analyzer was chosen due to the laboratory size dimensions. For generator we have used was HP 8350B and for the spectrum analyzer NARDA SRM 3000 was utilized. Horn antenna, made out of copper 0.55 mm thick and with a *N* type connector, was connected to the generator using RG 213 cable.

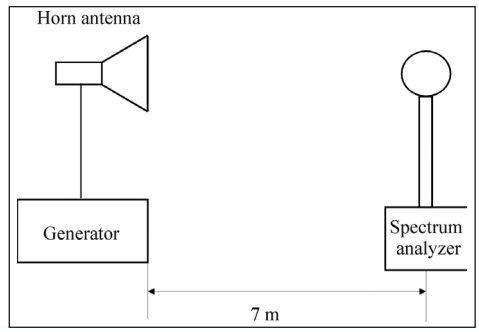

Figure 6.
Measurement set-up.

doi: 10.7225/toms.v04.n01.004

The measurements included measuring power density vs frequency, calculating propagation losses and measuring horn antenna gain compared to the dipole antenna at the frequency of 2.4 GHz.

The measurements were performed in the frequency range from 1.7 GHz to 2.6 GHz. The measured power density (P_D) results are shown in Figure 7. It can be seen that the received power density is highest at app 2.4 GHz, and then it drops to 2.6 GHz.

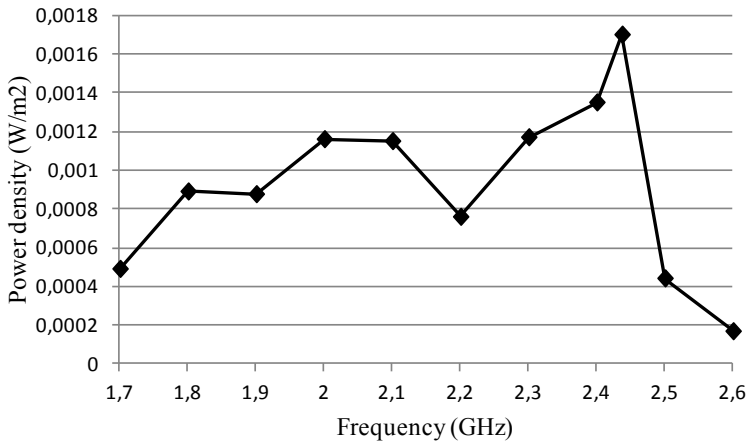

Figure 7.
Power density (P_D) vs frequency.

Antenna gain (G_t) is calculated from

$$G_t = P_r - P_t - G_r - L \quad (13)$$

where P_r and P_t are transmitted and received power, G_r is the receiver antenna gain and L is the signal attenuation. Signal attenuation L depends on the frequency ($\lambda = c/f$) and the distance d between the antennas and can be calculated from

$$L = 20log\left(\frac{\lambda}{4\Pi d}\right) \quad (14)$$

The values of L are given in Table 2. Transmitted power P_t was set to be +15 dBm.

Table 2.
Measurement results of received power, attenuation and gain.

Frequency [GHz]	Received power P_r [dBm]	Signal attenuation L [dB]	Antenna Gain G_t [dB]
1.7	-29.13	53.95	4.07
1.8	-27.04	54.44	6.67
1.9	-27.58	54.91	6.59
2.0	-27.89	55.36	6.72
2.1	-27.91	55.78	7.13
2.2	-29.48	56.19	5.96
2.3	-27.99	56.57	7.84
2.4	-27.72	56.94	8.48
2.437	-26.86	57.08	9.46
2.5	-32.94	57.30	3.61
2.6	-36.89	57.64	0.00

Received power (with $G_r = 1$, because it is embedded in the value of received power by spectrum analyzer) is calculated from

$$P_r = \frac{P_D}{4 \cdot \Pi} \cdot \frac{c^2}{f^2} G_r \qquad (15)$$

where P_D is the measured power density, c is the speed of light and f is the frequency.

The values of P_r are given in Table 2. Introducing values from (14) and (15) into (13), antenna gain (G_t) can be calculated.

We must take into calculation additional losses for indoor propagation (1 dB/m), losses in the cable (0.25 dB/m) and connector losses (0.5 dB each). Final results for horn antenna gain (Gt) are given in Table 2. The frequency dependence of the antenna gain is shown in Figure 8. It can be seen that the gain at frequency 2.437 GHz is highest and equal to 9.46 dB. This value is less than 15 dB, the value which was hoped for.

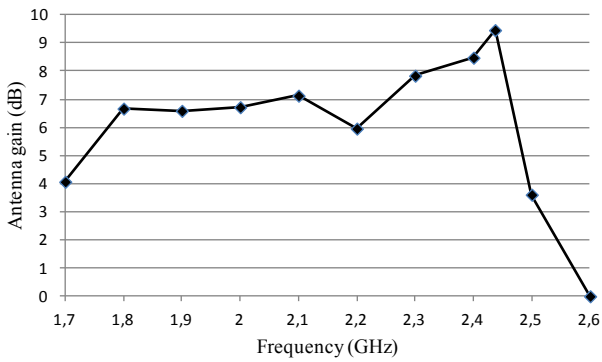

Figure 8.
Antenna gain (G_t) vs frequency.

The difference can be result of a measurement error or material deformations. Thicker metal would probably result in a higher antenna gain (the geometry of the antenna would be more stable). However, antenna gain stays above 6 dB in almost entire frequency range of interest.

For verification of the measurement method and the results, horn antenna gain was compared to the dipole antenna at frequency of 2.4 GHz with its known value of gain being 2.15 dB. The above mentioned measured method gave the result for the dipole antenna gain to be 2.29 dB which meant a measuring error of only 0.14 dB.

5. CONLUSION

The 2.4 GHz horn antenna was built based on the XFDTD simulation model. The designed antenna can be used for WLAN access on ships as well as for other purposes. The antenna gain of app. 9.5 dB is much higher than dipole antenna (2.15 dB) which is normally used. The desired antenna gain of 15 dB could be achieved with a more precise building and thicker metal instead of 0.55 mm copper which was used in our case. Although intended for 2.4 GHz, the antenna can be used in the frequency range from 1.7 GHz to 2.6 GHz with a high gain.

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Statistical Review of the Annual Report on the Performance of Maritime Safety Inspection in Croatia

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This paper provides a detailed analysis of the annual statistical report on the performance of Croatia's Maritime Safety Inspection. Statistical data have been processed with regard to the number of employees at the Directorate for Inspection Affairs within the Ministry of Maritime Affairs, Transport and Infrastructure. A statistical analysis of the number of inspection surveys per area has been made, with tables and graphs providing a detailed account of the deficiencies detected on board vessels and the number of detentions in 2013. The results obtained provide an insight into the overall performance of the Maritime Safety Inspection in that year.

KEY WORDS
~ Vessels
~ Maritime safety inspection
~ Statistical analysis
~ Annual report

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1. INTRODUCTION

Croatia is a maritime country with a very indented coastline and dense sea traffic. In addition to other issues, the Ministry of Maritime Affairs, Transport and Infrastructure of the Republic of Croatia is in charge of management and control of maritime demesne, seaports and vessels. The Ministry's Directorate for Inspection Affairs and the Directorate for Maritime Transport and Search and Rescue Operations are of particular importance for the subject of this paper.

The Republic of Croatia is a member of EMSA (European Maritime Safety Agency) and Paris MoU (Paris Memorandum of Understanding). In line with the requirements of these institutions and the national legislation, the officers of the Ministry of Maritime Affairs, Transport and Infrastructure are in charge of performing inspections of domestic and foreign vessels in the ports of the Republic of Croatia, with the purpose of enhancing the safety of navigation, safety of life at sea, and marine environment protection, at national, EU and international level.

Therefore it is important to gather data related to the inspections of domestic and foreign vessels and do a statistical analysis in order to get a realistic insight into the ways of performance and the results, i.e. the efficiency of the Directorate for Inspection Affairs.

Under the jurisdiction of Croatia's Ministry of Maritime Affairs, Transport and Infrastructure there are 8 Harbour Master's Offices with Inspection Departments, whose safety of navigation inspectors carry out supervision of domestic and foreign vessels and keep statistical records on the type, extent and nature of

the deficiencies observed. All these data are entered into two central computer systems: one system stores information on all inspected ships, boats and yachts in the Republic of Croatia, while the other stores exclusively the data on inspections of foreign vessels. The use of the latter system is compulsory for all member states of the EU and the signatories of PMoU. It enables reviewing the overall statistics and history of surveys of individual vessels, shippers, and members of the EU and PMoU. Supported by these information systems, the Ministry of Maritime Affairs, Transport and Infrastructure itself creates annual and other reports on the number of performed surveys, type and extent of the detected deficiencies, number of detentions, and related activities.

When inspecting foreign vessels, the inspectors in charge of the safety of navigation act exclusively in compliance with the international conventions and IMO (International Maritime Organisation) regulations governing the safety of navigation, safety of life at sea, and environment protection, such as SOLAS, MARPOL, LOAD LINE conventions, etc.

When inspecting domestic ships, boats and yachts, the inspectors in charge of the safety of navigation act in line with the international conventions as well as with the national laws and regulations including the Maritime Code, Regulation on the Inspection of the Safety of Navigation, Port Order Regulations, and the like (Maritime Code, 2004; Maritime Code, 2007; Maritime Code, 2008; Maritime Code, 2011; Maritime Code, 2013; Maritime Demesne and Seaports Act 2003; Maritime Demesne and Seaports Act, 2006; Maritime Demesne and Seaports Act, 2009).

2. STRUCTURE OF THE DIRECTORATE FOR INSPECTION AFFAIRS AT THE MINISTRY OF MARITIME AFFAIRS, TRANSPORT AND INFRASTRUCTURE

As it has been stated in the Introduction, the Directorate for Inspection Affairs consists of the headquarters in the capital of Zagreb and 8 Harbour Master's Offices. The optimum number of personnel engaged by the headquarters and individual Harbour Master's Offices has been defined by the Regulations on Harbour Master's Offices (Paris MOU – official web-site). Table 1 presents the optimum number of employees for each individual Harbour Master's Office as well as the actual situation on December 31, 2013.

Table 1.
Number of inspectors and authorised specialists in charge of navigation safety inspection – situation on December 31, 2013.

Inspectors and authorised inspection officers	Recommended by the Regulations	Situation on 31 December 2013	Recruited	Left the job
At Headquarters in Zagreb	20	3	1	0
At regional units (Harbour Master's Offices)	37	20	1	2
Pula	4	2	0	0
Rijeka	7	6	0	0
Senj	3	1	0	0
Zadar	5	3	0	1
Šibenik	5	1	1	1
Split	5	4	0	0
Ploče	3	1	0	0
Dubrovnik	5	2	0	0
TOTAL	57	23	2	2

In addition to inspectors and authorised specialists, navigation safety inspection is carried out – with limited authority – by 144 employees of the Harbour Master's Offices and their Branch Offices.

The tabulation shows a clear discrepancy between the optimum and the actual staff engaged by the Directorate for Inspection Affairs both at the Headquarters and at the individual Harbour Master's Offices. In addition to the optimum and actual personnel, Table 1 presents the statistics regarding the newly recruited employees and the ones who left the service or were retired. It can also be noticed that, besides the navigation safety inspectors, surveys are also performed by the authorised personnel under the Departments for Maritime Traffic and Search and Rescue operations. These employees are exclusively authorised for inspecting boats and yachts, both domestic and foreign.

3. INSPECTIONS OF SEA GOING SHIPS BY HARBOUR MASTER'S OFFICES IN 2013

Table 2 shows the overall number of inspections performed by individual Harbour Master's Offices (HMO). The data refer to Croatian flag ships and foreign ships.

Table 2.
Inspections of all domestic and foreign ships, performed by individual Harbour Master's Offices (HMO) in 2013.

REGIONAL UNITS	NUMBER OF INSPECTIONS	SHIPS WITH DEFICIENCIES	SHIPS WITH DEFICIENCIES IN %	SHIPS WITH DEFICIENCIES IN % WITH RESPECT TO OVERALL VESSELS WITH DEFICIENCIES	TOTAL NUMBER OF DEFICIENCIES	NUMBER OF DETENTIONS	NUMBER OF DETENTIONS IN %	DETENTIONS IN % OF ALL INSPECTED SHIPS	NUMBER OF INDIVIDUAL SHIPS
HMO PULA	99	44	44 %	10 %	254	9	17 %	9 %	85
HMO RIJEKA	239	136	57 %	32 %	622	16	30 %	7 %	218
HMO ZADAR	115	81	70 %	19 %	239	14	26 %	12 %	99
HMO ŠIBENIK	55	27	49 %	6 %	67	4	7 %	7 %	49
HMO SPLIT	86	61	71 %	14 %	347	1	2 %	1 %	71
HMO PLOČE	37	21	57 %	5 %	45	2	4 %	5 %	32
HMO DUBROVNIK	89	52	58 %	12 %	119	6	11 %	7 %	84
HMO SENJ	18	6	33 %	1 %	15	2	4 %	11 %	17
TOTAL	**738**	**428**	**58 %**	**100 %**	**1,708**	**54**	**100 %**	**7 %**	**655**

At national level, during all these inspection activities a total of 738 inspections were performed involving 655 inspected ships. During these surveys the inspectors detected 1708 deficiencies and detained 54 ships for breaching the regulations governing the safety of navigation at sea, i.e. 7 % of all inspected ships.

The Harbour Master's Office in Rijeka was the busiest regional unit (Table 2) with regard to its share in the overall number of the performed surveys and detentions at the national level, which is quite logical and expected, given the fact that Rijeka is Croatia's largest seaport (Ministry of Maritime Affairs, Transport and Infrastructure – official web-site).

Further statistical analysis of the performed inspections in 2013 (Tables 3 and 4) reveals that most of the surveys (73 %) were carried out on board domestic vessels flying Croatian flag, whereas only 27 % of the inspections were performed on board vessels flying foreign flags (Tomašević et al., 2007).

A very important information regarding the defeciencies of ships – therefore regarding the threatened safety of navigation – can be obtained by comparing the two tables (Tables 3 and 4). Namely, the inspections performed found a higher percentage of deficiencies on foreign ships (62 %) than on Croatian ships (57 %).

It is also interesting to note that the highest number of detentions of Croatian ships were performed by the Harbour Master's Office in Zadar, while the highest number of detentions of foreign-flag ships were performed by the Harbour Master's

Table 3.
Inspections of Croatian-flag ships by individual Harbour Master's Offices in 2013.

REGIONAL UNIT	NUMBER OF INSPECTIONS	SHIPS WITH DEFICIENCIES	SHIPS WITH DEFICIENCIES IN %	SHIPS WITH DEFICIENCIES IN % WITH RESPECT TO OVERALL VESSELS WITH DEFICIENCIES	TOTAL NUMBER OF DEFICIENCIES	NUMBER OF DETENTIONS	No. OF DETENTIONS IN % WITH RESPECT TO OVERALL DETENTIONS	DETENTIONS IN % OF ALL INSPECTED SHIPS	NUMBER OF INDIVIDUAL SHIPS
HMO PULA	75	26	35 %	9 %	147	7	17 %	9 %	63
HMO RIJEKA	154	84	55 %	28 %	360	9	22 %	6 %	135
HMO ZADAR	94	67	71 %	22 %	176	12	29 %	13 %	79
HMO ŠIBENIK	53	26	49 %	9 %	66	3	7 %	6 %	47
HMO SPLIT	54	39	72 %	13 %	215	0	0 %	0 %	43
HMO PLOČE	19	12	63 %	4 %	20	2	5 %	11 %	16
HMO DUBROVNIK	71	44	62 %	14 %	101	6	15 %	8 %	66
HMO SENJ	18	6	33 %	2 %	15	2	5 %	11 %	17
TOTAL	**538**	**304**	**57 %**	**100 %**	**1100**	**41**	**100 %**	**8 %**	**466**

Table 4.
Inspections of foreign-flag ships by individual Harbour Master's Offices in 2013.

REGIONAL UNIT	NUMBER OF INSPECTIONS	SHIPS WITH DEFICIENCIES	SHIPS WITH DEFICIENCIES IN %	SHIPS WITH DEFICIENCIES IN % WITH RESPECT TO OVERALL VESSELS WITH DEFICIENCIES	TOTAL NUMBER OF DEFICIENCIES	NUMBER OF DETENTIONS	No. OF DETENTIONS IN % WITH RESPECT TO OVERALL DETENTIONS	DETENTIONS IN % OF ALL INSPECTIONS	NUMBER OF INDIVIDUAL SHIPS
HMO PULA	24	18	75 %	15 %	107	2	15 %	8 %	22
HMO RIJEKA	85	52	61 %	42 %	262	7	54 %	8 %	83
HMO ZADAR	21	14	67 %	11 %	63	2	15 %	10 %	20
HMO ŠIBENIK	2	1	50 %	1 %	1	1	8 %	50 %	2
HMO SPLIT	32	22	69 %	18 %	132	1	8 %	3 %	28
HMO PLOČE	18	9	50 %	7 %	25	0	0 %	0 %	16
HMO DUBROVNIK	18	8	44 %	6 %	18	0	0 %	0 %	18
TOTAL	**200**	**124**	**62 %**	**100 %**	**608**	**13**	**100 %**	**7 %**	**198**

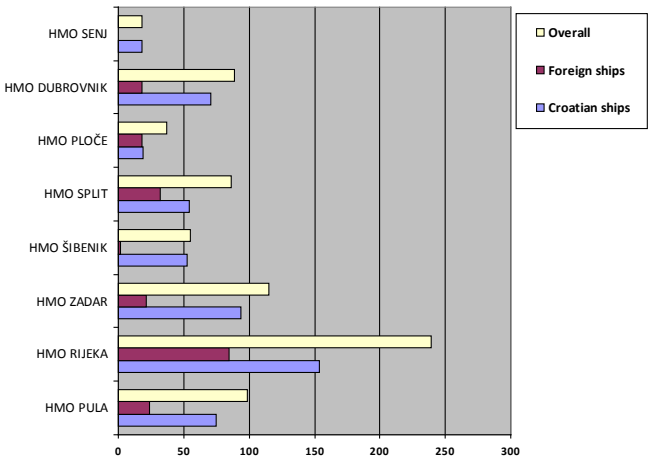

Figure 1.
Inspections of Croatian and foreign-flag ships by individual Harbour Master's Offices in 2013.

Office in Rijeka (as expected, given the fact that the Port of Rijeka handles the densest traffic of domestic and foreign vessels).

It can be clearly seen that Table 4 lacks statistical data referring to the inspections of foreign-flag ships by the Harbour Master's Office in Senj. The reason for this situation is that the Port of Senj is not a port intended for international traffic.

The graphic illustration (Figure 1) of the data presented in the above Tables straightforwardly leads to the conclusion that the Port of Rijeka performs most of the inspection surveys in the Republic of Croatia due to the highest rate of maritime traffic handled by this port. The Figure also shows that, due to the above mentioned reasons, the Harbour Master's Office in Senj carries out few inspections and these inspections refer exclusively to the Croatian flag vessels.

4. STATISTICAL CATEGORISATION OF DEFICIENCIES DETECTED ON BOARD SHIPS INSPECTED IN 2013

This section of the paper provides an overview of all the categories of deficiencies that navigation safety inspectors detect while surveying domestic and foreign ships. The overview presented is rather important as the data gathered show the most frequent deficiencies and their share in the overall number of deficiencies observed on board all the ships inspected. As it has been already pointed out, the categories of deficiencies are defined by the international conventions and by national laws and regulations (European Maritime Safety Agency (EMSA) – official web-site).

Table 5 presents 23 categories of the main deficiencies that are considered essential for the safety of navigation, safety of life at sea and marine environment protection. The data are presented numerically and as percentages for each individual category of deficiency, referring to the overall number of the deficiencies observed during inspection of all ships in 2013.

Most of the deficiencies observed (18.22 %) belong to the category of Ship's Certificates and Documents, followed by the deficiencies related to the Safety of Navigation amounting to 11.6 %, and Fire Safety Measures amounting to 11.66 % of the overall detected deficiencies. From the viewpoint of navigation safety, the percentages are rather high as these are essential deficiencies that are directly related to the safety of navigation, safety of life at sea and marine environment protection (Tomašević et al., 2007).

