2008

Operational readiness of float-free arrangements for liferaft and EPIRB : analysis of implications on safety training standards and procedures

Pedro De Lima Filho
World Maritime University

WORLD MARITIME UNIVERSITY
Malmö, Sweden

OPERATIONAL READINESS OF FLOAT-FREE ARRANGEMENTS FOR LIFERAFT AND EPIRB: Analysis of Implications on Safety Training Standards and Procedures.

By

PEDRO SEVERINO DE LIMA FILHO
Brazil

A dissertation submitted to the World Maritime University in partial fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE
IN
MARITIME AFFAIRS

(MARITIME EDUCATION AND TRAINING)

2008

DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflects my own personal views, and are not necessarily endorsed by the University.

Signature: Pedro Jinna Filho..............................

Date. 25 August 2008..............................

Supervised by:
John Liljedahl
Lecturer
World Maritime University

Assessor:
Professor Daniel Moon
World Maritime University

Co-assessor:
Åke Sjöblom
Chief Surveyor
Swedish Maritime Administration

ACKNOWLEDGEMENTS

As time goes by we learn to set the value of things according to opportunity cost. In order to attend the first and second semester of the Master of Science Programme in Maritime Affairs at the World Maritime University, in the year 2000, I was granted a generous scholarship from the Tokyo Foundation, as it was then called the Nippon Foundation. However the cost was that I was not be present comforting my father Pedro Severino de Lima when he passed away; indeed a high price even though considering that he always urged me to pursue whatever means to continuously improve my education.

Returning in 2008 as self-supported student to complete the course, the price was that the family temporarily split. Therefore I want to express my extreme love and gratitude to my wife Maria Miriam Barbosa de Medeiros Lima and to my son San Diogo Medeiros de Lima for the suffering and sacrifice during my absence and for their unbreakable support. Also to my daughter Shaula Reis de Lima for her endurance, herself struggling alone with a dissertation project.

As it can be seen, this dissertation, the successful completion of the course, and the degree all together have immeasurable value. Consequently expressing gratitude to the faculty and staff at the WMU is not mere formality but a sincere appreciation for their professionalism and dedication, and I wish them health to continue the noble mission with other students.

My best wishes also to Dr. Yohei Sasakawa and Mr. Eisuke Kudo. I am very pleased being invited to join the Sasakawa Fellows 2008, strongly believing that more important than a scholarship is the honor to be part of so selective group.

Ending this dissertation, I thank God for allowing me health and enough resources to accomplish the task, humbly recognizing that His timing is always the right timing.

ABSTRACTS

Title of Dissertation: Operational Readiness of Float-free Arrangements for Liferaft and EPIRB: Analysis of Implications on Safety Training and Procedures.

Degree: Master of Science.

Investigation of any casualty involving vessels engaged on international voyages includes verification on the status of life-saving appliances and radio communications equipment. In many cases it has been found that automatic activation of liferafts and emergency position indicating radio beacons (EPIRBs) failed, although the vessel was certified, classified, regularly inspected and surveyed. As such, the vessel theoretically possessed documented procedures and check-lists for weekly and monthly verifications of life-saving appliances and radio communications equipment.

Thus, in this dissertation it is investigated the reasons for deficiencies of float-free arrangements for liferafts and EPIRBs; it is examined the continuous improvement of requirements and technological evolution of the appliances; and it is reviewed the commitment and attitudes of the sectors responsible for safeguards against identified risks. Considerable examples of recurrent deficiencies are also provided.

The natural conclusion is that the immediate cause for deficiency related to non-readiness for immediate use is the lack of updated information on specific appliances provided on board, as well deficient familiarization training, which should be treated as result of bad safety management rather than isolated occurrences.

KEYWORDS: EPIRB; Float-free Arrangement; HRU; Liferaft; Life-saving Appliance; and Readiness for Immediate Use.

TABLE OF CONTENTS

LIST OF FIGURES

[1] Figures 2.8 and 2.9 refers to a 35,000 dwt bulk carrier flying the Brazilian flag where all four HRU were either expired or incorrectly installed, besides missing evidence of approval by the Administration.

