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DEVELOPMENT OF WEB APPLICATION FOR THE
ASSISTANCE OF SAFETY INSPECTIONS

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"The true value of safety is often only appreciated in its absence."

ICAO Accident Prevention Programme, International Civil Aviation Organization, 2005

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Anastasios Xiros

BACKGROUND

Shipping, under a strict technical scope, is a method of secure navigation. With this meaning, Shipping is the science and the art of successful ship navigation, which refers to the secure determination of the ship's signal, its course and the distance.

Nowadays, Shipping, apart from vessels which differ in size and type, has evolved into a complex industry, frequently referred as an "alloy" of dependent industries, i.e. oil producing industries and shipping companies. *"A major part of the shipping industry involves merchandise transport and international trade and operates in a complex global context of economic, political and social importance, among shipping companies, shippers, government organizations and other stakeholders."* (Giziakis et al, *Introduction to affreightments*, 2002).

More precisely, the core approach of the shipping market is in accordance with Rochdale Report (2007):

- The shipping market is a single industry offering marine transport services.
- Recognizes the economic and trade disputes in different parts of the shipping market.
- Recognizes the environment and demanding nature of the shipping industry.
- The shipping industry is characterized by the numerous and time consuming exchange of information.

For Greece, all the above are of great importance, since the country today is the first in the world in ships ownership, covering the 25% of global capacity in dwt (in reference Gross tonnage, from statistics Y.E.N 2005); with a significant force in ships flying the Greek flag.

PURPOSE

The purpose of this thesis is to reveal how advanced computer applications can support modern businesses, so as to operate more efficiently and effectively in due time. This goal seems difficult at first glance, but it is worthwhile to be pursued, given that new technologies in computer science have presented great improvements already.

In this thesis, the implementation of IT technologies in Classification Societies and in the Aviation Safety Management is analyzed. The central question of the study is how technology can assist the work of the inspector. The general rule to follow when someone tries to answer this question, is to have in mind that at the end of the day the inspector should be provided with the necessary tools which will enable his/her work to be conducted quickly and regardless of his/her location. Thus, initially what is essential, is an Internet connection through wireless LAN's or 3G and of course any device which can support internet browser (e.g. a laptop, PDA or even modern cell phones). However, since there is not only one person assigned with tasks, the necessity to share information should also definitely be considered.

This has been made possible by programs that are not hosted in the environment of a personal computer and in which case only one person is granted with access. In order to address this issue, the development of networked computing gave organizations the possibility to take advantage of existing IT programs, and extend those advantages to other stakeholders. Servers, a technological enhancement that is easy to manage and does not require a dedicated administrator, can provide access to personal contents to many users simultaneously. This is a good way for an inspector who is on ship, to have access to all of his data (reports, regulations etc.); to be able to fill reports at the very time of the inspection and e-mail them soon after. Moreover, by searching the database for a particular vessel, he/she can also have access to previous reports of any kind of inspection; see the history of the vessel and any remarks that have been done about it by previous inspectors.

In this direction, the objective of this study is to present an approach model, which initially will receive a backlog of massive paperwork –documents and forms that have to be filled after every inspection-; process the incoming data and prevent the user from making random mistakes and provide superiors or colleagues instant access to the final reports.

The research questions are:

- How to understand the inspector's work and its methods?
- What tools do they need, during an inspection and what is the nature of them?
- How can modern technologies assist the work of inspectors?
- How to apply these technologies and in what ways?
- How to harmonize the use of these new technologies?

ANALYSIS

Firstly, a regulation study is carried out to clarify the rules and the process of safety inspection. This study is structured on two poles; inspections which are taking place in the ship and aircraft industry. These two industries have many fundamentally common aspects and this is the reason why they can be presented along. It must not be set aside that they are both, the two major means of transportation when referring to cargo or passengers.

Continuing this theoretical part, the programming language, in which the program has been written, is presented. The choice of the programming language has been made, given the certain advantages offered by this kind of programming, -so called web development advantages- which will be described without getting into many details, to avoid confusing the reader. Thus, the focus will be on analysing the structure of this program, its innovative nature compared to the existing system and on revealing its unique advantages.

Moreover, the case study of the thesis highlights the benefits of the application; with a demonstration of how to log in and operate the program, in order to fully exploit the advantages of its utilities.

Moreover, a database has been created. In this database, sample reports and data of imaginary situations have been used, to indicate that it is easy in use; it has a user friendly graphical interface and presents a visual understanding of its possibilities. At the conclusions' section along with some key issues raised for the prior analysis, future developments of this program are proposed. Based on the study, these developments will address even better the needs of the inspectors. These enhancements will provide more efficient support to each inspection and consequently improve performance.

EXECUTIVE SUMMARY

This thesis, which is divided into five sections, is an attempt to present to the reader a more spherical scope about safety inspection carried out in ships and aircrafts and how IT Technologies can be implemented on these procedures. This study examines how a data storage and retrieval web application can enable the work of Safety Inspectors, in order to increase their efficiency and accuracy.

In the first section, the process of Maritime Inspection is being analyzed thoroughly. After a brief description of how Maritime Inspection is defined and structured, a detailed listing of the steps of the process that the inspector goes through during the inspection, follows. It also includes what should be checked and what to do or who to communicate with after each check is completed.

In the following section, the study describes the inspection process as applied on aircrafts. Rather than making an in depth analysis, this study focuses more on presenting the main aspects in aviation inspections and which areas demand more attention.

In the third section, the programming language (Ruby on Rails), which is used to develop the web application, is presented. Following the brief historical presentation of the language's evolution, the main ingredients which constitute the spine of the programming language are described. These technologies are the reason why Ruby on Rails is considered to be the quickest evolving language written for web applications. Moreover, this study makes a direct comparison of the most prominent programming languages at the time and justifies its selection based on the superiority of the attributes that it offers.

Finally, a case study is presented to suggest, how to utilize modern technologies in Safety Inspections. More precisely, two web applications are presented; one based upon Maritime Inspections and the other based upon Aviation Inspections. This description includes screenshots of both applications, each one accompanied with a brief analysis. These analyses demonstrate the main functions of the program and the web application design decisions – for instance, the various layouts or additional features which aim in making the whole process easier to familiarize for the user.

Keywords: Ruby on Rails, Object – Oriented, Ajax, RESTfull, Classification Societies, Civil Aviation, Safety Inspection.

ΠΕΡΙΛΗΨΗ

Η παρούσα διπλωματική, η οποία χωρίζεται σε πέντε μέρη, είναι μια προσπάθεια να παρουσιάσει στον αναγνώστη μια πιο σφαιρική άποψη των επιθεωρήσεων ασφαλείας, η οποίες διεξάγονται πάνω σε πλοία και αεροσκάφη και πως οι IT τεχνολογίες μπορούν να εφαρμοστούν σε αυτές τις διαδικασίες. Αυτή η εργασία εξετάζει, πώς μπορεί μια διαδικτυακή εφαρμογή αποθήκευσης και ανάκτησης δεδομένων να συνδράμει το έργο των επιθεωρητών ασφαλείας, ούτως ώστε να αυξήσει την αποτελεσματικότητα και ακρίβεια.

Στο πρώτο μέρος η διαδικασία των Ναυτικών Επιθεωρήσεων αναλύεται διεξοδικά. Μετά από μια σύντομη περιγραφή του πως ορίζεται και δομείται μια Ναυτική Επιθεώρηση, ακολουθεί μια λεπτομερής καταγραφή των σταδίων όλης της διαδικασίας που οφείλει να ολοκληρώσει ο επιθεωρητής κατά την επιθεώρηση ενός σκάφους. Πιο συγκεκριμένα, η ανάλυση περιλαμβάνει τα στάδια, που πρέπει να ελεγχτούν και το τι πρέπει να κάνει ή με ποιον πρέπει να επικοινωνήσει ο επιθεωρητής, μετά από την ολοκλήρωση κάθε ελέγχου.

Στην επόμενη ενότητα, η μελέτη περιγράφει τη διαδικασία ελέγχου όπως αυτή εφαρμόζεται στα αεροσκάφη. Αντί να γίνει μια σε βάθος ανάλυση, η μελέτη εστιάζεται περισσότερο στο να αναδείξει τα κύρια θέματα στις επιθεωρήσεις της Πολιτικής Αεροπορίας και ποιοι τομείς απαιτούν περαιτέρω προσοχή.

Στο τρίτο τμήμα παρουσιάζεται η γλώσσα προγραμματισμού (Ruby on Rails), που χρησιμοποιείται για να αναπτυχθεί η δικτυακή εφαρμογή. Μετά την σύντομη ιστορική παρουσίαση της εξέλιξης της γλώσσας, τα κύρια συστατικά που αποτελούν την ραχοκοκαλιά της γλώσσας προγραμματισμού περιγράφονται. Οι τεχνολογίες αυτές είναι και ο λόγος γιατί η Ruby on Rails θεωρείται ότι είναι η ταχύτερη εξελισσόμενη γλώσσα προγραμματισμού, σχεδιασμένη για δικτυακές εφαρμογές. Επιπλέον η μελέτη αυτή, προβαίνει σε σύντομη σύγκριση των κυρίαρχων γλωσσών προγραμματισμού που είναι διαθέσιμες σήμερα, με εκείνη που χρησιμοποιήθηκε στην παρούσα εργασία και έτσι δικαιολογείται καλύτερα η επιλογή της, καθώς γίνεται ξεκάθαρη η ανωτερότητα των ιδιοτήτων της.

Τέλος, μια μελέτη περίπτωσης παρουσιάζεται για να δείξει πως μπορούν αυτές οι μοντέρνες τεχνολογίες να εφαρμοστούν στις Επιθεωρήσεις Ασφαλείας. Πιο αναλυτικά, δύο δικτυακές εφαρμογές παρουσιάζονται – μια βασισμένη στις Ναυτικές Επιθεωρήσεις και η επόμενη στις Επιθεωρήσεις της Πολιτικής Αεροπορίας. Στην ανάλυση έχουν περιληφθεί και φωτογραφίες

από τη λειτουργία των δύο εφαρμογών, ώστε να παρέχεται μια πιο ολοκληρωμένη εικόνα στον αναγνώστη. Στόχος είναι να παρουσιαστούν οι κύριες λειτουργίες του προγράμματος και οι επιλογές στην σχεδίαση της εφαρμογής – όπως για παράδειγμα, η διαρρύθμιση ή τα πρόσθετα χαρακτηριστικά – με τρόπο που να κάνουν την όλη διαδικασία της εξοικείωσης με το πρόγραμμα όσο το δυνατό πιο εύκολη.

Λέξεις κλειδιά: Ruby on Rails, Object – Oriented, Ajax, RESTfull, Νηογνώμονας, Πολιτική Αεροπορία, Επιθεώρηση Ασφαλείας.

CHAPTER 1

Maritime Safety Inspections

Introduction

In this chapter, a detailed description of the process Maritime Inspectors go through for the completion of a Safety Inspection follows. Firstly, explicit and up to date presentation of the basic definition and categories of Maritime Inspections, are presented to ensure that the reader will be able to comprehend the significance and more importantly the notion of inspections in vessels. The analysis continues with the accreditations needed for the inspector to enter the vessel, along with a description of the safety reports standard layout, and concludes with all the main elements, which consist a Safety Inspection, and need to be checked thoroughly.

1.1 DEFINITION

A Safety Inspection, in general, is defined as the implementation of a structured examination or an official evaluation. Either an object (i.e vessel, aircraft etc.) or an activity can be subjects of a Safety Inspection; which involves the measurements, tests, and devises applied to certain characteristics of them. The results must fulfill the particular requirements and standards for deciding, whether the object or activity is conforming to these rules. Nowadays the great majority of Inspections that carried out, are usually non-destructive.

A Non-Destructive Examination (NDE) or a Non-Destructive Testing (NDT) is referred to technologies which are utilized for examining materials for either inherent flaws or damage from use. The most commonly applied methods are listed below:

- visual, liquid or dye penetrant inspection;
- magnetic-particle inspection;
- radiographic testing;
- ultrasonic testing;
- eddy-current testing;
- acoustic emission testing;
- thermographic inspection.

1.2 PURPOSE OF SAFETY INSPECTIONS

As previously described, a safety inspection on a ship or aircraft is a thorough examination of guarantying their structural integrity and a safe work environment for those operating on them. Its purpose is to detect and record existing and potential hazards, which can be corrected before an incident occurs. Safety inspections must be carried out on a regular time basis. The existence of a well thought safety inspection program is the key element to a successful safety management system. Conducting regular safety inspections should be a part of every manager's performance evaluation. Also, by following the inspection processes, a safe work environment shall be attained.

1.3 SCOPE

Safety Inspections follow some guidelines that provide the adequate information to the inspector in order to perform routine safety inspections. In addition, they require a general format to be respected by all inspectors. Although they may differ depending on the object of inspection, these guidelines are structured in the same way and are based on the following question. In general they include: what to inspect; inspection checklist; how and when to conduct inspections; who should inspect; inspection guidelines; organizing inspection results; communicating inspection results; and conducting follow-ups.

1.4 CATEGORIES OF MARITIME INSPECTIONS

It is mandatory to make a brief overview of different types of inspections (surveys), or requirements relating to the requirements imposed by the Classification Societies, before addressing, in detail, on the specific types of safety inspections done on ships. Inspections carried out on a ship can be broadly divided into the following two categories:

- Those performed by or in the presence of inspectors (surveyors) on behalf of a Classification Society, in order to evaluate the ship's condition and license a license a certificate of ability. These inspections are compulsory.
- Those performed by or on behalf of owners (owners surveys), by inspectors who are either responsible on a continuous basis for the monitoring of the vessel's condition or invited to do so in a particular case. In this category are, also, included inspections conducted on behalf of marine insurance.

1.5 INSPECTIONS ON BEHALF OF SHIP-OWNERS

An inspection can be requested in many cases and mostly for diverse reasons. Inspections requested by ship-owners are, generally, divided in four categories:

- Inspection on behalf of marine insurance: most of the time, it is performed during the ship repair. Its purpose is to indicate the percentage of the total cost of the repair, which must be covered by marine insurance.
- On hire inspection: it aims to determine whether the ship is able to meet the terms of the charter-contract and the carriage of goods, which will be chartered for. Its purpose is not considered in relation to the requirements of specific regulations, but to obtain an overall picture of the ship and its future development, with corresponding financial implications.
- Off-hire inspection: it refers to the evaluation of the ship, made after the end of the voyage (voyage charter) or the expiration of the charter-contract.
- Sale and Purchase inspection: it shares the same purposes to the previous one and is conducted by the marine superintendent of potential buyers or an independent certified inspector.
- Life Extension inspection: it presents a new category of inspections which see to the assessment of ships approaching the maximum age and of the potential extension of it. The special feature of these inspections is that they not intended to the extraction of a class license, although they are carried out by the Classification Society.
- Damage Inspection: its purpose is mainly to indentify and record the damages of the ships metal construction without needing to assess the way they occurred and who is responsible for them.

Prior to an inspection, the marine superintendent -representing the ship-owner-, the staff of the shipyard, the inspection team and, where possible, the inspector, must clarify the purpose of the inspection and make sure that the equipment are ready and the ship is prepared for testing.

In general, the inspection team should check the status of ship's metal construction and the corrosion monitoring system. Moreover an overview of the history record of the ship and its sister ships must be carried out in order to be prepared for common problems which are going to encounter. They should, also, be equipped with plans of typical components of the ship's metal construction (e.g. section grids, bottom plates etc.), so that each problem to be recorded and measured ad hoc. Before the inspection, a meeting with the Master is needed, so as to discuss access issues, planning, etc.

1.6 COMPULSORY INSPECTIONS

As already mentioned, compulsory inspections are performed usually by a Classification Society, in order to determine the ship's condition and issue the necessary certificates, assuring that it can operate legally and with the required security. In Table 1 all the compulsory inspections, which must be carried on any ship, are registered. It is noticed, that in general the requirements of all Classification Societies are similar. Thus, this chapter is analyzed through a general reference to the necessary inspections and requirements without referring to any particular Societies.

<i>Compulsory Inspections</i>
1) Annual Hull and Machinery Surveys
2) Intermediate Surveys
3) Docking Surveys
4) Special Surveys of Hull and Machinery
5) Boiler Surveys
6) Propeller Shaft Surveys
7) Enhanced Surveys

Figure 1: Compulsory Inspections.

1.6.1 ANNUAL HULL AND MACHINERY INSPECTIONS

The annual inspections should be conducted once a year, scheduled three months before or after the date of the Special Inspection. During the annual inspection, the following features must be in line with the satisfactory conditions of the inspection. Thus in good condition must be checked the:

- details of the metal construction of the ship, such as the plates of the main deck and superstructure, etc.
- means which ensure the impermeability of the cover-holds.
- piping and valves for the disposal of fluids from bilges, machinery spaces and cargo holds.
- handling equipment on deck, such as cranes and anchoring equipment, as winches, etc.
- auxiliary machinery equipment, such as pumps, power generators and distribution systems of electricity, communication with the

bridge, etc. Particular attention is given in order to eliminate risks that could cause a fire.

- systems of automation in the engine room, particularly in engine without crew (unattended machinery spaces, UMS), in inert gas systems in tankers, in fire detection systems, etc.
- identification of the freeboard marks on the sides of the ship. In particular, in dry bulk cargo ships there must be an internal inspection of cargo space holds. Also in tankers there must be a detailed inspection of all the cleaning equipment for the cargo tanks, the piping networks for possible leaks and the fire systems (foam, sprinklers, etc.).

1.6.2 INTERIM INSPECTIONS

Interim Inspections are conducted in instead of the second or third Annual Inspection. The requirements are the same as the ones of the Annual Inspections and depending on the age of the ship, the additional checks are listed below.

- For ships constructed from five to ten years ago, a general internal inspection is required. The emphasis is given to water-ballasts tanks. The tanks may be in the double bottom or to other independent places. If the inspection does not identify any visible problems, the inspection ends. If extensive corrosion or some other damage is found then more ballast tanks of the same type must be checked.
- In ships of over ten years is, also, required that an internal inspection of the above water-ballast tanks is performed. If case of unacceptable condition to the metal construction or the corrosion protective system a more detailed internal inspection is required.

In particular, for dry bulk cargo ships over 5 years additional checks should be made:

- Overall Inspection: it takes place to all the ship's cargo holds.
- Close-up Survey: it requires two holds that are thoroughly inspected, keeping in mind that one of them should be the bow cargo hold. Particular attention is paid to the situation of transverse bulkheads, sections and the links between them.

Moreover, in dry bulk cargo ships of over 15 years, all the cargo holds must be inspected.

For tanker ships between 5 to 10 years is required:

- Inspection of the cargo piping network and cleaning them from crude oil, fuel, steam, water-ballast and reassurance of ventilation in weathertight decks.
- General inspection of electrical equipment and cables mainly located in dangerous areas, which could endanger the safety of the ship and its occupants.

In tankers over 15 years additional checks are required:

- Inspection of the control mechanisms of anchoring and especially to anchors.
- Internal inspection of a bow and a stern tank.
- Inspection of the mechanical equipment, bilges and empty tanks, propulsion systems and fire protection systems.

In sum, it comes forward that, Annual and Interim Inspections are the most important of compulsory inspections and thus presented in detail. Under this scope, the aim to form a solid understanding of the standard definitions and of inspection has been achieved. However, further analysis to the other types of compulsory inspection should be done and would be more beneficial; but in purpose no reference has been made in order to keep analysis simple and avoid confusing the reader.

1.7 SHIP CLASSIFICATION

The scope of a Classification society in shipping business is to assure the seaworthiness of a vessel during the course of its lifetime and that remains so, based on certain rules and regulations that have to be respected. Each recognized classification society applies its Rules and Regulations, based on high quality standards, in order to insure the protection of life, property and the environment.

1.7.1.1 CLASS CERTIFICATION

The procedure for a vessel to be transferred in a class is the following:

- Submission of application form
- Submission of technical documentation

After completion of this procedure a class survey should be carried out. The results of this survey will affect the issuance of the class certificate of the vessel. This certificate does not imply an express warranty of safety fitness for the seaworthiness of the ship, but it is an attestation stating that the vessel complies with the standards that have been developed by the Rules & Regulations of the Classification Society.

1.7.1.2 AFTER CLASSIFICATION

During vessel's service life under a class, surveyors conduct periodic surveys to assure the maintenance of the vessel under the Classification Society's Rules and Regulations. Surveyors are also ready to attend or consult repairs and modifications as appropriate to assure that work conforms to these Rules and Regulations.

1.7.1.3 WITHDRAWAL OF CLASS

When a ship falls under any of the following cases, the society can decide to withdraw the classification and registry of the ship upon the approval of the Classification Committee when:

1. the Owners apply for the withdrawal of classification.
2. the required surveys for the continuation of classification have not been duly carried out in due date.
3. the society considers that the ship has not passed the survey in accordance with the rules.
4. the Maritime Administration due to sinking, dismantling, etc, cancels the registry of the ship.
5. the fees for the surveys are not paid.
6. the Owner fails to fulfill the Surveyor's recommendations.
7. any damage to the ship is to such an extent as affecting her class and is not repaired, or the ship has been altered without approval of the Society
8. the loading of the ship exceeds the load line assigned by the Society, or the freeboard marks have been placed higher on ship's sides than the position assigned by the Society.

1.7.2 SHIP CERTIFICATION

A Classification Society acts as an independent, private, common wealth oriented organization performing statutory activities. Inspection of ships and issuing of statutory certificates is strictly based on the following International Conventions:

- *International Convention on Load Lines 1966 (LL 1966)*
- *International Convention for the Safety of Life at Sea, 1974 (SOLAS 1974)*
- *International Convention for the Prevention of Pollution from Ships 73/78 (MARPOL 73/78)*
- *International Safety Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code)*
- *International Ship & Port Facility Security Code (ISPS Code)*
- *Code of Safe Practice for Solid Bulk Cargoes (BC Code)*
- *International Grain Code (Grain Code)*
- *Bulk Chemical Code (BCH Code)*
- *International Bulk Chemical Code (IBC Code)*
- *Gas Carrier Code (GC Code)*
- *International Gas Carrier Code (IGC Code)*
- *High Speed Craft Code (HSC Code)*
- *International Convention on Tonnage Measurement of Ships, 1969 (TM 1969)*
- *Convention on the International Regulations For Preventing Collisions at Sea (COLREG)*
- *Crew Accommodations, ILO Convention 92,153*
- *Cargo Gear, ILO Convention 152*
- *Minimum Standards in Merchant Ships, ILO Convention 14*

1.7.3 ISM

ISM (International Safety Management) Code is the International Management Code for the Safe operation of ships and for Pollution Prevention. ISM Code, adopted by the international Maritime Organization through Resolution A.741(18), aims to ensure safety at sea, prevention of human injury or loss of

life, and avoidance of damage to the environment, particularly the marine environment, and to the property.

The Code requires that all ship-owning companies who manage the following types of vessels develop, implement, and maintain a Safety Management System.

- Passenger ships, including passenger high-speed craft, since July 01st, 1998
- Oil tankers, chemical tankers, gas carriers, bulk carriers and cargo high-speed craft of 500 gross tonnage and upwards, July 01st, 1998
- Other cargo ships and mobile offshore drilling units of 500 gross tonnage and upwards July 01st, 2002

Based on the adoption and foreseen aims of the Code is easy to understand that implementing a Safety Management System the company reaps benefits as follows:

- 1) Reduced chances of human error.
- 2) Improved communication and feedback.
- 3) Fewer personal injuries.
- 4) Reduced risk of pollution.
- 5) Safer cargo handling and carriage.
- 6) Reduced risk of accidents.

Once a company has developed and implemented its Safety Management System, an independent third party company authorized by the administration of the vessel's flag state must audit it. If the company is found to comply with the requirements of the ISM Code, a Document of Compliance (DOC) will be issued. Then each vessel operated by the company must be audited. If the vessel is found to be compliant, a Safety Management Certificate (SMC) will be issued. In addition, the Classification Society's activities do not end on the basis of auditing and certifying ships and companies under ISM Code, but also address to the fields of advising the companies, on the proper ways for improving their managing system.

1.7.4 ISPS

Following the events of September 11th, 2001 that took place in New York, USA, apart from the safety of human life at sea and prevention of pollution of

the environment another sector of paramount importance to the operation of a ship or a port facility has entered. This sector is the maritime security.

For this reason the Diplomatic Conference on Maritime Security held in London in December 2002, adopted new provisions in the International Convention for the Safety of Life at Sea, 1974 (SOLAS) and International Ship and Port Facility Security (ISPS) Code to enhance maritime security.

The main objectives of the ISPS Code are as follows:

- to detect security threats and implement security measures
- to establish roles and responsibilities concerning maritime security for governments, local administrations, ship and port industries at national and international level
- to collate and promulgate security-related information
- to provide a methodology for security assessments so as to have in place plans and procedures to react to changing security levels

For the purpose of achieving these objectives this Code requires ship and port facility staff to:

- gather and assess information
- maintain communication protocols
- restrict access, prevent the introduction of unauthorised weapons, etc. provide the means to raise alarms
- put in place vessel and port security plans and ensure training and drills are conducted.

This Code applies to the following types of ships engaged on international voyages; Passenger ships - including high-speed passenger craft, Cargo ships - including high-speed craft of 500 gross tonnage and upwards, Mobile offshore drilling units.