The related categories indicated in Table 5 are merged together in order to better understand the Figure. According to Figure 2 and Table 5, it is obvious that Safety of Navigation is the most neglected among the categories, which is unacceptable as the sea traffic rate increases daily. This is why the conventions and regulations governing the issue of navigation safety are becoming stricter and are constantly amended, and the inspectors pay particular attention to that category of deficiencies during their surveys with the aim of improving safety of navigation, safety of life at sea and marine environment protection.

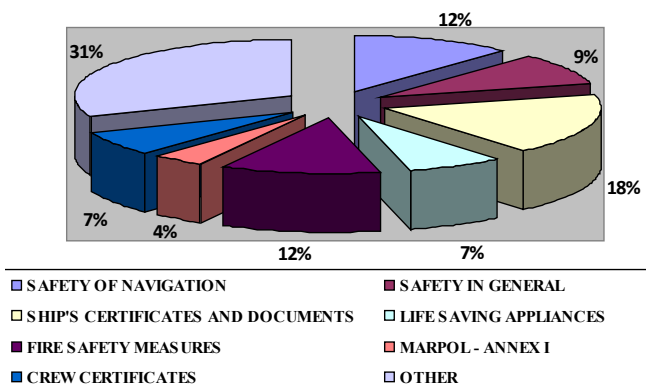

Figure 2.
Share of individual categories of deficiencies – all ships in 2013.

Table 6 presents the categories of deficiencies found on performing inspections of Croatian ships. Again, most of the deficiencies detected are related to the safety of navigation, safety of life at sea and marine environment protection – 50 % of all the deficiencies observed. Ship's Certificates and Documents is the category with the highest individual number of deficiences (24 %). This undesirable tendency is followed by the categories of Fire Safety Measures and Safety in General, each amounting to around 10 % of the overall detected deficiences.

Table 5.
Main groups of deficiencies – all ships inspected in 2013.

CODE	MAIN GROUPS OF DEFICIENCIES	NUMBER OF DEFICIENCIES	DEFICIENCIES IN % WITH REGARD TO OVERALL NUMBER OF DEFICIENCIES
0100	SHIP'S CERTIFICATES AND DOCUMENTS	308	18.22
0200	CREW CERTIFICATES	117	6.92
0300	CREW AND ACCOMODATION (ILO 147)	22	1.30
0400	FOOD AND CATERING (ILO 147)	13	0.77
0500	WORKING SPACES (ILO 147)	38	2.25
0600	LIFE-SAVING APPLIANCES	126	7.46
0700	FIRE SAFETY MEASURES	197	11.66
0800	ACCIDENT PREVENTION (ILO 147)	21	1.24
0900	SAFETY IN GENERAL	156	9.23
1000	ALARM SIGNALS	17	1.01
1100	CARGO OPERATION AND DANGEROUS CARGO OPERATION	6	0.36
1200	LOAD LINES	49	2.90
1300	MOORING ARRANGEMENTS	20	1.18
1400	PROPULSION AND AUXILIARY MACHINERY	62	3.67
1500	SAFETY OF NAVIGATION	196	11.60
1600	RADIO COMMUNICATION	33	1.95
1700	MARPOL – ANNEX I	73	4.32
1800	TANKERS	5	0.30
2000	SOLAS RELATED DEFICIENCIES	109	6.45
2100	MARPOL RELATED DEFICIENCIES	14	0.83
2300	MARPOL – ANNEX V	38	2.25
2500	ISM RELATED DEFICIENCIES	42	2.49
9900	OTHER DEFICIENCIES – not related directly to safety, health and marine pollution	28	4.32
TOTAL		**1690**	**100,00**

Table 6.
Main groups of deficiencies – Croatian ships in 2013.

CODE	MAIN GROUPS OF DEFICIENCIES	NUMBER OF DEFICIENCIES	DEFICIENCES IN % WITH REGARD TO OVERALL NUMBER OF DEFICIENCIES
0100	SHIP'S CERTIFICATES AND DOCUMENTS	267	24.28
0200	CREW CERTIFICATES	79	7.18
0300	CREW AND ACCOMODATION (ILO 147)	13	1.18
0400	FOOD AND CATERING (ILO 147)	4	0.36
0500	WORKING SPACES (ILO 147)	21	1.91
0600	LIFE-SAVING APPLIANCES	110	10.00
0700	FIRE SAFETY MEASURES	107	9.73
0800	ACCIDENT PREVENTION (ILO 147)	14	1.28
0900	SAFETY IN GENERAL	117	10.64
1000	ALARM SIGNALS	7	0.64
1100	CARGO OPERATION AND DANGEROUS CARGO OPERATIONS	1	0.09
1200	LOAD LINES	25	2.27
1300	MOORING ARRANGEMENTS	7	0.64
1400	PROPULSION AND AUXILIARY MACHINERY	32	2.91
1500	SAFETY OF NAVIGATION	93	8.45
1600	RADIO COMMUNICATION	16	1.45
1700	MARPOL – ANNEX I	36	3.27
1800	TANKERS	3	0.27
2000	SOLAS-RELATED DEFICIENCIES	82	7.45
2100	MARPOL-RELATED DEFICIENCIES	7	0.64
2300	MARPOL – ANNEX V	18	1.64
2400	PASSENGER SHIPS	4	0.36
2500	ISM-RELATED DEFICIENCIES	11	1.00
2600	BULK CARRIERS	2	0.18
9800	OTHER DEFICIENCIES – related directly to safety, health and marine pollution	3	0.27
9900	OTHER DEFICIENCIES – not related directly to safety, health and marine pollution	21	1.91
TOTAL		**1,100**	**100.00**

Table 7.
Main groups of deficiencies – foreign ships in 2013.

CODE	MAIN GROUPS OF DEFICIENCIES	NUMBER OF DEFICIENCIES	DEFICIENCES IN % WITH REGARD TO OVERALL NUMBER OF DEFICIENCIES
0100	SHIP'S CERTIFICATES AND DOCUMENTS	41	6.74
0200	CREW CERTIFICATES	38	6.25
0300	CREW AND ACCOMODATION (ILO 147)	9	1.48
0400	FOOD AND CATERING (ILO 147)	9	1.48
0500	WORKING SPACES (ILO 147)	17	2.80
0600	LIFE-SAVING APPLIANCES	16	2.63
0700	FIRE SAFETY MEASURES	90	14.80
0800	ACCIDENT PREVENTION (ILO 147)	7	1.15
0900	SAFETY IN GENERAL	39	6.41
1000	ALARM SIGNALS	10	1.64
1100	CARGO OPERATION AND DANGEROUS CARGO OPERATIONS	5	0.82
1200	LOAD LINES	24	3.95
1300	MOORING ARRANGEMENTS	13	2.14
1400	PROPULSION AND AUXILIARY MACHINERY	30	4.93
1500	SAFETY OF NAVIGATION	103	16.94
1600	RADIO COMMUNICATION	17	2.80
1700	MARPOL – ANNEX I	37	6.09
1800	TANKERS	2	0.33
2000	SOLAS-RELATED DEFICIENCIES	27	4.44
2100	MARPOL-RELATED DEFICIENCIES	7	1.15
2300	MARPOL – ANNEX V	20	3.29
2500	ISM-RELATED DEFICIENCIES	31	5.10
2700	DEFICIENCY RELATED TO MARITIME SUCURITY	3	0.49
2900	MARPOL – ANNEX IV	2	0.33
3000	MARPOL – ANNEX VI	4	0.66
9900	OTHER DEFICIENCIES – not related directly to safety, health and marine pollution	7	1.15
TOTAL		**608**	**100.00**

When comparing the categorisation of the deficiencies detected on board foreign ships (Table 7) with the categorisation of the deficiencies observed on board domestic ships, the results differ to a certain extent. It is obvious that most of the deficiencies on board foreign ships are related to Safety of Navigation (almost 17 %) and to Fire Safety Measures, amounting to 14 % of the overall detected deficiences. However, there are fewer deficiencies in Ship's Certificates and Documents than on board Croatian ships.

5. RESULTS OF INSPECTIONS OF FOREIGN SHIPS WITH REGARD TO SHIP'S AGE IN 2013

The ship's age and type are rather important parameters during inspection; they determine the frequency and scope of the survey. Accordingly, newly built ships up to 5 years old, depending on their type, belong to a group of low-risk vessels and are inspected once in 2 or 3 years, whereas older vessels belong to higher-risk groups and are surveyed more often and more thoroughly.

As expected, Table 8 shows that ships older than 20 years have the highest number of deficiencies and are most frequently inspected as they belong to the category of higher-risk vessels. 70 % of the overall deficiencies observed during inspections of all foreign ships refer to the ships older than 20 years.

Table 8.
Inspections of foreign ships by ship's age in 2013.

SHIP'S AGE	TOTAL NUMBER OF INSPECTIONS	NUMBER OF INDIVIDUAL SHIPS INSPECTED	INSPECTIONS WITH OBSERVED DEFICIENCIES	INSPECTIONS WITH DETECTED DEFICIENCIES IN % FOR ALL INSPECTED SHIPS RELATED TO THE AGE OF SHIPS	INSPECTIONS WITH OBSERVED DEFICIENCIES IN % FOR AALL INSPECTED SHIPS WITH DEFICIENCIES	TOTAL NUMBER OF DEFICIENCIES
0 to 5	20	20	6	30.00	4.84	29
6 to 10	36	35	15	41.67	12.09	51
11 to 15	23	21	12	52.17	9.68	42
16 to 20	7	7	4	57.14	3.23	8
over 20	114	106	87	76.32	70.16	478
TOTAL	**200**	**189**	**124**	**62.00**	**100.00**	**608**

6. CONTRIBUTION OF THE REPUBLIC OF CROATIA TO THE GLOBAL SAFETY OF NAVIGATION

Considering that PMoU is one of the first institutions established to improve the safety of navigation and protection of marine environment, the Republic of Croatia made every effort to join the institution and contribute to the safety of navigation and protection of marine environment both in Croatian and global waters.

The PMoU system uses the "FAIR SHARE" principle of distribution of inspections, depending on the number of calls at the ports of a member state. Given the current economic situation, the "FAIR SHARE" of the Republic of Croatia amounted to 201 inspections in 2013.

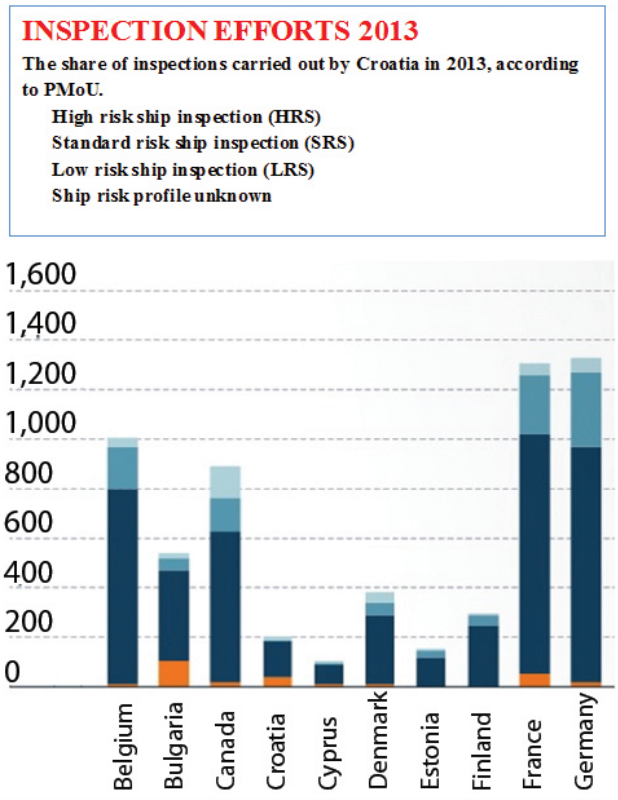

Figure 3.
The share of inspections carried out by Croatia in 2013, according to PMoU.

The above diagram shows that Croatia, as a PMoU member state, complied with the quota of 201 inspections, as allocated by "FAIR SHARE" system. Despite the lack of inspectors trained to perform such inspections, the Republic of Croatia fulfilled all obligations with regard to PMoU.

Table 9 presents the state of the Croatian fleet, with respect to the PMoU requirements for the safety of navigation.

Considering that the ships flying Croatian flag were ranked high on the PMoU "WHITE LIST" (earning the rank of the 10th out of 46 states), it is obvious that the Republic of Croatia has been concerned in a responsible and professional way for the safety of the vessels flying Croatian flag as well as of the vessels flying the flags of PMoU member states and the flags of other states. It is important to point out that, in addition to the "WHITE LIST", there are the "GREY LIST" and "BLACK LIST", showing Croatia's position at the global level.

7. CONCLUSION

The Republic of Croatia is the signatory of almost all relevant international conventions under International Maritime Organisation. As a member of the European Union and the Paris MoU, Croatia continuously observes and implements laws and regulations at national and international levels. Compliance with IMO and EU regulations, frequent inspections of vessels and implementation of increasingly stricter rules and conventions gradually result in improved safety of navigation, safety of life at sea and marine environment protection, as well as in increased awareness of shippers and shipowners.

Table 9.
"WHITE LIST" for 2013, according to PMoU.

WHITE LIST						
RANK	**FLAG**	**INSPECTIONS 2011-2013**	**DETENTIONS 2011-2013**	**BLACK TO GREY LIMIT**	**GREY TO WHITE LIMIT**	**EXCESS FACTOR**
1	France	278	0	27	12	-1,92
2	Norway	1 470	16	119	86	-1,79
3	Sweden	476	4	43	24	-1,69
4	Denmark	1 099	14	91	63	-1,68
5	Italy	1 243	17	102	72	-1,66
6	Hong Kong China	1 583	23	128	94	-1,66
7	United Kingdom	1 513	23	123	89	-1,62
8	Finland	421	4	39	20	-1,61
9	Germany	881	12	75	49	-1,61
10	Croatia	147	0	16	5	-1,59

In 2013 Rijeka was the busiest Harbour Master's Office in Croatia, inspecting the highest number of foreign and Croatian ships and, consequently, detecting most deficiencies on board inspected vessels. This was rather logical and expected, given the fact that Rijeka is Croatia's largest seaport handling the densest traffic of domestic and foreign vessels.

Most of the inspections took place on board ships flying Croatian flag (73 %). Inspections of foreign ships were performed less frequently (27 %). The inspections detected a higher number of deficiencies on board foreign ships. When gathering the data upon the inspections performed, it was found out that more deficiencies were observed on board foreign vessels (62 %) than on board Croatian vessels (57 %).

When taking into account all ships inspected, most of the deficiencies were observed in the categories Ship's Certificates and Documents (18 %) and Fire Safety Measures and Safety of Navigation (12 %). The large percentage of the detected deficiencies in these rather important categories resulted in detention of 7 % ships in total, i.e. 54 out of 738 inspected ships were detained. These vessels had to take appropriate action and eliminate deficiencies before they were allowed to sail.

Although the number of employees at Croatia's Ministry of Maritime Affairs, Transport and Infrastructure and at Harbour Master's Offices has been below optimum, the inspections of foreign and domestic ships have been performed frequently and thoroughly, and all deficiencies have been examined with great care, with the aim of enhancing safety of navigation, safety of life at sea and marine environment protection.

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CONTRIBUTION

News from IMO
Maritime heritage
News
Popularization of Science
Popularization of Technology
Pjesma / Poem
Nekrolog brodu / Obituary to a Ship
Guidelines

CONTRIBUTION

News from IMO

Tatjana Krilić

The paper presents current work of selected IMO bodies in the period preceding the publication of this issue of ToMs. The outcome of IMO bodies responsible for safety and environment protection has been covered, aiming at informing seafarers and shipping industry at large on the decisions taken, as well as on the IMO instruments and/or their amendments that have entered into force.

KEY WORDS
~ IMO
~ Safety
~ Environment protection

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INTRODUCTION

IMO Secretary-General Koji Sekimizu has launched this year's World Maritime Day theme, "Maritime education and training", emphasizing that "effective standards of training remain the bedrock of a safe and secure shipping industry, which needs to preserve the quality, practical skills and competence of qualified human resources," and adding that the 2015 World Maritime Day theme provided the opportunity to highlight the importance to everybody, not just within the shipping industry, of there being sufficient quantity and quality maritime education and training available to meet the sector's needs, now and into the future.

Since the last issue of ToMS, the Maritime Environment Protection Committee (MEPC) met at the Organization's London Headquarters for its 67th session from 13 to 17 October 2014, and the Maritime Safety Committee (MSC) held its 94th session from 17 to 21 November 2014. Selected decisions and outcome of discussions of both Committees have been presented in this review. Complete information on the outcome of various IMO bodies is available to the public in their reports, which can be found on the Organization's IMODOCS website (http://docs.imo.org/).

66th session of the Marine Environment Protection Committee (MEPC 67)

BWM resolutions adopted

The MEPC adopted resolutions aimed at facilitating the entry into force and implementation of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention), 2004.

Third IMO GHG Study 2014 approved

The MEPC approved the Third IMO GHG Study 2014 providing updated estimates for greenhouse gas emissions from ships. The Third IMO GHG Study 2014 estimates that international shipping emitted 796 million tonnes of carbon dioxide (CO2) in 2012, against 885 million tonnes in 2007. This represented 2.2 % of the global emissions of CO2 in 2012, against 2.8 % in 2007. However, the "business as usual" scenarios continue to indicate that those emissions are likely to grow by between 50 % and 250 % in the period to 2050, depending on future economic and energy developments.

Energy-efficiency measures for ships considered

IMO in 2011 adopted mandatory measures to address energy efficiency of international shipping, which entered into force on 1 January 2013 under Chapter 4 of MARPOL Annex VI. These Regulations on energy efficiency for ships make mandatory the Energy Efficiency Design Index (EEDI), for new ships, and the Ship Energy Efficiency Management Plan (SEEMP) for all ships.

The MEPC continued its work on further developing guidelines to support the uniform implementation of the regulations on energy-efficiency for ships. During the session, the MEPC adopted the 2014 Guidelines on survey and certification of the Energy Efficiency Design Index (EEDI), updating the previous version, as well as amendments to the 2013 Interim Guidelines for determining minimum propulsion power to maintain the manoeuvrability of ships in adverse conditions, to make the guidelines applicable to phase 1 (starting 1 January 2015) of the EEDI requirements.

Data collection system for fuel consumption of ships

The MEPC agreed, in principle, to develop a data collection system for ships, with the core elements including data collection by ships, flag State functions in relation to data collection and establishment of a centralized database by the Organization. The first input for the next MEPC session will be developed by an intersessional correspondence group.

Correspondence group instructed to continue with sulphur review methodology

The MEPC reviewed a progress report from the correspondence group which had been instructed to develop a draft framework for a methodology to examine whether sufficient fuel meeting the requirements set out in regulation 14 (Sulphur Oxides (SOx) and Particulate Matter) of MARPOL Annex VI is likely to be available by the effective date of those requirements, taking into account the global market supply and demand for fuel oil, trends in fuel oil markets, and any other relevant issues.

The group had developed a preliminary draft methodology framework and was instructed to continue its work and submit a final report to MEPC 68.

The sulphur content (expressed in terms of % m/m – that is, by weight) of fuel oil used on board ships is required to be a maximum of 3.50 % m/m (outside an Emission Control Area (ECA)), falling to 0.50 % m/m on and after 1 January 2020. Depending on the outcome of the review, to be completed by 2018, as to the availability of compliant fuel oil, this requirement could be deferred to 1 January 2025.

Within ECAs, the sulphur content of fuel oil (expressed in terms of % m/m: that is, by weight) must be no more than 1.00 % m/m; falling to 0.10 % m/m on and after 1 January 2015.

Amendments to MARPOL adopted

The MEPC adopted amendments to:

- MARPOL Annex I regulation 43 concerning special requirements for the use or carriage of oils in the Antarctic area, to prohibit ships from carrying heavy grade oil on board as ballast;
- MARPOL Annex III, concerning the appendix on criteria for the identification of harmful substances in packaged form; and
- MARPOL Annex VI, concerning regulation 2 (Definitions), regulation 13 (Nitrogen Oxides (NOx) and the Supplement to the International Air Pollution Prevention Certificate (IAPP Certificate), in order to include reference to gas as fuel and to gas-fuelled engines.