When ISPS Code apply to the prior type of ships, Classification Society, which are certified to act as Recognized Security Organizations (RSO), are issuing International Ship Security Certificates, carrying out security plan approvals and verification audits for ships entitled to fly its flag.

In addition, they are able to advise the companies on security issues that might occur during the vessel's Security Assessment or implementation of the Ship's Security Plan.

1.7.5 INSPECTION AND AUDITS

Ship-owners, who decide to have their ships under a classification society, enjoy class and statutory certification services, in accordance to continuously updated, Rules and Regulations in the following fields:

1. Annual, Intermediate and Special surveys covering Hull certificate.
2. Annual, Intermediate and Special or Continuous surveys covering Machinery certificate.
3. Dry-Docking Surveys.
4. Shaft Surveys.
5. Boilers & Pressure Vessels Surveys.
6. Refrigerating Installations Surveys.
7. Occasional Surveys due to damage, Port State Control interventions, implementation of new Regulations, Conversions or Repairs etc.
8. Statutory surveys covering individual Conventions requirements relating to: Load Lines, Tonnage Measurement, Passenger Ship Safety, Life Saving Appliances, Fire Protection, Fire Detection and Extinction, Radio Equipment, Grain Loading,
9. Marine Pollution Prevention, Collision Prevention, Liquefied Gas Carrier, Chemical tankers etc.

Technical Support, based on International Maritime Conventions and Port State Controls requirements, is offered to ensure the seaworthiness and smooth operation of classed vessels.

A survey schedule is required by ship-owners in order to be able to control their vessels. In *Figure 2* a typical survey program for five years is displayed. It is based on International Maritime Conventions and Classification Society's Rules and Regulations, which are, always, adjusted to vessel's type and needs.

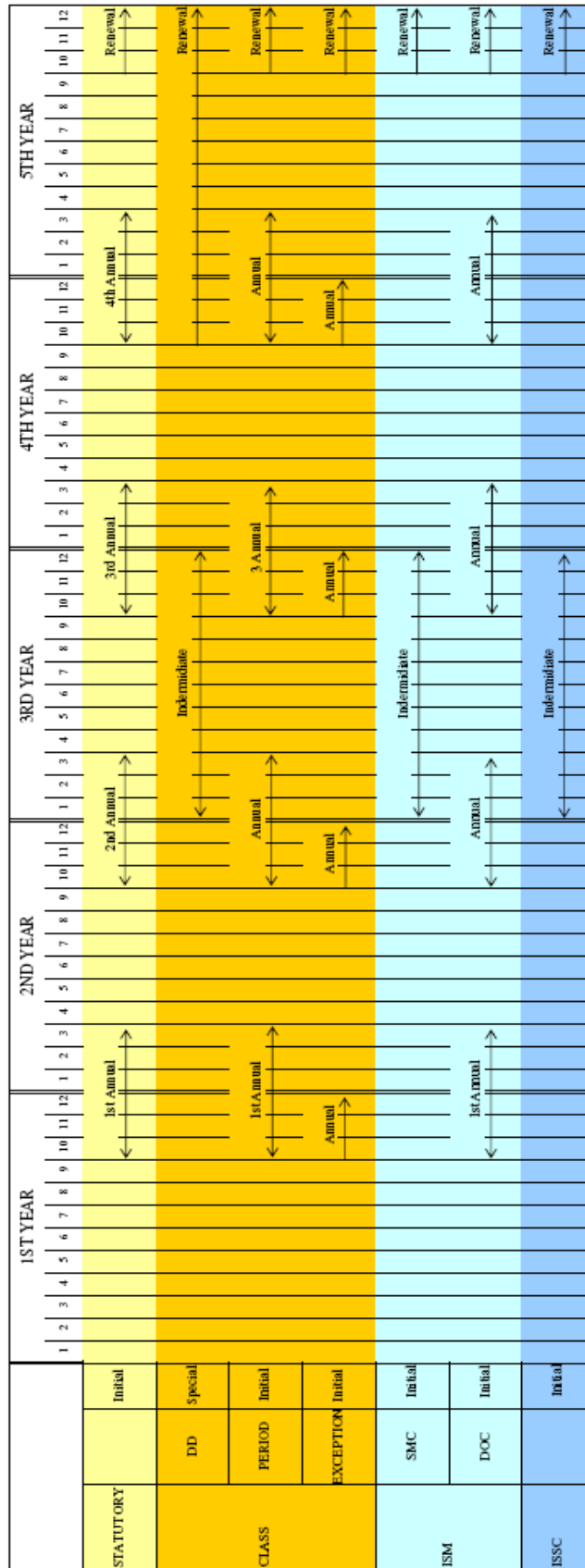


Figure 2: Time schedule of Class Inspections.

1.8 MARITIME SAFETY INSPECTION PROCEDURE

The prior presentation of Maritime Inspections illustrated an overview of how they are structured. In addition to that, a more detailed analysis will follow, in order to assist the reader to a more in-depth comprehension of the Maritime Safety Inspection process. This way, all aspects of it will become clearer and will give greater emphasis on the difficulties encountered.

1.8.1 MARITIME INSPECTOR CONTRACTS IDENTIFICATION CARDS AND MATERIALS

Maritime Inspectors are provided with a standard contract for inspection services that is valid most frequently for a period of three years. Maritime Inspectors are selected based on their qualifications including professional experience, training/education work history, certificates, etc.

Maritime Inspectors in coordination with the Administration's Office are expected to fulfill all duties described in their contract, including conducting ship inspections, investigations and reporting the findings. The duties of a Maritime Inspector should be in accordance with the applicable maritime regulations of the Classification Society they work for.

Before boarding a vessel for inspection an I.D. card is issued to authorize the Maritime Inspector. The Administration also provides publications, and expendable supplies that is necessary for them to perform their duties. All material provided to the Inspectors remains property of the Administration, and they agree to return it, except for the expendables.

Maritime Inspectors need to be provided with Internet Access and other computer capabilities such as the Administration's website where they are able to find and download all necessary forms and information in order to perform their work adequately.

1.8.2 BOARDING OF VESSELS

All Inspectors are strongly advised to contact Marine Safety or local Regional Officer-in-Charge prior to conducting a maritime inspection on a vessel in order to avoid double scheduling of an inspection of a particular vessel.

Whenever possible, it is highly recommended that the Inspector liaise with the vessel's local agent well in advance of the ships arrival. The agent must notify the Master of the scheduled inspection and if necessary, advise the Inspector of

changes in the ETA. Maritime Inspectors are urged, whenever possible, to board vessels for inspection immediately after arrival unless the vessel is in port for an extended time period. Based on the guidelines as specified in the in the Classification Society, all crewmembers should be on board and the ship fully operational. Before beginning the inspection the Maritime Inspector is expected to present his or her I.D. Card to the Master of the vessel.

Upon completion of the inspection, the Maritime Inspectors are urged to notify the Marine Safety about the inspection date of the vessel in order to preclude an inadvertent inspection of the same vessel at a different port.

1.8.3 COMPLETION OF REPORT OF SAFETY INSPECTION

There are specific inspection forms that must be filled out in a certain unified way to assist the easy comprehension of the reader. The most common format, followed by the majority of the Classification Societies, is described below:

Heading. Firstly the geographic port name must be cited. This is not to be confused with the name of a terminal within a port area. However in case of offshore areas, the field or the regional area must be specified. The Maritime inspector must then complete the date and type of the present inspection, the last prior inspection and the next port of call. All dates should be expressed with the day and year in numbers and the month by the first three letters of the month. For example June 10, 2001, should be depicted as 10 Jun 01.

General Information. The name of the vessel should be preceded by the abbreviation "m.s." (Motor screw), "s.s." (Steam screw) or "n.p." (Non-propelled), etc. After that the vessel's Official Number must be filled in. The "Vessel's Flag State" should be filled as registered in the Classification Society. At the following stage, the ship's type is required as it appears on the certificate of registry (it must be indicated if the vessel is a tank vessel, i.e. , product tanker, crude tanker, chemical tanker, gas (LNG, LPG) tanker, general cargo, bulk carrier, container ship, passenger ship, etc.

Additional required fields are the vessel's Call Sign, the year the vessel was built, the vessel's Classification Society, the IMO Number, Gross Tons and Deadweight Tons.

In case of an emergency situation it is also required to complete the contact information of the managing owner, operator or bareboat charterer of the vessel (name, address, telephone, telefax).

The final required field is the operational status of the vessel at the time of inspection.

1.8.4 SHIP'S DOCUMENTS - STATUTORY CERTIFICATES

The inspector is responsible for entering the expiration dates and dates of issuance or last endorsement of all certificates in the corresponding fields. A certificate is considered invalid after the expiration date passes or is to become invalid unless the mandatory annual survey is realized within the prescribed "range dates" as specified in the particular Classification Society. Normally more than three months need to intervene between the dates the certificate ceases to be valid unless a short term certificate or extension is issued by class. However, short term or interim certificates are not valid for more than five months.

All inspectors have to be aware of the Revised Part A of the Safety Inspection Report form where all statutory international convention certificates for different types of vessels are mentioned.

It is necessary that Part A is completed correctly. The particular guidelines that need to be followed are:

- "Expiry Date": The date that appears on the certificate, unless there is an official extension issued by the appropriate Classification Society)
- "Issue Date": The date of a new certificate before the annual authorization or mandatory annual survey, have incurred.
- "Date of Endorsement": The most recent date shown on the back of the certificate which indicates that it has been endorsed for a mandatory annual survey.

The specific certificates each type of ship must have on board are listed in Part A. It's a total of 14 certificates but it depends on the type of the vessel which of them are required. The different types of vessels are:

- Passenger ship - it carries more than 12 passengers.
- Cargo ship - a ship subject to SOLAS (except for passenger ship). This term refers in Oil Tankers, Chemical Tankers and Gas Tankers, bulk carriers(cargo ships primarily designed with a single deck, single sides, topside tanks and hopper tanks in cargo spaces and intended to carry dry cargo in bulk) and includes ore carriers and combination carriers. It is remarkable that general cargo, container, RO/RO type cargo ships are required to hold an ISM Code SMC on and after 1 July 2002.
- MODU - a self-propelled drill ship and non-self propelled drilling unit.

1.8.5 PUBLICATIONS

The inspector is responsible for checking that the listed publications are on the vessel and since they are numerous he or she must be extremely careful.

- Combined Publications Folder (MI-300). It now circulates in a CD format. A revised edition is issued every one to two years. The Maritime Inspector has to check if the latest series are on board and enter the relevant dates appropriately.
- Articles of Agreement. The official form must be consistent and updated with an indication of the last entry checked.
- International Safety Guide – Applicable only for Oil Tankers and Terminals.
- ICS Tanker Safety Guide (Chemicals) - only required on Chemical Tankers.
- Cargo Record Book for Chemical Carriers. Issued by the applicable Flag State. The inspector checks that it is kept on board of chemical tankers and the date of the last entry.
- Oil Record Book. The specific format is described in appendix III to Annex I of MARPOL. The Inspector checks the whether all instructions were followed when completing the form. Tankers must carry separate oil record books for machinery space and cargo/ballast operations. Inspectors must also ensure whether an official Oil Record Book is carried on board. If not, the Master should obtain an Oil Record Book or Books promptly, as required by the applicable Flag State regulations and MARPOL '73/78.
- IMO International Maritime Dangerous Goods (IMDG) Code. It is mandatory on general cargo/break bulk ships, container ships, Ro/Ro ships.
- MARPOL 1973/78.
- MI Marine Notice 2-013-8.
- IMO IAMSAR Manual.
- 11 SOLAS Consolidated Edition.
- Shipboard Oil Pollution Emergency Plan (SOPEP)/Shipboard Marine Pollution Emergency Plan (SMPEP) - endorsed by Flag State or Classification Society.
- Garbage Management Plan and Record Book.
- ICS Tanker Safety Guide (Liquefied Gas) - required only for Gas Carriers.
- Cargo Securing Manual (CSM) - required for cargo ships carrying other than bulk liquid or bulk solid cargo.
- IMO Code of Safe Practice for Timber Deck Cargo - only required on vessels that carry timber deck cargoes.
- IMO International Code of Signals.

It is noticed that the latest editions of above mentioned and out-of-date publications should be removed to avoid any confusion must be on board. For missing or outdated publications the Master should consult the appropriate Marine Notice that explains how to obtain forms and publications.

1.8.6 MANNING

Concerning the manning of the ship's crew there specific steps to follow:

- All crew members should be on board at the time of the inspection. If there are any absentees they must be listed by their ranking order. Moreover, all relative Flag State GMDSS Certificates must be available.
- A Noncompliance Contravention Citations to the Master can be issued, if necessary, and a copy of that should be added to the report. Given this the Master should be aware that potential fines could be imposed.

1.8.7 OFFICER CERTIFICATES OF COMPETENCY

In order to fill in this part of the report, the actual Flag State certificates of competence must be used accordingly for the names of the officers. The rest of this section should be completed with information derived from all original documents.

Section .1 Senior Officers: the Master, the Chief Mate and the Chief Engineer. A vessel is not permitted to sail unless these officers need to have at their disposal a valid Certificate of Competence, or CRA or a valid facsimile authorization, each containing the certificate number assigned to that officer. The appropriate documents should be submitted by the officers, otherwise a Detention Order is to be issued and only removed after compliance is ensured.

The grade certificate must be sighted. In the case of an engineering officer, additional indication is required for qualification for steam or motor or both. It should be indicated that if the original certificate is not strung and or available and whether certificates are posted as required by Flag State regulations.

Section .2 In this section there is a list of the officers' names not having valid Flag State certificates of appropriate rank, holding invalid certificates or no certificates at all.

A Noncompliance Contravention Citations to the Master can be issued, if necessary, and a copy of that should be added to the report. Given this the Master should be aware that potential fines could be imposed. (*Appendix I-1, I-2, I-3*)

1.8.8 SEAFARERS' IDENTIFICATION AND RECORD BOOK

It is an important stage of the procedure, which requires that the inspector must verify certain qualifications of the crew by examining their certifications. In detail:

- The inspector must mention whether all officers and crew members are holding a valid Flag State Seafarer's Identification and Record Book.
- After inspecting the Flag State ID books The Maritime Inspector must specify the number of persons who hold Special Qualifications. This must include Tankerman Special Qualifications where applicable.

The STCW Convention (1978) has introduced new certified Tankerman requirements in management level applicable to Master, Chief Mate, C/E, 1 A/E; Operations level-officers in charge of cargo watch, 2nd, 3rd Mates. All must be qualified person-in-charge (P-I-C) for the appropriate type of cargo corresponding to the Tankerman certificates.

Support Level - Ratings assisting in cargo operations. (*Appendix I-3*)

- 3. A Noncompliance Contravention Citations to the Master can be issued, if necessary, and a copy of that should be added to the report. Given this the Master should be aware that potential fines could be imposed.

1.8.9 MEDICINE CHEST AND MEDICAL PUBLICATIONS

The IMDG Supplement is suggested for all ships except those that transport a full time medical staff such as Passenger Ships. The Maritime Inspector should ensure there is a Medicine Chest and that the instructions on administration of the drugs included are in language that all can understand. That is, of course, not required in ships with a full time doctor.

Every ship is mandatory to have assigned medical care personnel in action. The incorporation of the onboard certification, as proper documentation is based on the fact that it is a Special Qualification signed by the vessels Flag

Administration, e.g. a Certificate of training, or a notation on a National License, or a Seafarers' Identification from one of the Flag Administrations signatory to STCW, or even completion of training from an acknowledged school.

In the case of ship hospitals reassurance is required that the only purpose of usage is exclusively for medical purposes.

The Master is required to assign a person or committee to be in charge of Accident Prevention. The Committee should include:

- A medical Person In Charge
- A medical First Aid Provider

All officers and crew should have acquired an up-to-date physical medical examination certificate in the past 2 years. The inspector should check the crew for any members who possess certificates dated more than 2 years old.

1.8.10 ACCOMMODATION INSPECTION (REQUIRED UNDER ILO CONVENTIONS)

A visual inspection of crew accommodation conditions should take place along with the inspection of the vessel. It can be done in parallel when the inspector is conducting the safety equipment examination within the accommodations. Items to be checked on the spot should include:

- Interior finishing and decoration – the conditions and cleanliness levels need to be assessed as well as the insulation mainly on the ship's side and deckhead.
- Ventilation – a check for efficiency and prevention of any obstructions.
- Lighting - a check for efficiency, missing or broken equipment and guards.
- Access and Escape Arrangements – they must be clear of obstacles, easy to access and clearly marked.
- Sanitation – toilets and bathrooms must be checked for appropriate water supply and general cleanliness and sanitary/soil pipes for condition and leaks. A check for insect/rodent infestation should be conducted too.
- Drinking Water – a check for adequate supply and infrastructure.
- Galleys – a check for cleanliness and general situation. More thorough examination of the cleanliness levels of the galley range hood and

grease traps is required. The fire suppression system must be checked too.

- Stowage of Ship's Stores or Equipment in Crew Spaces – these are banned. Additional verification is required.
- The training, maintenance and crew familiarization manuals must be checked that are in use. (*Appendix I-3*)

1.8.11 LOG BOOKS AND RECORDS

Flag State vessels do not require a standard official National form of the Bridge Log Book. However detailed data requested by the Flag State and International regulations should be entered in such a log. If requested, the Master should give information on all entries made in the Log Book of significance. In specific entries regular inspections on a weekly and monthly basis and maintenance of all lifesaving equipment must be examined as well as emergency general alarm and line throwing apparatus and steering gear, emergency steering drill, emergency generator etc. tests should be run. An extra test for regular use of the Master's night order book or the Master's standing orders must be done.

Engine/Bridge Movement Records. On vessels equipped with a data logger or engine movement recorder, this record should be preserved to keep track of all orders passed between the Navigation Bridge and Engine-room. Where an automatic recorder is installed, inspector must check that it is operational and that it records time and movements with accuracy. A separate Bell Book/Bridge Movement Book is not required if the engine orders are included in both the Deck Log/Engine Log.

Dates and details of boat drills, fire, emergency drills and other onboard training shall be recorded in the log. If practice sessions, drills and training are not organized there should be provision and for an extensive training program to be scheduled.

A record of work and leisure hours must be kept. This record must be available to the Inspector for a thorough examination. Watch schedules are required to be published onsite and particular attention needs to be paid to the instructions for completing and posting it.

1.8.12 NAVIGATIONAL AIDS/EMERGENCY COMMUNICATIONS

Another area of inspection interest is the checking of the navigational aids and emergency equipment:

- **Radars.** Whenever there is a possibility, sets should be turned on and operated by qualified personnel, with the Inspector checking both operation and performance
- **ARPA/Radar Plotting Facilities.** The inspector must examine the type provided and whether it is ready to put into effect. On all vessels manual radar plotting must also be available.
- **Magnetic Compass.** Inspector must check the compass' deviation card, record the date of last change, examine the compass error book, and identify if there is any irregularity of deviations. Deviations $< +/- 3$ degrees are not considered irregular. Continual deviation > 3 degrees may demand that the compass is adjusted.
- **Gyro compass and Repeaters.** The Inspector must compare the headings of the master compass with repeaters and with true heading for berth. Additionally the supply of heading information to Emergency Steering Positions needs to be checked in case of false indications that may derive from either Gyro or Magnetic or by Telephone (or movable compass).
- **Echo Sounding Equipment.** Regular checks need to be done by each watch. For graph type equipment, it should be ensured whether there is a sufficient number of spare rolls of recording paper.
- **Course Recorder.** The Inspector checks if it's in use and then look for previous voyage tracings. The Inspector must look for spare rolls of paper that course indicators are accurate.
- **Rate of Turn Indicator.** It must be ensured whether it is functional. (As of 1 July 2002, required on all ships over 50,000 g.t.)
- **Speed and Distance Indicator.** Speed and distance through the water is required for ARPA input. All ships of 50,000 Gross Tons and upwards must be equipped with speed and distance measuring devices, or other means, to measure speed and distance over the ground in the forward and athwartships directions as of 1 July 2002.
- **Automatic Identification Systems (AIS):** The required installation date for Automatic Identification Systems (AIS) for ships of 300 gross tonnage and upwards but less than 50,000 gross tons, other than passenger ships and tankers, is no later than the first safety equipment survey after 1 July 2004 or 31 December 2004. The first safety equipment survey means the first annual survey, the first periodical survey or the first renewal survey for safety equipment, whichever was done first after 1 July 2004, and, in addition, in the case of ships under construction, the initial survey. There is a companion modification that all ships fitted with AIS maintain the AIS in operation at all times except where international agreements, rules or standards ensure the protection of navigational information. Masters should be familiar with Regulation 8 of Chapter XI-2 titled, "Master's discretion for ship safety and security" which provides

them with a respectable authority to handle safety and security on the ship.

- **Steering gear.** Whenever possible the inspector must use the wheel and check the functioning of the steering gear; meaning correct indications are shown. A hard-over to hard-over test is useful; response time must be observed and recorded. The last inspection/test date of steering and auxiliary (emergency) steering gear is necessary, if none is performed at the current inspection. SOLAS requires emergency steering drill/every 3 mos. and checking the steering gear at least 12 hours prior to sailing – these dates are noted in the Log Book.
- **Satellite Transponder (S.A.R.T.).** Total number of two - One stowed on each side of bridge (one for each boat). A batteries check is required.
- **Emergency Position Indicating Radio Beacon (E.P.I.R.B.)** – The inspector checks for valid battery/coding, float free, certified test date.
- **V.H.F./PORTABLES** - hand held VHF Radio. Total number of three - 1 per boat – essentially secure on tankers/gas ships – A batteries check is also required.
- **NAVTEX.** The inspector must attribute exempt and certify that it is fitted and functional.

In this point it is interesting to notice that while SOLAS '74 specifies that inefficiencies of certain navigation equipment do not necessarily mean that a ship should be considered unseaworthy, nor be a reason for delaying its departure from the port, where there is no infrastructure for repairs. Prolonged malfunction of the above mentioned aids need to be reported to the Marine Safety Division as this could probably set the ship in Class "A" or Class "B" Deficiency and may result the ship liable to detention.

Deficiencies are classified as follows:

Class "A" - In this case, the ship may be subject to ad hoc detention depending on the situation. This deficiency incorporates any defect in hull, machinery, equipment, manning or senior officer certification, which clearly and materially compromises the safety of the vessel or persons on board, the safety of other vessels or persons, the safety of cargoes and port installations or the safety of the marine environment. These deficiencies are to be reported immediately to Marine Safety or the Duty Officer.

Class "B" - This deficiency implies that a rectification has to take place prior to the next inspection. It is any default in fulfillment of legal requirements which falls short of a Class "A" deficiency. In case, that several Class "B" deficiencies are noted in a single inspection

or continuously neglected Class "B" deficiencies may constitute automatically a Class "A" deficiency.

1.8.13 NAVIGATION CHARTS, PUBLICATIONS AND RECORDS

Every ship has to carry proper and modern charts, Sailing Directions, Light Lists, Notices to Mariners, Tide Table and various other maritime publications essential for the planned voyage (*Regulation 20, SOLAS, 1974*). It is vital that outdated navigation charts and maritime publications should be disposed of and not retained on board.

In more detail the necessary equipments can be delineated as follows:

- Chart List or Catalogue. Only one is requested to be carried, which should be published by the same authority as the charts carried on vessel. This may therefore be either B.A. (U.K.) or D.M.A. (U.S.) or any other acceptable National Authority. In this case, the nationality of origin of the list should be noted. In certain cases, it may be necessary for some vessels to carry two or more lists. However, always it is important that when the list in use is over than two years old, the Master should be notified to receive a more modern edition.
- Navigational Charts. Spot check on charts for the following voyage must be done to ensure that they are up to date. Moreover, a check that the day of last correction which appears on each chart and that charts are of latest issue is required too. Some vessels may have been at sea for a long time, thus an inspector has to check for last corrections with latest Notices to Mariners on board and compare them with voyage records to check corrections which have been carried out during voyage. There must also be a record of all navigational charts on board. It is important because they can also be used in relation with recording Notices to Mariners corrections made to each chart. Date must present the last correction/entry on this list.
- Pilot Books/Sailing Directions. The degree of coverage must be verified too, in addition to the date of publications. The Inspector has to check either if up-to-date supplements are available in each book currently used, or are corrected recently.
- Notices to Mariners. These include the information of state publishing authority and date of last Notice received. Check notices are held out by same authority as that of charts and publications. They also indicate

whether a record of receipt is preserved or if a chart correcting system is maintained.

- List of Lights/Radio Aids. Inspector in addition must take down the date of Light List and Radio Aids to Navigation -also referred as List of Radio Signals- on vessel and the date of last correction. Some versions are supplied in uncorrected state, so a latest edition would still demands correction from Notices to Mariners from the date of Issue. A hint must be given to the Master, of the dangers of retaining old editions on board, even though editions for present trading are fully corrected. Volume is required for giving details for radio direction when searching for stations. A record of the date of publication and correction and check for volumes is required, including Wx Nav warnings, GMDSS and VTS/Port Ops.
- Tide Table. A check for current year and trading area is demanded.
- Maritime Almanac. In this category are included all the current in use Navigational Tables, Publication, for instance H.O.214, H.O.229, Norie's e.t.c. and all those national publications implemented in navigational purposes.
- Passage Planning. Inspector must be informed by Master whether or not the regular passage planning is respected as well as basic bridge procedures -contained in the ICS publication "Bridge Procedure Guide" or similar recommendations.

In order, the inspector to be eligible to fill in his report in this area, he follows the guidelines of the above Regulation and more precisely proceed in certain corrections. *Inter allia*, the Regulation 20 stresses that a requirement for maritime charts and publications. Firstly, to be up to date for the vessel's planned journey, meaning to include the port of final destination and also include interim ports or points. Of course failure of vessels to follow the essence of the provisions of the Regulation presents a Class 'A' deficiency, which may set the vessel in detention.

In this case, the inspectors is obliged to inform Marine Safety ad hoc, when he comes to the fact that during the course of his inspection, the vessel is not adequately equipped to comply in substance with the provisions of Regulation 20.

The corrections are always in reference to Maritime Charts and Publications, so inspectors are reminded and requested to step into the date of the last

correction along with the year of issued. Moreover it is important that an inspector draw Master's interest to policies of Port States, where vessels may be retained for the reason that they are found with old and non corrected charts, or for insufficient and improper log book entries and not up to date publications and reference materials.

Thus, deficiencies must always be delivered to the Master in order to be granted with the opportunity to rectify each deficiency in due time before the vessel departs for its next journey.

1.8.14 GENERAL SAFETY

Safety Inspections are designed in order to support the Master, officers and crew in sustaining high standards of safety in the operation of the vessel and to inform the owners/operators of the conditions observed in the inspection period. The inspector has to spot check the ship's safety and firefighting equipment to guarantee that it is functioning and the ship's crew is skilled for its proper use, in respect to the provisions of the Flag State Maritime Regulations and the relevant international conventions codes and practices. However, it is not required, that inspectors are to conduct a full-scale safety equipment inspection for which the Classification Society is charged with.

Nonetheless, this does not deter from a spot check of lifesaving and fire fighting equipment which must be done to confirm that the equipment is maintained properly and continues to be operational. Thus it is vital to mention that, if during an inspection, the above equipment is either absent, or not at the right quantities, or not in good function condition according to MI regulations and finally does not matches with the statutory certificate, then a Marine Safety is necessary to be contacted for further guidance. The proper Classification Society is to be called to the ship by the Master, and verify conditions. For instance, lifeboat falls have to be renewed if corrosion is observed, end-for-ended at least every thirty months and renewed at least every five years if not frequently, or alternatively, renewed every four years due to end-for-ending.

It is essential to analyze at this point the certain components of this key importance issue – i.e. the General Safety Regulations- under the scope of where the inspectors' examination is focused.

- Pilot Boarding Arrangements. The inspector must check the pilot ladder and accommodation ladder or any mechanical pilot hoists, to conclude

if the conditions are good and comply with the provisions of Regulation (*Regulation 17, SOLAS '74*). In case that a mechanical pilot hoists is found even with a single fall, no hoisting arrangement is acceptable.

Then the process continues with a request of re-inspection and special inspections, so as to be ensured that the right corrections, of outstanding deficiencies have took place, given the annual inspections or port state control deficiencies. During re-inspections a reference the last Report of Safety Inspection and other information supplied by Marine Safety and check for correction is mandatory.

In case of inability to perform the re-inspection or special inspection, a notification to Marine Safety is necessary. More importantly if it is ascertained that any deficiencies (e.g. a class "A" deficiency) remain uncorrected, the inspector should inform Marine Safety or the Duty Officer immediately by phone, fax, or email, since the ship is subject to detention.

The outcome of the re-inspection is to return the applicable page or pages of the Report of Safety Inspection to Marine Safety with the findings, giving the ship's characteristics enclosing the name of managing owner/operator/bareboat charterer.

In this case the inspection check must ensure confirm that the pilot ladder/accommodation ladder has side ropes, man ropes and steps are in acceptable condition; the lights of the ladder and boarding position are in proper order; and a heaving line and lifebuoy with self-igniting light are readily at hand.

- *Date Lifeboats Last Lowered Into Water.* The inspector must also notice the date of last time that lifeboats were lowered into the water. He must also highlight to the Master that the Maritime Regulations demand that all lifeboats must be lowered into the water at least once in every three months and the crew to exercise in boat operations. Free fall lifeboats should be launched every six months if conditions allow, as well. Rescue boats should also be launched/waterborne at least every three months.
- *Fire Drill - Abandon Ship Drill.* The operation must be held on week basis unless prevented by great diverse conditions and reason entered into log. The aim is to measure the performance of the crew. Furthermore, onboard training and instructions - each crew member must be instructed/trained in the use of the ships lifesaving appliances, firefighting equipment and survival craft equipment as soon as possible but not later than two weeks after joining the ship. A copy of this information in a log must be retained on board. (*Appendix I-3*)

- *Lifesaving Equipment*. A spot check should also ensure the following parameters in equipment designed for lifesaving situations.

More precisely, concerning:

The *lifejackets* of the ship must be in right quantities and each one with whistle, light, retro-reflective material; in serviceable condition; and stored in accessible and clearly marked places.

The *Immersion Suits and Thermal Protective Aids* must be in right quantities as well and in serviceable condition with retro-reflective material (in case that exemption certificate has been issued or is justified, must be noted).

The *Lifebuoys* must be checked if be highly visible in color, fitted with beackets and readily accessible; marked in block capitals with name and port of registry of the ship; fitted with lines, self-igniting lights or lights and smoke signals; and in position to easily be used in case of emergency.

The *Line throwing equipment* must be checked and conclude that the line throwing appliances, with rockets and lines and distress signals are in satisfactory condition; and the dates of manufacture and/or dates of expiry of line throwing rockets, line throwing igniter cartridges (if applicable), and fully equipped with lines/buoyant rockets.

Moreover, *Emergency Escape Breathing Devices (EEBDs)* –since July 2002, are required in sufficient amounts in machinery spaces and at least 2 in crew accommodation spaces- must be examined if they are in the required quantities in each location in accordance with the Fire and Damage Control Plan for location guidances.

For the *Pyrotechnic distress signals* the inspection must ensure the presence of red parachute signals.

Concerning *Muster lists*; they must be presented in a language understood by the crew; rightly posted in several areas on the vessel. These lists generally include statements of the assigned crew duties, like closing of watertight doors, fire doors, valves, scuppers, sidescuttles, skylights, portholes and other similar openings in the ship; equipping of the survival craft (with blankets) and other life-saving equipment; preparation and launching of survival craft; overall preparation of other life-saving appliances; use of communication equipment; manning of fire parties assigned to deal with fires; special duties assigned with respect of the use of fire-fighting equipment and installations; named responsible officers for maintenance of life-saving and fire-fighting

equipment and that equipment is ready for immediate use are shown; named in charge officers; and officers are familiar with fire control plans/damage control plans.

In case the inspection is taking place on passenger ships or if passengers are carried on board the following shall also be noted in addition:

- procedures for locating and rescuing passengers trapped in their rooms;
 - warning of passengers;
 - guaranteeing they are suitably dressed and properly donned with a lifejacket;
 - assembling passengers at muster stations;
 - keeping order in passageways, stairways and generally controlling the movement of passengers.
- *Fire Fighting Equipment*. The spot check is always important in ensuring the functionality of fire pumps (including the emergency fire pump), firemain, hydrants, hoses, etc. of water fire fighting system and international shore connection. The scope of inspection is to justify that fire pumps are able to produce the required two jets of water (while also permitting, in case of tankers, the simultaneous operation of foam fire-extinguishing system).

Moreover important also is that the *pumps, firemain, hydrants, hoses, nozzles, applicators, spanners, relief valves and international shore connection* are in good condition and that each fire hose complete with couplings, nozzle and tools are kept ready for use at all times as well.

The inspection also examines the *Portable fire extinguishers*, in the scope of whether they are of approved type, fully charged and stowed in their proper positions as required; the dates of their last recharging/servicing and hydrostatic test date should be checked as recorded by the ship. Another point of interest is that verification that in an approved portable fire extinguisher is provided in each boiler space (where a box containing sand is not fitted); and that sufficient spare charges for extinguishers other than gas extinguishers are provided, an additional 10% spare for each different type should be on board.

For the category of *Non portable fire extinguishers and portable foam applicator units*, the check is focused on their types; if they are fully charged and stowed in their proper position as required; dates of their

last recharging/servicing/ hydrostatic test date are to be checked as recorded by the ship.

Essential is also the examination of the *Firefighters outfits*. The characteristics that are examined are whether:

- the vessel is equipped with the complete number of units as required, all stored in their proper locations and in serviceable condition.
- each self-breathing apparatus is provided with air cylinders, including spare cylinders, are fully charged.
- the air compressor for air cylinder recharging (if applicable) is operating satisfactorily.
- The smoke masks with air pumps and hoses (if applicable) are operating satisfactorily.

Nonetheless in this area of interest, the inspection also pays attention to the explicit *Fixed fire-extinguishing systems and fire protection systems*, which are available on the vessel. More precisely, the ship is fitted with fixed systems as demanded and with the following systems for each of the protected spaces presented below, as applicable:

- Engine room
- Boiler room
- Pump room
- Dry cargo spaces
- Cargo tanks
- Galley exhaust ducts
- Paint locker

Each of these spaces must be found in general good condition upon spot checking as far as practicable; in particular, piping and nozzles are in good condition and free from obstructions and gas release alarm system is operating satisfactorily. In other words the survey must ensure that the *Carbon Dioxide System, Halon System and Foam System* are in good condition as far as practicable; the dates of the last check of CO²/halon containers contents, of the last pressure test of CO² or halon containers/foam-forming liquid sample(s) containers and of the last servicing of the system itself are to be noted.

Furthermore, the good condition, as far as practicable, of *Fixed Pressure Water Spraying System, Automatic Sprinkler System* –also important to check for Automatic Sprinkler System whether the visual and audible alarm is activated whenever the system functions- and *Dry Powder System on Gas Carriers*.

For the *Fixed Fire Detection and Fire Alarm System*, it is sufficient to ensure that all parts of the system are in satisfactory condition upon spot checking as far as practicable and are operating properly; and the visual and audible alarm is automatically activated, if visual and audible signals at the control panels have not received attention within two minutes.

Finally according to the type of vessel inspected special systems are also important to be confirmed with proper function. Thus in case of Oil Tankers, Chemical Tankers and Gas Carriers, the *Inert Gas System* must be assigned with a special class notation and have in satisfactory condition the inert gas generator (if any); the scrubber and blowers. Furthermore the proper function of inert gas distribution line; non-return valve; deck seal; shut-off valves; soot blower interlocking devices; effluent piping; and overboard discharge for the scrubber; all alarms fitted; automatic shut-down devices is also checked.

Concerning the machinery spaces and cargo spaces the check is centered on testing that:

- the remote controls for the means of stopping machinery and shutting off oil fuel suction pipes are operating sufficiently;
- ventilator dampers, funnel openings, skylights, doorways and tunnel doors can be closed from outside the machinery spaces;
- ventilating fans and ventilators and all other openings serving cargo spaces can be stopped or closed from outside those spaces.

For the specific case of vessels with periodically unattended machinery spaces attention must also be given on the required fixed fire detection and fire alarm system fitted in periodically unattended machinery spaces, (PUMS) including audible and visual alarms are operating satisfactorily; and on the required remote controls for sea inlets and discharges below the waterline and bilge injection system, if fitted, whether they are operating efficiently;

Furthermore for vessels with Ro-Ro cargo spaces and other spaces intended for the carriage of motor vehicles with fuel in their tanks for their own propulsion, the spot check examines that all required special arrangements as required and spot checked as far as practicable, are in satisfactory condition.

For the case of Ship engaged in the trade of carrying dangerous goods, the interest lays on the required special arrangements and equipment as required which are fitted onboard the ship are checked as far as practicable, are in good condition and operating satisfactorily.

Finally for Oil tankers and chemical tankers the cut out valves in the foam main and in the fire main and piping of fixed fire fighting system for cargo tanks and cargo pump room, externally examined as far as practicable, the check must present that they function sustainably.

- Abandon Ship and Fire/Emergency Drills. The fire/emergency and abandon ship exercises should be held as in case of an actual emergency takes place unless prohibited by terminal/port rules. It is possible that the inspection, the inspector may reach to the point that the ship is deficient in this respect, he must order complete boat and fire drills to be held at another port under the supervision of another maritime inspector. All these are noted in the report of inspection for follow-up action by the appropriate division. Moreover, fire/emergency exercises must be organized occasionally in the engineering spaces. Emergency escape routes, cut-out procedures for fuel and ventilation systems should also be checked and assure the ability of the crew to communicate effectively during drills.

In more detail, and concerning the *Fire Drill*, check must aim in:

- starting the Emergency Generator and other standby sources of power
- switching to Emergency Power and energizing emergency circuits
- starting bilge/fire pumps and the emergency firepump(s)
- checking emergency (auxiliary) steering procedures
- putting water on deck at full pressure from at least two (2) hoses
- ensuring operation of ventilation dampers and closures
- checking firefighters' outfits and breathing apparatus.
- ensuring date of recharge of fire extinguishers and that 10% extra charge is carried.
- confirming that crew members/responsible officers should be

familiar with operation of emergency machinery/equipment and fire control/damage control plan.

For the case of *Abandon Ship Drill*, the attention is on:

- gathering passengers and crew to muster stations with the alarm followed by drill announcement on the public address or other communication system and ensuring that they are made aware of the order to abandon ship;
 - reporting to stations and preparing for the duties described in the muster list;
 - checking that passengers and crew are properly dressed;
 - examining that lifejackets are properly donned;
 - lowering of at least one lifeboat after any necessary preparation for launching;
 - functioning of davits used for launching life rafts, if applicable;
 - checking the status of the hull of the boats;
 - checking the status of the blocks, tackles and lowering gear. Date when falls last renewed or end for ended should be checked and noted;
 - examining whether personnel safety measures are noted while the boat is being lowered;
 - starting the boat engine and checking the reverse gear (on tankers, the boat engine should not be started if the ship is loading or discharging);
 - spot-checking the boat inventory; (This check should always include water, food and distress signals. Date of expiration of distress signals to be entered in Report. Date of last maintenance/check by crew should be noted.)
 - a mock search and rescue of passengers trapped in their staterooms; and
 - instruction in the use of radio life-saving appliances.
- The Inspector shall then check the *date of last inspection of the life rafts and hydrostatic release* and fill in the relevant report.
- *Master's ISM Code responsibilities, SMS manual on board.*
- *Observations.* The final point to be stressed out is that the inspector shall must present his opinion and observations as to the overall condition of the ship and expand upon any deficiencies not available in the report. It is a way to identify problematic areas needing special attention and not having the proper chance to do so. It may also be used to provide positive comments as well.

Having in mind all the previously stated regulations of the Classification Societies, it is clear that the inspection is a process of reviewing, signing, copying and submission. The important point is to draw the Master's attention to the "IMPORTANT NOTICE." Thus, it is necessary to review the report with the Master and discuss any rising issues. Inspectors must invite the Master to provide comments about the report before it is signed. Nowadays that most ships are equipped with computers, faxes, copy machines, e-mail and internet access, it is usually only necessary to produce one original and one copy; the original is to be sent to Marine Safety, and the copy is submitted to the Master for retention on board. The inspector is also free to keep a copy for his records.

CHAPTER 2

Aviation Inspections

Introduction

In this chapter, the analysis on Safety Inspections continues and now focuses on Civil Aviations Safety Management systems. After defining what the notion of "safety" is within an organization, the pillars of Safety Management are presented. In sum, the essence of these systems can be restricted to the following: safety health and how to access it and safety oversight including safety inspection, surveys and audits. Finally this chapter closes by referring the Olympic Airlines safety audits, as a special case study.

2.1 NEED FOR PREVENTION OF ACCIDENTS IN CIVIL AVIATION

Aviation sector has experienced considerable growth, during the last decades. The number of flights has increased impressively since the 50's. Estimations reveal, that today more than 30 million flights are scheduled, on a regular basis, per year. This progress is based to a great degree on the efforts for decreasing and controlling of relevant hazards. The measures which support accident – prevention, respect a fundamental principle; that is the "flight security". Given the fatal accident rates of other sectors, it easily comes forward that the aviation sector enjoys a rather scare possibility of such incidents. Nonetheless, since the number of flights, scheduled or not, is going to be doubled during the next decade, increasing air circulation, will also negatively affect the accident trends.

Moreover, the accidents in aviation sector may range from the less frequent fatal catastrophic accidents to the more frequent, even every day, less serious incidents, e.g. mechanical bugs. The latter ones, can be a solid indication of increased danger and loom over the flight safety; predicating more serious accidents. Even though, incidents, and sometimes accidents, do not end up to casualties, imply a direct cost of money. The solution of insurance coverage does not solve the problem; it only disperses the associated cost, for certain accidents but it cannot compensate the social cost of a death toll.

Thus, it comes more distinct that the future of aviation is vitally dependent on the ability to effectively accident precaution. So flight safety is a prerequisite.

2.2 SAFETY MANAGEMENT SYSTEM (SMS)

A Safety Management System (SMS) is a management tool which in practice determines the safety policy of an aviation firm and sets how the firm is going to manage safety as an inherent component of its overall management strategy. It includes policies, responsibilities and other organizational structures Safety measures are increasing the rate of performance on security issues which definitely must be above the standard ones, required by the regulations.

The aim of the System is to improve constantly the organizational performance and security. This is achieved through a delineation of the processes which will evaluate the objectives, the design and the performance of the management tool. In essence, SMS is creating an organizational culture in which safety has a central role. Thus the system must have three important dimensions; be a corporate approach, based on organizational tools and provide a safety oversight.

Practically, SMS resembles to the process cycle of accident prevention. As it can be noted on the following figure it is a process of prioritization, implementation and feedback supply.

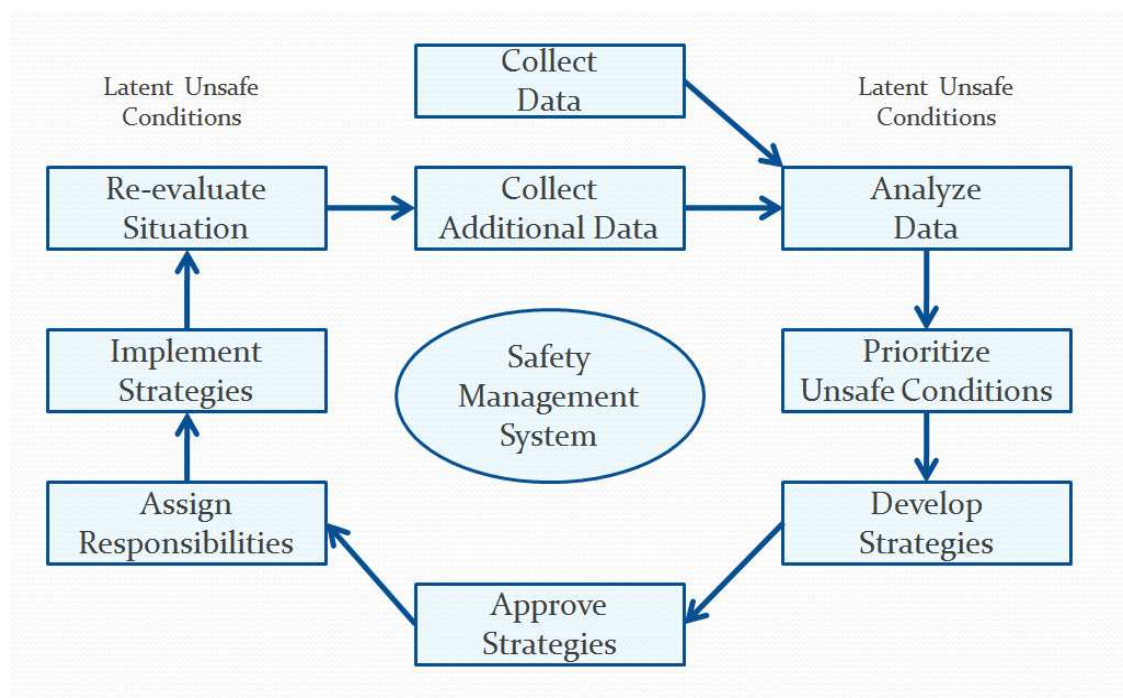


Figure 3: SMS structure

The most important dimension of this process is probably the feedback which must be available to all responsible stakeholders. This feedback concerns an evaluation of the safety performance to complete the safety management cycle. Through feedback, system performance can be evaluated and any necessary changes can be effected. In addition, all stakeholders require an indication of the level of safety within an organization for various reasons. Although the stakeholders in an organization's safety process want feedback, their individual perspectives as to "what is safe?" vary considerably. Deciding what reliable indicators exist for acceptable safety performance depends largely upon how one perceives "safety", for instance:

- Senior management may seek the unrealistic goal of "zero accidents". Unfortunately, as long as aviation involves risk, there will be accidents, even though the accident rate may be very low.
- Regulatory requirements normally define minimum "safe" operating parameters, e.g. cloud base and flight visibility limitations. Operations within these parameters contribute to "safety"; however, they do not guarantee it.
- Statistical measures are often used to indicate a level of safety, e.g. the number of accidents per hundred thousand hours, or fatalities per thousand sectors flown. Such quantitative indicators mean little by themselves, but they are useful in assessing whether safety is getting better or worse over time.
- The freedom from danger or risks, meaning those factors which cause or are likely to cause harm. Although it can be defined as a more theoretical aspect of the term.
- A "safe" corporate culture which is, always, implemented by the attitude that corporate employees keep towards unsafe acts and conditions.
- The degree to which the inherent risks in aviation are "acceptable". Although, risk cannot be always quantified and placed into certain borders so that "acceptable" can be defined.
- The process of hazard identification and risk management. It must be noticed though that risk management statistics are not always correct due to variable criteria.
- A final perception is that by controlling accidental loss - of persons and property, and damage to the environment – safety can be guaranteed. Although constraining the unpredictable is not a human act.

Nowadays Safety is increasingly viewed as the management of risk. Judging this, ICAO (*ICAO, Safety Management Manual - First Edition 2006*) considers safety to have the following meaning:

"Safety is the state in which the risk of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and risk management."

The above definition requires a safety policy which will be a reflection of a predetermined organizational perception for safety, of realistic safety aims and a justified focus on fulfilling those targets.

A starting point in safety management is the development and implementation of precise directions, which clarify the plans and expectations of management for the constant improvement of security level. It comes forward, that all these are once more are depending on the safety culture of firm. For instance, a safety policy of a reactive firm – a firm which respond to incidents as they come and at the moment they taking place- will be considerably different to that of a proactive firm – a firm which foresees potential incidents and taking its measures to prevent them.

After clearly defining the Safety Management, the following part is dedicated on the pillars in which Safety Management is based on.

2.2.1 SAFETY HEALTH

The complexity of interactions affecting safety and the difficulty in defining what is safe and what is not, some safety experts make reference to the "safety health" of an organization.

"Safety health is an indication of an organization's resistance to unexpected conditions or acts by individuals."(ICAO, Safety Management Manual - First Edition 2006)

It also reflects the systemic measures put in place by the organization to defend against the unpredictable. Furthermore, it is an indication of the organization's ability to adapt to the unforeseen too. In effect, it reflects the safety culture of the organization. Although the absence of safety-related events (accidents and incidents) does not necessarily indicate a "safe" operation, some operations are considered to be "safer" than others. Safety deals with risk reduction to an acceptable (or at least a tolerable) level. The level of safety in an organization is unlikely to be static. As an organization adds defenses against safety hazards, its safety health may be considered to be improving. However, various factors (hazards) may compromise that safety health, requiring additional measures to strengthen the organization's resistance to misadventure.

2.2.1.1 ASSESSING SAFETY HEALTH

In principle, the characteristics and safety performance of the "safest" organizations can be identified. These characteristics, which reflect industry's best practices, can serve as benchmarks for assessing safety performance.

2.2.1.2 SYMPTOMS OF POOR SAFETY HEALTH

Poor safety health may be indicated by symptoms that put elements of the organization at risk. A weakness in any one area may be tolerable; however, weaknesses in many areas indicate serious systemic risks, compromising the safety health of the organization. Symptoms that may be indicative of poor safety health are:

- inadequate organization and resources for current operations
- instability and uncertainty due to recent organizational change
- poor financial situation; Unresolved labour-management disputes
- record of regulatory non-compliance; Low operational experience levels for type of equipment or operations
- fleet inadequacies such as age and mix
- poorly defined (or no) corporate safety function
- inadequate training programs
- corporate complacency regarding safety record, current work practices, etc.
- poor safety culture.

2.2.1.3 INDICATORS OF IMPROVING SAFETY HEALTH

Following are indicators of improving safety health. These reflect the industry's best practices and a good safety culture. Organizations with the best safety records tend to "maintain or improve their safety fitness" by implementing measures to increase their resistance to the unforeseen. They consistently do more than just meet the minimum regulatory requirements.

- proactive corporate safety culture
- investment in human resources in such areas as non-mandatory training
- formal safety processes for maintaining safety database, incident reporting, investigation of incidents, safety communications, etc.

- operation of a comprehensive safety management system (i.e. appropriate corporate approach, organizational tools and safety oversight)
- strong internal two-way communications in terms of openness, feedback, reporting culture and dissemination of lessons learned
- safety education and awareness in terms of data exchange, safety promotion, participation in safety forum, and training aids.

2.2.1.4 STATISTICAL SAFETY PERFORMANCE INDICATORS

Statistical safety performance indicators illustrate historic safety achievements; they provide a "snapshot" of past events. At the highest level, this could be the number of fatal accidents per year over the past ten years. At a lower (more specific) level, the safety performance indicators include such factors as the rate of specific technical events (e.g. losses of separation, engine shutdowns, TCAS advisories and runway incursions).