94th session of the Maritime Safety Committee (MSC 94)

Polar Code adopted

The MSC adopted the International Code for Ships Operating in Polar Waters (Polar Code), and related amendments to the International Convention for the Safety of Life at Sea (SOLAS) to make it mandatory, marking an historic milestone in the Organization's work to protect ships and people aboard them, both seafarers and passengers, in the harsh environment of the waters surrounding the two poles.

The Polar Code covers the full range of design, construction, equipment, operational, training, search and rescue and environmental protection matters relevant to ships operating in waters surrounding the two poles.

Ships trading in the polar regions already have to comply with all relevant international standards adopted by IMO, but the newly adopted SOLAS chapter XIV "Safety measures for ships

operating in polar waters", adds additional requirements, by making mandatory the Polar Code (Preamble, Introduction and Part I-A (Safety measures)).

The expected date of entry into force of the SOLAS amendments is 1 January 2017, under the tacit acceptance procedure. It will apply to new ships constructed after that date. Ships constructed before 1 January 2017 will be required to meet the relevant requirements of the Polar Code by the first intermediate or renewal survey, whichever occurs first, after 1 January 2018.

Because it contains both safety and environment related provisions, the Polar Code will be mandatory under both SOLAS and MARPOL. Following the approval of the necessary draft amendments to make the environmental provisions in the Polar Code mandatory under MARPOL, MEPC is expected to adopt the Code and associated MARPOL amendments at its next session in May 2015, with an entry-into-force date to be aligned with the SOLAS amendments.

SOLAS amendments to make IGF code mandatory approved

The MSC approved, in principle, the draft International Code of Safety for Ships using Gases or other Low-flashpoint Fuels (IGF Code), and also approved proposed amendments to make the Code mandatory under SOLAS, with a view to adopting both the IGF Code and SOLAS amendments at the next session, MSC 95, scheduled to meet in June 2015. Associated draft amendments to the 1978 and 1988 Protocols were also approved.

The IGF Code will provide mandatory provisions for the arrangement, installation, control and monitoring of machinery, equipment and systems using low-flashpoint fuels, to minimize the risk to the ship, its crew and the environment, having regard to the nature of the fuels involved.

Adoption of SOLAS amendments

The MSC adopted the following amendments, with an expected entry into force date of 1 July 2016:

- Amendments to SOLAS chapter VI to require mandatory verification of the gross mass of containers;
- Amendments to add a new SOLAS regulation XI-1/7 on Atmosphere testing instrument for enclosed spaces, to require ships to carry an appropriate portable atmosphere testing instrument or instruments. Consequential amendments to the Code for the Construction and Equipment of Mobile Offshore Drilling Units (1979, 1989 and 2009 MODU Codes) were also adopted and a related MSC Circular on Early implementation of SOLAS regulation XI-1/7 on Atmosphere testing instrument for enclosed spaces was approved; and
- Amendments to update the International Code on the Enhanced Programme of Inspections During Surveys of Bulk Carriers and Oil Tankers (2011 ESP Code), including revisions to the minimum requirements for cargo tank testing at renewal survey and addition of a new paragraph on rescue and emergency response equipment in relation to breathing apparatus.

E-navigation strategy approved

The MSC approved the e-navigation Strategy Implementation Plan (SIP), which provides a framework and a road map of tasks that would need to be implemented or conducted in the future to give effect to five prioritized e navigation solutions:

- improved, harmonized and user-friendly bridge design;
- means for standardized and automated reporting;
- improved reliability, resilience and integrity of bridge equipment and navigation information;
- integration and presentation of available information in graphical displays received via communication equipment; and
- improved communication of vessel traffic services (VTS) Service Portfolio (not limited to VTS stations).

Work on passenger ships safety continued

The MSC continued its ongoing work related to passenger ship safety and updated its long-term action plan on passenger ship safety, following consideration of the outcome of the Sub-Committee on Implementation of IMO Instruments (III) on the casualty report on the Costa Concordia and other proposals received. The updated long-term action plan includes, among others, a new item on the possible extension, to existing passenger ships, of the SOLAS requirement relating to computerized stability support for the master in case of flooding and a new item on watertight doors maintenance.

Other issues

In connection with other issues arising from the reports of IMO sub-committees and other bodies, the MSC, inter alia:

- Adopted amendments to the Code for the Construction and Equipment of Mobile Offshore Drilling Units, 2009 (2009 MODU Code), to allow an alternative procedure for lifeboat launching and manoeuvring drills;
- Adopted an amendment to the recommendation on conditions for the approval of servicing stations for inflatable liferafts (resolution A.761(18)), in relation to checking date-expired items in the contents of packed inflatable liferafts; and
- Approved Interim guidance for in-service testing of automatic sprinkler systems.

Amendments to IMO instruments that have entered into force on 1 January 2015

- 2013 amendments to SOLAS 1974, 1988 Load Lines Protocol and MARPOL to make the Code for Recognized Organizations (RO Code) (resolutions MSC.349(92) and (MEPC.237(65)) mandatory.
- 2013 amendments to SOLAS 1974 relating to the International Code of Safety for High-Speed Craft, 1994 (1994 HSC Code) (resolution MSC.351(92)); the International Code of Safety for High-Speed Craft, 2000 (2000 HSC Code) (resolution MSC.352(92)); International Safety Management (ISM) Code (resolution MSC.353(92)); and the International Maritime Solid Bulk Cargoes (IMSBC) Code (resolution MSC.354(92)).
- 2013 amendments to the Protocol of 1988 relating to the International Convention on Load Lines, 1966 (resolution MSC.356(92)).

Nairobi International Convention on the Removal of Wrecks, 2007, enters into force on 14 April 2015

- On 14 April 2014, the entry into force requirement of the Convention was met and, in accordance with article 18 thereof, the Convention will enter into force on 14 April 2015.

White Ships, Black Smoke

Marijan Žuvić

The regular steamship liner services on the eastern coast of the Adriatic endured for over 120 years, making the steamer era the most dynamic, interesting and eventful part of the shipping history. Unfortunately, these years are long forgotten. Except among the narrow circle of maritime historians and passionate shiplovers, the days of steam are rarely mentioned. So it's no wonder that the story of the three black years that wiped out the Adriatic white steamers, sailed into oblivion.

We know for a fact that in only three years of the last century, 1963-1965, the fleet of 26 coastal steamships was sent to ship graveyard, 'Brodospas' breaking yard at Sveti Kajo in the vicinity of Split. Nothing similar happened anywhere else in the world! Which is yet another reason to recollect those fine white ships and black smoke tailing behind.

The author's ambition is not to write even the shortest history of steam navigation on the eastern coast of the Adriatic. But the life stories of 26 steamers sentenced to death over such a short period are history in their own right. They were a motley group (or bunch if you like) of steamships ranging from 19th century veterans to modern liners built in 1931. And each of them had a place in the Adriatic shipping history.

All these steamers sailed in the fleet of Jadranska Linijska Plovidba, the Yugoslav state shipping enterprise generally known as Jadrolinija. It was established in January 1947 and assembled the nationalized ships of Yugoslav pre-war shipping companies Jadranska Plovidba d.d. from Sušak (today a part of Rijeka), Dubrovačka Plovidba a.d. from Dubrovnik and Zetska Plovidba d.d. from Kotor. Jadranska Plovidba was by far the largest among

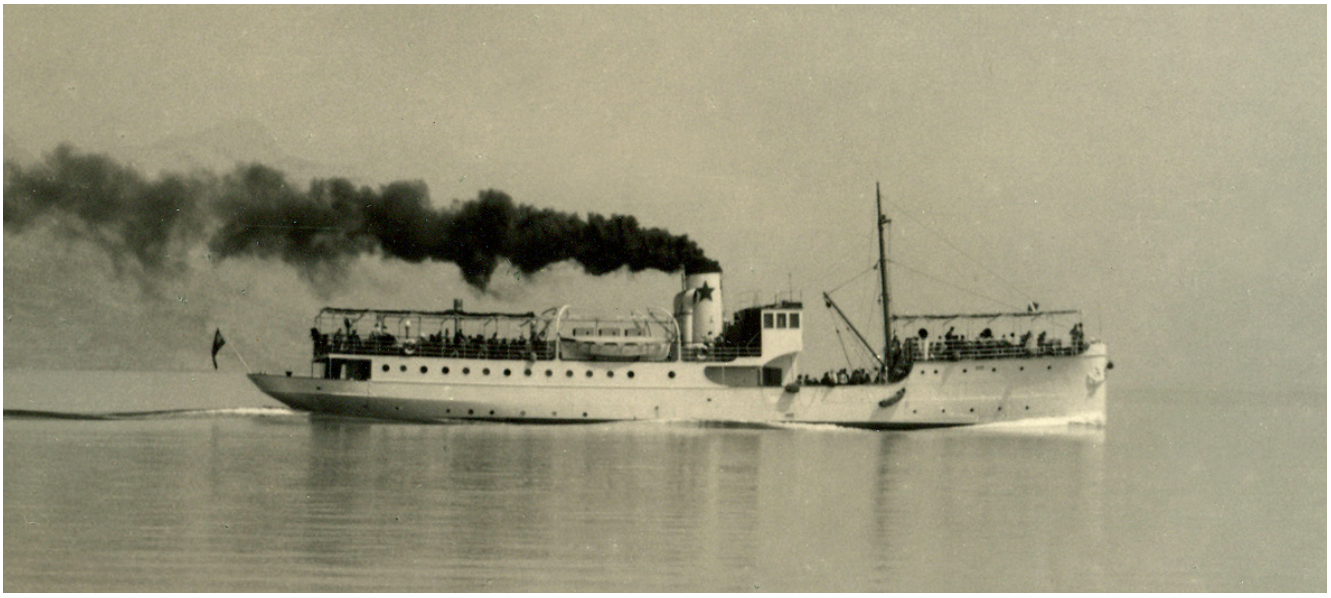

Figure 1.
White liner tailed by black smoke – the handsome 'Rab'.

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Figure 2.
Breaking yard at Sveti Kajo packed with coastal steamers.

them. Just like Jadrolinija in 1947, at the time of its foundation in 1923, Jadranska Plovidba consisted of ships of pre-war (World War I) companies. A great majority of ships had come from Ugarsko-Hrvatsko Dioničko Pomorsko Parobrodarsko Društvo, better known under the Italian abbreviation Ungaro-Croata, and 'Dalmatia' Austrijsko Parobrodarsko Društvo na Dionice.

There is clearly a pattern here: Ungaro-Croata was established by the merger of small steamship companies from the northern Adriatic in the late 19th century, while 'Dalmatia' emerged in 1908 as a result of the merger of four leading companies in Dalmatia. The mid 1960s Jadrolinija fleet included ancient steamship liners like Brač, which bore witness to all of these changes. Originally owned by a Makarska shipowner, captain Ante Rismondo, she became part of 'Dalmatia' in 1908, Jadranska Plovidba in 1923 and finally Jadrolinija in 1947!

Side by side with the old 'Brač', the fleet also had ships like 'Bakar', 'Rab' and 'Šipan', modern coastal liners built in 1931. These ships were extensively renovated after the war and in an excellent condition. Consequently, the most frequently asked question is why all of them had to die at the same time? The usual answer is that the completion of a modern freeway along the eastern Adriatic coast made all steamers redundant.

Commonly called Jadranska Magistrala, this road was completed between 1963 and 1965 and connected dozens of ports along the coast. Suddenly there was no need for many regular shipping lines established a century ago. Cars were now pouring down the coast and ferryboats became the ships of utmost importance. Furthermore, in 1963 Jadrolinija's fleet was strengthened with four state of the art inter-island motorships of the 4P class ('Porozina', 'Perast', 'Punat' and 'Postira'). Maritime experts generally consider these ships to be the best ever built for local service. Back in 1955 three small, but high quality coastal motorships of the 'Town' class ('Ohrid','Valjevo','Karlovac') were built. In 1957 the next trio of much bigger coastal liners of the 'City' class was delivered to Jadrolinija: 'Trogir', 'Tuzla' and 'Takovo'.

But, there was still room for newer steamships, built in the thirties and known for their good performances. Only rare shipping experts know what happened! To encourage Jadrolinija to replace all steamships with motorships built in the national shipyards, the Yugoslavian Government allocated lavish subsidies for breaking up steamers. Almost the entire fleet of coastal steamships ceased to exist in only three years.

'Kormat' was by far the oldest of the 26 white steamships sent to Sveti Kajo. Scrapyard records show that she arrived there in July 1964 after 73 years of navigation. And she was still in good shape! She was built as 'Croatia' by a renowned German shipyard Howaldtswerke from Kiel and delivered in November 1891 to Ugarsko-Hrvatsko Dioničko Pomorsko Parobrodarsko Društvo. (For practical reasons abbreviation Ungaro-Croata will be used hereinafter). At the time, she was the most modern coastal liner of Ungaro-Croata.

It has to be noted that after World War I all ships owned by Austro-Hungarian companies were seized by the Paris-based Inter-Allied Reparations Commission. In September 1920, Italy and the recently formed Kingdom of Serbs, Croats and Slovenes (later renamed Yugoslavia) concluded the Trumbić-Bertolini Agreement and divided the fleets of coastal shipping companies amongst themselves. As a final document, this Agreement was

Figure 3.
'Kormat' – the veteran from Kiel sailed for 73 years.

Figure 4.
Awkward looking 'Beli' was built in 1898.

confirmed by the Inter-Allied Reparations Commission in August 1921. 48 out of 54 steamships owned by Ungaro-Croata were allocated to Yugoslavia.

In 1923, 'Croatia' became a part of the Jadranska Plovidba fleet, under a new name 'Hrvatska'. She sailed peacefully until 1941 when she got caught up in the winds of war. After the defeat of Yugoslavia in the short April War the entire fleet of Jadranska Plovidba was seized by Italians. All ships were renamed and 'Hrvatska' became 'Sansego'. In May 1944, she was sunk by Allied aircrafts at Mali Lošinj. Two years later, she was raised and towed to Kraljevica where she was rebuilt. That was one of the reasons why she lasted for 73 years.

Seventeen years after 'Croatia', the Kiel shipbuilders delivered 'Brasso', another ship for Ungaro-Croata. Following the Trumbić-Bertolini Agreement she became 'Cetinje' sailing under Jadranska Plovidba, but flied the company's flag for only two

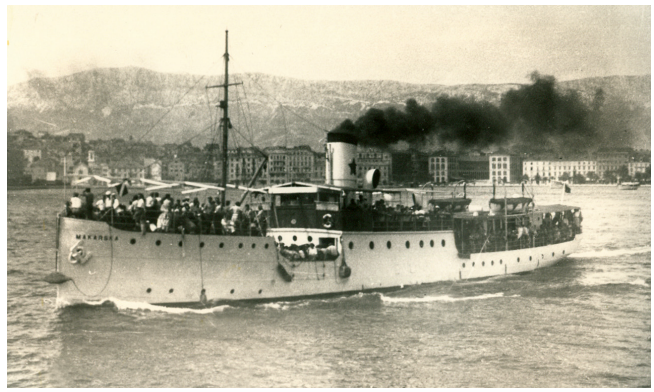

Figure 5.
'Makarska' sailing full steam ahead.

Figure 6.
'Makarska' loading coal from the barge.

years. After being sold to Italian owners she sailed as 'Cherso', 'Calitea' and 'Scarpanto'. In September 1943, 'Scarpanto' was seized by the German Navy and actively served in the northern Adriatic. In March 1945, she was attacked and sunk by three British gunboats, off the Istrian coast. The steamer spent seven years at sea bottom before being raised in March 1952. She was towed to Split and completely renovated under a new name - 'Pag'. Delivered to Jadrolinija in July 1953, she was sold for scrap in June 1963.

The Howaldstwerke yard also built the steamer 'Brač', another oldie from the Jadrolinija's white fleet. She was a rather small ship, being only 36.1 meters long. She was delivered to German owners as 'Brunsbüttel II' in 1896 and seven years later sold to captain Ante Rismondo from Makarska. In 1908, Rismondo's ships became part of new company 'Dalmatia' Austrijsko Parobrodarsko Društvo na Dionice registered at Zadar. Except for the WWII years, when Italians renamed her 'Malinsca', this steamer sailed as 'Brač' for 60 years, and was finally delivered to the breakers in the autumn of 1963.

In the three black years for white ships, another two 19th century veterans met their end at the Sveti Kajo breaking yard: 'Beli' and 'Hercegnovi'. 'Beli' was built in Trieste in 1898, by the Arsenale di Lloyd Austriaco shipyard. She was one of the numerous coastal liners built in Trieste for Ungaro-Croata and was named 'Sava'. After WWI she was purchased by Brodarsko Akcijsko Društvo 'Boka' from Kotor and sailed on local lines at Boka Kotorska as 'Morava'. She was lucky enough to avoid the perils of WWII and become 'Bar' in Jadrolinija's fleet in 1947. In 1962 she was renamed 'Beli' and scrapped the next year.

'Hercegnovi' was also built in Trieste and sailed for the same owner, the 'Boka' shipping company. She was constructed by the Stabilimento Tecnico Triestino shipyard in 1897 for Trieste-based Societa di Navigazione a Vapore Istria-Trieste, as 'Arsa'. Upon her arrival to Boka Kotorska in 1931, she was renamed 'Hercegnovi',

Figure 7.
'Pašman' was one of many Trieste built ships.

but was not as lucky as 'Morava' sailing for the same company. Being seized by Germans in September 1943, she served as a military transport ship in the Zadar area. In October 1944, during the Allied heavy bombardment, she was sent to the bottom of the Zadar harbour. After the war, 'Hercegnovi' was raised and finally rebuilt at Kraljevica in 1948. Sixteen years later she ended up at Sveti Kajo.

Five more steamers built by the Stabilimento Tecnico Triestino (STT) were wiped out in the mid-sixties. The most prominent were the sister ships 'Gradac' and 'Makarska', ordered by 'Dalmatia' and delivered in 1908, the first in September, the second in October. The 'Gradac', originally built under the name 'Cetina', was renamed in 1947 upon joining Jadrolinija's fleet, while 'Makarska' sailed under the same name her entire life. They were born together and died together: both arrived at the Sveti Kajo ship graveyard in early 1965.

In 1908, Stabilimento Tecnico Triestino built a third ship for 'Dalmatia' and delivered her only a month after 'Makarska'. She was smaller than the first two ships but undoubtedly better looking. She was originally named 'Adria' and was renamed 'Pašman' in 1921. She arrived at Sveti Kajo in January 1963. It is interesting that all three vessels built in 1908 for 'Dalmatia' survived the four years of WWII unscathed.

In the early 1900s, the Ungaro-Croata shipping company also had two coastal steamers built at Trieste's STT shipyard. 'Tatra' was delivered in 1905 and 'Senj' two years later. While 'Senj' spent her entire life under her original name, 'Tatra' changed names frequently. Both were victims of WWII. 'Tatra' joined the fleet of Jadranska Plovidba as 'Triglav', the Italians renamed her 'Medea' in 1941, the German Navy christened her G.310 in 1943, Jadrolinija named her 'Opatija' in 1948, then she became 'Vida', then 'Opatija' once again, only to finally go back to 'Vida'!

Both ships were amongst the first victims of the April War of 1941. They were scuttled together with other steamers of Jadranska Plovidba at Soline Anchorage on the island of Krk on April 11th to avoid capture by Italians, but were raised and repaired in a matter of weeks. The 'Senj' became a victim for the second time in October 1943 when Allied aircrafts sunk her at Starigrad. Four years later she was raised and repaired at Kraljevica in 1949. The 'Triglav' became a wreck in 1944 near Trieste, but was raised and repaired, also at Kraljevica.

By far the biggest builder of Adriatic coastal liners was the Marco U. Martinolich shipyard on Mali Lošinj. Many survived both world wars and nine were broken up at Sveti Kajo in the dark sixties. The tenth, steamship 'Knin', also ended up there but not until 1991, only to become the very last among 630 ships scrapped there!