Statistical safety performance indicators are focused on specific areas of the operation to monitor safety achievement, or on identifying areas of interest. This "retrospective" approach is useful in trend analysis, hazard identification, risk assessment, as well as in the choice of risk control measures.

Accidents (and serious incidents) in aviation can be characterized as random and rare events since they do not all share the same basis. In that scope, assessing safety health based only on statistical indicators does not provide a valid indication of safety performance, especially in the absence of reliable exposure data.

2.2.1.5 ACCEPTABLE LEVELS OF SAFETY

Aviation companies must conform to regulatory requirements to confirm the acceptable levels of safety. The firms which have recently meet these standard requirements, however, might not be *healthy* from a safety scope. The reason is that, although they have slashed their deficiencies in the unsafe acts and conditions most prompt to accidents. In reality, they have adopted only the minimum precautionary measures.

Weak organizations which fail to reach the acceptable levels of safety, will be probable excluded from the aviation system either proactively, by the regulator stripping them off their operating certificate, or inactively, due to commercial pressures like the high cost of accidents or consumer resistance.

2.2.2 SAFETY OVERSIGHT

One of the millstones for effective safety management is a formal system for safety oversight. Safety oversight involves regular (if not constant) monitoring of all aspects of an organization's operations. On the surface, safety oversight demonstrates compliance with State and organization rules, regulations, standards, procedures, etc. However, its value goes much deeper. Monitoring provides another method for proactive hazard identification, validation of the effectiveness of safety actions taken, and the continuing evaluation of safety performance.

2.2.2.1 SYSTEMS TO ACHIEVE QUALITY OVERSIGHT

The following elements are in place in Olympic Airlines Safety Management System:

- a system for analyzing flight recorder data for the purpose of monitoring flight operations and for detecting unreported safety events; The Company has in place a Flight Data Monitor programme.
- a company-wide system for the capture of written safety event/issue reports; The Company has implemented an Accident-Incident & Occurrence Reporting system.
- a planned and comprehensive safety audit review system which has the flexibility to focus on specific safety concerns as they arise; The Company has implemented a Safety Audit system.
- a published system for the conduct of internal safety investigations, the implementation of remedial actions and the communication of such information; The Company has implemented an Accident-Incident Investigation system.
- systems for effective use of safety data for performance analysis and for monitoring organizational change as part of the risk management process; The Company has implemented a Hazard Identification & Risk Management system.
- periodic review of the continued effectiveness of the safety management system by an internal, independent body; The Company has implemented a Quality Assurance Programme and an SMS Manager responsible for the oversight and a Safety Review Board.

2.2.2.2 SAFETY AUDITS

"Safety auditing is a core safety management activity. Similar to financial audits, safety audits provide a means for systematically assessing how well the organization is meeting its safety objectives. The safety audit programme, together with other safety oversight activities (safety performance monitoring), provides feedback to managers of individual units and senior management concerning the safety performance of the organization. This feedback provides evidence of the level of safety performance being achieved. In this sense, safety auditing is a proactive safety management activity, providing a means of identifying potential problems before they have an impact on safety. ."(ICAO, Safety Management Manual - First Edition 2006)

Safety audits are conducted internally by the Safety & Security Department, or by an external safety auditor. The most common way of it is by demonstrating safety performance to State regulatory authorities. Although other stakeholders could demand an independent audit as a precondition for a specific approval - e.g for financing, insurance, partnerships with other airline companies, and entry into foreign airspace. No matter the driving force for the audit, the process followed and the upcoming results from both internal and external audits are mostly identical. Safety audits are, always, conducted on a frequent and systematic basis following with the Company's safety audit programme.

2.2.2.3 INSPECTIONS

Perhaps the simplest form of safety oversight involves carrying out informal "walk-arounds" of all operational areas of the organization. All Safety & Security Department personnel are tasked to perform informal inspections on the daily operations of the Company while on duty and to provide feedback to the Safety & Security Director. Talking to workers and supervisors, witnessing actual work practices, etc. in a non-structured way provides valuable insights into safety performance "at the coal face". The resulting feedback helps to fine-tune the Safety Management System (SMS). To be of value to the company, the focus of an inspection is on the quality of the "end product".

Unfortunately, many inspections simply follow a tick-box format. Using a tick-box format may be helpful for verifying compliance with particular requirements, but it is less effective for assessing systemic safety risks. Alternatively, a checklist can be used as a guide to help ensure that parts of the operation are not overlooked. Management and line supervisors may also conduct safety inspections to assess adherence to organizational requirements,

plans and procedures. However, such inspections may only provide a spot check of the operations, with little potential for systemic safety oversight.

2.2.2.4 SURVEYS

Surveys of operations and facilities can provide management with a perspective of the levels of safety and efficiency within its organization. Realizing the systemic hazards and inherent risks related with everyday activities allows a company to minimize unsafe acts and respond proactively by developing the processes, conditions and other systemic issues that lead to unsafe acts.

“Safety surveys are one way to systematically examine particular organizational elements or the processes used to perform a specific operation — either generally or from a particular safety perspective. They are particularly useful in assessing attitudes of selected populations, e.g. line pilots for a particular aircraft type, or ATCOs working a particular position.”(ICAO, Safety Management Manual - First Edition 2006)

In attempting to determine the underlying hazards in a system, surveys are usually independent of the routine inspections performed by government or company management. Surveys completed by operational personnel can provide important diagnostic information about daily operations. They can present an impeccable mechanism to receive significant information concerning many aspects of the firm, including:

- views and opinions of operational workforce.
- degree of teamwork and cooperation among various employee groups.
- problematic areas or bottlenecks in everyday operations.
- corporate safety culture.
- current areas of dissent or confusion.

Safety surveys usually involve the use of checklists, questionnaires and informal confidential interviews. Interestingly Surveys, particularly those using interviews, may elicit information that cannot be obtained any other way.

Typically, specific data that are suitable for assessing safety performance can be acquired through well structured and managed surveys. However, the validity of all survey information obtained may need to be verified before corrective action is taken. Similar to voluntary incident reporting systems, surveys are subjective, reflecting individuals' perceptions. Consequently, they are subject to

the same kinds of limitations, for example, the biases of the author, the biases of the respondents, and biases in interpreting the data.

It is common place that activities associated with safety surveys can be spread to the entire risk management cycle. Surveys are, usually, held by organizations that have already went from a reactive to a proactive safety culture.

2.3 SAFETY AUDITS: OLYMPIC AIRLINES CASE STUDY

The third component that is safety audits is presented through a case study, the one of the Olympic Airlines in order to illustrate a practical aspect the process. Olympic Airlines maintain a Safety Audit system in order to achieve the highest level of safety possible and to oversight the Safety Management System.

The methodical, detailed and well planed audit is based on the corporate safety goals set by the Company. Every department and section of Company operations is audited to find lapses or hazard areas in the operations system itself. The safety auditor checks daily operation against the goals and provisions of this manual.

- The audit checklists must be well documented in order to make discovery of deficiencies in the system an easy task.
- Every safety audit must include operations of third party contractors that affect the safe operation of the Company (i.e. aerodromes, aerodrome personnel, maintenance organizations etc).

Safety Audits are performed by:

- The Safety & Security Director
- All managers and supervisors of the Safety & Security Department;
- The SMS Manager
- External auditors

All safety audits must be performed twice a year and before and after a change in the operational structure of the Company. The audits may include interviews with Company personnel and managers and observation of the working environment.

The Safety & Security Director is responsible for maintaining the audit checklists and for their distribution to the appropriate department and sections

of the Company and third party contractors that are scheduled to be audited. He is also responsible that all auditors are appropriately equipped, trained, and capable and acquainted with the subject of their audit. Each individual department or section audited receives feedback of any findings via the Safety Audit form so they can facilitate any corrective action necessary.

All audit findings are analyzed and presented to the Safety Committee and to the CEO in the Safety Review Board.

The Safety & Security Director is responsible for maintaining the safety audit records for a period of three years and for the planning and scheduling of the safety audits.

2.4 CORPORATE SAFETY POLICY REVIEW

The Corporate Safety Policy manual is reviewed annually along with the rest of the Safety Management System to ensure it remains relevant and appropriate to the operation of Olympic Airlines. The review process takes place during the second annual Safety Review Board meeting.

All suggestions for revision is being forward to the Safety & Security Director, who, after evaluating them, presents them to the Safety Review Board for approval from the CEO. All changes to the Corporate Safety Policy then is clearly communicated to all personnel.

2.5 KEY BENEFITS

Olympic Airlines have to explore considerable benefits from the effective implementation of Safety audits. More precisely:

- Dependence on a service which can give interesting information to support decision making in selecting carriers.
- Assessment of the ability of carriers to satisfy firm's requirements in terms of safety and quality of services (availability, reliability, punctuality, responsiveness, etc.).
- Refinement of a policy and a standard for assessing the safety level of carriers.
- Increased safety, prevention and management of risks related to Quality, Health & Safety, Environment, and Social Responsibility.
- Potential to develop carrier selection process so as to provide to employees or customers a better safety guarantee.

- Availability of an independent assessment of the safety level in relation to the expectations of your customers or your ordering parties

In sum, it can be inferred that Safety Management and more specifically Safety Audit is a dynamic approach to enhance aviation safety. Such audits may prevent or rectify future or existing situations accordingly. Inter alia, is a way to improve safety policies and more importantly communicate it to the passengers.

Of course the potential savings - in lives, serious injuries, and property damage is impeccable. Thus, every effort in improving safety has to be enforced in spite of limited resources and the ongoing need to focus on maintenance and operations. This is also the reason why safety issues are an important component of any organizations safety strategy.

CHAPTER 3

RUBY ON RAILS

Introduction

In this chapter the programming language implemented for the development of the application, which is called Ruby on Rails, will be presented. After a quick background analysis, Ruby on Rails is described in detail, simply to highlight the key features. Moreover, there is a reference to modern technologies which are utilized to the application. Ending this chapter, there is a cross-examination of the most popular programming languages – targeted to web development – that justify the Ruby on Rails selection.

3.1 BACKGROUND

Ruby on Rails, broadly shortened to Rails or RoR, is an open source web application framework for the Ruby programming language. The objective is to be used with an Agile development methodology which is generally used by web developers for rapid development. As many contemporary web frameworks, Rails is based on the Model-View-Controller (MVC) architecture pattern to organize application programming.

Ruby on Rails was originally written and developed by David Heinemeier Hansson. This was a product derived from his original work on Basecamp which is a project management tool developed by 37signals (now a web application company). Ruby on Rails was first released in 2004 and was an open source – licensed under the MIT license. David Heinemeier Hansson did not share commit rights to the project until February 2005. The Rails framework reached a milestone, when Apple announced that it would include Ruby on Rails with its new Operating System, which in turn was released in October 2007.

3.2 Ruby on Rails: REASONING AND PHILOSOPHY OF THE STUDY

"Ruby on Rails features several tools intended to make commonplace development tasks easier "out of the box".(Agile Web Development with Rails, The Pragmatic Bookshelf, 2005).

The Rails framework provides *scaffolding* which is a unique feature to all frameworks. After running a simple command, it gives the programmer a basic CRUD (Create, Read, Update, Delete) application in which he can be based upon. This means that some of the models and views needed for a basic website are automatically created. A simple ruby web server (WEBrick) and Rake build system are also included. By including these common tools with the Rails framework, a basic development environment is in effect provided with all versions of the software.

Ruby on Rails applications rely on a Rails configured web server to run it. The majority of programs, at the time of writing, are developed using Mongrel - slightly heavier but more stable than Mongrel. When deployed more sophisticated web server are utilized like Lighttpd, Apache (either as a module - Passenger for example - or via CGI, FastCGI or mod_ruby), and many others.

Ruby on Rails is also noteworthy for its extensive use of modern technologies. The Rails framework comes with JavaScript library Prototype included. Also other, more lightweight, libraries can be utilized like Script.aculo.us and JQuery for Ajax. At its early days, lightweight SOAP (*Simple Object Access Protocol*) was used for web services and it was lately replaced by RESTful web services. For the further facilitation of this update, in Rails 2.0 both HTML and XML output formats were offered by default.

3.2.1 PHILOSOPHY AND DESIGN

"Ruby on Rails is intended to emphasize Convention over Configuration (CoC), and the rapid development principle of Don't repeat yourself (DRY)."(Advanced Rails, O'Reilly, 2007)

"Convention over Configuration" means a developer only needs to specify unconventional aspects of the application."(Advanced Rails, O'Reilly, 2007)). This means that in a Rails application, if there is a class named User in the model, the corresponding table in the database is by default called users. It is only if one deviates from this convention, such as calling the table "users_logged», which the developer needs to write code regarding these names. Generally, this leads to less code and less repetition, which can be further translated to less debugging and quicker applications.

Moreover *"Convention over Configuration"* is a software design paradigm which seeks to decrease the number of decisions that developers need to make, gaining simplicity, but not necessarily losing flexibility. This more configuration

free approach to programming allows the programmer to work at a higher level of abstraction without actually having to create a layer of abstraction.

Yet another utilization of this software design is when multiple configuration files must be altered in order for changes in the program's code to take effect. Traditionally, frameworks have multiple configuration files, each with many settings. These files provide specific information for the program, ranging from URLs to mappings between classes and database tables. Regarding the complexity of an application, the size and number of those files grows as well resulting to a lot of work that can be skipped by following the principles of this software design.

3.2.2 "Don't repeat yourself"

"Don't Repeat Yourself" (usually stated as DRY) is a process philosophy aimed at reducing duplication, particularly in computing. The philosophy emphasizes that information should not be duplicated, because duplication increases the difficulty of change, may decrease clarity, and leads to opportunities for inconsistency." (Andy Hunt and Dave Thomas's book, The Pragmatic Programmer, 2006.)

It is, broadly, applied to include "database schemas, test plans, the build system, even documentation. By successfully applying the DRY principle in an application, the modification of a single element of the system does not alter other logically-unrelated elements. On the contrary, elements that are logically related, to the modification made, all change in a predictable way and uniformly. Thus every single element is kept in sync.

3.2.3 DRY coding

The DRY code philosophy is stated as "Every piece of knowledge must have a single, unambiguous, authoritative representation within a system." (Andy Hunt and Dave Thomas's book, The Pragmatic Programmer, 2006.)

In model-driven architectures, this philosophy is also dominant. DRY code is created by data transformation. Its basis is that software artifacts are derived from a central object model, such as UML. This allows the software developer to avoid copy and paste operations. Its main purpose of utilization is to make large software systems easier to maintain, given that data transformations are easy to create and maintain. Most common examples of DRY coding techniques are tools such as XDoclet and XSLT. Enterprise Java Beans Examples, a very commonly used system, requires duplication of information not just in

Java code but also in configuration files. The Ruby on Rails application development environment includes the DRY code philosophy in the attempt to reduce duplicate information.

DRY code is very commonly used, nowadays, since modern applications tend to be based on multi-level architectures. The Model-View-Controller architectural pattern, used in a plethora of web applications, gives data transformation a great importance and so software developers are challenged to utilize those in a functional manner.

But this transition to the principles of DRY philosophy is not always easy to be done or even needed. Sometimes the effort required to enforce the DRY philosophy may be greater than the effort to maintain separate copies of the data. In other cases, duplicated information is immutable or kept under a control tight enough to make DRY not required.

- Community involvement – for instance in wiki sites - could be recessed if strict adherence to DRY is imposed.
- Usually development and testing are practiced together using, of course, slightly different code so that production is not affected. Ideally differences are kept reasonably small and eventually reconciled.
- Documentation in computer programs is, typically, an explanation of the code for those who do not have the ability or time to read and understand the code. However, DRY holds that if documentation adds no value and that the effort should be focused in generating it rather than writing it.
- Source code generation is affected since duplicated files are not entirely modified.
- Limitations in a programming language - in low-level languages such an implementation could be costly and would produce confusing code.

Prior to a more profound analysis, it is necessary to explain some terms which are already used or will be used in order to be more comprehensible.

3.3 Ruby on Rails: TYPE

Ruby on Rails is an open source program created by Heinemeier Hansson but its development is – in a considerable part - community based.

“Open source is an approach to design, development, and distribution offering practical accessibility to a product's source (goods and knowledge). Some

consider open source as one of various possible design approaches, while others consider it a critical strategic element of their operations. Before open source became widely adopted, developers and producers used a variety of phrases to describe the concept; the term open source gained popularity with the rise of the Internet, which provided access to diverse production models, communication paths, and interactive communities." (O'Reilly Open Source Convention - July, 24-28, 2006 - Portland, OR)

3.4 Ruby on Rails: STRUCTURE

MVC

Beyond the above type of program it is also necessary to guarantee the function of the program, laying to ensure a specific structure. In this case MVC is applied.

"Model-view-controller (MVC) is an architectural pattern used in software engineering. A successful use of the pattern isolates business logic from user interface considerations, resulting in an application where it is easier to modify either the visual appearance of the application or the underlying business rules without affecting the other." (Agile Web Development with Rails, The Pragmatic Bookshelf, 2005)

In MVC, each part has each own role. The model handles the information (for instance, the contents of a database) of the application; the view reacts to the user's actions such as input fields, radio button items, etc.; and the controller is responsible of handling the interactions between the information data and the rules used to manipulate the data to and from the model. These become more clear with the image below.

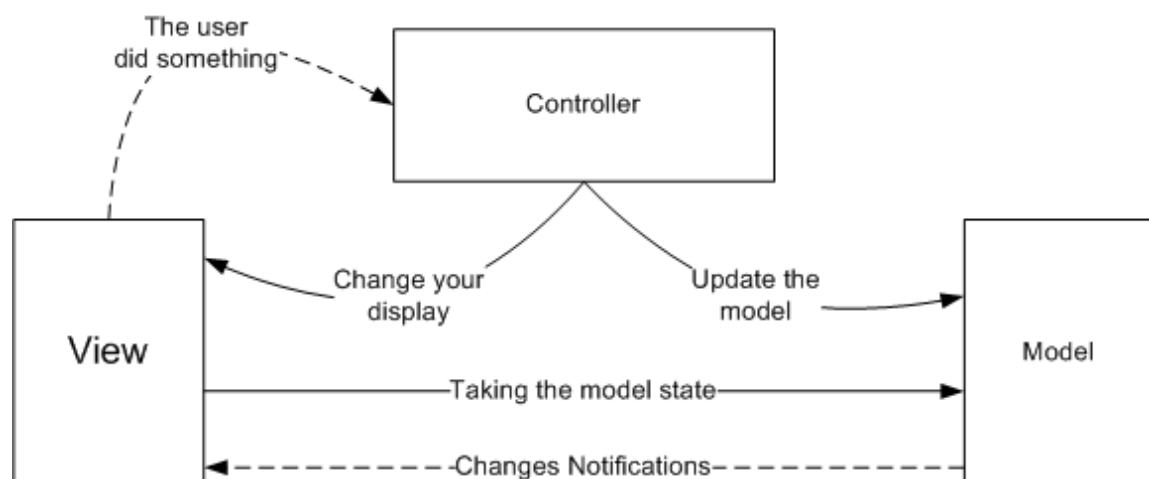


Figure 4: MVC structure.

More precisely Model–view–controller is both an architectural pattern and a design pattern, depending on where it is used.

3.4.1 ARCHITECTURAL PATTERN

Usually an application is divided into three separate layers: the presentation/user interface (UI), business logic, and data access. Each one of these layers run on different computers. The MVC architectural pattern focuses in separating the User Interface layer in three additional layers.

Although MVC can be found in different types, control flow generally appears as follows:

- The user interacts with the user interface in certain way (for instance, presses a mouse button).
- The controller handles the input event from the user interface, often via a registered handler or callback.
- The controller notifies the model of the user action, possibly resulting in a change in the model's state.
- A view uses the model indirectly to generate an appropriate user interface. The view gets its own data from the model. The model and controller have no direct knowledge of the view.
- The user interface waits for further user interactions, which restarts the cycle.
- Some implementations such as the W3C XForms also use the concept of a dependency graph to automate the updating of views when data in the model changes.
- By decoupling models and views, MVC helps to reduce the complexity in architectural design and to increase flexibility and reuse of code.

3.4.2 DESIGN PATTERN

Under this perspective MVC encompasses more of the architecture of an application than is typical for a design pattern. When considered as a design pattern, MVC is fundamentally the same as the Observer pattern.

More precisely the nature and notion of structure is based on the following pillars:

Model

The model can be perceived as the domain-specific representation of the information upon which the application

operates. Domain logic adds meaning to raw data (for example, calculating whether today is the user's birthday, or the totals, taxes, and shipping charges for shopping cart items).

Many applications use a persistent storage mechanism (e.g. a database) to store data. MVC does not specifically mention the data access layer because it is perceived to be underneath or encapsulated by the model.

View

Renders the model into a form suitable for interaction, typically a user interface element. Multiple views can exist for a single model for different purposes.

Controller

Processes and responds to events (typically user actions) and may indirectly invoke changes on the model.

3.5 Ruby on Rails: FRAMEWORK

Rails is a framework that is designed to support the development of dynamic websites, Web applications and Web services. It's complete, open source, and cross-platform. Ruby on Rails is separated into various packages, namely ActiveRecord (an object-relational mapping system for database access), ActiveResource (provides web services), ActionPack, ActiveSupport and ActionMailer. ActiveRecord is a powerful database abstraction layer, which works with all popular database systems. It ships with a sensible set of defaults and provides a well-proven, multilayer system for organizing program files and concerns.

Its goal as a framework is to solve the majority of the problems that occur in web development, assuming that the remaining are the problems that are truly unique to the application's domain. Although it might sound exaggerative, the surprisingly percentage of 80% of the code that must be written in an application is infrastructure by itself. Considering all the work that's involved in application construction, from directory structure and naming conventions, to the database abstraction layer and the maintenance of state the time gained is noticeable. Rails is specific about directory structure, file naming, data structures, method arguments. When a Rails application is developed, the programmers is required to follow the conventions that have been laid. Instead of focusing on the details of merging the application together, the focus is

concentrated on the part of development that deals with the issues of the application.

The two more important packages – components of the Rails framework - which deserve a more precise description are the ActiveRecord and the ActionPack.

3.5.1 ActiveRecord

ActiveRecord is a Ruby library that implements the like-named object-relational mapping (ORM) pattern described by Martin Fowler:

“ An object that wraps a row in a database table or view, encapsulates the database access, and adds domain logic on that data. ”

It creates a persistable domain model from business objects and database tables, where logic and data are presented as a unified package.

Moreover ActiveRecord adds inheritance and associations to the pattern above, solving two substantial limitations of that pattern. A set of macros acts as a domain language for the latter, and the SingleTableInheritance pattern is integrated for the former; thus, ActiveRecord enhances the functionality of the active record pattern approach to database interaction.

3.5.2 ActionPack: The View and Controller

View Support

In Rails, the view is responsible for creating either all or part of a page to be displayed in a browser. At its simplest, a view is a chunk of HTML code that displays some fixed text. More typically dynamic content is included, created by the action method in the controller.

In Rails, dynamic content is generated by templates, which come in three types. The most common templating scheme, called Embedded Ruby (ERb), embeds snippets of Ruby code within a view document. This approach is very flexible, but there are often objections that this violates the spirit of MVC. By embedding code in the view, additional logic is added that should be in the model or the controller. This complaint is largely groundless, because views contained active code even in the original MVC architectures. Maintaining a clean separation of concerns is part of the job of the developer.

XML Builder can also be used to construct XML documents using Ruby code and the structure of the generated XML will automatically follow the structure of the code. Rails also provides RJS views. These allow to create JavaScript fragments on the server that are then executed on the browser. This is great for creating dynamic Ajax interfaces.

Controller

The Rails controller is the logical center of the application. It coordinates the interaction between the user, the views, and the model. However, Rails handles most of this interaction behind the scenes; the code written concentrates on application-level functionality. This makes Rails controller code remarkably easy to develop and maintain.

The controller is also home to a number of important ancillary services:

- It is responsible for routing external requests to internal actions. It handles people-friendly URLs extremely well.
- It manages caching, which can give applications orders-of-magnitude performance boosts.
- It manages helper modules, which extend the capabilities of the view templates without bulking up their code.
- It manages sessions, giving users the impression of ongoing interaction with our applications.

3.6 Ruby on Rails: PROGRAMMING LANGUAGE

"Ruby is an object-oriented programming language that makes programming both enjoyable and fast. With the easy-to-use interpreter, familiar syntax, complete object-oriented functionality, and powerful class libraries, Ruby has become a language that can be applied to a broad range of fields from text processing and CGI scripts to professional, large-scale programs. "(Ruby in a Nutshell by O'Reilly Media)

Ruby was initially developed and designed by Yukihiro "Matz" Matsumoto and is considered a "young language" since it was released in 1995. It is based on the syntax of Perl with shares ideas found in Smalltalk, Eiffel, Ada and Lisp.

More precisely object-oriented means that every data type is an object, including classes and types which many other languages designate as primitives (such as integers, booleans, and "nil"). Every function is a method. Named values (variables) always designate references to objects, not the objects themselves. The last stable release is 1.8.7 and is written in C, as a single-pass interpreted language.

3.7 Ruby on Rails: LIBRARY

In a nutshell, Ruby Gems allow developers to distribute and install Ruby code wherever Ruby can be installed. Specifically, Ruby Gems is a package-management system for Ruby applications and libraries. It permits developers to install Ruby code—called *gems*—to any computer running Ruby. It can also resolve dependences, so if a given piece of software must be installed, Ruby Gems can handle that process. It can even resolve version dependencies—so that if a certain gem or snippet of code requires a certain version of another gem, it can be fixed internally. Finally, Ruby Gems wraps all of this functionality in a very easy-to-use package. They are now part of the standard library from Ruby version 1.9.

3.8 Ruby on Rails: KEY FEATURES

Below, there are provided as well, two key features of modern web applications which will be described in order to demonstrate the innovative nature of the application.

3.8.1 RESTful APPLICATION

Representational state transfer (REST) is a style of software architecture for distributed hypermedia systems such as the World Wide Web. In short, REST is a unifying theory for how “distributed hypermedia” systems (primarily, the World Wide Web) are best organized and structured. The term is often used more loosely to describe any simple interface which transmits domain-specific data over HTTP without an additional messaging layer such as SOAP or session tracking via HTTP cookies. As such, it is not strictly a method for building “web services.” Systems which follow REST principles are often referred to as “RESTful”.

Some key features of this applications are:

- conceptual simplicity
- caching and scalability
- robustness to change
- uniformity

Further analysis would be go into many details that requires extended knowledge in computer science and how HTTP and World Wide Web is structured. Something like this, is out of this thesis purpose.

3.8.2 AJAX

Ajax stands for Asynchronous JavaScript and XML is a group of interrelated web development techniques used on the client-side to create interactive web applications. It represents an important change in the way the World Wide Web is structured and even conceived. Ajax is based on the simple idea that web pages, already loaded in a browser, can “talk” with the server and potentially change themselves as a result. For instance a form submission, without the utilization of Ajax, would cause a whole new page to load. On the other hand, an Ajax form submission happens in the background and just updates the current page in place; no refresh, no flash of white as the page changes, no change in the address bar. That is the essence of Ajax.

While keeping in mind that simple and concrete definition of Ajax, to understand how it really works, a more abstract way looking at it is required. First, it must be clear how the Web traditionally works.

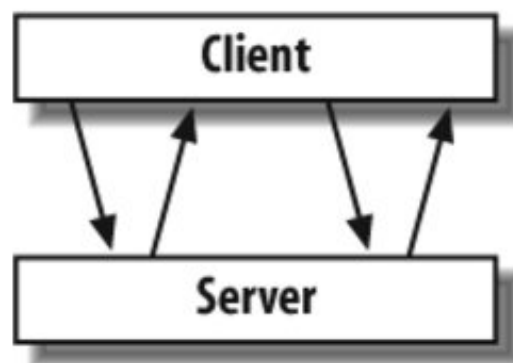


Figure 5: Server–Client interactions

In this model, a simple server – client interaction is presented. Between these two sides data information are exchanged. The server sends a response containing a page perhaps including a header area with a logo, a sidebar containing navigation, and a footer. When the user clicks on a button or a link, the whole cycle repeats for the next page meaning a new connection to the server, a new request, and a new page. Even the parts of the page that haven't changed (e.g. the header and sidebar) are sent back to the server again. The process of sending the request, waiting for the response, and rendering a new page might take a while especially in low bandwidth internet connections. Once the user has clicked, he's effectively committed to that wait before he can proceed to another action.

This model works fine, to a point. In fact, when the nature of a site is primarily document-centric, it's quite desirable. But when developing web applications,

it's a bit uncomfortable interactions that ought to feel responsive, are sluggish instead. For instance, in a web application for managing to-do lists – like an inspector's list- if simply checking an item off the list causes the entire page to be re-fetched and rendered.

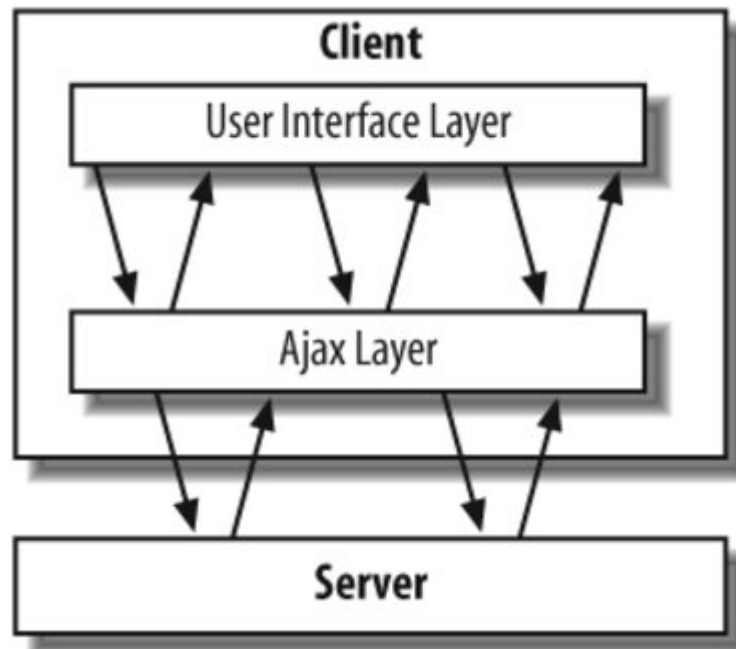


Figure 6: Server–Client interactions (Using Ajax).

In the Ajax model, the action on the client side is split into two logical parts: a user interface layer and an Ajax layer. When a user clicks a link, or submits a form, that input is handed to the Ajax layer, which could then interact with the server, and update the UI layer as appropriate. This is the conceptual cornerstone of Ajax: the UI interaction is logically separated from the network interaction.

Some important notices can be pointed out after looking the above image:

- In cases of simple form validation, the entire process could be handled completely client-side.
- Requests between the Ajax layer and the server are for small pieces of information. This is translated to less database interaction, rendering time, and data to transport, shortening the time needed for the whole process to take place.
- The UI layer is not directly dependent on the server's responses. So the user can continue to interact with a page while activity is happening in

the background. This means that, for some interactions, the user's wait time is effectively zero.

- Communication between user's actions reflecting to the page and the server doesn't necessarily imply that Ajax always results in a change to the UI.

The above mentioned are the main reasons why Ajax applications are to be significantly more responsive. These is a major breakthrough which means that web applications can start performing like desktop applications and retain all the benefits of being hosted, rather than installed locally.

Given the analysis of AJAX applications it becomes clear that its implementation in the case study presented in this thesis, it offers a lot of advantages.

3.9 Ruby on Rails: CRITICAL ANALYSIS WITH OTHER LANGUAGES

Ruby on Rails is a very recent framework targeted to web development, but even from its early years has be greatly supported by programmers and has find use to big enterprise projects. The main reason for its immediate acceptance is basically that it makes it easier to develop, deploy, and maintain web applications. Something that it comes handy when talking for instance about site maintenance. Having to read, understand and fix or upgrade thousands of lines of PHP or Java code with no specific structure can be a very difficult and time consuming experience. In the following pages there will be demonstrated some of Ruby on Rails main advantages.

First of all a look at the values expressed in the Agile Manifesto as a set of four preferences: Ruby on Rails development favors the following:

-Individuals and interactions over processes and tools. Rails is consisted of individuals and interactions. There are no heavy toolsets, no complex configurations, and no elaborate processes. The only things that are needed to make an application is a text editor and a basic knowledge of Ruby coding. This leads to transparency; what the developers do is reflected immediately in what the customer sees. It's an intrinsically interactive process.

-Working software over comprehensive documentation. Moreover a great feature of Rails is that it favors documentation. It is very easy to create HTML documentation for the entire codebase by simply writing a command in Ruby's console window. It must be declared though that the Rails development process isn't driven by documents. Instead, any question aroused by this

process can be answered by other users and developers who are jointly exploring their need and the possible ways of answering that need.

-Customer collaboration over contract negotiation. According to the above mentioned it can be easily comprehend that Rails encourages customer collaboration. When customers see just how quickly a Rails project can respond to change, they start to trust that the developer or developers can deliver what's required, not just what has been requested. Confrontations are replaced by "What if?" sessions.

-Responding to change over following a plan. The main idea is to be able to respond to change quickly. Rails uses the DRY principle in a very accurate way which means that changes to Rails applications require less code to be altered than the same changes would in other frameworks. And since Rails applications are written in Ruby programming language, having in mind the main attributes of it, changes are more localized and easy to write. The deep emphasis on Rails shows into testing, along with support for test fixtures and stubs during testing, enables developers to effectively test their changes. In this way, changes can be less of a problem.

Continuing in a more in depth analysis of Ruby on Rails main features and comparing them to the other of different programming languages, the following advantages can easily be delineated.

- 1) Developers using other frameworks to write web application were frustrated with the difficulties imposed. No matter what language they were using - Java, PHP, or .NET - there was a growing sense that the process of development, testing and deployed was extremely time consuming due to unnecessary overlapping and difficult since more than one languages are needed – e.g PHP(programming language) and SQL(query strings embedded to the code). On the other hand Rails is easier to understand and write and does not require other knowledge due to the technologies it processes – ActiveRecord does the job of translating Ruby code to SQL commands.
- 2) Another great advantage is that developing applications written in Rails can stand the test of time because they are designed and implemented using modern, professional techniques. For instance, all Rails applications are implemented using the Model-View-Controller (MVC) architecture. Java developers also have similar types frameworks such as Tapestry and Struts, which are based on MVC. The big difference is that when developing in Rails, there's a place for each piece of code, and all the pieces of the application interact in a standard way. This means that by starting a new application its skeleton is already prepared.

- 3) Probably the part of developing an application that takes the more time is testing. All Rails applications have testing support right in. As functionality is added to the code, Rails automatically creates test stubs for that functionality. The framework makes it easy to test applications, and as a result, Rails applications tend to get tested.
- 4) Rails applications are written in Ruby. With utilizing Ruby code in an application, ideas can be easily expressed. This leads to programs that are easy and fun to write and (just as important) are easy to read months later.
- 5) Rails takes full advantage of all Ruby tools - extending it in novel ways that make a programmer's work easier. This concludes to shorter programs and more readable. It also allows tasks to be performed inside the codebase instead of what would normally be done in external configuration files instead.
- 6) The Rails framework is based in two key concepts: DRY and Convention over Configuration. DRY, as previously analyzed, stands for don't repeat yourself meaning that every piece of information in a system should be placed just ones and in a unique place. Rails application are consisted of low levels of duplicate information – everything that needs to be written is written in one place — a place often suggested by the conventions of the MVC architecture—and then continue. For programmers used to other web frameworks, a simple change to the structure would involve them in even more code changes. Having Rails that diminished, creates a whole new era where changes can happen, code can be altered and tests written as simple as possible. This is a true revelation.
- 7) Convention over configuration is very important, too. It means that Rails is structured to have flexible defaults for just about every aspect of putting together the application. By following the conventions, Rails applications can be written using less code than a typical Java web application uses in XML configuration.
- 8) In addition Rails is new, and the core team of developers understands the new Web. Rails isn't trying to follow the new de facto web standards; it's helping define them. And Rails makes it easy for developers to integrate features such as Ajax and RESTful interfaces into their code, because support is built in.
- 9) Moreover another important issue of successfully developing web applications is that of deployment. With Rails successive releases of the

application can be deployed to any number of servers with a single command - and roll them back equally easily should the release prove to be somewhat less than perfect.

In sum, Rails was extracted from a real-world, commercial application. Judging from the above mentioned, this is the probably the best way to create a framework. It is to find the main unique attributes in a specific application and then sum them in a generic foundation of code. When developing a Rails application, is equal to starting with half of a really good application already in place.

3.10 Ruby on Rails: RECENT DEVELOPMENTS

On December 23, 2008, Merb and Rails announced a commitment to work together. The Rails team announced they would work with the Merb project to bring "the best ideas of Merb" into Rails 3, ending the "unnecessary duplication" across both communities. Merb, short for "Mongrel+Erb", is a model-view-controller web framework written in Ruby which adopts an approach that focuses on essential core functionality, leaving most functionality to plug-ins.

Rails version 2.3 was released on March 15, 2009. There were many major new developments and multiple enhancements in this version of Rails. In sum it includes templates, engines, Rack and nested model forms. More precisely the 2.3 release version of the open source rails framework includes:

- performance optimizations, customizable templates, memory savings, and ability to write the most performance-dependent parts in Ruby. It also features HTTP Digest Authentication, an API for authentication.
- new templates capability enables creation of templates already fitted with specific capabilities such as plug-ins, instead of just having a bare-bones, skeleton template
- enables different Ruby frameworks to work together more easily. A developer, for instance, could add into a Rails project a piece of an application built in the more lightweight Sinatra framework.
- the Rails Metal capability in Rails 2.3 lets developers author part of an application directly in Ruby rather than in Rails, to boost performance.

Although there is more to be expected from the upcoming version of Rails - Rails 3. Heinemeier Hansson assured that Rails 3 will take full advantage of the competing Merb effort, which is now being merged into Rails.

CHAPTER 4

Web Application Presentation

Introduction

In this chapter the web application is presented. There were two applications developed. The former is for the Safety Department of Olympic Airlines, which assists the administration of the reports (Occurrence and Hazard reports). The latter stands as a proposal for a Classification Society, based on the checklists that the Honduras Maritime Inspection utilizes in ship inspection. This presentation will be based on the description of two web applications and the most significant services they provide, illustrated through screenshots.

4.1 HOW TO START UP

To begin with it must be clarified that these applications can run in two ways. The first one, is by hosting the program and the database in the user's PC, which of course is a setback, because it removes the most important advantages presented in previous chapters. The term PC is used to indicate that the Operating System (OS) has to be a distribution of Windows. The application's start up process is different in MacOS and Linux. The second way, which is more appropriate, is to host both the application and database in a server computer and access them through another computer by opening an internet browser and then enter in the URL the IP (it must be static) or domain name of the server (in both LAN and WAN configurations).

This thesis adopts the first way described above for the reason that it is very easy to be executed by anyone with basic computer skills knowledge and in addition to that there is a lot of documentation available for further assistance. Setting up a server can be a very frustrating experience to someone that has not done it before, because it requires a lot of knowledge on how to setup a Apache, MySQL (or any other database program like SQLite, PostgreSQL etc.) and Ruby On Rails server system. Things become a lot more complicated when it comes to the point of deploying the web application. Programs such as Capistrano must be also configured in order to deploy them. All of these could take a lot of time to be fully explained and such thing is beyond the scope of this study.

4.2 STARTING UP

The start up process can be performed on a very easy basis. Of course there are some issues that must be addressed in advance. Firstly, Instant Rails must be downloaded, then a program written in Ruby on Rails must be placed in the rails_apps folder and it must be connected to the database which in Ruby on Rails environment is done very easily using two lines of command; db:create:all, to create the development, test and deployment databases and then db:migrate to create the database tables.

Taking for granted that all the above are done correctly, the following steps must be done prior to the launch of the application.

Step 1: Instant Rails is to be opened. This is a key feature when programming in Ruby on Rails. It comes as a zipped file and contains everything a user needs to develop or start a web application. A special feature is that it has preinstalled Apache server , MySQL and PHPmyAdmin, which is particularly important since it saves a lot of time. PHPmyAdmin is a HTML page with direct view to the contents of the database and database control capabilities. All the above make the whole process much easier. The figure below shows the Instant Rails's control window, in which the user can manage the application and have instant access to all of the configuration files.

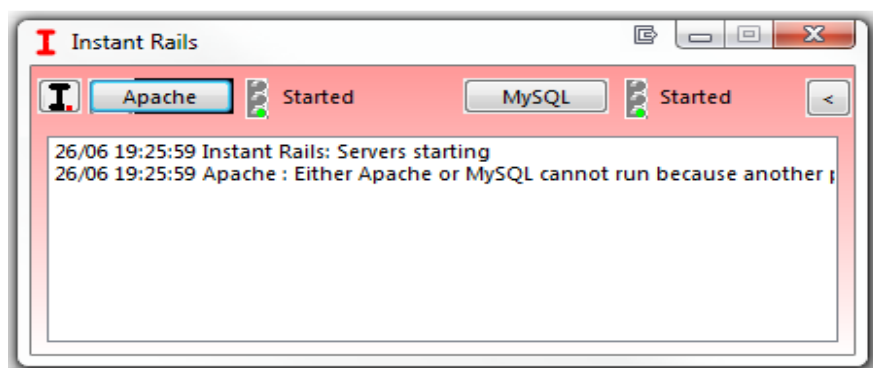



Figure 7: Control window.

Step 2: After confirming that the Apache and MySQL have started properly – which is indicated in the message right after each one- click on the  button and the following menu will appear. Then select on *Manage Rails Applications...* as shown in the figure below.

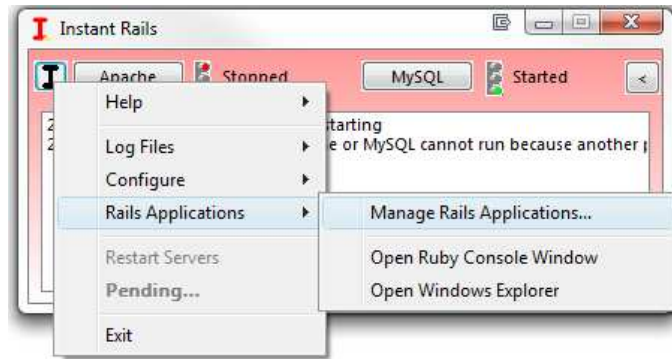


Figure 8: Finding user's application.

Step 3: In the depicted window, all the applications located under the *rails_apps* folder are listed. To start up an application, user must click from the list on the desired application and then press the *Start with Mongrel* button.

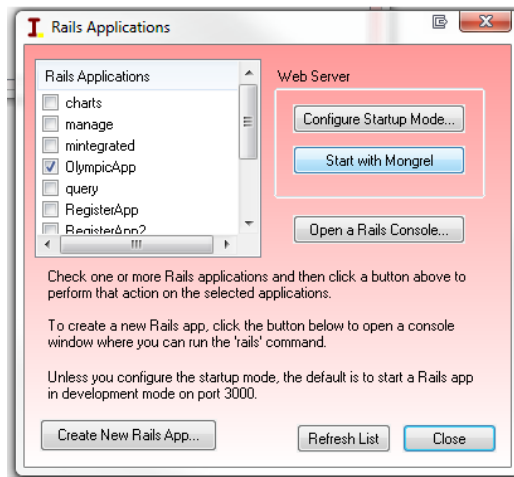


Figure 9: Selecting an application.

Step 4: The following command window, which is displayed, shows that the built in server (Mongrel) is initiated and at which port. In this case the port is 3000 as displayed in the first row.

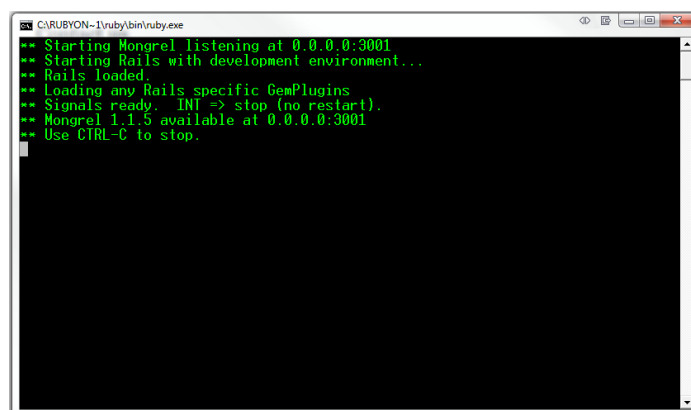


Figure 10: Mongrel's output window.

Each port can host only one application at a time. Thus, if more applications are needed to be run simultaneously, a different port must be assigned for each one of them. This means that the user must return to step 3, select another application and appoint to it a unique port by clicking the “*Configure Startup Mode ...*” button, different from the others. In order to avoid any conflicts with other applications the port must be chosen carefully. The *Runtime Mode*: indicates which one of development, test and deployment database are currently running.



Figure 11: Type of database and port.

After these steps the application is up and running and the only thing left to do is to open an internet browser and type: <http://localhost:3000/>

The variable in the above address is the port number (in this case 3000), so user must write the port number that has appointed as instructed in step 4. Domain name *localhost* is by default set in Ruby on Rails. It can be changed in the *database.yml* file which is responsible for setting up the core attributes of the database.

Then the next screen will be displayed indicating that the Ruby on Rails application is up and running. In order to get to a specific page of the application, the user must insert in the URL the corresponding controller and view of the page. So it must be of the type:

[http://localhost:3000/controller\(name\)/view\(name\).](http://localhost:3000/controller(name)/view(name).)

For instance <http://localhost:3000/start/welcome.>

In order to be automatically redirected to a certain page, the user must set this page as the start up page. This is done by modifying the *routes.rb* file. Extreme caution must be taken in this part in order not to give access to users in restricted pages before redirecting them firstly to login.

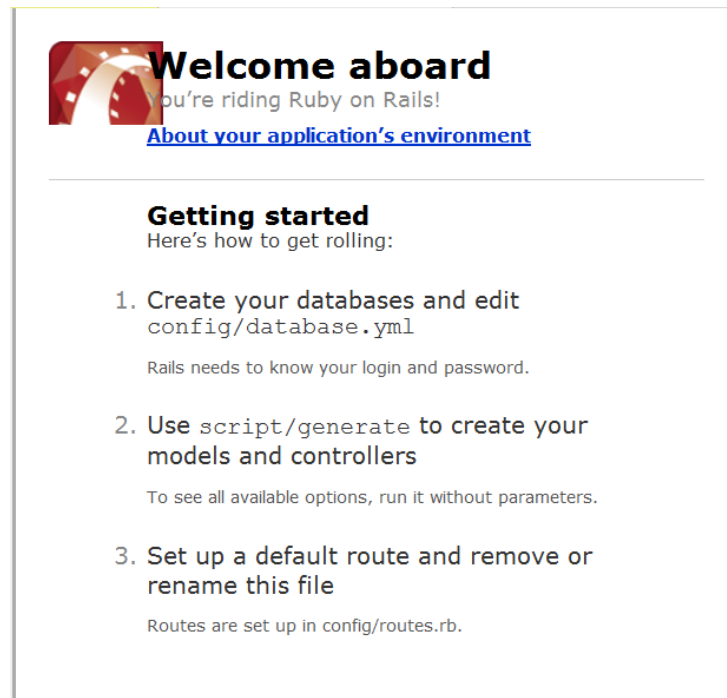


Figure 12: "Welcome aboard" screen.

In the following section there is a demonstration of the two programs. This demonstration is consisted of screenshots that presents the key page and function of the programs.

4.3 Olympic Airlines: SITE PRESENTATION

Introduction

Firstly the Olympic Airlines Database program will be demonstrated. This site has advanced features included, such as a user registration system, user rights system, create-edit-destroy function to reports, advanced query functions and graphical display of data through flash charts.

A demonstration of what the user will see when he visits the site for the first time is depicted in *Figure 13*. It gives an outline of the site's purpose and how it is structured. On the top left corner there is a "welcome guest" message followed by links to Log IN (if he is already a user) or to Sign Up (if he is a new user). Also in the bottom section there are placed useful links. A menu with direct links to the contents of the site is placed at the right - each one with a rule of requesting to login first.