Indeed, 'Knin' had a very colourful life! She was delivered to Ungaro-Croata in October 1913, as the very last newbuild in company's history. As a brand new ship she was suitable for various duties in the Austro-Hungarian Navy in World War I,

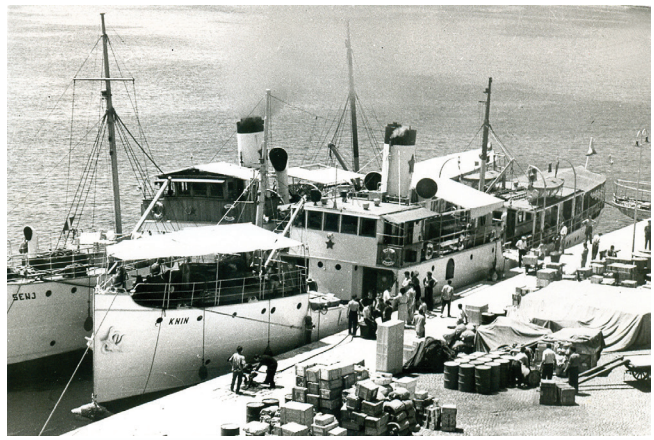

Figure 8.
'Knin' – a colourful history.

finally being armed as a submarine chaser! In April 1941, she once again found herself in the naval service, this time as Italian 'Ugo Botti'. The capitulation of Italy in September 1943 found her in the Split shipyard where Partisans scuttled her to avoid capture by Germans. She was raised only a month after the liberation of Split, in November 1944 and returned to service in 1945.

In 1963, Jadrolinija decided to sell 'Knin' for scrap, but she was saved by the entertainers! The 'Pozornica' enterprise from Opatija purchased the steamer to have her converted into a luxury floating restaurant, striptease bar & dancing room at the 'Viktor Lenac' shipyard. Named 'Barba Rude', she was the very first ship of that kind in socialist Yugoslavia. After 1978, she served the same function at various tourist locations: Biograd, Pakoštane, Vodice, Betina...Finally, the former 'Knin' arrived at Sveti Kajo in the summer of 1988, but was held there for four years before being scrapped.

The first of the Martinolich built steamers to be broken up in the dark sixties was the 'Lovran'. She arrived at Sveti Kajo in January 1963, being followed, in that same year, by 'Cres' and 'Ugljan'. In 1964 'Poreč', 'Ulcinj', 'Rovinj' and 'Pelješac' ended up there. The list was closed in 1965 when steamers 'Ston' and 'Kupari' were broken up. The majority of these ships were built for Ungaro-Croata, but not the 'Ston', which also had an eventful life.

In 1908, a group of investors from Dubrovnik founded a coastal shipping company called Obalna Paroplovitba Društvo and ordered a new liner from the Martinolich shipyard. Everything went smoothly until delivery in 1909. The owners had a fierce discussion about the name of the new ship. The flared passions were subdued by an unusual proposal: let's name the ship simply 'Naš' (meaning 'Ours' in Croatian). 'Naš' sailed for full 19 years. Upon being purchased by Dubrovačka Parobrodarska Plovidba, she was renamed 'Ston', under which name she arrived at Sveti Kajo.

Of all the steamships wiped out in the mid-sixties only two were built in Italy: 'Podhum' and 'Starigrad'. These handsome sister ships were ordered at Chioggia by Hrvatsko Parobrodarsko Društvo from Senj and delivered in 1904 by Ditta Giovanni Poli. Their original names were 'Ante Starčević' and 'Hrvatska'. They sailed together for six decades, proved to be lucky in the two great wars together and finally died together at Sveti Kajo.

As previously mentioned, the great controversy of the dark sixties is that Jadrolinija didn't only scrap the 19th century veterans, but also sent her most modern steamships to scrapyard. These were 'Bakar','Rab' and 'Šipan', built in 1931. Sister ships 'Bakar' and 'Rab' were especially handsome steamers, ordered from the British shipbuilder J. Samuel White & Co. Ltd. of East Cowes on the Isle of Wight. Upon their delivery to Jadranska Plovidba in March 1931, they immediately became the most modern inter-island steamships on the Adriatic. 'Bakar' and 'Rab' soon came to be praised by passengers for their comfort and seaworthiness.

And then war came to Adriatic shores. Seized by Italians in April 1941, they were renamed 'Buccari' and 'Arbe' respectively. At the time of Italian capitulation, 'Bakar' was moored at Split. Taken by Yugoslavian Partisans, she sailed to a small port of Bobovišće on the island of Brač to avoid German air raids on the Split harbour. On September 14, 1943 her crew hoisted the Yugoslav flag with the red star. Being the very first steamship under the new ensign, the 'Bakar' was held in high regard in communist

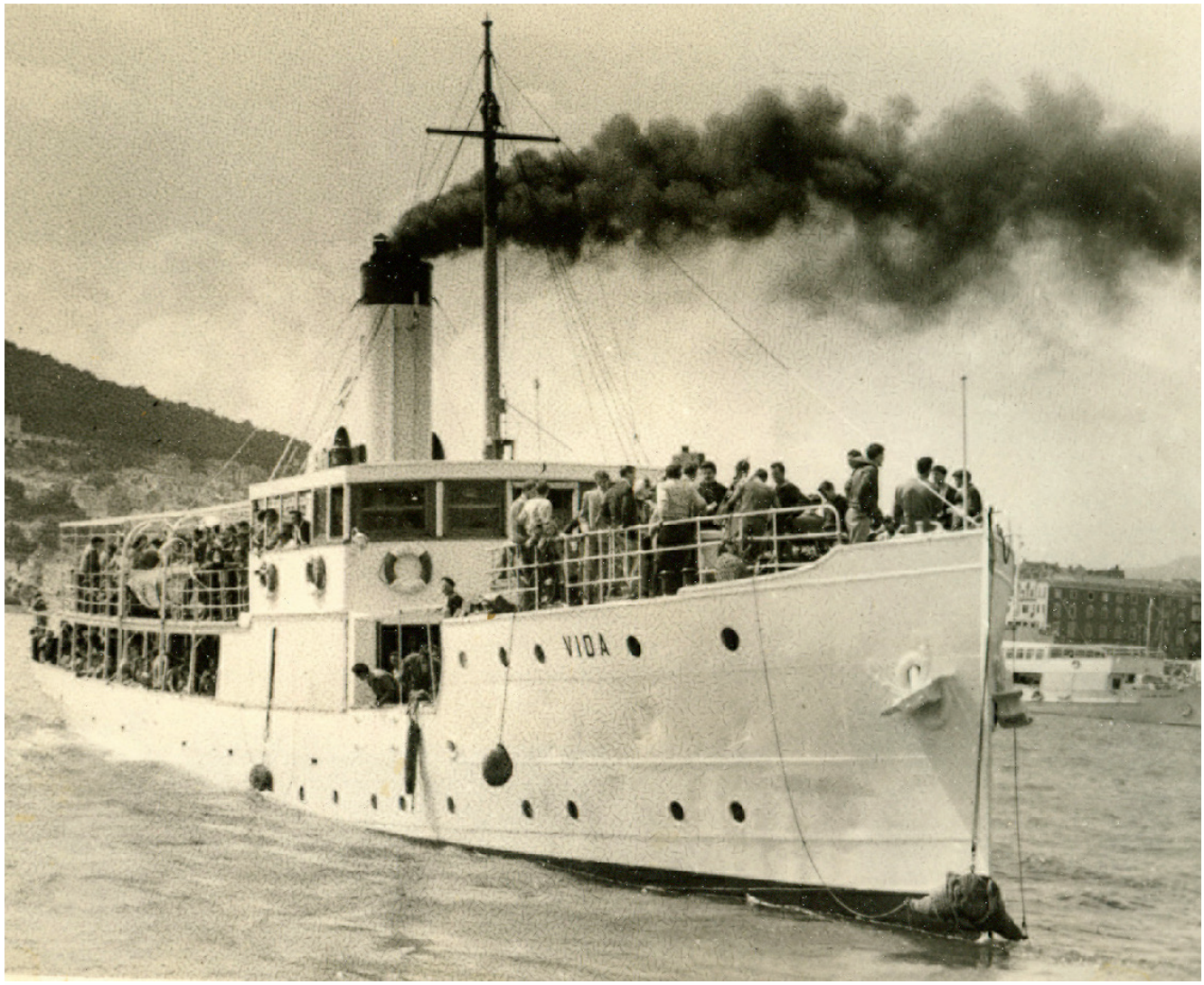

Figure 9.
'Vida' – so many names for one ship.

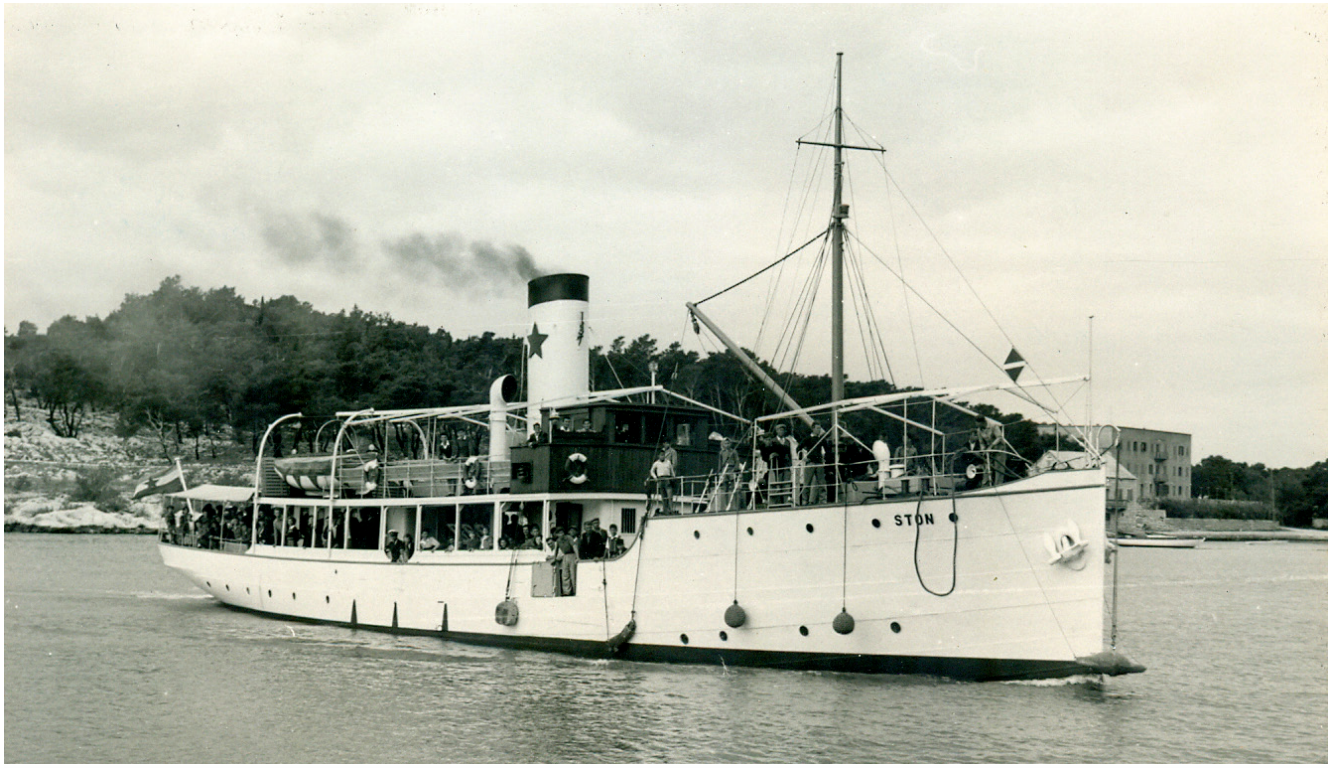

Figure 10.
'Ston' – remembered for the battle of 'Naš'.

Yugoslavia. Moreover, in May 1964, she became the first and the only ship awarded the Order of National Liberation.

But the days of pride and glory abruptly ended in December 1965 when 'Bakar' arrived to the ship graveyard at Sveti Kajo. The country was shocked with the news: The hero ship was going to be scrapped! She was immediately declared a protected heritage monument and scrapping was banned. But her bad luck persisted! Between 1968 and 1973, the unprotected and practically abandoned 'Bakar' sunk three times at three different anchorages and each time she was raised and repaired. Her sad story finally ended in 1982: the steamer was broken up at Korčula. Her bow section was shipped to Split and remains preserved at the courtyard of the Croatian Maritime Museum to this day.

Her sister ship 'Rab' was seized by Germans in September 1943 and next month she was engaged to carry troops during the fierce battle for the Pelješac peninsula. On the morning of October 24, 1943 she was sunk by British aircrafts near the village of Crkvice. But she wasn't seriously damaged. Raised while the war was still raging, in March 1945, she was towed to Split and repaired. Her sailing days ended at Sveti Kajo in 1965.

A year earlier another modern steamer of the 1931 vintage arrived to Sveti Kajo. It was 'Šipan', a sturdy coastal liner built for Dubrovačka Parobrodarska Plovidba by renowned shipbuilders

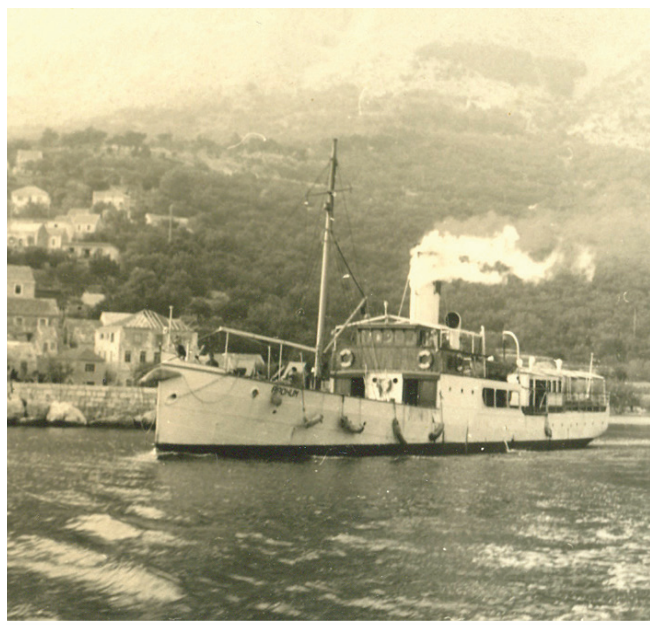

Figure 11.
'Podhum' was built at Chioggia.

Figure 12.
Perils of the sea - sturdy 'Šipan' in the storm.

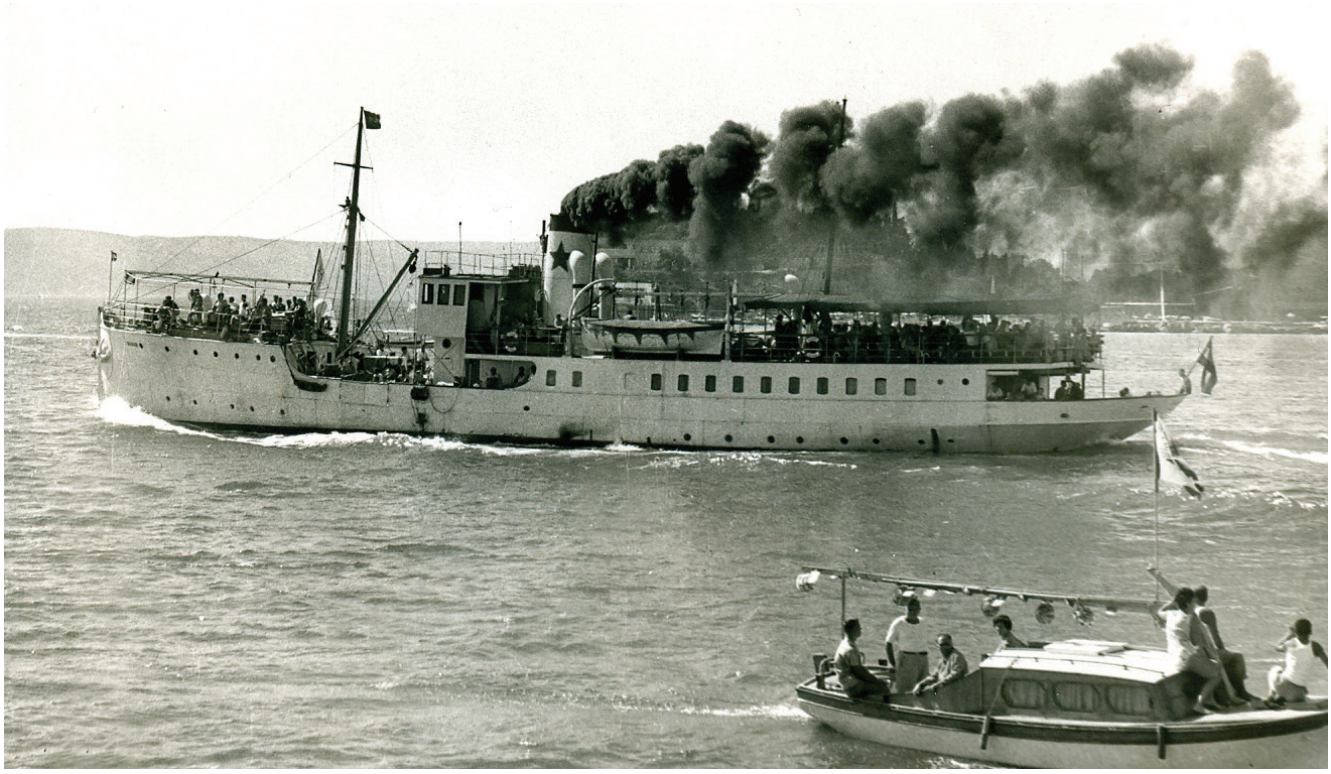

Figure 13.
'Bakar' - a ship of glory and sadness.

F. Schichau G.m.b.H. from the German city of Elbing, today Polish Elblag. She sailed on routes in the Dubrovnik area all her life. During the Allied air bombardments in the spring of 1944 she sought shelter in Jansko, a small cove in the vicinity of Slano, but was discovered and sunk in an air raid on May 15th. Quickly raised after the war, she was fully renovated at the Tivat Naval Yard. The fact that she was like new didn't save her from the breaker's torches...

News

ILO MOVES ON SHORE LEAVE FOR SEAFARERS

The International Labour Organization (ILO) has made progress in improving arrangements for shore leave for seafarers. At a meeting in Geneva, Switzerland, employers, trade unions and governments agreed a common approach to improving ILO Convention 185, which covers identity documents for seafarers, enabling access to shore leave.

The recommendations, which now go through the ILO for discussion before implementation, would bring seafarers' identity documents in line with e-passports. This acknowledgment of the current electronic technology should help encourage member states to ratify Convention 185, which has received little take up since it was adopted in 2003. The recommendations should improve the welfare of seafarers taking shore leave and in transit, as well as addressing the security concerns of member states.

Welcoming the moves, ITF seafarers' section chair David Heindel said they "should help persuade states that ratification is sensible and in everyone's best interests".

Figure 1.
Seamen's job.
Source: ToMS archive.

The outcome of the meeting was also welcomed by the International Chamber of Shipping (ICS).

MARITIME TRAINING & EDUCATION IS LIFELONG LEARNING

Learning about job on board ships, new technology and regulation does not end when you graduate from a maritime academy or school. Modern ships require more knowledge and skill to get a promotion, and to keep level of safety aboard. Equipment on ships is regularly upgraded. Most mariners change ships after contract and each ship is specific. IMO assembly adopted Resolution A.680 (17) entitled "IMO Guidelines on Management for the Safe Operation of Ships and for Pollution Prevention". While not mandatory, the Resolution established standards for measures that owners and operators should implement to reduce the risk of marine casualties. The Company was identified as responsible not only for ensuring that its ships were adequately manned for the trade in which they were engaged, but also for ensuring that ship's personnel have the proper knowledge of the technical aspects of the ship and its operation as necessary for performance of their duties, and receive the necessary training for familiarization with the particular ship or equipment. Statistics show that most casualties happen during familiarization with ships. Usual familiarization is 1-2 months on board ship with an average level of technology. Seafarers' contracts are somewhat shorter, but in most cases of the same duration. It is easy to conclude that familiarization and contract usually end at the same time.

This concept that 'familiarization with the particular ship in which the seafarer was engaged' was a Company responsibility had not previously been articulated.

The IMO recognized that, as ships became increasingly differentiated, it was important that seafarers be made aware of the particular characteristics of the vessel to which they had been assigned, even if that concept was not mandatory. In 1993, when the ISM Guidelines became the ISM Code, the 'familiarization' provision was reworded to: *The Company should establish procedures to ensure that new personnel and personnel transferred to new assignments related to safety and protection of*

the environment are given proper familiarization with their duties. Instructions which are essential to be provided prior to sailing should be identified, documented and given.

The 1994 Conference of Contracting Governments to the International Convention for the Safety of Life at Sea (SOLAS) 1974 adopted a new chapter IX on Management for the Safe Operation of Ships, with the effect that the ISM Code, including the ship familiarization provision, became mandatory on 1 July 1998 for passenger ships, including passenger high-speed craft, oil tankers, chemical tankers, gas carriers, bulk carriers, and cargo high-speed craft of 500 gross tonnage and upwards, regardless of their date of construction. The ISM Code was adopted for the United States by means of section 602 of the Coast Guard Authorization Act of 1996 (codified at 46 U.S. Code, Chapter 32 – Management of Vessels) and became mandatory for covered US-flag vessels on 1 July 1998. The ISM Code was implemented for the United States by means of a new Part 96 to title 33 of the Code of Federal Regulations – Rules for the Safe Operation of Vessels and Safety Management Systems, promulgated as a final rule on 24 December 1997.

The STCW Convention and Code were changed again in 2010 by means of the Manila Amendments. In addition to recognizing various increased complexities, a number of wholly new provisions were added. Measures were added to address the risk of fraudulent certificates of competency and to closely monitor flag administrations' compliance with the Convention. Requirements relating to hours of work and rest and for prevention of drug and alcohol abuse were strengthened. Specific requirements regarding training in and use of such technology as electronic chart displays and information systems (ECDIS) were added.

Use of electro-technical equipment and dynamic positioning systems were recognized, with training and certification standards defined for the first time. Distance learning and web-based learning were recognized as alternative or supplementary approaches.

The STCW Code, in the mandatory Section A-I/14, contains detailed provisions for implementation of this responsibility for familiarization, including the requirement for written instructions to the master, allocation of a reasonable period of time for newly employed seafarers to gain the necessary familiarity, and designation of a knowledgeable crew member who will be responsible for ensuring that an opportunity is provided to each newly employed seafarer to receive the essential information.

In the non-mandatory Section B-I-14, the STCW Code recommends that companies should provide ship-specific introductory programs aimed at assisting newly employed seafarers to familiarize themselves with all procedures and equipment relating to their areas of responsibility.

The ISM Code and STCW Convention and Code provisions regarding the vessel familiarization requirement are basically the same, although the STCW Convention and Code includes greater detail. Both have been adopted by the United States and have been implemented and are enforced by the U.S. Coast Guard. Both have been adopted by the vast majority of national governments. Thus, it can fairly be said that the vessel familiarization requirement is universal.

Experience has taught us, though, that the practice of vessel familiarization has not been universally applied. Investigations following marine casualties commonly include findings indicating that one or more seafarers on the unfortunate ship were unfamiliar with an important piece of equipment or an important procedure. Matters rarely go any further.

An exception was the 7 November 2007 allision of the COSCO BUSAN with the Delta Tower of the San Francisco-Oakland Bay Bridge and subsequent oil spill. Investigations by both the U.S. Coast Guard and the National Transportation Safety Board (NTSB) noted that the master and deck officers (all of whom were newly assigned to the ship only 24 hours prior to departure on this voyage) were unfamiliar with pertinent provisions of the ship's Safety Management System (SMS).

It is to conclude that each newly-assigned mariner is fully familiar with the ship or with the equipment that he or she will have to use to perform required tasks. The day of the departing mariner passing his or her replacement on the gangway is past. New technologies require time for training.

NEW STUDY ABOUT PASSENGER SHIP COMFORT

Comfort determines passenger satisfaction, onboard expenditure and passenger return levels. However, comfort is subjective as people are very different. Luxurious ships typically have a gross tonnage (GT) of less than 50,000 and the number of passengers is often fewer than 500. These cruises are often to exclusive destinations worldwide, and they call at smaller ports. Due to the relatively limited size of these vessels, the ship motions play an important role in the comfort levels. This is in sharp contrast with the ultra large cruise ships, which have a gross tonnage of more than 100,000 and a passenger capacity of over 4,000 passengers. These cruise ships typically offer one to two-week cruises to popular destinations in the Caribbean and the Mediterranean. Due to the size of these ships, the ship motions are negligible in most weather conditions. Accelerations are caused by the combined ship motions (surge, sway, heave, roll, pitch and yaw). The discomfort experienced, as a result of these accelerations, relates to seasickness and disruptions during all kinds of onboard activities. Seasickness is mainly caused by vertical accelerations but the horizontal accelerations and the combination of both are also important. As criterion the Illness Rating (IR) is applied. Typical phenomena that might induce vibrations and noise are bow flare and stern slamming. Bow flare slamming occurs mainly when sailing in steep seas from the bow

quarter, while stern slamming typically takes place at low or zero speed in relatively low seas (or in high head seas conditions). it is important to further increase the industry's knowledge about actual passenger ship operations and how they are influenced by ship hydrodynamics.

Figure 2.
MSC Musica in port.
Source: Flickr.com.

DENMARK MARITIME SECTOR WITH GOOD WIND

Shipping is the leader of all Danish industries. By value, Denmark transports roughly 10% of the world's trade and is among the largest operators in terms of total tonnage, earning Danish shipping companies approximately $21.6 billion per year. According to figures from the Danish Shipowners' Association, the size of the Danish flagged merchant fleet in May 2014 was 629 vessels, a cumulative 14.7 million DWT. At the same point in time, the Danish newbuilding program counted 105 vessels on order, 4.7 million DWT.

A.P. Moller–Maersk Group - The A.P. Moller –Maersk Group performs in a wide range of business sectors, primarily relating to transportation and energy.

NORDEN has a newbuilding program with 30 vessels on order (26 dry cargo ships and four tankers). TORM, presently in its 126th year, operates a fleet of tankers which carry refined oil products such as gasoline, jet fuel, naphtha and diesel oil, additionally operating dry bulk vessels mainly focused in the Panamax segment, primarily transporting grain, coal and iron ore.

J. Lauritzen A/S transports dry cargo and gas products around the world through a fleet of more than 150 vessels including short-term charters. The company's business portfolio includes Lauritzen Bulkers (dry bulk cargoes) and Lauritzen Kosan (petrochemical and liquefied petroleum gases), as well as part-ownership of flotel service provider Axis Offshore Ltd. through a joint venture with HitecVision.

Nordic Tankers is a ship owning company operating one of the largest global specialized chemical tanker fleets in the segment below 25,000 dwt. The company operates by owning, chartering in, pooling and having chemical tankers on commercial management.

Denmark is a trailblazer for energy-efficient shipbuilding, design, repair and retrofitting, and produces a variety of high-quality, innovative products, from engines, scrubbers and ballast

water treatment systems to ship paint and coatings, navigation systems and safety equipment. Denmark is a hub for green shipping technology. Many leading companies devoted to ballast water treatment technology are located in Denmark. As a global leader in environmental innovation, Denmark recently launched a research project called Blue NNOship, which aims to develop or enhance technologies which reduce emissions and particles from sulphur (Sox) nitrogen (NOx) and carbon dioxide (CO2)through a focus on ship design and propeller solutions, performance and monitoring, alternative fuel solutions, emission reducing technologies and service/retrofitting.

Denmark relies on offshore wind for roughly 10 per cent of its electricity production. At more than 130 vessels servicing offshore wind activities, the Danish-operated fleet is one of the world largest.

36M-CREWBOAT FOR BRAZIL

Fast, capable crewboat design and construction continues to be a leading edge niche in the global marine market, with the latest manifestation being the BS Camburi, a 36m-monohull crewboat built in Brazil by Arpoadorngenharia to the Petrobras type P2 specification, for Brazil Supply. Incat Crowther designed the boat.

The vessel's aft main deck features a large open deck, separated for two main purposes. The aft portion, measuring 60.5 sq. m., is dedicated to a man-riding basket. The forward portion, measuring 28 sq. m., is dedicated to cargo, with large cargo rails offering heavy duty protection. The main deck passenger cabin houses 60 seats in a mixture of forward-facing and booth styles. A bow loading platform is integrated into the design to facilitate passenger embarking and disembarking from offshore facilities. Served by a stair-tower aft with direct access to all decks, BS Camburi's wheelhouse features forward and aft control stations. The vessel accommodates 10 crew in five cabins, alongside a galley, crew mess and bathrooms. BS Camburi is powered via a trio of Caterpillar C32 main engines coupled to Doen DJ290 waterjets. The center engine drives a 600 cu. m./hour fi re pump. On sea trials, BS Camburi achieved a top speed of 25 knots, and it has a fully loaded service speed of 17 knots.

BS Camburi Main Particulars

Length, o.a.	118.2 ft. (36 m)
Length Waterline	108.4 ft. (33 m)
Beam, o.a.	24.6 ft. (7.5 m)
Draft (hull)	4 ft. / 1.2 m
Depth	11/5 ft. (3.5 m)
Construction	Marine Grade Aluminium
Ship's Fuel Oil	3,963 gal.
Cargo Fuel Oil	7,925 gal.
Ship's Fresh Water	1,532 gal.
Cargo Fresh Water	7,925 gal.
Black Water	330 gal.
Grey Water	660 gal.
Passengers	60
Crew	10
Deck Area	28 sq. m.
Deck Load	50 t
Deck Strength	2.5 t/sq. m.
Speed (Service)	17 knots
Speed (Max)	25 knots
Main Engines	3 x Caterpillar C32 Diesels
Propulsion	3 x Doen DJ290 Waterjets
Flag	Brazil
Class / Survey	RINA

VIRTUAL AIDS TO NAVIGATION MARK RESEARCH EQUIPMENT

Vesper Marine will provide its Virtual Aid to Navigation technology to the French company CGG, a geoscience company that provides geological and geophysical survey and analysis primarily to the oil and gas industry. In its on-going quest to map the ocean's floors, CGG survey vessels tow an array of cables in the water at a up to a 50 ft. depth, an array of cables that contain seismic energy sources, usually a series of airguns that are fired at regular intervals as the vessel moves along predetermined survey lines. Energy reflected from beneath the seafloor is detected by numerous 'hydrophones' contained inside long, neutrally buoyant 'streamers' also towed behind the vessel. A typical towed configuration is between 12 and 20 cables and streamers, measuring up to 5mi long with a separation of 328 ft., a massive spread which equates to 3 square miles of equipment had no way of knowing that this equipment was in the water, and there historically have been numerous collisions with the streamers resulted in a high loss of both equipment and productivity. It is hoped that by using Vesper Marine's Virtual AIS Beacons to broadcast positioning data to other ships in the area, CGG will eliminate this loss.

The VAB1250 Virtual AIS Beacon is designed to continually broadcast the positions of the towed equipment via an interface to CGG's proprietary navigation software. The software provides the updated position of the equipment regularly to the VAB1250 identifying points at the front, middle and tail of the spread of streamers and on the outer cables. These points are then displayed on any AIS-equipped ECDIS, chart plotter and radar within a range of approximately 20nm. "We began discussing this project with Vesper Marine in July 2013," said Matthieu Champenois, Field Support Engineer – Navigation & Positioning Department, CGG. "Jeff Robbins and his teams quickly grasped our needs and developed a solution that was suited for this project."

CGG currently has two ships outfitted with Virtual AIS Beacons and has made the decision to outfit all 13 vessels in their fleet. The first installation was completed in December, 2013 on the CGG Symphony. In step with Vesper, CGG developed its own software interfaces between the existing navigation and positioning systems and the beacon. The fully automated system shares an existing VHF antenna on the ship with the radio via a Vesper Marine AIS/VHF splitter. "The second system was installed on the CGG Oceanic Challenger in May 2014 before a job in a location where the vessel traffic reached 120 vessel crossings per day," said Champenois. "As the broadcasted marks appearing on the displays presented an unusual situation for vessels in the area, their bridge officers contacted the Challenger's master in order have a clearer view of the situation and to avoid any collision. This was exactly the intended result."

A Virtual Aid to Navigation is created when a signal sent from a transmitter in an accessible location is used to mark a remote point. This mark is displayed as a special feature or hazard on a vessel's when within range. The ship's onboard equipment is then able to alert crews to the presence of and if they are on a collision course with the marked navigational hazard.

FIRST SHIPARRESTOR DELIVERED

Following a full product trial in New Zealand, the Norwegian Coastal Administration (NCA) signed its acceptance of the first of two ShipArrestor systems from Miko Marine, making Norway the first country with a system that gives it the ability to protect its shores from the danger of drifting oil tankers and from the disastrous pollution that can result when they run aground. ShipArrestor was put through a complete customer acceptance trial in Tasman Bay, New Zealand using chartered helicopters and vessels. The system consists of a large fabric parachute-style sea anchor that is looped by a helicopter onto a ship drifting without engine power. This is achieved without any involvement of the ship's crew after which a line terminating with the sea anchor in a container is paid-out upwind by the helicopter. When the container is dropped into the sea it releases the fabric anchor, a recovery line and a buoy that shows its location. The sea anchor cuts the speed of the ship's drift and consequently increases the time available for a rescue tug to reach the ship and take it in tow before it runs aground and ruptures its tanks. As designed, when the rescue tug arrives it can lift the buoy on board and

use its line to tow the ship to safety. The advanced materials used by the ShipArrestor give it the strength and ability to quickly turn any size of ship, from a trawler to a supertanker, into the wind and halve the speed at which it is drifting. The ShipArrestor was developed by salvage technology specialists Miko Marine, which led a consortium of eight European organizations partly funded by the European Union. Coppins Sea Anchors Ltd of Motueka, New Zealand joined the team as co-developers of the ShipArrestor in early 2014.

Figure 3.
ShipArrestor.
Source: miko.no & kystverket.no.

TRAWLERS SPECIFIED WITH MAN'S SCR SYSTEM

In connection with the recent announcement of the construction of three wetfish trawlers for HB Grandi, the Icelandic fishing concern, MAN Diesel & Turbo has announced that the newbuildings' MAN main engines will also feature its SCR (Selective Catalytic Reduction) system. The company states that the system will enable the trawlers' IMO Tier II-compliant engines to fulfil the strict IMO Tier III NOx emission requirements.

Vilhjalmur Vilhjalmsson, CEO of HB Grandi said: "When we decided to renew our fresh-fish fleet, we immediately focused on the task of curtailing the ships' power requirements, both in terms of the propulsion plant as well as electricity production, so as to make the exhaust gas as clean as possible."

Vilhjalmsson added that HB Grandi deliberately pursues a green company profile and that its focus on clean and responsible fishing ultimately led to MAN technology being chosen for the trawlers. As such, HB Grandi's profile suited the minimal environmental footprint from operations, including the cleaner exhaust gasses and NOx reduction that the MAN package offers. A further advantage of choosing MAN was the relatively straightforward integration of engine, propeller, propulsion controls and SCR system that equipment from the same manufacturer entails.

MAN Diesel & Turbo reports that special attention was given to selecting the optimal position for the SCR system aboard the trawler. This challenge was met and solved in great part through good cooperation with Nautic, the Icelandic specialist designer and ship consultant, at an early stage of the project.

Nautic – based in Reykjavík – is designing the new vessels, which will replace three wetfish trawlers currently in service. The vessels, with their distinctive bows, will be built in Turkey by Celiktrans Deniz Ltd. Sti. with delivery scheduled for May 2016, late-2016 and spring 2017, respectively.

The new HB Grandi wetfish trawlers will enjoy the benefit of several features to optimise operation. These include employing a floating-frequency concept that increases their flexibility and economical part-load pattern with an up to 17% lower engine/propeller speed and a commensurately lower fuel consumption.

MAN Diesel & Turbo's new, advanced Alphatronic 3000 generation propulsion-control system will also be installed aboard the trawlers and, among other characteristics, features tailored 'dual-propeller load curves' for optimising towing/trawling and free-sailing conditions.

SCR is the most tested and approved system for achieving NOx reduction rates up of to 90%. SCR involves the injection of ammonia or urea, into the diesel engine's exhaust stream. The urea decomposes into ammonia and carbon dioxide, with the ammonia subsequently reacting with NOx and oxygen in the presence of a catalyst, transforming into the ecologically-benign constituents of water and nitrogen.

In order to optimise the SCR process at part load, the engine is specified with a turbocharger bypass as part of the exhaust gas temperature system that ensures sufficiently high temperatures.

MAN Diesel & Turbo's SCR system is available in fourteen different sizes, in this way fully covering its entire portfolio of medium-speed engines. The system has been devised as a modular kit of components for reasons of simplicity and to minimise costs.

A special feature of the system is its communication with the engine control system that optimises the temperature for the SCR system at individual load-points.

A further special feature of the system is its continuous NOx-emission control that saves urea and avoids ammonia slip.

MAN Diesel & Turbo also offers customised SCR systems on demand.

The main components of the MAN Diesel & Turbo SCR system are:

- an SCR reactor
- catalyst elements
- a soot-blowing system
- a dosing unit
- a mixing device
- a urea-injection lance
- a control unit
- a compressed-air reservoir module.

Nautic wetfish trawler design for HB Grandi will be powered by an MAN six-cylinder L27/38 unit, accompanied by a four-bladed, 3.8-metre, ducted MAN Alpha VBS 860 propeller (Both images courtesy of HB Grandi/Nautic).

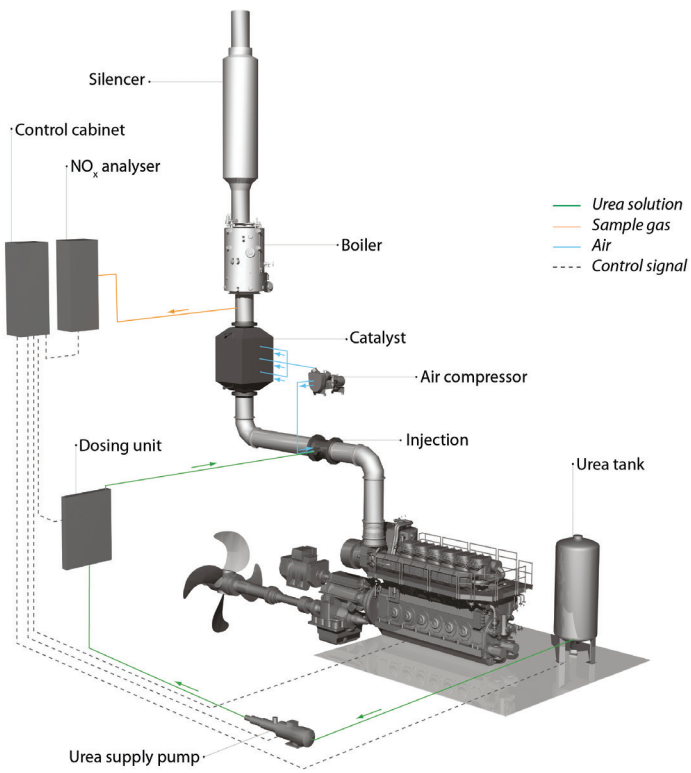

Figure 4.
Annotated diagram showing the key components of the MAN Diesel & Turbo SCR system.
Source: www.corporate.man.eu.

Figure 5.
Graphic representations of the Nautic wetfish trawler design for HB Grandi.
Source: www.corporate.man.eu.

TWO MAJOR ME-GI MILESTONES CONFIRMED

MAN Diesel & Turbo reports that its ME-GI engine has now passed another milestone with orders for more than 100 engines received. In its press release, issued 2 February 2015, FLEX LNG announced fuel-efficient, two-stroke slow-speed ME-GI main engines as the propulsion system for two LNG carriers to be built at Samsung Heavy Industries. The expected delivery dates of the vessels have been postponed from Q1 2017 to Q1 and Q2 2018.

Ole Grøne, Senior Vice President Low-Speed Sales and Promotions, MAN Diesel & Turbo, said: "With our ME-GI order book now having passed the 100-unit milestone, we view it as a sign that our confidence in this low-speed, dual-fuel engine concept has been both well-founded and well-timed, and that we are providing what the market desires. Indeed, it seems as if the ME-GI is set to become the new industry standard."

The first two ME-GI units (MAN B&W 8L70ME-GI types), recently successfully passed their Factory Acceptance Tests (FATs) in Korea, and have now been installed aboard two 3,100-TEU container vessels currently under construction in the United States.