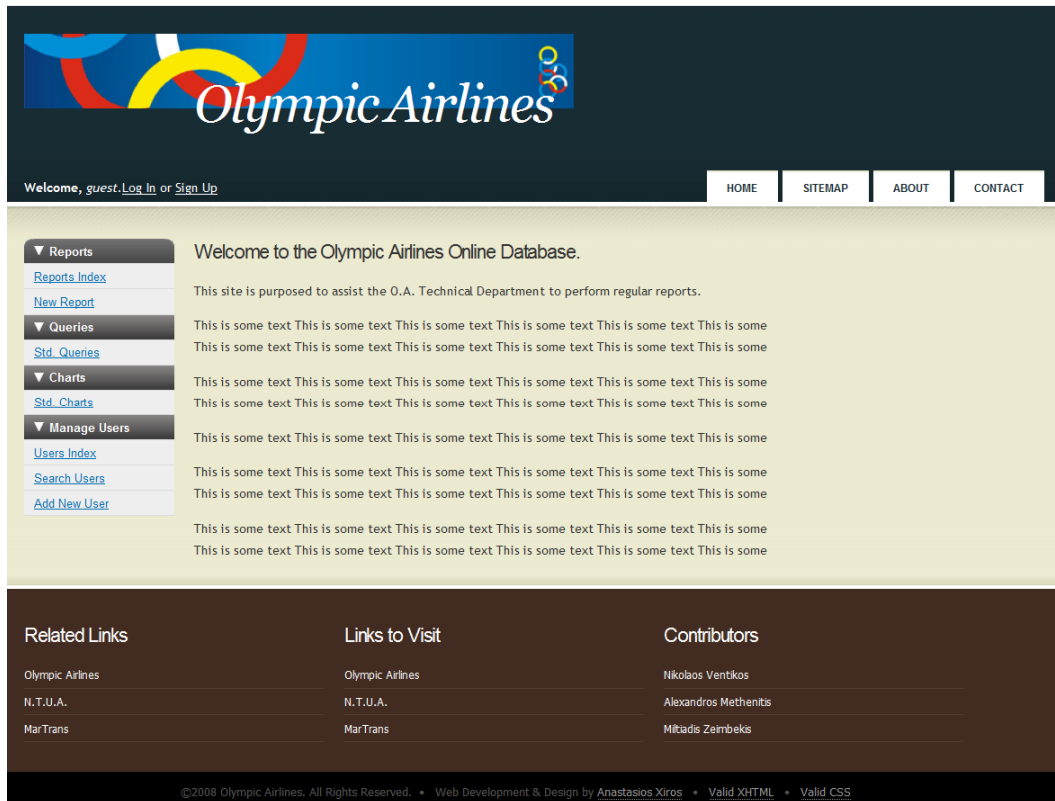


Figure 13: Olympic Airlines welcome screen

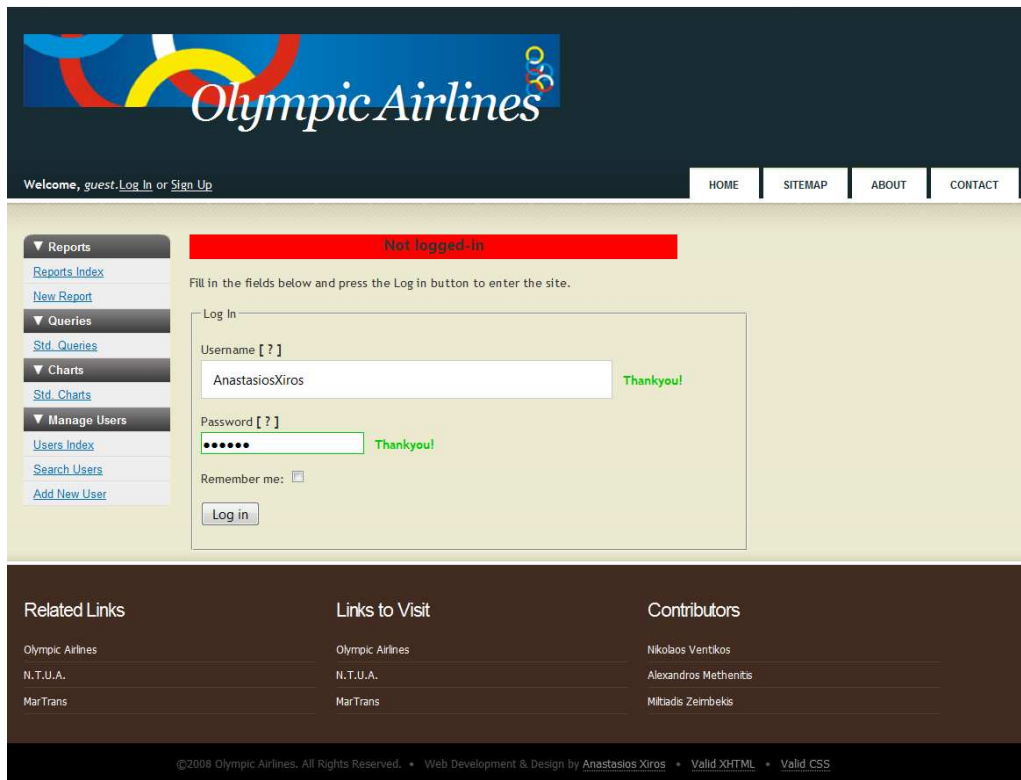


Figure 14: Login screen.

In this screen (*Figure 14*) the user can login into the program. There are many features in this page. On the top of the contents page there is a message section that gives direct commands from the controller. In this case a “Not logged-In” message is displayed in a red frame. After each field, there is also a message section which is refreshed, after every keystroke or mouse-click, to show if what’s written is valid, according to what the programmer has set. This is called on-click client-side live validation. Client side means that the process runs on the user’s computer and not in the server and this in turn means that less server resources are used. Of course client side validation must always be used along with server side validation for security reasons. The purpose then is to make this process more user friendly. Next to the Username and Password input fields a “[?]” is placed. By rolling the mouse over, a tooltip window is displayed to show some restrictions to the username’s and password’s format. This is a feature that takes away unnecessary information to former users and makes the site more user friendly once more. Finally by clicking on the Remember me checkbox the user can skip the process of login for a limited period of two weeks’ time. This is done without adding a cookie file to the browser, which is made possible with RESTfull applications.

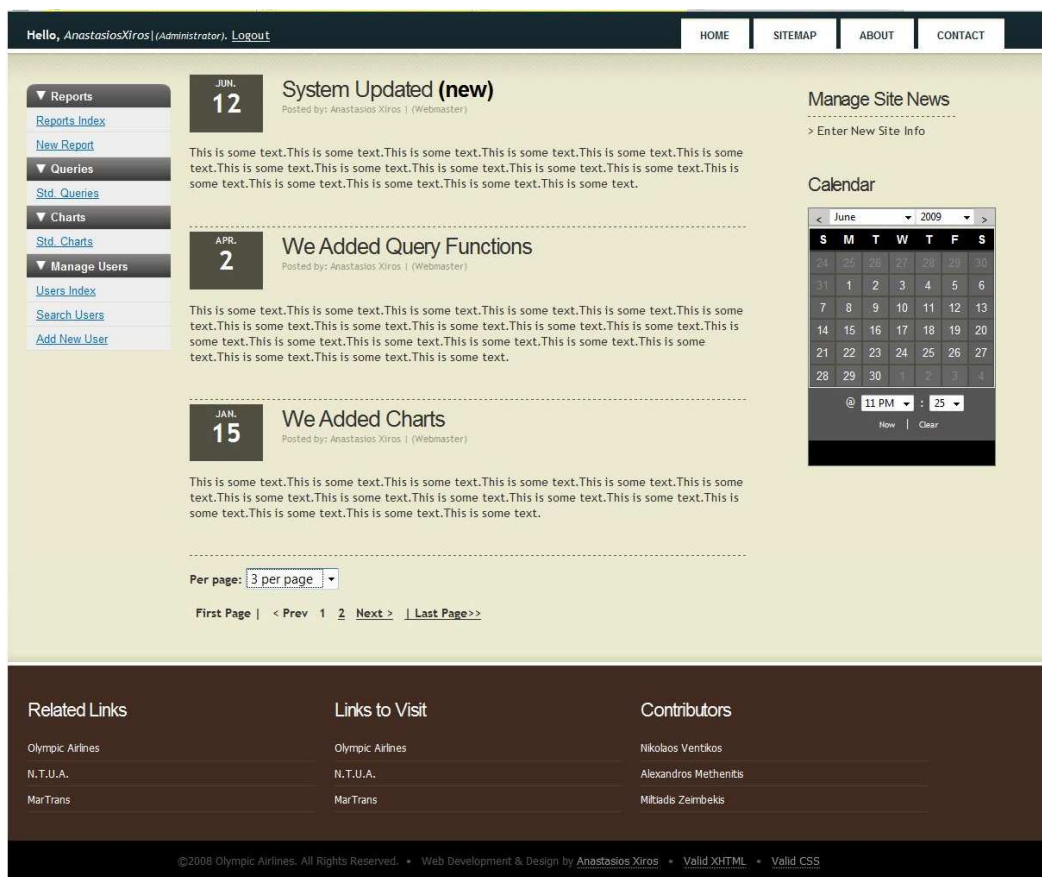


Figure 15: Site news' page.

This is the site's news section of the application (Figure 15). The user is automatically redirected to this page after logging into the site. A difference to the previous pages is that now the program recognizes the logged in user and displays a message containing his Username and, in parentheses, his account type followed by a link to logout. In this section important messages are displayed for the user's information about changes or upgrades that have been made to the site. Every new post is indicated by a blinking message saying **(new)**. The menu "Manage Site News" on the top right of the page is displayed only when the logged in user has administrative rights. Thus posts can be added only by authorized users (i.e. administrators) in order to avoid posts irrelevant to the page spirit. A new feature to this page is the pagination function. With this function the user can choose from a select box how many post he wants to be displayed on screen and he gets also the direct links to the pages. This function is written using AJAX and that makes the process of pagination very fast.

Report Listing

Number of Reports found: 4 reports. Per page: 5 per page

OcR **ATC Incident** submitted: 2 months ago
 This is some text.This is some text.This is some text.This is some text.This ...
created at: Fri Apr 03 23:47:16 +0300 2009
 updated at: Fri Jun 26 23:20:52 +0300 2009

OcR **Fire Emergency** submitted: about 1 hour ago
 This is some text.This is some text.This is some text.This is some text.This ...
created at: Fri Jun 26 22:25:25 +0300 2009
 updated at: Fri Jun 26 22:25:25 +0300 2009

OcR **EMERGENCY LANDING** submitted: about 1 hour ago
 This is some text.This is some text.This is some text.This is some text.This ...
created at: Fri Jun 26 22:26:39 +0300 2009
 updated at: Fri Jun 26 22:26:39 +0300 2009

OcR **Fumes in cockpit** submitted: about 1 hour ago
 This is some text.This is some text.This is some text.This is some text.This ...
created at: Fri Jun 26 22:27:40 +0300 2009
 updated at: Fri Jun 26 22:27:40 +0300 2009

Table View

Id	Commander	Date Inc	Air Type	Air Reg	Depar	Dest	Land
1	ALEX METHENITIS	2009-04-03	BOEING-747	OOO-9099	ATHENS	LONDON	LONDON
2	GEORGE PAPAZISIS	2009-06-26	AIRBUS A-321	WWW-2222	ATHENS	ALEXANDRO...	ALEXANDRO...
3	John Tiligkadas	2009-06-26	CESNA	YZN-9156	ATHENS	MYKONOS	MYKONOS
4	NIKOLAOS VENTIKOS	2009-06-26	BOEING-747	KKK-1234	ATHENS	OSLO	OSLO

Per page: 5 per page

Figure 16: List of the reports.

Reports management - this is probably the most important part of the application. Features, like user's identification and pagination appear also in this page. Throughout this page the user can see the reports that are saved in

the database and their total number via a reports counter. At the top section there is an odd-even listing of the reports, which shows for each report the type (indicated by an image placed at the end of the row), the title of the event, the text of the events description (limited to 80 characters), and some timestamps (when it was created, how much time to date, displayed in text and when it was last updated). Also on the right of every report display are placed three links; show, edit and destroy. There is a rights system application in these links to prevent users to edit or delete reports. Advanced users cannot delete reports and of course administrators have full privileges. At the table view reports are in direct correspondence with the reports above but show different details about them. The sorting can be modified by clicking the links of each columns header.

New Report

Flight Details | Event Description | MET / MIS | Subject - Description | ATC Incident | Vortex - RVSM | Bird - P.E.D.

Flight Details

Commander	First Officer	Other CrewMember
ALEX METHENITIS	GEORGE PAPADOPOULOS	FLIGHT ASSISTANT
ID	ID	ID / Rank
ZZZ-1234	XXX-4321	AAA-7894 / 1st CLASS
Flight Number	Aircraft Type	Aircraft Registration
XYN-GR456	BOEING-747-400	XTT-OAL321-KK

Date of Incident
 2009 July 9

Blocks OFF	Blocks ON	Minutes
12:38	12:48	10
Departure APT	Destination APT	Landing APT
ATHENS	BARCELONA	MALAGA
Pax	RWY	Crew
211	12	5

Phase of Flight

Towing	<input type="checkbox"/>	Cruise	<input type="checkbox"/>
Parking	<input type="checkbox"/>	Descent	<input type="checkbox"/>
Taxi	<input type="checkbox"/>	Holding	<input type="checkbox"/>
Take Off Roll	<input type="checkbox"/>	Approach	<input checked="" type="checkbox"/>
Initial Climb	<input type="checkbox"/>	Landing	<input type="checkbox"/>
Climb	<input type="checkbox"/>	Taxi In	<input type="checkbox"/>

ETOPS
 YES NO

RVSM
 YES NO

Data of Occurrence

Location	Time inUTC	Altitude
NICE	12:45	12.000
Weight	QTY Fuel Jettisoned	Time Fuel Jettisoned
13	1.2	12.30

[Back to Reports](#)

Figure 17: Adding a report.

In this page the user can add reports to the database. This page has a very interesting feature. Given that great length in pages of the report, the user should have to scroll many times down in order to fill the form. This is the

reason why it was splited in tabs, to make the filling of the report as easy as possible. The issue of redirecting to another page, each time a tab is clicked, and saving the whole session to a cookie, has been overcome by utilizing AJAX to this page too. This way, when each tab is clicked the content of the current tab fades out and the ones clicked comes forward. As a result the process of filling out a report is done much quicker without using many server resources.

The screenshot shows a web application interface with a horizontal tabbed menu at the top. The tabs are: 'Flight Details', 'Event Description', 'MET / MIS', 'Subject - Description' (which is the active tab), 'ATC Incident', 'Vortex - RVSM', and 'Bird - P.E.D.'. Below the tabs, the 'Event Description' tab is active, displaying a form with the following fields:

- Type of Event:** A text input field containing the value '/images/ocr.jpg'.
- Subject:** A text input field containing the value 'Fire Emergency'.
- Event Description:** A large text area containing the text: 'The passengers notices fumes coming out the back of the plane. Immediate landing was decided by the captain crew.'

At the bottom of the form, there is a 'Create' button and a link labeled 'Back to Reports'.

Figure 18: Entering the events description

The user must click on the "Create" button to save the report, after completing all the forms placed in each tab. Then he is redirected to a preview of the report he just created in order to check if any changes are necessary (Figure 19). Finally, he can press on the "Back to reports" link if the report is correct or Edit report if some mistakes were found, and then press "Update" to update the report. To fasten the process for simple users, who can only write reports, there is an additional link "New Report" placed.

The next step is to go back to the report listing, where the new report has been added and placed in the last row. There are features that control how many reports appear on the screen. By default the maximum reports that can be viewed in a single page are 25. When this number is succeeded then pagination takes charge and creates more Ajax pages. In addition, all the

reports can be sorted by clicking on each column's header in the Table view section. Thus clicking the Id header, the last created report will appear first.

Show Report

Flight Details Event Description MET / MIS Subject - Description ATC Incident Vortex - RVSM Bird - P.E.D.

Flight Details

Commander: ALEX METHENITIS First Officer: GEORGE PAPADOPOULOS Other CrewMember: FLIGHT ASSISTANT

ID: 457899 ID: 447851 ID / Rank: 784511

Flight Number: XYN-GR456 Aircraft Type: BOEING-747-400 Aircraft Registration: XTT-OAL321-KK

Date of Incident: 2009-07-09

Blocks OFF: 12:38 Blocks ON:12:48 Minutes: 10

Departure APT: ATHENS Destination APT: BARCELONA Landing APT: MALAGA

Pax: 211 RWY: 12 Crew: 5

Phase of Flight				
Towing	✗	Cruise	✗	ETOPS
Parking	✗	Descent	✗	YES
Taxi In	✗	Holding	✗	RVSM
Take Off Roll	✗	Approach	✓	NO
Initial Climb	✗	Landing	✗	
Climb	✗	Taxi In	✗	

Data of Occurrence

Location	Time inUTC	Altitude
NICE	12:45	12

Weight	QTY Fuel Jettisoned	Time Fuel Jettisoned
13	1	12.30

[Edit Report](#) | [Back to Reports](#) | [New Report](#)

Figure 19: Reports overview before saving it.

The Query Listing section (Figure 20) has a very advanced system. It is based on AJAX as well, to fasten the process. This means that after filling out the query form and pressing search the page does not refresh and appear the result immediately. Notice that it can be selected to use as matching conditions ALL or ANY of the fields, for more advanced searching. Additionally, the window with the query form is collapsible through a JavaScript in order to make the screen as small as possible. Functions as pagination, reports sorting are also used in this page.

To search for the report created, the user has to fill in some or all of the fields in order to set the criteria for the search. For instance, the user enters; "All" in the matching conditions, the name of the commander, the city of departure and the type of event. Notice that the keywords are not case sensitive meaning that it does not matter if the names were written in capital letters or not.

Query Listing [Show Query Form](#) [close](#)

Search Reports

Match ANY or ALL of the conditions All ▼

Commander keywords
alex

Air type keywords

Air reg keywords

Depar keywords
ath

Dest keywords

Land keywords

Phase of Flight	
<input type="checkbox"/> Towing	<input type="checkbox"/> Cruise equals
<input type="checkbox"/> Parking equals	<input type="checkbox"/> Descent equals
<input type="checkbox"/> Taxi equals	<input type="checkbox"/> Holding equals
<input type="checkbox"/> Takeoff equals	<input type="checkbox"/> Approach equals
<input type="checkbox"/> Iclimb equals	<input type="checkbox"/> Landing equals
<input type="checkbox"/> Climb equals	<input type="checkbox"/> Taxin equals

Type of Event

<input checked="" type="checkbox"/> Techirr equals	<input type="checkbox"/> Envir equals	<input type="checkbox"/> Atc inc equals	<input type="checkbox"/> Eggws act equals
<input type="checkbox"/> Secur ev equals	<input type="checkbox"/> Oper ev equals	<input type="checkbox"/> Human fac equals	

Number of Reports found: 2 reports. Per page: 25 per page ▼

ATC Incident submitted: 3 months ago

This is some text.This is some text.This is some text.This is some text.This ...

created at: Fri Apr 03 23:47:16 +0300 2009
updated at: Sat Jun 27 19:35:51 +0300 2009

[Show](#)
[Edit](#)
[Destroy](#)

Fire Emergency submitted: 21 minutes ago

The passengers notices fumes coming out the back of the plane. Immediate land...

created at: Fri Jul 10 00:11:56 +0300 2009
updated at: Fri Jul 10 00:13:04 +0300 2009

[Show](#)
[Edit](#)
[Destroy](#)

Table View

Id ▲	Commander	Date Inc	Air Type	Air Reg	Depar	Dest	Land
1	ALEX METHENITIS	2009-04-03	BOEING-747	OOO-9099	ATHENS	LONDON	LONDON
12	ALEX METHENITIS	2009-07-09	BOEING-747-400	XTT-OAL321-KK	ATHENS	BARCELONA	MALAGA

Figure 20: Query form

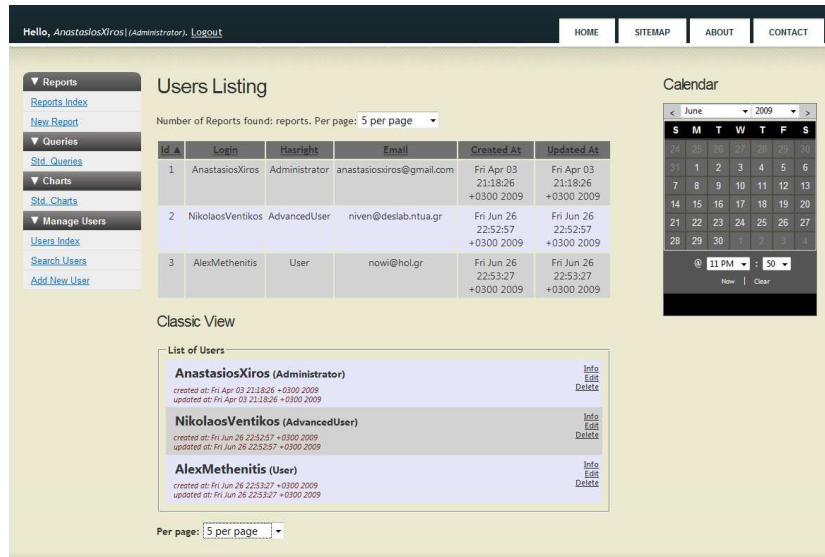


Figure 21: Users page.

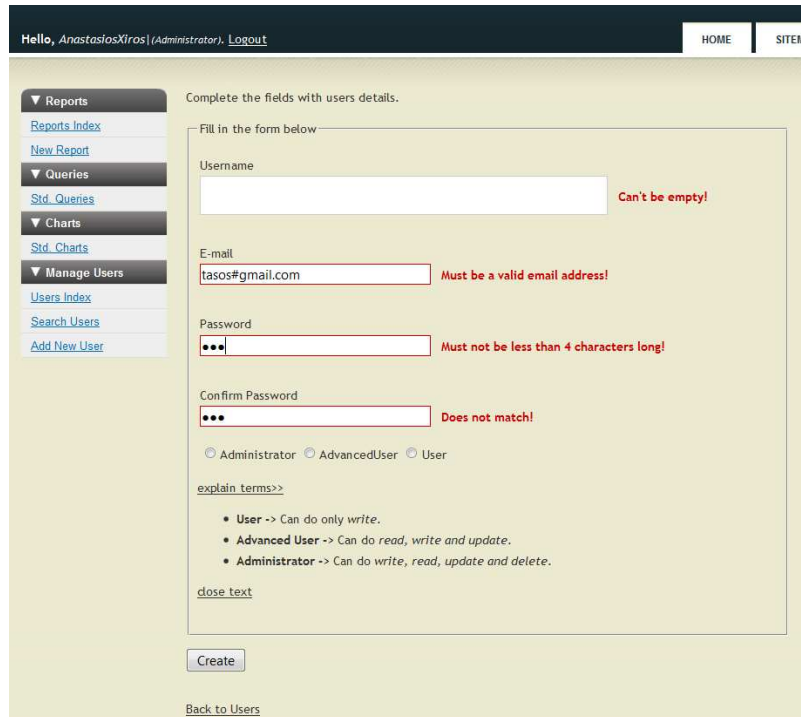


Figure 22: User registration page.

The two above figures demonstrate the user's management system. The user's index screen is structured in the same way as the reports listing. In the second figure the user's rights section are depicted. A common problem when creating new users, is granting them with multiple rights. In this application this problem was addressed by using radio button selection for the setting of the user's rights. In addition, there is a collapsible text window that explains each type of user's rights. Functions, such as pagination and live validation are also used. In the case of live validation a new feature is used to reduce the number

of wrong inputs, -a case match rule is added to the password fields to assure they have exactly the same contents.

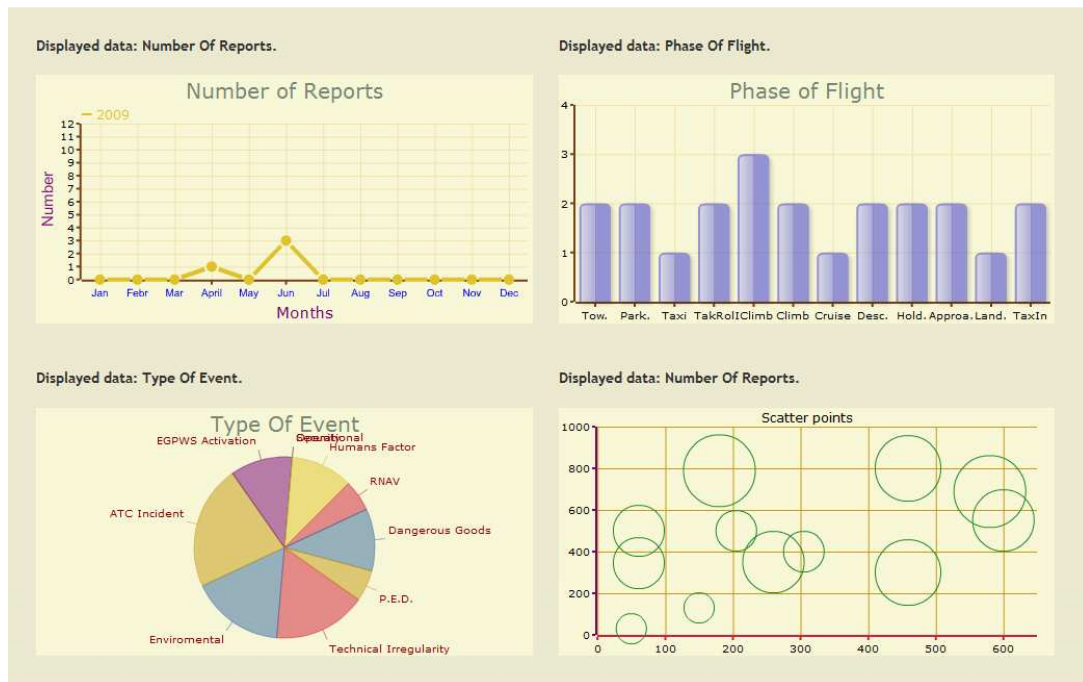


Figure 23: Charts Page

The last part of the site is the charts section. This is particularly useful in order to give to the user a more visual and comprehensive image of the database’s contents. It must also be mentioned that the charts and the data that appear, were requested by Olympic Airline’s security director. Flash charts were chosen because there wasn’t a need for dynamic content, but instead they offer user friendly features, like mouse over tooltip windows which show the actual values of data and they are more pleasing to the eye. At the top-left corner, a graph chart is utilized to show the number of reports they were made on a year base. At the top right corner, a bar chart is utilized to show how many times a problem occurred to the aircraft at a specific phase of flight. At the bottom left corner, a pie chart is utilized to demonstrate the percentage of occurrence of each type of event. Finally a scatter chart is utilized to show a different perspective of the number of the reports listed.

In the figures to follow, each flash chart is presented in a magnified view.



Figure 24: Graph Chart.