MAN Diesel & Turbo reports that the test-bed performance of the ME-GI engines exceeded expectations, providing tangible evidence of the soundness of the concept. The company is pleased that this confirms the ME-GI's high-pressure technology as a state-of-the-art solution, which the market has embraced, judging by the significant volume of orders seen in the short period of time since the ME-GI was launched.

Grøne added: "The development process, particularly in relation to the seals associated with the gas-supply pressure, has been demanding but the successful FATs have shown that this challenge has been fully resolved. Overall, the ME-GI's fuel-gas system has performed extremely well, confirming our expectations and the experience gained from various demonstrations and tests. As such, MAN Diesel & Turbo is confident that the ME-GI engine will continue as the unquestioned market leader and the only demonstrated two-stroke, dual-fuel engine that has passed exhaustive testing."

The ME-GI engine represents the culmination of many years' work, and gives shipowners and operators the option of utilising fuel or gas depending on relative price and availability, as well as environmental considerations. The ME-GI uses high-pressure gas injection that allows it to maintain the numerous positive attributes of MAN B&W low-speed engines that have made them the default choice of the maritime community. The ME-GI is not affected by the multiple de-ratings, fuel-quality adjustments or large methane-slip issues as have been seen with other, dual-fuel solutions.

MAN Diesel & Turbo sees significant opportunities arising for gas-fuelled tonnage as fuel prices rise and modern exhaust-emission limits tighten. Indeed, research indicates that the ME-GI engine delivers significant reductions in CO2, NOx and SOx emissions. Furthermore, the ME-GI engine's negligible methane slip makes it the most environmentally friendly technology available. As such, the ME-GI engine represents a highly efficient, flexible, propulsion-plant solution.

An ME-LGI counterpart that uses LPG, methanol and other liquid gasses is also available, and has already been ordered.

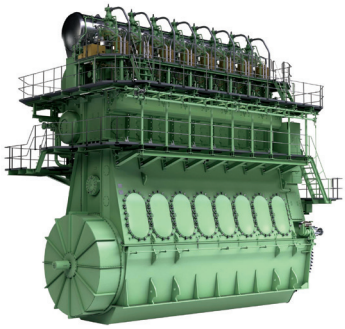

Figure 6.
ME-GI engine.
Source: www.corporate.man.eu.

NEW OFFSHORE GENSET TARGETS DRILLING SEGMENT

MAN Diesel & Turbo has announced the launch of its PA6 B Offshore GenSet (OG). Aimed at the offshore-drilling segment, the new engine is specifically targeted at semi-submersible drilling rigs.

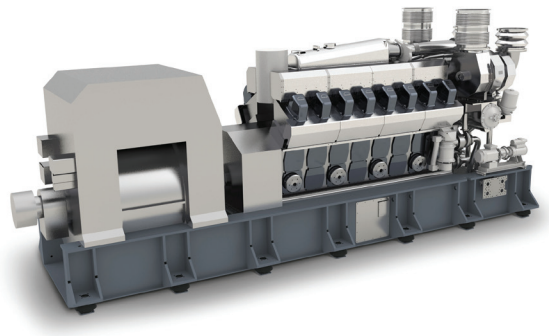

Figure 7.
View of the PA6-B (OG) Offshore GenSet.
Source: www.corporate.man.eu

The PA6 B is a four-stroke, medium-speed engine built at MAN Diesel & Turbo's St. Nazaire, France facility from where the company has successfully sold the engine for many years. St. Nazaire will assemble individual PA6 B OG units together with an alternator in constructing the new, offshore GenSets. Typically, 8 × 16PA6 B OG units are installed aboard a semi-submersible both for main and emergency power supply.

Originally developed in the 1960s, the PA6 B is a highly reliable engine whose basic design has proven itself over innumerable running hours, as well as in starting and loading sequences. Continuously developed and improved since its inception, the PA6 B has set the benchmark in many of its segments, being especially recognised within such applications as diesel-electric propulsion for commercial and military vessels, and emergency gensets in nuclear power plants, as well as other, offshore segments. Currently, more than 1,000 engines of the PA class are in service globally.

In developing the new OG-variant, the original PA6 B engine has been much adapted to meet current market demands. One major innovation has been on the emissions front with the result that the PA6 B OG is now Tier II-compliant and can also meet Tier III regulations with the SCR (Selective Catalytic Reduction) technique. Another key development is that the PA6 B OG now employs SaCoSone, MAN Diesel & Turbo's proven engine-safety-and-control system, while the range of turbochargers suitable for operation with the new engine has accordingly been updated.

The PA6 B OG is a compact, lightweight, and robust powerhouse with remarkably low noise-emissions and vibrations. Its power range from 4,440 to 7,400 kW makes it eminently suitable for diesel-electric propulsion and power generation in the offshore segment.

The PA6 B engine is highly resistant to shock and the offshore GenSet can deal with tilts of up to 25° in any direction. Its ability to handle transient load increases and long-term, low-load operation are also noteworthy, while its proven design and the use of high-class OEM components facilitate long maintenance intervals.

Furthermore, the PA6 B OG features:

- quick start-up timing
- rapid response to load increases
- an integrated cooling, lube- and fuel-oil system
- maximum reliability
- low-load SFOC optimization.

US ORDERS TRAWLER WITH COMMON-RAIL TECHNOLOGY

Tier II-compliant 32/44CR technology to deliver fuel efficiency, low emissions and improved productivity

MAN Diesel & Turbo has received an order for an MAN 8L32/44CR engine to power a newbuilding trawler for Fishermen's Finest, the US fishing concern. The 32/44CR engine order is significant on two counts in that it represents the first CR engine sold to the American fishing segment that is fully US EPA Tier II-compliant and is, simultaneously, a first reference for MAN Diesel & Turbo in the important, domestic fishing industry.

Helena Park, CEO Fishermen's Finest, said: "I am impressed with the technological advantages the MAN 8L32/44CR common-rail diesel engine will give our eco-trawler, 'M/S America's Finest'.

Robert Burger, Managing Director – MAN Diesel & Turbo, USA, said: "Fishermen's Finest aims to be a leader in the

Figure 8.
Graphical rendering of the ST-116 XL design for 'America's Finest'.
Source: Skipsteknisk.

competitive US fishing industry and habitually employs the latest technology to improve the productivity of its fleet. In ordering our four-stroke engine, it recognises the commercial advantage it can gain from our common-rail technology that is fully integrated with the engine and has best-in-class fuel efficiency accompanied by low emissions."

The engine will have an output of 4,800 kW (600 kW/cylinder) and will be built at MAN Diesel & Turbo's Augsburg, Germany works. The prime mover is part of a propulsion package that includes:

a MAN Alpha 4–blade CP propeller type VBS 940 Mk 5 Ø 3,800 mm including an AHT high-thrust nozzle

- MAN's proprietary Sacosone common-rail engine-control system
- MAN's Alphatronic 3000 Propulsion Control System
- a gearbox – power 4,800 kW, horizontal offset 950 mm, PTO 2,900 kW.

The vessel will be built at Dakota Creek Industries in Anacortes, Washington State, USA using an ST-116 XL design from Skipsteknisk, the independent, Norwegian naval architect and marine engineering company. Delivery of the propulsion package is scheduled for December 2015 with vessel delivery expected in November 2017.

Fishermen's Finest reports that its new order comes at a time when the political climate in the State of Washington is very positive and openly promoting efforts for distant-water fishing fleets to replace outmoded vessels.

Recent public statements by the State Government to this effect have given broad support to introducing modern ship designs that can dramatically reduce fuel costs, increase efficiency, and better meet new requirements for environmental protection. As such, the order for America's Finest with its modern MAN technology comes at an opportune moment.

MAN Diesel & Turbo's common-rail engines are among the most technologically advanced in its portfolio with a segment-leading SFOC that significantly lowers emissions of soot and NOx at all possible engine operating points. The company's CR engines have already established a solid foothold in other, major fishing markets.

Fishermen's Finest Inc. is an independent American fishing company that manages a fleet of two catcher/processor vessels operating in the bottom-fish fisheries of the North Pacific and Bering Sea where the large continental shelf supports a rich ecosystem and huge populations of, among other fish species, pollock and cod.

Fishermen's Finest has its headquarters in Kirkland, Washington State, and its fleet hails primarily from Dutch Harbor, the fishing capital of the Aleutian Islands.

Figure 9.
An example of the MAN 8L32/44CR engine that will power 'America's Finest'.
Source: www.corporate.man.eu

WÄRTSILÄ AND VTT - MAIN CONTRIBUTORS TO NEW PROPULSION TECHNOLOGY RESEARCH PROGRAMME

A new technology research programme aimed at developing propulsion products specifically for operating in arctic conditions has been implemented with Wärtsilä and VTT, the Technical Research Centre of Finland, as the main contributors. The ArTEco (Arctic Thruster Ecosystem) project will altogether be supported by ten industrial and academic partners from Finland and other countries.

Figure 10.
Wärtsilä and VTT.
Source: Wartsila.com

ArTEco is a three year programme, commencing in 2015 and ending in 2017. Its primary aim is to foster new technology for propulsion solutions in an arctic operating environment. The platform will consist of developing state-of-the-art simulation and load determining methods for dynamic loading conditions; researching possibilities for dampening dynamic loads; researching the use of Environmentally Acceptable Lubricants in propulsion products; and researching new sensor technology for components used in propulsion products.

The new technology that is expected to emerge from this project will have the potential to significantly improve the competitiveness of solutions, in terms of cost, size and reliability, compared to products currently available. This will be aided through the creation of a technology demonstrator, i.e. a large-scale prototype, to be used for validating the technology within the project. This validation will take place at the Wärtsilä Propulsion Test Centre in Tuusula, Finland.

The specific focus will be on creating an Extreme Value Thruster as a platform for demonstrating quantum leaps in thruster technologies. Wärtsilä is confident that this research will form the foundation of an extended and highly advanced product portfolio. The programme has a budget of EUR 7.5 million.

"The challenge to create increasingly reliable and competitive solutions is on-going. Wärtsilä has a duty to its customers to ensure that its R&D activities are supported by the best tools, technologies and partners so as to develop the best solutions. The creation of this project consortium will help us maintain our position as an innovator and technology leader within the marine sector. In particular, the state-of-the-art simulation methods and the possibility to carry out full scale validation of our new products will keep us at the forefront of new technology development," says Arto Lehtinen, Vice President, Propulsion, Wärtsilä Ship Power.

NYK TO IMPLEMENT NEW EMPLOYMENT SCHEME FOR JAPANESE SEAFARERS

NYK has decided to implement a new employment scheme in which Japanese seafarers will be engaged to work only on vessels and not within NYK's offices.

Figure 11.
NYK LNG Carrier.
Source: https://www2.nykline.com/

Japanese seafarers have traditionally been well regarded the world over for their teamwork and skills, generally developed through state-of-the-art education and training programs provided at renown maritime education institutions. And seafarers having specialized knowledge and skills are becoming more needed as NYK becomes more active in its LNG (liquefied natural gas) and offshore businesses.

NYK is thus making this move to fill positions that will require seafarers with particular technical expertise. This new work-style will also allow Japanese seafarers to settle in areas of their choosing and contribute to local communities. The employment of several officers and engineers is currently scheduled to take place from April or October 2016.

NYK will continue to secure and train technically advanced non-Japanese seafarers, who professionally man the bulk of NYK's fleet and NYK will continue its efforts to enhance its employment methods to ensure stable transport services.

NYK BEGINS PROJECT TO ENCOURAGE GREATER MARITIME AWARENESS AMONG STUDENTS

NYK has started the "NYK Mirai Project" to encourage greater awareness of maritime affairs and the seafaring life among students at elementary, junior, high, and maritime schools in Japan.

The demand for seafarers around the world has been increasing, and skilled Japanese seafarers are well-regarded. However, a seafaring career is often not an option considered as a future job among younger generation in Japan. Therefore, NYK has implemented this project to help familiarize students with vessel operations and life aboard so that informed career choices can eventually be made.

Sample Activities of the NYK Mirai Project

- Visits by maritime school students to shipyards to witness the building of NYK vessels
- Lectures at elementary and junior high schools by NYK maritime staff
- Offering vessel boarding opportunities to elementary and junior high school students, in addition to general citizens
- Introduction of the maritime industry at junior high school orientations
- Taking maritime school teachers aboard vessels operated by NYK

On December 13, as the first activity of this project, NYK maritime staff took students from the Hiroshima National College of Maritime Technology on a visit to the Ohnishi Shipyard (Imabari City, Ehime Prefecture) of Shin Kurushima Dockyard Co. Ltd. (Head office: Chiyoda-ku, Tokyo; President: Hisashi Kadota), where the students took a tour of the construction of a vessel that had been ordered by NYK. Students seeing an immense vessel for the first time were surprised by the difference in the size of the vessel compared with the school's training ship.

NYK will continue its efforts to enhance this project through such activities so that elementary, junior high, and maritime school students who will lead the next generation can develop an interest in the maritime industry and thus consider careers at shipping companies.

Figure 12.
On the bridge of a vessel under construction.
Source: https://www2.nykline.com/

NYK TO TEAM WITH CLASSNK AND OTHERS TO DEVELOP TECHNOLOGICALLY ADVANCED EXHAUST GAS CLEANING SYSTEM

This joint research project between Singapore and Japan will be funded by a grant from the Singapore Maritime Institute and carried out with the support of the ClassNK Joint R&D for Industry Program.

Unlike the development of EGCSs intended for use inside ECAs, this research will focus on the future need to comply with SOx emissions regulations outside ECAs after 2020 or 2025. Working with a leading EGCS manufacturer, the project will utilize the most advanced technology available to simplify EGCS operations, as well as reduce costs and CO2 emissions compared with existing conventional EGCSs for ECAs. The project will also aim to promote the development of new technologies for system installation such as simplification and miniaturization, in order to ensure that the system can be installed on a variety of ship types, as well as newbuildings and existing vessels.

NYK, MTI, and ClassNK will continue their efforts, ahead of international regulations, in the research and development of beneficial environmental measures.

A system that removes harmful substances, such as SOx and particulate matter, by spraying the exhaust gas in the scrubber with wash water and then treating the used wash water.

The requirements applicable to ships for controlling air pollutant emissions are becoming stricter every year. In particular, regulations aimed at reducing SOx emissions from vessels are becoming ever more stringent.

- Within Emission Control Areas (ECAs)

Emission limits of sulfur in fuel oils used in ECAs, which are mostly located off Europe and North America, will fall from the current 1.0 % to 0.1 % from January 1, 2015.

- Outside ECAs

Emission limits will fall from the current limit of 3.5 % to 0.5 % in 2020 or 2025. (The exact year will be determined by 2018.)

VIKING SHIPTECH INTRODUCES 80 KNOT SHIPS

The concept combines the delivery time speed of air transport and price range applicable for shipping. The air transport has an 80 times higher CO2-emission than shipping, and is also 80 times more expensive. If we can move cargo from airplanes to ships, the eco winnings would be bigger than those introduced by any other measures. By moving only 3% of the cargo from airplanes, the reduction in CO2-emission is estimated to more than 80% with current fuel.

The new technological solution being introduced by Viking Shiptech are ships that can reach up to 80 knots of speed. Under the concept, a ship is powered by turbines that make a hundred

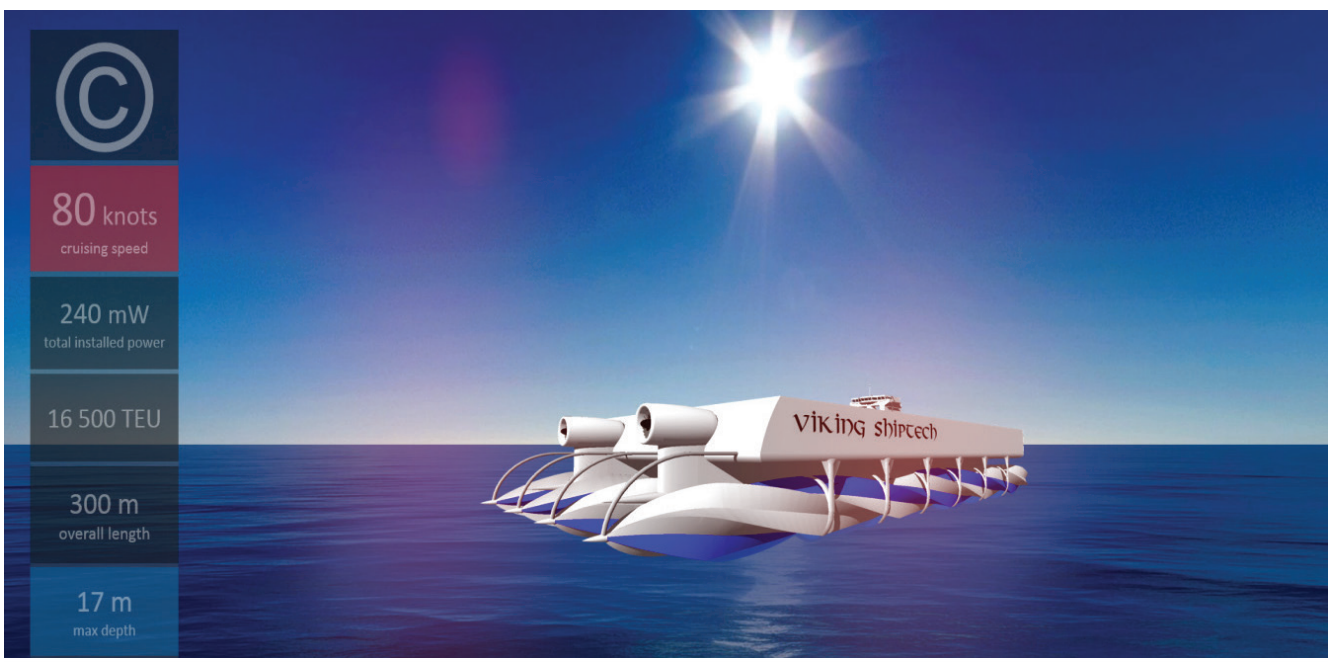

Figure 13.
New patent pending shipping technology
Source: http://www.viking-life.com/viking.nsf

times gyro stabilization, and then, the ship, gaining on the torque force, is being propelled forward "as cast in the sea".

Combined with a submersible Swath solution, it provides a 100 % stability in all speeds and up 10 meters high waves, the designer claims. On the other hand, an increased platform width is aimed at preventing the inclining of the vessel, distributing the cargo to lowered stacks and gravity.

Two jet engines in front of the platform reduce the air resistance, and then supply the subsea surface with an air layer that destroys the shear forces. High speed combined with a torque controlled pressure distribution make a permanent efficiency of air lubrication in all seas and weathers.

In terms of design capacity, the ships in question would feature up to 16,500 in TEU, 17 meters in maximum depth and up to 300 meters in length overall.

The design is said to be able to provide up to 37 % in fuel savings when compared to slow moving ships, based on results of CFD-analysis.

According to Viking Shiptech, the 80 knots ship requires lower crewing requirement (-72 %) when compared to what is currently required on regular ships.

By compensating the building prices of four 16 knots ships with one 80 knots ship, the money from the residual three can be invested in technology instead of several ships.

CARLA MAERSK'S SALVAGE OPERATION

Two of the tanker's port cargo tanks were ruptured in the clash resulting in a spill of an unknown quantity of Methyl Tertiary Butyl Ether (MTBE).

As informed by CTCAC, the salvage plans include utilizing high-density foam to suppress any flammable vapor seeping from the punctured tanks.

Figure 14.
Carla Maersk alongside view.
Source: USCG

Houston Ship Channel is likely to open within next 12 hours within the safety zone introduced after the collision, as predicted by the West Gulf Maritime Association (WGMA).

A section of the channel, from light 86 to the Fred Hartman Bridge has been closed since the collision.

The closure of the channel's section has impacted operations of Exxon Mobil Corp's refinery in Baytown, Texas amid tanker delays, Bloomberg reports.

Since Wednesday afternoon, 83 vessels were queuing at the ship channel, 48 inbound and 35 outbound, the US Coast Guard said.

According to responders conducting air and water tests, there are no public health or environmental concerns at the time.

To date, more than 500 air and water tests have been conducted, equalling approximately 50-70 tests per hour.