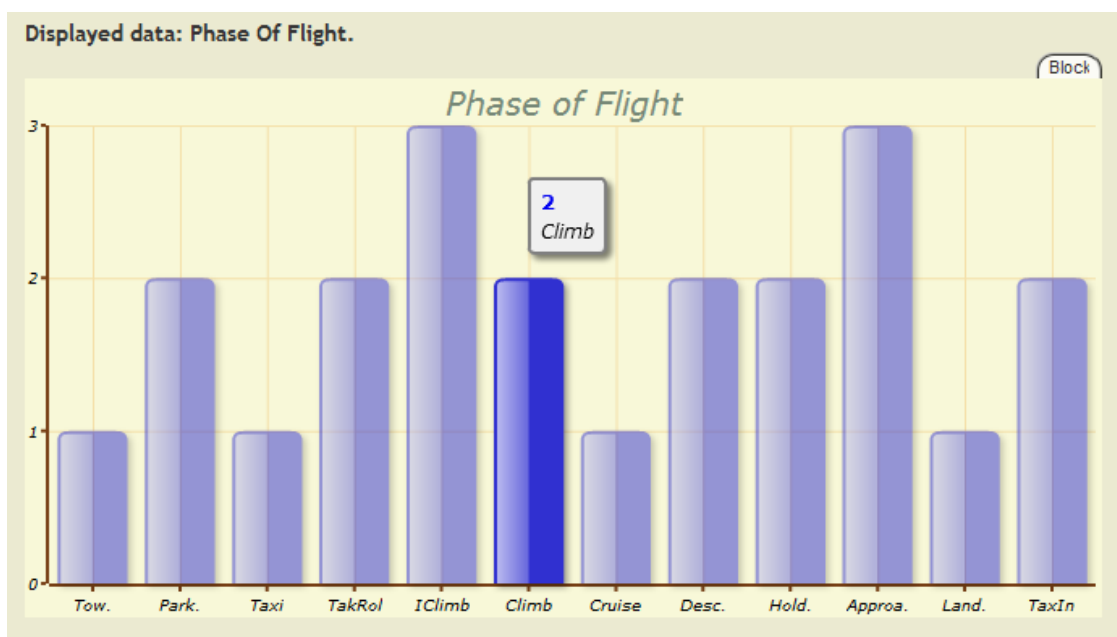


Figure 25: Bar Chart

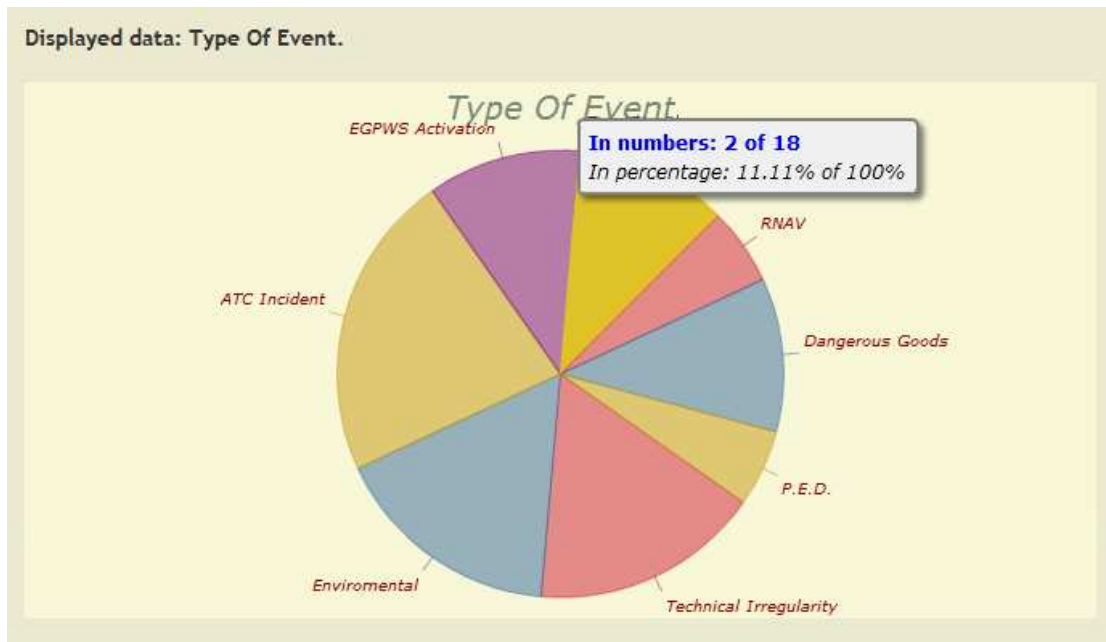


Figure 26: Pie Chart.

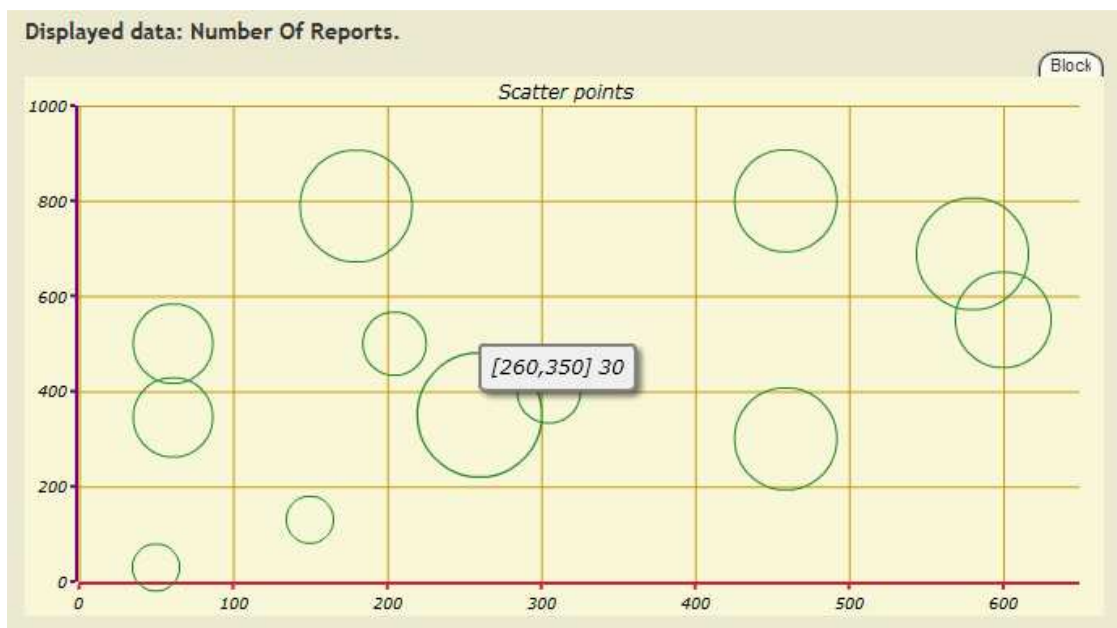


Figure 27: Bubble Chart

4.4 CLASSIFICATION SOCIETIES' APPLICATION

Now that the above presentation of the Olympic Airlines web application is completed, it is necessary to present a proposal which can be adopted to the Classification Societies. The purpose is to provide a solid base to improve the organizing of the vast paperwork backlog which needs to be filled out, checked, stored and recovered when demanded. This will mainly assist the work of inspectors by being able to have their entire database of reports anywhere.

This application shares many common features with those applied in the Olympic Airlines site. Its target, though, is more of a data storage application with emphasis on simple design, reduced routing and user friendly layouts. The reason of doing so is because the user must be able to take advantage of the site's capabilities even in adverse situations. These situations require that the site is quick and responsive to overcome slow internet connections. Moreover, it must be of high quality, even in the smallest resolutions offered by PDA devices. Thus, no high quality pictures are deployed or flash as background or banners in the pages, in order to reduce loading time. There has been made extensive use of controller message outputs, so that the user knows exactly what was made after his interaction and that is assuring that less errors will be occur.

This site does not have a closed registration or user-rights system because this is always a subject which depends on the customers' special needs. Many changes took place though. It is not a RESTfull application but is based entirely on the tools given by the new release of the Rails framework. Consequently the code needed to have a fully functional registration system, which was reduced from approximately 800 lines of code to only 450 lines, meaning improved speed for each session.

4.4.1 CLASSIFICATION SOCIETIES: SITE PRESENTATION

This is the starting page of the website that hosts site news, links to login or register, links to the site's other pages and a very useful calendar. As it is easily noticed bright colors were chosen and no use of images in order to make page loading quicker. The calendar is a JavaScript based on the Prototype.js – a built in JavaScript library of the Rails framework. This means that is very quick, scalable and can work in every resolution and browser.

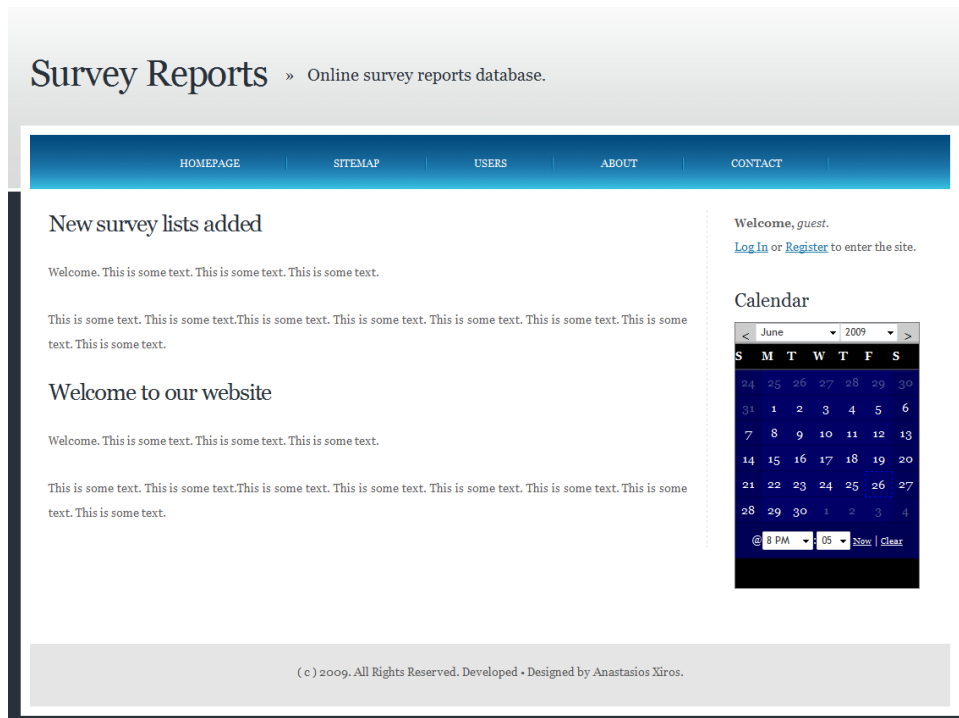


Figure 28: Survey reports start page.



Figure 29: List of survey types reports.

After logging in, the user is automatically redirected to the page that is depicted above. In this page there are a number of reports hosted in the database. There are samples to illustrate the functionality of the program. In the following figures the *Inspection Of Crew Accommodation* report is been

illustrated. Since the rest reports are sharing the main structure, it is not necessary to be presented, as nothing new is going to be added to the analysis.

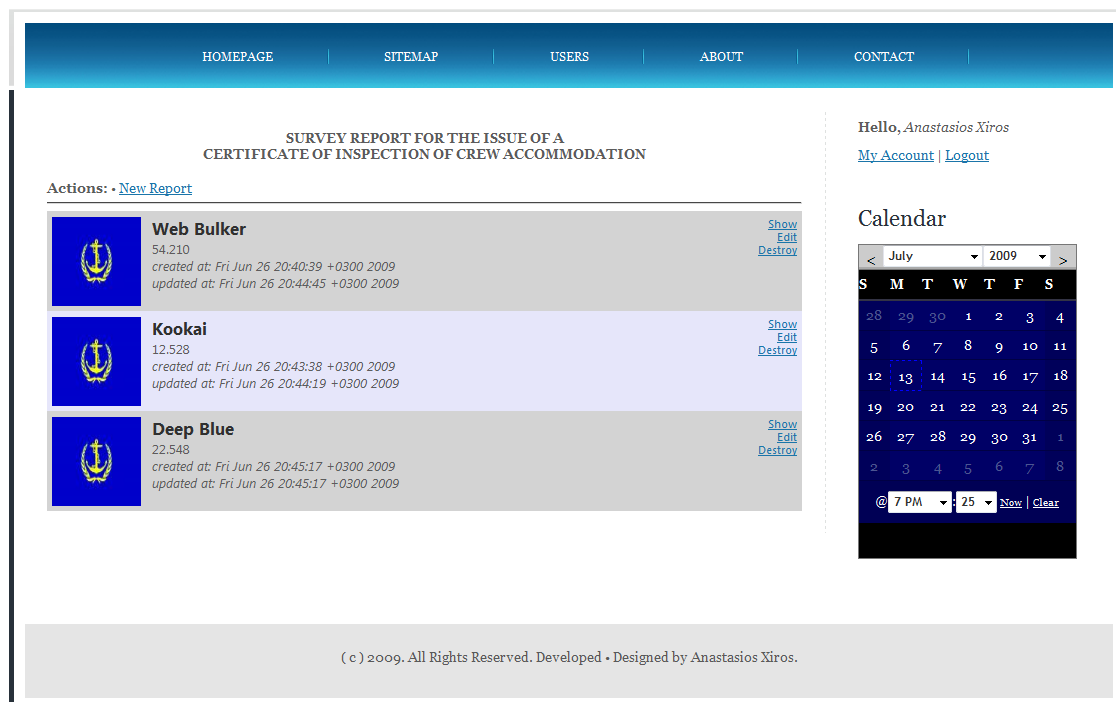


Figure 30: List of stored reports.

In this section the user can see the stored reports in the database and how to manage them. There is the basic CRUD function. CRUD stands for Create, Read, Update and Delete. Above the reports, there is a menu placed, named "Actions", where links to route the database are placed.

In *Figure 31* the page in which the reports can be filled out, is demonstrated. In this page the "Actions" menu (*Figure 32*) can also be noted. It has the exact page format as the lists that the inspectors are already using, and this was decided in order to reduce the time the user needs to familiarize with the program. The layout is very simple, clear, lacks in complexity and so it is easy to be comprehended by the user. More importantly, the whole list appears on a single page. In this case the same AJAX tab format, as utilized in the Olympic Airlines site, is not used. The reason is that the working area scales into different resolutions. Moreover it does not burden the cache memory of the browser with data packages that require increased memory size – a limited feature in devices as PDAs. To avoid scrolling all the way up in order to use the "Actions" menu, this menu is also placed at the bottom, so to increase functionality.

Actions: • [Back to Reports](#)

CERTIFICATE OF INSPECTION OF CREW ACCOMMODATION

Name of Ship	Distinctive Number or Letters	Port of Registry
<input type="text" value="Web Bulker"/>	<input type="text" value="AAA132444478"/>	<input type="text" value="Pereaus"/>
Type of Ship	Date of Built	Gross Tonnage
<input type="text" value="Bulk Carrier"/>	<input type="text" value="08/1995"/>	<input type="text" value="54321"/>
Patent of Navigation (Number and Expire Date)	IMO Number	
<input type="text" value="587-2009"/>	<input type="text" value="ASD456789"/>	

Owners / Operators :

Extent of Survey:

- Initial survey
- Periodical survey for renewal of certificate
- Completion of new building
- Change of flag or change of name
- Conversion of the ship
- Expire of Certificate of Inspection of Crew Accommodation

Record of approved crew accommodation details:

- Record on board
- Record in agreement with particulars of vessel, as ascertained by examination
- Alterations to the Record have been checked and are listed overleaf

Documentation action:



- Short term certificate has been issued: valid for:
- The existing certificate has been extended until
- Interim certificate valid five months has been issued valid until:
- No certificate issued due to the deficiencies found
- Any recommendation issued or deficiencies noted upon completion of the survey are listed overleaf

- A major conversion of the crew accommodation has taken place since the date of the Record of Approved Crew Accommodations Details
- 1.1 Are the particulars of the galley in agreement with the Record of Crew Accommodations Details?
- 1.2 Are the galley appliances operational?
- 1.3 Are appliances using naked flames adequately protected and secured?
- 1.4 Is the galley maintained in clean and efficient conditions?
- 1.5 Are floor drains in the galley, including water/grease traps, in good condition?
- 1.6 Are cold and hot drinking water available at the washing-up area?

Figure 31: Completing a report.

Actions: • [Back to Reports](#)

Figure 32: Actions Menu in New Report page

In *Figure 33*, a completed report is demonstrated. It's the page, which follows the "Create Report" page. The format and all the functionality attributes are kept the same in this page too. There were added two more, though, for better presenting the updates. On the right of the "Actions" menu, a controller message output window is placed, so that the user knows if his action was completed successfully or if there is a problem. In case of an error the corresponding message is written in red to capture attention. For the same reason instead of showing "true" or "false" exactly beside each question, these output messages are replaced with  and  accordingly - this is made feasible by using Rails Helpers.







Actions: [Edit Report](#) [Back to Reports](#) [Cica was successfully created.](#)

CERTIFICATE OF INSPECTION OF CREW ACCOMMODATION




Name of Ship	Distinctive Number or Letters	Port of Registry	Gross Tonnage
<i>Web Bulker</i>	AAA132444478	<i>Pereaus</i>	54321
Type of Ship	Date of Built	IMO Number	
<i>Bulk Carrier</i>	08/1995	ASD456789	
Patent of Navigation (Number and Expire Date)	587-2009		

Owners / Operators : *XXX Shipowners*






Extent of Survey:

- Initial survey 
- Periodical survey for renewal of certificate 
- Completion of new building 
- Change of flag or change of name 
- Conversion of the ship 
- Expire of Certificate of Inspection of Crew Accommodation 

Record of approved crew accommodation details:

- Record on board 
- Record in agreement with particulars of vessel, as ascertained by examination 
- Alterations to the Record have been checked and are listed overleaf 

Documentation action:

- Short term certificate has been issued: valid for: 
- The existing certificate has been extended until 
- Interim certificate valid five months has been issued valid until: 
- No certificate issued due to the deficiencies found 
- Any recommendation issued or deficiencies noted upon completion of the survey are listed overleaf 








- A major conversion of the crew accommodation has taken place since the date of the Record of Approved Crew Accommodations Details 
- 1.1 Are the particulars of the galley in agreement with the Record of Crew Accommodations Details? 
- 1.2 Are the galley appliances operational? 
- 1.3 Are appliances using naked flames adequately protected and secured? 
- 1.4 Is the galley maintained in clean and efficient conditions? 
- 1.5 Are floor drains in the galley, including water/grease traps, in good condition? 
- 1.6 Are cold and hot drinking water available at the washing-up area? 

Figure 33: Report is completed.

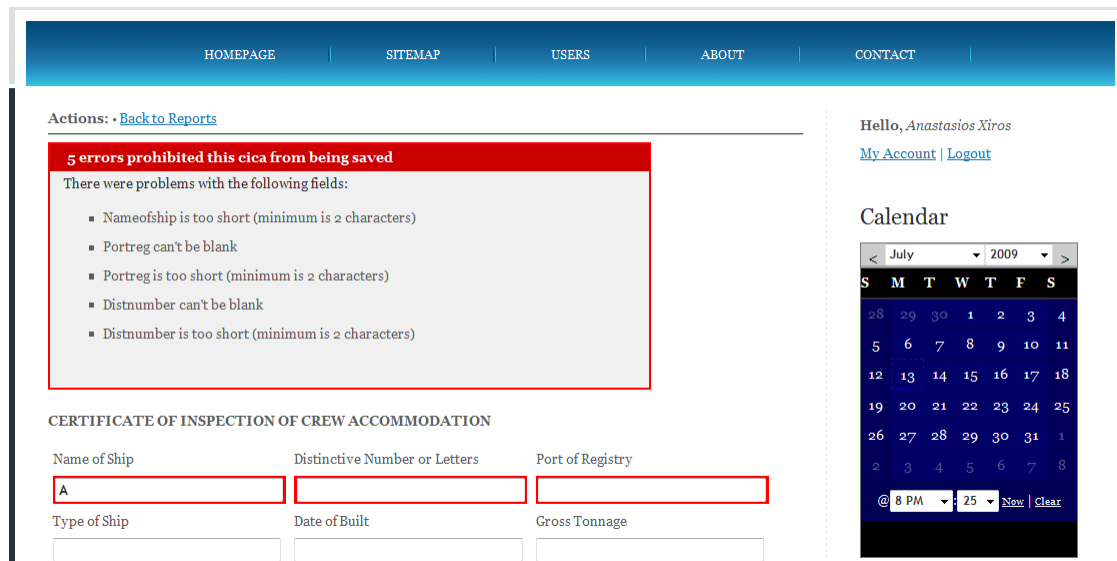


Figure 34: Server-side validation.

In Figure 34, a server-side validation output window is depicted. This output aims in preventing reports with wrong inputs to be saved. In the red window, there are displayed two parameters; the number of errors, and the type of errors which were made in the corresponding input field. A great feature is that the input fields, which contain the error, are highlighted in a red frame, in order to make them more distinct. The rules of what is perceived as an error are set in the model file (in this form *cicas.rb*) and can be set to all fields under a variety of conditions; mandatory inputs, minimum/maximum length, validation of uniqueness etc.

4.5 CODE SNIPPETS.

In the final part of this chapter, the code which is the basis for all the previous applications will now be presented. A file from each one of the *Model Controller View* structure will be illustrated, so that the reader be in position to have an overview of what is required for performing some basic or more advanced function. Firstly, the main features of the code to follow are displayed and comments –text that start with # - in the code are added to translate in words what will follow.

4.5.1 Olympic Airlines: model class User.

Main features: server side validation, password encryption, "remember me" attribute.

```
require 'digest/sha1'
class User < ActiveRecord::Base
  has_many :reports

  # Virtual attribute for the unencrypted password
  attr_accessor :password

  validates_presence_of :login, :email, :hasright
  validates_presence_of :password, :if => :password_required?
  validates_presence_of :password_confirmation, :if => :password_required?
  validates_length_of :password, :within => 4..40, :if => :password_required?
  validates_confirmation_of :password, :if => :password_required?
  validates_length_of :login, :within => 3..40
  validates_length_of :email, :within => 3..100
  validates_uniqueness_of :login, :email, :case_sensitive => false
  before_save :encrypt_password

  # prevents a user from submitting a crafted form that bypasses activation
  # anything else you want your user to change should be added here.
  attr_accessible :login, :email, :hasright, :password, :password_confirmation

  # Authenticates a user by their login name and unencrypted password. Returns the user or
  nil.
  def self.authenticate(login, password)
    u = find_by_login(login) # need to get the salt
    u && u.authenticated?(password) ? u : nil
  end

  # Encrypts some data with the salt.
  def self.encrypt(password, salt)
    Digest::SHA1.hexdigest("--#{salt}--#{password}--")
  end

  # Encrypts the password with the user salt
  def encrypt(password)
    self.class.encrypt(password, salt)
  end

  def authenticated?(password)
    crypt_password == encrypt(password)
  end

  def remember_token?
    remember_token_expires_at && Time.now.utc < remember_token_expires_at
  end
end
```

```
# These create and unset the fields required for remembering users between browser closes
def remember_me
  remember_me_for 1.weeks
end

def remember_me_for(time)
  remember_me_until time.from_now.utc
end

def remember_me_until(time)
  self.remember_token_expires_at = time
  self.remember_token = encrypt("#{email}--#{remember_token_expires_at}")
  save(false)
end

def forget_me
  self.remember_token_expires_at = nil
  self.remember_token = nil
  save(false)
end

# Returns true if the user has just been activated.
def recently_activated?
  @activated
end

protected
# before filter
def encrypt_password
  return if password.blank?
  self.salt = Digest::SHA1.hexdigest("--#{Time.now.to_s}--#{login}--") if new_record?
  self.crypted_password = encrypt(password)
end

def password_required?
  crypted_password.blank? || !password.blank?
end

end
```

4.5.2 Olympic Airlines: Reports controller

Main features: checks if the user is signed in, message outputs, redirecting system if conditions don't comply.

```
class ReportsController < ApplicationController

  # GET /reports
  # GET /reports.xml
  def index
```

```
    redirect_to new_session_path and return unless logged_in?

    @search = Report.new_search(params[:search])
    @reports, @reports_count = @search.all, @search.count

end

# GET /reports/1
# GET /reports/1.xml
def show
  @report = Report.find(params[:id])

  respond_to do |format|
    format.html # show.html.erb
    format.xml { render :xml => @report }
  end
end

# GET /reports/new
# GET /reports/new.xml
def new
  redirect_to new_session_path and return unless logged_in?

  @report = Report.new

  respond_to do |format|
    format.html # new.html.erb
    format.xml { render :xml => @report }
  end
end

# GET /reports/1/edit
def edit
  @report = Report.find(params[:id])
end

# POST /reports
# POST /reports.xml
def create
  @report = Report.new(params[:report])

  respond_to do |format|
    if @report.save
      flash[:notice] = 'Report was successfully created.'
      format.html { redirect_to(@report) }
      format.xml { render :xml => @report, :status => :created, :location => @report }
    else
      format.html { render :action => "new" }
      format.xml { render :xml => @report.errors, :status => :unprocessable_entity }
    end
  end
end
```

```
end

# PUT /reports/1
# PUT /reports/1.xml
def update
  @report = Report.find(params[:id])

  respond_to do |format|
    if @report.update_attributes(params[:report])
      flash[:notice] = 'Report was successfully updated.'
      format.html { redirect_to(@report) }
      format.xml { head :ok }
    else
      format.html { render :action => "edit" }
      format.xml { render :xml => @report.errors, :status => :unprocessable_entity }
    end
  end
end

# DELETE /reports/1
# DELETE /reports/1.xml
def destroy
  @report = Report.find(params[:id])
  @report.destroy

  respond_to do |format|
    format.html { redirect_to(reports_url) }
    format.xml { head :ok }
  end
end

end
```

4.5.3 Olympic Airlines: Application helper

Main feature: replaces boolean's output message with the *boolean.png* picture.

```
# Methods added to this helper will be available to all templates in the application.
module ApplicationHelper
```

```
  def true_false_image boolean

    image_tag("#{boolean}.png", :size => "17x17", :alt => boolean)

  end
```

```
end
```

4.5.4 Olympic Airlines: Queries view.

Main feature: pagination, Ajax ordering system, user's rights confirmation.

```
<div id="movie-list">

<% if @reports_count > 0 %>

  <p><b>Number of Reports found:</b><big><%= @reports_count %></big> reports. </p>

  <% if @search.page_count > 1 %>
  <p class="pagination"><%= remote_page_links( :spread => 1 , :first=>"First Page | "
, :last=>"| Last Page>>" )%></p>
  <% end %>

  <table cellspacing="1" cellpadding="2" table-layout="fixed" bgcolor="black">
  <tr style="background:#707070;">
    <th><%= remote_order_by_link :id %></th>
    <th><%= remote_order_by_link :commander %></th>
    <th><%= remote_order_by_link :date_inc %></th>
    <th><%= remote_order_by_link :air_type %></th>
    <th><%= remote_order_by_link :air_reg %></th>
    <th><%= remote_order_by_link :depar %></th>
    <th><%= remote_order_by_link :dest %></th>
    <th><%= remote_order_by_link :land %></th>
  </tr>
  <% @reports.each do |report| %>
  <tr valign="top" class="<%= cycle('list-line-odd', 'list-line-even') %>">
    <td align="center"><%= report.id %></td>
    <td align="center"><%= report.commander %></td>
    <td align="center"><%= report.date_inc %></td>
    <td align="center"><%= report.air_type %></td>
    <td align="center"><%= report.air_reg %></td>
    <td align="center"><%= (truncate(report.depar,12)) %></td>
    <td align="center"><%= (truncate(report.dest, 12))%></td>
    <td align="center"><%= (truncate(report.land, 12)) %></td>
  </tr>
  <% end %>
</table>

  <p>
  <b>Per page:</b> <%= remote_per_page_select(:choices => [{"3 per page", 3}, {"5 per
page", 5}, {"10 per page", 10}, {"25 per page", 25}, {"50 per page", 50}, {"100 per page", 100},
{"150 per page", 150}, {"200 per page", 200}, {"Show all", nil}] )%>
  </p>
  <% if @search.page_count > 1 %>
  <p class="pagination"><%= remote_page_links( :spread => 1 , :first=>"First Page | "
, :last=>"| Last Page>>" )%></p>
  <% end %>
  <% else %>
  <p> NO reports were found</p>
  <% end %>
```

```
</div>

<br>

<div id="movie-list">

  <table cellpadding="5" cellspacing="0">
    <% for report in @reports %>
      <tr valign="top" class="<%= cycle('list-line-odd', 'list-line-even') %>">

        <td>
          <br><br>
          <b><i><big><%= h(report.id)%>.</big></i></b>
        </td>

        <td>
          
        </td>

        <td width="100%">
          <span class="list-title"><%= h(report.subject) %></span><br />
          <span><%= h(truncate(report.descript, 80)) %></span><br />
          <div class="listdates">
            <i>created at: <%= h(report.created_at)%></i><br />
            <i>updated at: <%= h(report.updated_at)%></i>
          </div>
        </td>

        <td class="list-actions">
          <%= link_to 'Show', report %>
          <%= link_to 'Edit', edit_report_path(report) %>
          <% if current_user.hasright == 'Administrator' %>
            <%= link_to 'Destroy', report, :confirm => 'Deleting Report...Are you
sure?', :method => :delete %></td>
          <% end %>
        </td>
      </tr>
    <% end %>
  </table>
</div>
```

CHAPTER 5

CONCLUSIONS

Based on prior analysis, a Maritime Inspection can prove to be quite challenging. As it becomes clear, it is a rather long and difficult procedure which requires a lot of skill from the inspectors. In sum, some basic characteristics demand extensive knowledge of ships' structure and functions; in depth knowledge of the Classification's Society Safety Management Code employed and increased familiarization with all the Certificates and Publications on vessel. All these underpinned with working pressure, sometimes not in ideal situations, suggest that among other objectives, the inspector has to overcome a lot of difficulties as well.

Therefore a way of overcoming these obstacles is by the effective implementation and use of IT Technologies. IT continues to develop rapidly, as the key underlying technologies of disk drives, semiconductors and network communications improve at exponential rates. Constant improvements in the underlying technologies make it possible for new IT applications to affect all areas of society, including the economy, households, government, and the R&D enterprise. But this cannot be taken for granted. For instance, the doubling of processing speeds does not necessarily drives to the doubling of utility, which is the main target after all.

In this study, implementation of IT technologies was translated into the use of a modern and advance programming language written for web development. Ruby on Rails has a lot of advantages to offer and a constantly increasing plethora of attributes. It must be noted that its core is based on the rationale of helping industries integrate their activities with modern technologies, as it was developed initially through an actual business project. This characteristic makes Ruby on Rails even more suitable.

5.1 OBJECTIVES

Having already described the problems that arise during an inspection and having considered the best way to resolve them, this study pointed out a set of objectives. Thus, the program developed must effectively accomplish the following:

- Ability to respond effectively to real-life business projects;

- Easy access from anywhere;
- Reduce the time required for routing the reports;
- Improve decision making;
- Assist the easy extraction of statistic related problems.

The web application developed in this thesis indeed derives from a real life business project. It responds to the true needs of the Safety Management section of Olympic Airlines. It was developed so as to address those needs but also to cover additional areas in order to improve them. Thus, this characteristic makes easier the adaptation in every kind of related organization or business.

Furthermore, the main feature of this application is to create, store, modify and generally manage reports. The breakthrough is that the reports can be accessed from anywhere and by a lot of users simultaneously, requiring only an internet connection and a device capable of connecting to it. This feature will offer a great sense of flexibility to whoever uses web based applications.

Moreover, it minimizes the time needed from the report filling, until it reaches the appropriate Authority. The reason is that after a report is saved, it can be immediately accessible by anyone who is authorized to use the application. This way a great part of the routing system of reports is replaced entirely through the application.

In addition, due to the advanced query functions, the user can have immediately all the reports for any specific project –reports which comply with the conditions he chose. This can be proven a big advantage because it assists decision making when there is limited time. Also it would be valuable sort of an index file permitting quick access to the desired reports.

It can also serve to assist statics studies, since a chart section is included. In these charts the user can have a comparative overview of different variables and events (e.g. the number of reports stored or the ones which occurred when the airplane was in parking position) in the desirable time basis. This feature could assist the Safety Department to observe how changes to regulations will affect real situations through the years to come.

5.2 DIFFICULTIES

It must be noted, though, that the effective implementation and use of this web application and IT technologies, in general, are the result of a complex process that requires not only the adoption of a technology but also affects the

basis of firms or businesses. As part of this process, individuals and organizations actively adapt (and sometimes resist) these technologies. As a result, the effects of IT, often, take place more slowly than it could be predicted.

Thus some changes must be implemented, so the application can be operated effectively. Great familiarization with the application is not required, but only basic knowledge on how to navigate through a site page. Generally it would demand little time for a user to get accustomed with and learn the new functions provided. The main issue would be to implement it in their everyday work, because it introduces a lot of changes on the way they previously operated.

5.3 FUTURE DEVELOPMENTS

The capabilities of such technologies are vast and yet unexplored, because there is a direct dependency with the constantly evolving computer science. Indeed, every day new hardware and software are developed/designed, providing quicker data processing and more advanced tools for the developers.

This study gives a first glance on the new possibilities of technologies and how they can be exploited to enable the process of a Safety Inspection. The more advanced features of this web application are the query forms and the flash charts. A future capability would be to merge these features. Thus, the results of an advanced query function would be displayed not only through reports listing, but through flash charts as well. This would provide the user with instant visual information through time, even for the most sophisticated queries. For instance, it would take just a few minutes to identify in how many reports there is a reference for extensive corrosion in the fore peak water-ballast tank and how this number fluctuates through the years.

Moreover, the upgrade of flash charts can provide support to the decision making process. Great benefits can derive by combining the query functions with the flash charts. This presents a very powerful tool, which can be used for depicting the trend of specific dimensions of Safety through the years. It is possible, by successfully utilizing statistic techniques and variables, such trend lines etc.

A future capability would be an application which has its own "intelligence". For instance, the user would initially insert some data concerning the type of inspection, ship, its size etc. After the data process, the output would summarize all the necessary information for a Safety Inspection, which may

vary from the appropriate forms to be filled, to the checklists of what must be tested etc.

Another benefit of having an application with its own "intelligence", would be to automatically inform, via e-mail, the corresponding Authorities about the completion of the report. It could, also, give them a synopsis and provide them with a direct link to the report and its results.

5.4 FINAL THOUGHTS

Although all these may sound very interesting and intuitive, great caution must be taken. Attention must be paid to the correct selection of all the criteria and the parameters related to the above described features. However, the main idea critically depends on the fact that computer-based decisions should be the exact same as the human ones, both based on the Safety Management code.

Finally, all the above are feasible with the new technologies, which provide every day new features with more advanced capabilities. Though, the real challenge is to make them compatible with all kinds of electronic devices that support an internet browser – especially in PDA devices, since they provide great flexibility while using them. The current technology utilized in this application aim to this goal and has succeeded. In this direction, all the future advancements in this web application should be based on this, as they become wider and more powerful. Although the examination of this issue remains beyond the scope of this thesis, it will be a good starting point for a future research at a postgraduate level.

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APPENDIX I

APPENDIX 1

CERTIFICATION AND MANNING: CONTRAVENTION CITATIONS/DETENTION

Required Certificates

The Maritime Regulations require each officer serving on board to hold a certificate of competence issued by the Flag State Authority.

Position on Board	Grade Certificate
Master	Master – Oceans (i.e., Worldwide)
(First Officer/Chief Mate)	Chief Mate
(Second Officer/Second Mate)	Second Mate
(Third Officer/Third Mate)	Third Mate
Chief Engineer	Chief Engineer--(Steam or Motor as appropriate to ship's propulsion.)
(Second Engineer/First Assistant Engineer)	First Assistant Engineer--(Steam or Motor as appropriate to ship's propulsion.)
(Third Engineer/Second Assistant Engineer)	Second Assistant Engineer--(Steam or Motor as appropriate to ship's propulsion.)
(Fourth Engineer/Third Assistant Engineer)	Third Assistant Engineer--(Steam or Motor as appropriate to ship's propulsion.)
Radio Officer	RTO, General, or First or Second Class-- (On passenger ships, General or First Class is mandatory.)

GMDSS equipped ships must have on board either one GMDSS Radio Electronic Operator/Maintainer or two deck officers with GMDSS General Operator Certificates.

If the requirements prescribed above are not complied with, the ship may be placed under Class "A" deficiency detention and not permitted to proceed to sea until all licensing certification has been rectified.

Contravention Citations

In exceptional circumstances, where an officer does not hold a valid Flag State certificate of competency as appropriate but does possess a valid National certificate of rank, Marine Safety may grant permission for the ship to continue trading for a period not exceeding ninety days (only those countries' national certificates recognized on an equivalency basis may be granted permission to continue sailing). In the event that, at the expiration of this 90-day period, any delinquent officer does not possess a valid Flag State certificate, or he has not been replaced, the vessel will be subject to Class "A" deficiency detention (wherever it may be).

In cases where Marine Safety invokes this procedure the Maritime Inspector will be authorized to serve a Contravention Citation on the Master, stating what rectification of licensing deficiencies is required and specifying the terminal date of the 90-day period of grace. The original Citation will be handed over to the vessel's Master while a copy will be attached to the Report of Safety Inspection to be submitted to Marine Safety. An application for certificate of competency must be filed with a request for facsimile authorization as required by flag requirements, prior to the vessel's sailing.

Detention

- (a) A non-Flag State officer certificate cannot be recognized in fulfillment of the certification requirements.
- (b) A Class "A" deficiency exists and immediate remedial action must follow in any situation in which the vessel does not have aboard and in service a duly-certificated Master, a duly-certificated Chief Mate, and a duly-certificated Chief Engineer holding a Flag State certificate of competency of rank (steam or motor as appropriate). Applications are never acceptable in lieu of issued certificates of competency in these grades. Only Certificates of Receipt of Application (CRAs), Facsimile Authorizations or faxed Flag State dispensations may be considered as an immediate remedy.

In every case of detention, Maritime Inspectors are to notify the Master that the vessel must bear the cost of verification of deficiency rectifications and the cost of any additional verification inspection which will be held within 90 days following the detention.

Where a Contravention Citation is served, the original Citation will be handed to the vessel's Master and a copy attached to the Report of Safety Inspection.

Where forgery or fraud with respect to a certificate of competency or Seafarer's Identification Book is suspected, the Maritime Inspector should report the facts immediately to Seafarers' Documentation or the Duty Officer and where possible confiscate the certificate and transmit it with the Report.

It remains the fundamental purpose of the Administration to ensure that no vessel sails in a substandard condition and that it includes qualified and adequate numbers and grades of officers, certificated ratings and special qualifications required for the type vessel, in light of the intended voyage and other relevant circumstances. In any exceptional case, the Maritime Inspector concerned is to exercise reasonable discretion in order to achieve this objective and shall immediately make a report of such case to Seafarers' Documentation or the Duty Officer.

APPENDIX 2

VESSEL DETENTION: CERTIFICATION/CERTIFICATE OF RECEIPT OF APPLICATION

Applicants for equivalent issuance of an Officer Certificate of Competency, as appropriate, usually obtain a Certificate of Receipt of Application (CRA). Fax authorization from Seafarers' Documentation, with certificate number assigned, has the same validity as the CRA.

It is noticed that the Certificate carries an expiration date that should be ninety days from the date of issue. Each Certificate must be validated by the raised impression or an ink seal of the issuing office to the left of the issuing officer's signature.

When a valid Certificate of Receipt of Application (CRA) is produced, it is the equivalent of a valid National Flag State certificate of competency and should be accepted as such.

APPENDIX 3

SIGHTING OF ORIGINAL CERTIFICATES OF COMPETENCE AND SEAFARER IDENTIFICATION AND SPECIAL QUALIFICATIONS/TRAINING

GENERAL REQUIREMENTS

FOR OFFICERS

Maritime Inspectors should site the original certificate of competency or Certificate of Receipt of Application (CRA) for officers and valid certificates for GMDSS (GOC), Medical Care Person in Charge, and Seafarers' Identification and Record Book including Special Qualifications such as Tankerman, COW, etc., as appropriate. Deck officers are considered to be qualified Survival Craft Crewmen/Rescue Boat, except for Special Qualifications for Fast Rescue Boat (passenger ships), therefore Survival Craft Crewmen/Rescue Boat Special Qualifications are not required. New engineering officers are required to hold Special Qualifications as Survival Craft Crewman/Rescue Boat by the STCW Convention (1978) as amended.

FOR RATINGS

Maritime Inspectors should site the original Seafarers' Identification and Record Book with Special Qualifications appropriate for the position serving on board, i.e., Able Seaman, Oiler/Motorman, Ordinary Seaman, including Survival Craft Crewman/Rescue Boat, Tankerman Assist, Medical First Aid Provider (Assist). A copy of the application for Certification of Special Qualifications is valid for a period of 90 days pending receipt of the Seafarers' Identification and Record Book. The original of the Physical Examination Report Form is valid for two years and should be retained by the seafarer.

The above certificates and Seafarer's Identification and Record Books must be checked by the Maritime Inspector at every inspection (including Special Inspections).

RO/RO PASSENGER VESSEL TRAINING

Senior Officers and every person on board RO/RO passenger ships assigned immediate responsibility for embarking and disembarking passengers, loading, discharging, securing cargo, or closing hull openings shall have evidence of approved training in passenger safety, cargo safety and hull integrity prior to assuming their duties on board.

Senior officers and any other person having responsibility for the safety of passengers in emergency situations must have evidence of approved training in crisis management and human behavior.

Personnel providing direct service to passengers in passenger spaces on board RO/RO passenger ships shall be evidence of approved safety training.

PASSENGER VESSEL TRAINING (OTHER THAN RO/ROs)

Masters, officers, ratings and all other personnel designated on the muster lists to assist passengers in emergency situations on board passenger ships (other than RO/RO passenger ships) must have evidence of training in the following prior to assuming their duties on board:

- Crowd Management
- Familiarization
- Safety Training (for those persons providing direct service to passengers in passenger spaces)
- Passenger Safety
- Crisis Management and Human Behavior

FAMILIARIZATION TRAINING

Each person on board must have evidence of Familiarization Training before assuming duties or upon being re-assigned to the ship. A record of training for each person must be maintained on board ship.

Each ship must maintain a record of all the above training for each person employed on board ship for review by Port State Control officials as well as Flag State inspectors and surveyors as appropriate. Special Qualifications are not issued by the Classification Society Administration for the above training.

IRREGULARITIES IN APPEARANCE

Maritime Inspectors should be familiar with the appearance of genuine certificates in order that any irregularities in appearance may be discovered. If a certificate is irregular in its appearance it should be taken up by the inspector pending verification. Authenticity can be verified quickly through Seafarers' Documentation by telephone, fax, e-mail. If a forgery is found, the certificate should be sent to Seafarers' Documentation. The Master should be advised and instructed to arrange for an appropriately certified replacement. Marine Safety or the Duty Officer should be notified immediately if it involves the Master, Chief Mate or Chief Engineer.

APPENDIX 4

RE-INSPECTION AND SPECIAL INSPECTIONS WHEN REQUESTED BY MARINE SAFETY

Maritime Inspectors are requested to make every effort to conduct re-inspection and special inspections, since in all cases such inspections are to ensure correction of outstanding deficiencies from previous annual inspections or port state control deficiencies. When conducting such inspections, the Inspector should refer to the copy of the last Report of Safety Inspection and other information supplied by Marine Safety and check for correction.

Should the Maritime Inspector for any reason be unable to conduct the re-inspection or special inspection, he should promptly notify Marine Safety to that effect in order that alternative arrangements can be made.

If it is ascertained that any deficiencies remain uncorrected, the Maritime Inspector should notify Marine Safety or the Duty Officer immediately by telephone, fax, or e-mail, since the vessel is subject to detention.

Whenever an Inspector carries out a re-inspection or special inspection, he must return the applicable page or pages of the Report of Safety Inspection to Marine Safety with the findings, giving the vessel's particulars including the name of her managing owner/operator/bareboat charterer.

If a special inspection is carried out to ascertain compliance with the provisions of an Order of Detention, a separate sheet should be added to the normal Report of Safety Inspection. This sheet should have the heading "Rectification Procedure" and should list all the rectifications made before detention was lifted.

APPENDIX 5

INFLATABLE LIFE RAFTS/HYDROSTATIC RELEASE

Float-Free Capability

The attention of Maritime Inspectors should be directed to SOLAS '74 Consolidated Text Chapter III, Regulation 19, which requires Life Saving Appliances to be immediately available at all times. Inflatable life rafts particularly must have a float free capability and the trip line should be adequately secured. The life raft carried on the forward part of the vessel, as required by the above Convention as amended Chapter III, Regulation 31.1.4, need not be float-free.

Servicing (IMO Resolution A273)

In accordance with the terms of the above Resolution, the Administration requires that inflatable life rafts be serviced at intervals not exceeding twelve months.

Recognizing that efficient servicing stations are not always available, the Administration has instructed Marine Safety to take into consideration the circumstances of each case.

Hydrostatic Release Mechanisms should also be checked and tested at an approved servicing facility at regular intervals.

APPENDIX 6

RENEWAL OF PYROTECHNIC DISTRESS SIGNALS AND EMERGENCY COMMUNICATIONS BATTERIES

All pyrotechnic signals, including line throwing rockets and cartridges for line throwing projectors, must be checked for expiration dates. SART, VHF/Portables Batteries and Man O/B Signals should be examined annually and must be renewed immediately if any of the following conditions exist:

- 1) the expiration date marked on the appliance has passed,
- 2) if the expiration date is not marked on the appliance, renewal is to be effected within four years after the date of manufacture,
- 3) if the condition, in the opinion of the Inspector, warrants renewal,
- 4) calcium Smoke floats should be replaced by approved battery types.

Renewal of pyrotechnics included in life raft equipment is to be effected at the annual servicing carried out during the twelve months prior to the expiration date. If the expiration date is not marked, renewal is to be effected at the first annual servicing after three years from the date of manufacture.

EPIRBs and VDRs must have batteries and certified test date confirmed.

APPENDIX 7

SERVICING OF FIREFIGHTING AND EMERGENCY EQUIPMENT

Fixed CO² and Halon Systems.

A visual examination of the system is performed every year. In addition, every two years the contents of the cylinders are verified by weight or isotropic measurement as part of the survey for issuance of the SOLAS Safety Equipment Certificate.

Weigh scales may be used to verify cylinder contents and recharging is required if the loss in charge is 10 percent or more. Generally the weigh scale is part of the CO² system equipment in order to satisfy SOLAS, Chapter II-2, Regulation 5.1.11.

Ships' officers are responsible for performing the monthly visual inspection of all firefighting system equipment and making the log book entry for the inspection. The inspections described above are an integral part of the annual statutory surveys for the SOLAS Safety Equipment Certificate and must be to the satisfaction of the Classification Society surveyor. The crew may assist in this survey or the surveyor may accept the certificate from an authorized servicing facility, in part or in full, as evidence of servicing.

All cylinders must be hydrostatically tested after each 20 years of service, prior to recharging a discharged cylinder, or when visual inspection reveals a potential defect.

Hydrostatic test dates must be stamped on the cylinders.

Portable Fire Extinguishers.

As with the fixed system, the annual servicing of this equipment is an integral part of the statutory surveys for the SOLAS Safety Equipment Certificate. As such, the Classification Society surveyor must be satisfied with the condition of the extinguishers. Some surveyors may want the crew to service the extinguishers in their presence while others may be satisfied with a spot check of recently serviced extinguishers. There is also the option of the surveyor

accepting a servicing certificate from a servicing facility acceptable to the society.

Refilling of extinguishers should be in accordance with the manufacturer's recommendations. Lacking same, refill is required when the extinguishing media starts to lose effectiveness.

The intervals for hydrostatically testing of portable extinguishers are the same as that required by the Classification Society to maintain the vessel in class. It will vary slightly from one IACS Classification Society to another since there is presently no IACS agreed upon interval. A hydrostatic test may also be required if visual examination indicates a potential defect in the cylinder.

Hydrostatic testing must be performed shoreside in a servicing facility acceptable to the Classification Society surveyor.

Fixed Foam System.

Foam analysis is a part of the survey for issuance of the SOLAS Safety Equipment Certificate and thus is performed every two years. The Classification Society surveyor may require it at other times if there is cause to question the suitability of the foam or condition of the storage tank.

Self-Contained Breathing Apparatus.

As with portable fire extinguishers, hydrostatic testing of the cylinders is performed in accordance with Classification Society requirements. Intervals may vary from one Classification Society to another and will depend upon whether the cylinders are standard thickness or the ultra lightweight type.

Most, if not all, of the Classification Societies will require marking of the hydrostatic test date on the bottles.

Servicing must be performed to the satisfaction of the Classification Society surveyor. The use of a "specialist firm" located shore side is generally required.

Since there is not SOLAS requirement or other regulation that requires a low pressure alarm, a pressure indicator could not be accepted.

APPENDIX 8

SOLAS REQUIREMENTS FOR ONBOARD TRAINING MANUALS

Regulation 19 of SOLAS 74, Chapter III requires regular abandon ship training and drills.

This administration requires drills “weekly” rather than monthly as specified in SOLAS. Additionally, onboard training/maintenance manuals required by Regulations 35 and 36, which may also consist of audio-visual aids, and which should as a minimum include the following areas, should be readily available to and used by the crew as follows:

1. is general alarm system explained;
2. donning of lifejackets and immersion suits, as appropriate;
3. muster at the assigned stations;
4. boarding, launching, and clearing the survival craft and rescue boats and use of marine evacuation systems training (if equipped);
5. method of launching from within the survival craft;
6. release from launching appliances;
7. methods and use of devices for protection in launching areas, where appropriate;
8. illumination in launching areas;
9. use of all survival equipment;
10. use of all detection equipment;
11. with the assistance of illustrations, the use of radio lifesaving appliances;
12. use of drogues;
13. use of engine and accessories;
14. recovery of survival craft and rescue boats including stowage and securing;
15. hazards of exposure and the need for warm clothing;
16. best use of the survival craft facilities in order to survive;

17. methods of retrieval, including the use of helicopter rescue gear (slings, baskets, stretchers), breeches -buoy and shore life-saving apparatus and ship's line-throwing apparatus;
18. all other functions contained in the muster list and emergency instructions; and
19. instructions for emergency repair of the life-saving appliances.

It is noticed that onboard training in the use of davit launched life rafts shall take place at least every four months on ships fitted with life rafts launching davits (Passenger vessels).

Instructions for onboard maintenance

Instructions for onboard maintenance of life-saving appliances should be easily understood, illustrated wherever possible, and, as appropriate, shall include the following for each appliance:

1. a checklist for use when carrying out the inspections required by regulation;
2. maintenance and repair instructions;
3. schedule of periodic maintenance;
4. diagram of lubrication points with the recommended lubricants;
5. list of replaceable parts;
6. list of sources of spare parts; and
7. log for records of inspections and maintenance.

APPENDIX II

APPENDIX 1

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