MTBE evaporates very quickly from surface water, the US Environmental Protection Agency said citing results of various studies. However, Texas Department of State Health Services advised that fisherman exercise common sense by avoiding fish and shellfish containing chemical odour.

SWITCH TO LOW SULPHUR FUEL PRIOR TO ENTERING ECA

The US Coast Guard (USCG) has voiced concerns about the increasing number of vessels at risk of experiencing loss of propulsion when performing change-over operations to low sulphur fuel, the marine insurer Gard reports.

As part of the increasingly stricter air emission limits enforced through MARPOL Annex VI, vessels operating in the established Emission Control Areas (ECAs) can, as of January 1, 2015, no longer use fuel with a sulphur content exceeding 0.1 % by weight unless an approved exhaust gas cleaning system is installed.

As the machinery systems of many vessels were not designed to operate on low sulphur fuels, difficulties can arise when switching from one fuel to another, both during the actual fuel change-over and during continuous operation on low sulphur fuel.

According to the USCG, vessels have reported several incidents involving substantial fuel leakages while switching fuel to ensure compliance with the North American ECA requirements. Although these leakages were contained, the USCG emphasises that fuel releases of any kind can lead to more serious incidents involving pollution, engine room fires, and personal injuries.

The USCG also reports that many losses of propulsion have occurred in various ports and have been associated with fuel change-over processes and procedures.

Gard has warned its members that ships operating within ECA areas, currently the North American area, the US Caribbean Sea area, the Baltic Sea area and the North Sea area, must use low

sulphur fuel the entire time the vessel is operating within an ECA, on inbound and outbound transits as well as at the dock.

Each vessel must develop and implement suitable shipboard procedures for fuel change-over in accordance with MARPOL Annex VI, Regulation 14.6, allowing sufficient time to complete the fuel oil change-over prior to crossing the ECA border.

THREE SHIPS AGROUND IN FRONT OF SPLIT DUE TO STRONG BORA

Three cargo ships ran aground off Dalmatian coast, Croatia this afternoon as violent storm rages throughout the region.

The ships have been identified as Krka, Orebić and Vranjic and are owned by Split-based shipping company. Unconfirmed information says that the third ship got beached in a nearby area called Slatine. There were no injuries reported as the ships had no crew on board.

The ships had been berthed at the harbour; however; strong winds snapped the ropes holding the ships in place, setting them adrift.

Two tugs have been rushed to the scene and one coast guard vessel. Nevertheless, there is nothing that can be done at the moment due to the weather. The salvage operation is scheduled for 1 month.

Figure 15.
View to ships aground.
Source: www.crometeo.hr

BLUE QUEEN READY TO RULE THE SEAS

The Norwegian shipbuilder Ulstein Verft, part of Ulstein Group, today delivered the platform supply vessel Blue Queen to Blue Ship Invest.

The PX121 design PSV is the first of two for which Norway-based Golden Energy offshore is awarded the ship management contract.

Blue Queen is the ninth PSV of this design being constructed at Ulstein Verft.

Figure 16.
Blue Queen.
Source: http://worldmaritimenews.com/

HHI REALIGNING ITS BUSINESS

South Korean shipbuilding giant Hyundai Heavy Industries (HHI) has revealed plans to integrate overlapping roles and responsibilities across HHI and its shipbuilding affiliates, Hyundai Mipo Dockyard and Hyundai Samho Heavy Industries. The move comes within the conglomerate's drive to realign the business.

HHI recently identified four areas of overlap for phase one of functional integration, namely, finance, accounting, IT and public relations. The shipbuilder said that, going forward, the scope of business coordination would eventually expand into other functions as well as to other affiliates under the HHI group.

"The business realignment is geared toward achieving increased synergy among affiliates by minimizing redundant investment, enhancing coordination and ensuring efficiency in HR management," HHI said.

HHI posted nearly 50 % less in new orders in the first two months of 2015 compared to the same period last year.

The group's shipbuilding sector marked a 77 % decrease in newbuild orders for the period, from 2.68bn in 2014, to USD 609 million in 2015.

The dismal results were chalked off to a growing competition from Chinese shipbuilders and a slumping demand from European owners, in addition to falling of oil prices.

The shipbuilding conglomerate has resorted to restructuring measures that saw lay-offs and closing of unprofitable business branches, such as those engaged in renewables, so as to steer

WORLD'S LARGEST CABLE LAYER TAKES TO WATER

On 7th March, Jan De Nul launched the world's largest multipurpose cable laying vessel named Isaac Newton.

The launching ceremony took place at Uljanik shipyard located in Pula, Croatia.

The vessel will be able to perform different jobs as a trenching and offshore support vessel, a subsea rock installation vessel, and a cable laying vessel.

The Isaac Newton is planned to start her maiden voyage in August 2015.

Figure 17.
Launching of Isaac Newton.
Source: Jan de Nul

SCIENTISTS WARN NICARAGUA CANAL COULD TURN INTO ECO DISASTER

A consortium of 21 environmental scientists from North and South America has expressed strong concern about the impact of the controversial Nicaragua Canal through a co-authored paper titled *"Scientists Raise Alarms About Fast Tracking of Transoceanic Canal Through Nicaragua."*

The Hong Kong Nicaragua Canal Development Group, is building the 172-mile, USD 50 billion canal in collaboration with the Nicaraguan government, which granted the concession last June. Preparation for the project has begun with the construction of roads to move heavy equipment and supplies into place, with

the first ships scheduled to pass through the canal in late 2019. It will be longer, wider and deeper than the 51-mile Panama Canal to the south.

Figure 18.
Map of Nicaragua with marked Canal.
Source: Rice University

The Canal will cut through Lake Cocibolca (aka Lake Nicaragua), Central America's main freshwater reservoir and the largest tropical freshwater lake of the Americas; this plan will force the relocation of indigenous populations and impact a fragile ecosystem, including species at risk of extinction, according to Rice University environmental engineer Pedro Alvarez and other members of the consortium.

"The biggest environmental challenge is to build and operate the canal without catastrophic impacts to this sensitive ecosystem," **Alvarez** said. *"Significant impacts to the lake could result from incidental or accidental spills from 5,100 ships passing through every year; invasive species brought by transoceanic ships, which could threaten the extinction of aquatic plants and fish, such as the cichlids that have been evolving since the lake's formation; and frequent dredging, impacting aquatic life through alterations in turbidity and hypoxia, triggered by re-suspension of nutrients and organic matter that exert a relatively high biochemical oxygen demand."*

Alvarez and his colleagues wrote that dredging required to open a channel in the lake deep and wide enough for ships will disperse enough sediment to lower its oxygen content and kill marine life. They anticipate the project will impact Nicaragua's ecotourism and the supply of fresh water for drinking, irrigation and power generation.

The researchers listed their concerns in three broad categories: water and sediments, biodiversity and ecosystem integrity, and socio-economic impact.

They acknowledged Nicaragua's hope that the Canal, one of the largest engineering projects ever attempted, would create jobs and lift the nation out of extreme poverty; but they are concerned the benefits would not match expectations, particularly since the Nicaraguan government *"has not published a detailed business plan for the canal."*

"Nicaragua should prepare and publicly vet a detailed economic assessment that includes not only a cost-benefit analysis but also considers externalities associated with national economic development, environmental impacts, social equity, human rights and legal and national security issues," the authors of the paper wrote.

DNV GL LOOKS INTO HULL AND PROPELLER PERFORMANCE

International certification society DNV GL is launching an advanced hull and propeller performance analytics module as part of the new fleet performance management service ECO Insight.

According to DNV GL, the module is based on computational fluid dynamics (CFD) methods to correct for changing operational conditions and produces much more accurate results than existing approximate or experimental methods.

As explained, tracking hull and propeller degradation is a challenge that has not yet found an adequate solution. Experts suggest that, as a result of hull fouling, the world fleet could be sailing with approximately 30 per cent added resistance and consequently significantly higher levels of fuel consumption. Undertaking hull and propeller cleaning on a more regular basis is already recognized as improvement lever by many shipping companies. However, the question of when and how the procedure should be carried out has not yet been addressed systematically.

Hull and propeller performance computations show how much resistance is added over time due to fouling, by analysing the gap between the theoretical and measured power demand of a vessel, after correcting for influences like speed, draft, trim, weather and other operating conditions.

CFD capabilities, which we are used in lines optimisation, retrofit and trim assistant services, allow us to very accurately normalize vessel specific power demand under each reported condition.

NEW YACHT DESIGN-PROJECT STAR

Lobanov Design and BMT Nigel Gee have presented an avant-garde yacht design named Project STAR. Measuring 132m in length and over 60m in height, STAR's technical development features a symmetrically fore and aft double ended hull form, with all-electric architecture and fully azimuthing propulsion.

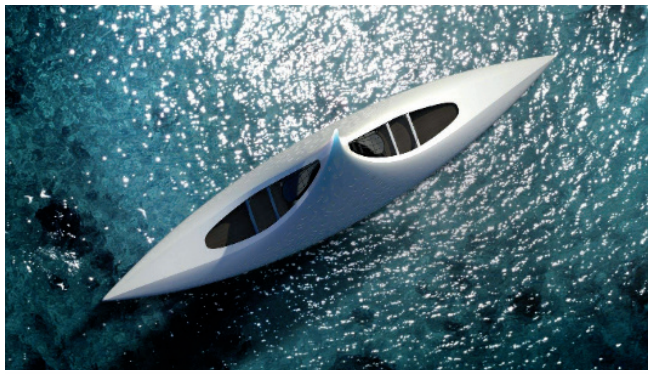

Figure 19.
Computer simulation of Project STAR.
Source: http://worldmaritimenews.com

Coupled with a dynamic positioning system, STAR would rotate within her own length to track the arc of the sun free from the constraints of traditional anchors.

Collaborating with BMT Nigel Gee for naval architecture and to assess technical feasibility, STAR has been developed as a private yacht, or more radically, as the world's most exclusive private hotel, redeploying to the world's iconic marine cities and events worldwide. STAR rethinks both artistic form and content.

The vessel has been designed with a maximum speed of 18 + kts and with a range at 14 kts of 5000+NM. Over 3,500 m^2 of luxury interior space is provided within the 9000 Gross Tons, whilst a central cluster of 4 lifts provide access across 8 decks.

BMT NG STAR1Notably lifts 1 and 3 extend from a sub-marine viewing area within the lifting keel, up to a viewing platform on the eighth deck, offering unprecedented views down onto the unique form of the vessel itself, as well as providing a range of visibility of over 20 km.

Festival Of Science: An Opportunity to Promote University Research

Livia Puljak

FESTIVAL OF SCIENCE: AN OPPORTUNITY TO PROMOTE UNIVERSITY RESEARCH

The 13th Festival of Science will be organized in a number of Croatian towns on April 20-25, 2015. The organization of the Festival in Croatia was initiated by a non-profit organization, the British Council, which continues to provide central support. Every year volunteers from any town can apply and organize the Festival of Science in their town. The Festival of Science was initially limited to university towns, but for a number of years now, smaller non-university towns have been actively organizing successful Festivals of Science. Local organizing committees are usually composed of university professors and volunteers-enthusiasts. The goal is to devote an entire week to science and popular scientific activities which tend to be organized in town centers and sometimes in academic institutions, with the idea of bringing science closer to citizens, taking it out of academic classrooms and research laboratories.

Children: special target audience

The Festival of Science consists of numerous activities, such as lectures, demonstrations of experiments, workshops, round tables, students' science fairs, exhibitions, etc. Since one of the goals of this Festival is to kindle enthusiasm for science among kindergarten and school children, they are its special target audience. When children are shown that science can be fun and solve everyday problems, they learn about science in context, which makes science more relevant for their lives. These challenges can be successfully handled by mobilizing the scientific research community.

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Why the promotion of science?

The promotion of science includes the advancement of the benefits of science by motivating and engaging non-scientists in an attempt to present the basic concepts of science in an easily comprehensible way, showing everyone what science is really about. However, since the public is not a homogeneous mass with uniform interests and understanding, the Festival of Science includes numerous activities for different audiences. Making science and technology essential parts of our culture is a major challenge. The promotion of science makes knowledge the central component of culture, social awareness and collective intelligence. Access to information has the potential to change one's vision of the world and transform the relationship between humans, appropriation and dissemination of knowledge. In today's world access to knowledge equals development, well-being and quality of life. In this context, scientific literacy is a social right of all citizens. The successful promotion of science requires the abandonment of very stiff scientific terminology and the explanation of science in simple terms.

Festival of Science in Split

Approximately 500 volunteers are expected to participate in the organization and execution of activities in the framework of the Festival of Science in Split. They include university professors, scientists from research institutes, students, middle school and primary school teachers, kindergarten teachers and children performing experiments. The anticipated turnout is at least 10.000 citizens. Hoping that the Festival of Science will improve the citizens' understanding of the scientific processes and awaken the interest in science among children, we invite you to visit some of the many activities of the Festival of Science 2015 in Split, Croatia.

The Introduction of 3D Printing into the Maritime Industry

Igor Vujović

Until several years ago, replication ability was not in the domain of science, but rather seemed like something from science fiction. However, the technology known as 3D printing is making the replication of components, spare parts and other items increasingly available for general civilian applications. One would expect a technology of this type to first be introduced by the space industry, agency or company and indeed, NASA is planning to use 3D printers in space flights and during long manned missions. Printing the necessary parts rather than taking them from Earth certainly makes sense (How NASA Will Use 3D Printers in Space). However, its use is more widely spread in navy and marine applications. The Maersk shipping company is already installing 3D printers on its ships upon their arrival to their maiden port (Major Shipping Company 3D Printing Spare Parts While Out at Sea – Video; Video: Using 3D Printing To Make Spare Parts On Maersk Tankers; Feature: 3D printing in space and at sea). The said company estimates that the delivery of a single spare part at sea costs USD 5,000 in average, including transportation costs. Since most spare parts are neither that large nor too expensive, transporting, i.e. a one-dollar part just doesn't make economic sense (3D Printing: Changing The Way We Fight). Printing them in 3D is far more efficient.

Armies and navies worldwide are considering changing their military strategy due to advances in 3D printing (3D Printing: Changing The Way We Fight; PLA Navy use 3D printers; In Tomorrow's Wars; Navy Beefs Up 3D Printing Efforts With New 'Print the Fleet' Program; Global Maritime Survey; Could 3D printers provide a solution to demand for spare parts?; Appleton, 2014; Morrell, 2014). Naturally, nobody expects to print a large generator or a diesel engine, but many small parts important for system operation could be easily printed (3D Printing: Changing The Way We Fight). Experiments are already being conducted and the application of the new technology is underway (PLA Navy use 3D printers).

So what does 3D printing technology owe its increasing popularity to? Well, carrying data about parts is certainly easier than actually hauling all the spare parts. However, printing text or figures on paper is quite different than printing parts. 3D printing requires a special software, giving the printer detailed instructions on what to do. The software orders layers upon layers of printing, each of which can be different. Layers are connected by adhesives. So, the actual spare parts and the printed spare parts have a different 3D structure. Normal spare parts are compact and mostly produced from 3D structures using a technological process of some sort. A 3D printed part has a layered structure with adhesives between layers. The question is: Are the characteristics of the normal spare parts and printed parts the same? It is clear that they can never be the same, but it remains to be seen in maritime practice whether they can perhaps be satisfactory for a specific application.

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Oltôr naśri môra

Vinko Kalinić

An Altar Amidst the Sea

trans. by Darko Kotevski

edited by Mirna Čudić

Pītôl je jelnèga
jedônput nìki tãmo:
śkuźôjte bôrba,
ma je mi mòrete ispjegât
kojû je ono nãmo bãrdo
ca śtarśî var kûlfa
hûdo i gãrdo

a govori vèmu ovi vãmo:
nìśta śînko, ono bãrdo
nit je hûdo, nit je gãrdo
oltôr naśri môra nò je
i źivòt i śmârt otò je

onò je śkûj
di śon se rodîl
di śon bîl
i di ću jòpet puć

Someone out there
once asked another one:
excuse me, sir,
but could you possibly tell me
what that hill yonder is,
sticking out from the open sea
evil and dismall

this other one answers that one:
nothing son, that hill there
is neither evil, nor is it dismall
an altar amidst the sea it is
and life and death it is too

that is the island
where I was born
where I've been
and where I'll go again.

RJEČNIK

oltor	žrtvenik, oltar
nasri	nasred
pitol je	pitao je
jelnega	jednoga, nekoga
jedonput	jednom
niki tamo	neki tamo
škužojte, borba	ispričavam se, barba (gospodine)
morete	možete
ispjegat'	objasniti
namo	onamo
bardo	brdo
ca starši	koje strši
nasri kulfa	nasred pučine
hudo i gardo	zlo i ružno
govori vemu ovi vamo	odgovori onome ovaj
i život i smart oto je	ono je i život i smrt
škuj	otok
di son se rodil	na kojem sam se rodio
di son bil	gdje sam bio
di ću jopet puć	kamo ću opet poći

NEKROLOG BRODU

Adio brode, Starino

Pero Vidan

OBITUARY TO A SHIP

Farewell, my old companion

Pero Vidan

Source: Tomislav Skračić

Petoga marča 2015. u tri ure popodne dogodila ti se pegula[1].

Ne mogu virovat da si to ti. Ne mogu virovat da si tod i da ćeš vako skončat[2]. Obrisi broda su tvoji, dobro se nas dva znamo. Opasno si se nagnu, nešto ti je. Moran doć bliže, vidit če ti je. Oću, neću... Ono ča ću vidit, znan da mi se neće svidit. Znan da će me ražalostit, a pomoć ti ne mogu.

Eto me na Prvoj vodi[3], podan Marjana. Vata se mrak. Skoro si uša u lučicu Spinuta. Veren s po škrapan[4]. Mladost je već došla na

1. pegula-nezgoda
2. skončat- završit, umrijet
3. Prva voda-kupalište podno Marjana
4. škrape-grote, stijene uz more

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On 5th March 2015 at three o'clock in the afternoon a misfortune befell you.

I can't believe it's you. I can't believe you are here, that you are going to end up like this. The shape is yours, I am sure of it because we've known each other so very well. You are listing hard, something strange is happening to you. I have to get closer to see what went wrong. I am shilly-shallying… For I know I won't like what I am going to see. I know it will make me sad, I know I can't help you at all.

Here I am at Prva voda[1], beneath the slopes of Marjan Hill. It's getting dark. You have almost drifted into Spinut[2] Harbour. I am stumbling along the harsh rocky shoreline. The youth have already come for rendezvous in the dark and have hidden in the cars under pine trees. I'm wrenching my feet, stepping across the rocks, coming closer to see you. Are you hurt? Will you survive?

1. Prva voda-beach beneath the slopes of Marjan
2. Spinut-same name marina in Split

rendes, u škuribandu[5] i sakrila se s autima pod bore. Izvrćen noge po škrapan i gren te vidit. Jesi li ranjen? Oćeš li se spasit?

Sićan se svog ditinjstva i dana kad san te upozna. Isto vakvo vrime, marač ili april. U prvon san razredu osnovne škole. Lipi dan. Metković, kuća Lučke kapetanije di san živi. U prizemlju, u kancelariji, pokojni otac. Uvik obrijan, uredan, u uniformi. U službi je. Oko njega veliki registri ka libri, stanica je pojačana, a u kantunu tiho svira radio. Doša san mu se javit prin skule, a on me zove da ulizen. „Vidi !" pokaže mi kroz ponistru. Podigne me na ponistru kancelarije da boje vidin i govori: „Vidi brod ča je doša. Ime mu je Orebić."

Zadivjeno san te gleda. Iako nakrcan, bi si visok za rivon. Najveći brod u portu. Veći od zgrade luke, veći od naše kuće. Na maloj Neretvi, bi si div.

Otac me je odgoji da poštujen more i volin brode. Bi je pomorac. Ka i njegov otac i njegova oca otac. Poslin san pomorcen posta i ja. Nisam se puno misli.

Ka ditetu mi ni bilo jasno zašto je otac, kad je brod Atlantske plovidbe Koločep prodan u rezalište, bi onako tužan. Koločep je isplovi iz Metkovića na poslidnje putovanje u rezalište Sveti Kajo. Trubi je dugo, dugo… Otac mu je maha. Niz obraze su mu išle suze. Tad nisan zna čemu suze, ni zašto brod trubi.

„Brod plače jer je tužan ča nas napušta. Brodi su ka i judi", objasni mi otac suznih očiju. „Više ga nećemo vidit". Tad san se i ja rastuži.

Koločep se nikad više ni vrati.

Orebiću, već onda si bi starac, stariji i od Koločepa. Godine ti se nisu poznavale. Još godinan si osta s menon. Kad bi uplovi u sedan uri ujutro, pozdravja si grad s jednim kratkim pištunom. Kad si odlazi navečer, pozdravja si s tri duga i jednin kratkin, onako ka ča se brodi pozdravjadu na moru. I kad iz luka gredu na dugo putovanje.

Naviru mi misli, sićanja.

Prin odlaska ti je makinja uvik bila *stand by*. Posada je na kuverti[6]. Barba[7] na paramentu[8]: „Provene konope skini, ostavi samo krmenu lancanu[9]!" Čekaš, kurenat[10] Neretve te okriće. Pajet[11] na krmi je spreman za slučaj da makinja ne uvati. A uvik je uvatila. I onda zavozi naprid, sasvim lagano. Pusti krmenu lancanu. Čuje se veseli zvuk starog *Deutza*, motora još za onog rata zaplinjenog s njemačkih podmornic i stavljenog u te. Zavozi si. Juriš niz Neretvu!

Iz okuke u okuku, livo, pa desno. Visok si, cila dolina te vidi. S pola snage, osan čvori, usporavaš na Opuzenu i Kominu na sasvim polagano. Takvi je zakon, pravilo plovidbe Neretvom.

5. škuribanda-skriveno mjesto, zaklon od pogleda
6. kuverta-paluba
7. barba-zapovjednik
8. paramenat-lastavice broda, vanjski dio mosta
9. lancana-dugi krmeni konop
10. kurenat-morska struja
11. pajet-bokobran

I remember my early childhood and the day I met you. The same time of year, March or April. I was a first-grader at primary school. A beautiful day. The town of Metković, the building of the Harbor Masters' Office was our home. On the ground-floor, in his office, my late father in his uniform, neat and shaved, as usual. He is on duty, surrounded by large registers that look like giant books. The radio station receiver is turned on loud, while music from the wireless in the corner can be barely heard. I come to say bye and he invites me in. "See?" he points through the window. He lifts me up to the office window so I can see better, and says: "Look at this ship that just arrived. Her name is Orebić."

I watched in awe. Although loaded, you stood high by the quay. The largest ship in the port. Larger than the Port building, larger than our house. On the small Neretva River you looked like a giant.

My father raised me to respect the sea and admire ships. He was a seafarer. Like his father and his father's father before him. Later on I became one myself. Didn't think twice.

As a little kid, I couldn't understand why my father was so sad when the Atlantska plovidba[3] ship named Koločep was sold to a ship-breaking yard. The Koločep sailed on her last voyage from Metković to the ship-breaking yard at Sveti Kajo[4]. She sounded her horn for a long, long time… My father waved her goodbye. Tears went down his cheeks. I didn't know then what were those tears for, nor why the ship sounded her horn.

"The ship is weeping because she is sad to leave us. Ships are like humans." my father explained, his eyes full of tears. "We shall never see her again." This made me sad.

The Koločep never returned.

And you, Orebić, you were already an old lady in those days, older than the Koločep. You didn't show age, though. You remained with me for years. When you entered our port at seven in the morning, you greeted the town with one brief blast. When you set out in the evening, you sounded three long and one short blasts, the way ships greet one another at sea. Or when they sail off on a long voyage.

I am overwhelmed with memories, recollections.

Before leaving, your engine is always on stand-by. The crew are on the deck. The Old Man is on the wing. "Take off the bow lines, leave only the stern line!" As you are waiting, the Neretva current is turning you around. The fender on the stern is ready in case the engine would not put in gear. But it always put in gear. And it would run forward, gently. "Cast off stern line." The cheerful sound of the old Deutz, a World War II engine retrieved from a German submarine just for you. You are running. Steaming full speed down the Neretva!

From bend to bend, to port, then to starboard. You are tall, the entire valley can see you. At medium speed, eight knots, you

3. Atlantska plovidba-shipowner company from Dubrovnik
4. Sveti Kajo- small place and port next to Split

Zna si to. Pa ipak, čuju se beštimje Kominjana kojima je moreta broda uzdrmala trupice. Mašu rukan, upinju ti roge, ali ne iz bisa ili zlobe. Tako je uvik bilo. Biće da je takav bi običaj. Isto je bilo od prvog puta kad si uša u Neretvu. Onda, Rogotin. Spuštaš jarbol da ne zapne za most. Dolazi ušće, okrićeš za Gumancem[12] i *full speed* do Splita.

Završi san školu i fakultet. Još si bi tu. Otiša san na dugu plovidbu. Kadetura, poručnički, kapetanski…A ti si još plovi. Na tebi su se pomorci minjali. Na tebi su se učili i s tobom živili. A ti si živi za njih.

Onda san se poželi iskrcat s duge plovidbe i radit na kraju. To ni lako, a živit se od ničega mora dok iščem novi posal. Zaposli san se na Splitsku i dopa si me ti. Uplovi, isplovi: Metković, Dubrovnik, Zadar, Bar, Monfalcone, Porto Marghera, Ancona, Bakar…Po buri, snigu, kiši, po moreti, i oluji, *mare sette, mare brutto*[13]. Iz pojade[14] u pojadu, provuci se kraj Olipe, sakrij usrid Komiže.

Ja sam otiša, a ti si i dalje plovi.

A onda je sve stalo. Tvornice cimenta izgasile su peći. Za te posla više ni bilo. Ni bilo ni nafte, ni piture za te. Osta si sam. Vezali su te za rivu.

Noć je. Gledan te brode, tužnog. Bura me tiska od tebe. Ruzina[15] te odavno grize. Korbe[16] su ti slabe, nećedu izdržat jutro. Valovi te nosidu na škrapu. Lamarin[17] cvili. Propinješ se i škrabješ[18]. Stenješ i plačeš a bura ti kroz mrtve bande zavija. Moreta se priliva priko tebe, ankora te tuče po brandunu. Skida ti ono malo piture šta ti sakriva lamarin. Ostat ćeš gol do jutra. Plačeš. Po prvi put si sam i pristrašen. Sram te je. Star si i slab. Nima ti spasa. Niko ti pomoć ne može.

„Brod plače. Brodovi su ka judi", istinu je govori moj pape. A za tobom, plačen i ja.

12. Gumanac-pličina na ušću Neretve
13. mare sette, mare brutto - tal. more sedam, uzburkano (riječi s talijanske prognoze vremena)
14. pojada- zaklonište
15. ruzina- hrđa
16. korbe- brodska rebra
17. lamarin-metalna oplata broda
18. škrabješ- tući i stvarati zvukove pri tom

are slowing down while approaching Opuzen[5] and Komin[6]. That's the rule, the rule of navigation on the Neretva River. You knew it. And yet, the residents of Komin are swearing at you as your wash rocked their trupice[7], little river flat-bottomed boats. They are raising hands, showing longhorns, but not out of rage or malice. It has always been like that. It must have been customary. It has remained the same since the first time you sailed up the Neretva. And then, Rogotin[8]. You are lowering your mast so you can pass under the bridge. You are approaching the Delta, turning round Gumanac[9] Shallows, and then full speed to Split.

I finished both school and university. You were still there. I departed for a deep-sea navigation. Cadetship, lieutenant examination, master examination... And you were still sailing. The seamen signed on and off. They were trained on you, and lived for you. And you lived for them.

Then I wished to sign off, quit world-wide navigation and work ashore. It is by no means easy, one must survive while searching for a new job. I was employed by the shipper Splitska[10] and I met you once again. Sail on, sail off: Metković, Dubrovnik, Zadar, Bar, Monfalcone, Porto Marghera, Ancona, Bakar… In the cold north-easterly bura[11], snow, rain, swell and storm, mare sette, mare brutto[12]. From haven to haven, scraping through by Olipa[13] lighthouse, finding shelter in Komiža[14] Harbour.

I went away, and you kept on sailing.

And then it all came to a halt. Cement factories put out their furnaces. There was no work for you any amore. There was no oil or paint for you. You remained alone. They tied you to the quay.

It's night. I'm looking at you in your misery. The bura is blowing me away from you. Rust has been long biting you. Your ribs are weak, they won't last till morning. Breaking waves are pushing you onto the rocks. Your plates are whining. You are pitching and striking, moaning and weeping, with the bura howling through your corridors. The swell is pouring over you. The anchor is beating against your bow carvings, chipping off the paint that has remained. You will be naked by the morning. You are weeping. For the first time, you are alone and frightened. You are ashamed, old, and weak. There is no hope for you. No one can help you.

"The ship is weeping. Ships are like humans" as my father once said, and it is true. I am weeping too, mourning for you.

5. Opuzen – village at River Neretva
6. Komin- village at River Neretva
7. trupica-traditional small boats of River Neretva
8. Rogotin—village near the Delta of the Neretva River
9. Gumanac-shallow on Delta of River Neretva
10. Splitska-short way of Splitska plovidba, shipowner from Split
11. bura-nort east wind on Adriatic sea, very strong and cold
12. mare sette, mare brutto-italians sea 7, swell (from italian weather forecast)
13. Olipa- lighthouse on same name island on approaching Dubrovnik
14. Komiža-village at island of Vis

About ToMS: Ethics, Conflict of Interest, License and Guides for Authors

The Journal is published in English as an open access journal, and as a classic paper journal (limited edition).

ToMS aims at presenting the best maritime research primarily, but not exclusively, from Southeast Europe, particularly the Mediterranean area. Papers will be double-blind reviewed by 3 reviewers. With the intention of providing an international perspective at least one of the reviewers will be from abroad. ToMS also promotes scientific collaboration with students and has a section entitled Students'ToMS. These articles also undergo strict peer reviews. Furthermore, the Journal publishes short reviews on significant papers, books and workshops in the fields of maritime science.

Our interest lies in general fields of maritime science (transport, engineering, maritime law, maritime economy) and the psychosocial and legal aspects of long-term work aboard.

1. PUBLICATION ETHICS

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- Submit only original work to the journal.
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Our interest lies in general fields of maritime science (transport, engineering, maritime law, maritime economy) and the psychosocial and legal aspects of long-term work aboard.

6.1. Before you begin

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6.2. Guidelines for authors: manuscript preparation and submission

6.2.1. Organization of the manuscript

First (title) page

The first page should carry:

a. the paper title;
b. full names (first name, middle – name initials, if applicable), and last names of all authors;
c. names of the department(s) and institution(s) to which the work should be attributed. If authors belong to several different institutions, superscript digits should be used to relate the authors' names to respective institutions. Identical number(s) in superscripts should follow the authors names and precede the institution names;
d. the name, mailing address and e-mail of the corresponding authors;
e. source(s) of research support in the form of financial support, grants, equipment or all of these.

Last page

The last page should carry:

a. ethical approval, if required;

b. authors' declarations on their contributions to the work described in the manuscript, their potential competing interests, and any other disclosures. Authors should disclose any commercial affiliations as well as consultancies, stock or equity interests, which could be considered a conflict of interest. The details of such disclosures will be kept confidential but ToMS urges the authors to make general statements in the Acknowledgement section of the manuscript.

c. a list of abbreviations used in the paper (if necessary);

Other pages

Each manuscript should follow this sequence:

- title page;
- abstract;
- text (Introduction, Methods, Results, Conclusions/ Discussion);
- acknowledgments;
- references;
- tables (each table complete with title and footnotes on a separate page);
- figures and figure legends, and the last page.

6.2.2. Text organization and style

6.2.2.1. Abstract

The second page should contain the Abstract. ToMS requires that the authors prepare a structured abstract of not more than 250 words. The abstract should include (at least) four sections: Aims, Methods, Results, and Conclusion, not necessarily separated.

Aim. State explicitly and specifically the purpose of the study.

Methods. Concisely and systematically list the basic procedures, selection of study participants or laboratory/ experimental/simulation setup, methods of observation (if applicable) and analysis.

Results. List your primary results without any introduction. Only essential statistical significances should be added in brackets. Draw no conclusions as yet: they belong in to the next section.

Conclusion. List your conclusions in a short, clear and simple manner. State only those conclusions that stem directly from the results shown in the paper. Rather than summarizing the data, conclude from them.

6.2.2.2. Main text

Do not use any styles or automatic formatting. All superscripts or subscripts, symbols and math relations should be written in MathType or Equation editor.

Introduction

The author should briefly introduce the problem, particularly emphasizing the level of knowledge about the problem at the beginning of the investigation. Continue logically, and end with a short description of the aim of the study, the hypothesis and specific protocol objectives. Finish the section stating in one sentence the main result of the study.

Results

Key rules for writing the Results section are:

a. the text should be understandable without referring to the respective tables and figures, and vice versa;

b. however, the text should not simply repeat the data contained in the tables and figures; and

c. the text and data in tables and figures should be related to the statements in the text by means of reference marks.

Thus, it is best to describe the main findings in the text, and refer the reader to the tables and figures, implying that details are shown there. The formulations such as "It is shown in Table 1 that the outcome of Group A was better than that of Group B" should be replaced by "The outcome of Group A was better than that of Group B (Table 1)."

The need for brevity should not clash with the requirement that all results should be clearly presented.

Discussion/Conclusions

The discussion section should include interpretation of study findings in the context of other studies reported in the literature. This section has three main functions:

a. assessment of the results for their validity with respect to the hypothesis, relevance of methods, and significance of differences observed;

b. comparison with the other findings presented in the relevant literature; and

c. assessment of the outcome's significance for further research.

Do not recapitulate your results, discuss them!

6.2.2.3. Tables

Information on significance and other statistical data should preferably be given in the tables and figures. Tables should not contain only statistical test results. Statistical significances should be shown along with the data in the text, as well as in tables and figures.

Tables should bear Arabic numerals. Each table should be put on a separate page. Each table should be self-explanatory, with an adequate title (clearly suggesting the contents), and logical presentation of data. The title should preferably include

the main results shown in the table. Use tables in order to present the exact values of the data that cannot be summarized in a few sentences in the text.

Avoid repetitive words in the columns: these should be abbreviated, and their explanations given in the footnotes. Present data either in a table or a figure.

Each column heading for numerical data given should include the unit of measurement applied to all the data under the heading. Choose suitable SI units.

Place explanatory matter in footnotes, not in the heading.

Explain in footnotes all nonstandard abbreviations that are used in each table.

6.2.2.4. Figures

Figures should be numbered in sequence with Arabic numerals. Legends to figures should be listed on a separate page, in consecutive order. Minimum resolution for all types of graphics is 300 dpi and 600 dpi is recommended. The legend of a figure should contain the following information:

a. the word "Figure", followed by its respective number;
b. figure title containing major finding (e.g. Manuscripts which follow Guidelines for Authors had higher acceptance rate, and not Relationship with manuscripts style and their acceptance rate).

Use simple symbols, like closed and open circles, triangles and squares. Different types of connecting lines can be used. The meanings of symbols and lines should be defined in the legend.

Each axis should be labeled with a description of the variable it represents.

Only the first letter of the first word should be capitalized. The labeling should be parallel with the respective axis. All units should be expressed in SI units and parenthesized. Make liberal use of scale markings.

Graphs, charts, titles, and legends in accepted manuscripts will be edited according to ToMS style and standards prior to publication.

Preferred format for graphs or charts is xls. Graphs and charts saved as image (raster) files such as JPG, TIF, or GIF and imported or copied/pasted into Word or Power Point are not acceptable.

The resolution for photographic images should be at least 300 dpi, and minimum image width should be 6 cm. Please submit files in RGB format. For published manuscripts, image files will be posted online in their original RGB format, maintaining the full color of your original files. Note that we will still need to convert all RGB files to CMYK for printing on paper and color shifts may occur in conversion. You will not receive a CMYK proof. You can view an approximation of print results by converting to CMYK in Adobe® Photoshop® or Adobe® Illustrator®.

6.2.2.5. Authorship statement

All contributing authors must fill out and sign these statements and submit them to the Editorial Office. Accepted manuscripts will not be published until signed statements from all authors have been received.

6.2.2.6. Acknowledgments

Technical help, critical reviews of the manuscript and financial or other sponsorship may be acknowledged. Do not acknowledge paid services, e.g. professional translations into English.

6.2.2.7. References

References cited in the manuscript are listed in a separate section immediately following the text. The authors should verify all references. Usage of DOIs is encouraged.

Examples of citation in text:

It is well known fact (Strang and Nquyen, 1997; Antoniou, 2006) that FT is not an appropriate tool for analyzing nonstationary signals since it loses information about time domain.

First group of authors (Vetterli and Gall, 1989) proposed Multiresolution Signal Analysis (MRA) technique or pyramidal algorithm. Second group (Crochiere et al., 1975; Crochiere and Sambur, 1977) proposed subband coding algorithm. Legal acts are cited as in example: The Constitution of the Republic of Croatia (Constitution of the Republic of Croatia, 2010) is the main legal source for this subject matter, as well as any other subject matter relating to the Croatian legal system. References from the Web are cited in the text as (Author(s) last name, year of origin if known (year of accessed in other cases). If the author is unknown, such as in case of company web page, instead of author's name, title of the web page is used.

Examples for reference section:

Journals

Petrinović, R., Wolff, V. S., Mandić, N. and Plančić, B., (2013), International Convention on the Removal of Wrecks, 2007. – a New Contribution to the Safety of Navigation and Marine Environment Protection, Transaction on Maritime Science, 2(1), pp. 49-55., http://dx.doi.org/10.7225/toms.v02.n01.007

Pennec, E. and Mallat, S., (2005), Sparse Geometric Image Representations with Bandelets, IEEE Transactions on Image Processing, 14(4), pp. 423 – 438., http://dx.doi.org/10.1109/TIP.2005.843753

Web links

Donoho, D., Duncan, M. R., Huo, X. and Levi, O., (1999), Wavelab, available at: http://www.stat.stanford.edu /_wavelab/, [accessed 12 August 2011.].

Unknown, Wavelab, available at: http://www.stat.stanford.edu /_wavelab/, [accessed 12 August 2011.].

ToMS home page, available at: http://www.toms.com.hr, [accessed 12 July 2012.].

Books

Mallat, S., (2009), A Wavelet Tour of Signal Processing, 3rd Edition, New York: Academic Press.

Conference proceedings

Łutowicz, M. and Lus , T., (2013), Effect of Loss of Cylinder Pressure Indicating Channel Patency on Parameters Values Obtained from Indicating Graph, Proc. 5th International Maritime Science Conference, Solin, Croatia, April 22 – 23, pp. 382-389., available at: http://www.pfst.hr/imsc/archive/2013/IMSC2013_proceedings.pdf

Kingsbury, N.G. and Magarey, J.F.A., (1997), Wavelet Transforms in Image Processing. Proc. First European Conference on Signal Analysis and Prediction, Prague, Czech Republic, June 24 – 27, Birkhauser, pp. 23 – 24., available at: http://www.sigproc.eng.cam.ac.uk/~ngk/publications/ngk97b.zip, [accessed 12 August 2011.].

Regulations, standards or legal acts:

Constitution of the Republic of Croatia, (2010), Narodne novine, 2010(76), pp. (if known).

6.2.2.8. Supplementary materials

Supplementary materials are optional. Authors can submit different types of materials which will be available on-line.

6.2.2.9. Language

Authors may use standard British or American spelling, but they must be consistent. The Editors retain the customary right to style and, if necessary, shorten texts accepted for publication.

This does not mean that we prefer short articles – actually, we do not limit their size - but rather a resection of the obviously redundant material.

The past tense is recommended in the Results Section.

Avoid using Latin terms; if necessary, they should be added in parentheses after the English terms. Real names rather than "levels" or "values" should refer to parameters with concrete units (e.g. concentration).

6.2.2.10. Abbreviations

Only standard abbreviations and symbols may be used without definition and may be used in the title or the page-heading title.

Non-standard abbreviations should not be used in the title or page-heading title. They must be explained in the text in the following way: the term should be written in full when it appears in the text for the first time, followed by the abbreviation in parentheses; from then on, only abbreviation is used in the text. This applies separately to the Abstract and the rest of the text.

6.2.3. Submission of manuscripts

Paper submission via Open journal system.

Manuscripts can also be submitted to:

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