LIST OF ABBREVIATIONS

CHIRP	Confidential Reporting Program for Aviation and Maritime.
DOC	Document of compliance
DP	Designated Person.
DPA	Designated Person Ashore.
EPIRB	Emergency Position Indicating Radio Beacon.
FSA	Formal Safety Assessment.
FSC	Flag State Control.
GL	Germanischer Lloyd.
GMDSS	Global Maritime Distress and Safety System.
HRU	Hydrostatic Release Unit.
IACS	International Association of Classification Societies.
ILLC	International Load Line convention.
ILO	International Labor Organization.
IMO	International Maritime Organization.
ISM	International Safety Management.
LSA	Life Saving Appliances.
MARPOL	International Convention for the Prevention of Pollution from Ships
MARS	Marine Accident Reporting Scheme
MCGA	Marine and Coast Guard Agency
MOU	Memorandum of Understanding on Port State Control.
PSC	Port State Control.
SMC	Safety Management Certificate.
SOLAS	International Convention for the Safety of Life at Sea.
STCW	Standards of Training, Certification and Watchkeeping.
TONNAGE	International Convention on Tonnage.
UNCLOS	United Nations Convention on the Laws of the Sea.
WIPO	World International Property Organization.

CHAPTER ONE

1. Introduction.

Among other measures for the safety of life at sea, it is essential that liferafts and emergency position indicating radio beacons (EPIRBs) are rapidly released and activated when a ship sinks, as liferafts are regarded as the last resource for life saving, while EPIRBs are fundamental for search and rescue. However, according to Marine Guidance Note 104 (M+F) issued by the Maritime and Coast Guard Agency "Statistics show that up to 1 in 5 merchant ship and fishing vessel has an incorrectly secured liferaft which may not work in an emergency" [2] (Maritime And Coast Guard Agency, 1999). On the other hand, a subjective view presented in a report to the International Marine Accidents Reporting Scheme, with attached Figures 1.1 and 1.2 on incorrect arrangements [3] found on board a 50,000dwt tanker, is also worth quoting:

> I suppose 70% or more of the ships which I attended as a cargo surveyor/expeditor/loss controller have their liferaft hydrostatic releases wrongly secured in some way. When I am ship vetting, I can usually insist that things are put right. Unfortunately, the rest of the time I generally find little interest shown by those on board, the attitude is "the ship has passed her safety inspections" or "it looks alright to me". I am somewhat saddened by this state of affairs and consider it must be worth an "M Notice". (The Nautical Institute, 1998)

[2] It would be very helpful if the studies that originated the mentioned statistics could be evidenced, however within the limitations of this dissertation that was not possible.

[3] On both situations, during manual launching, the liferafts would be held by the weak link only, which may part due to the dynamic forces involved in throwing overboard; consequently the liferafts could be lost uninflated.

Furthermore, the rationale behind the objectives of this dissertation is supported by the occurrences below mentioned, taken from official reports or notes:

- In the autumn of 1998 a fishing vessel sank in 10 meters of water in calm and clear weather only 2 nautical miles from her home port. Divers later found that the hydrostatic release unit (HRU) for the vessel's liferaft had functioned correctly, but that the weak link at the end of the painter had been incorrectly attached to the liferaft lashing. That prevented the lashing from releasing the raft, which did not float off to the surface to inflate as the vessel sank. As a result, all three crew members lost their lives. After the accident, the authorities carried out an inspection campaign and found that a large percentage of HRU were wrongly installed and would not have functioned if the vessel sank. It was also observed that all HRU were designed to the standard set by the International Convention for the Safety of Life at Sea, 1974, as it may be amended (SOLAS 1974), and all had been delivered with installation instructions. (Director General of Shipping, 1999)
- As reported by the permanent commission of enquiry into accidents at sea (CPEM), on 11th December 1999 the tanker Erika, while crossing the Bay of Biscay in heavy weather, experienced structural failure and sank. The official investigation carried out revealed that "hydrostatic release units and/or the inflation mechanism (there should have been two of them on board) did not work" and "the hydrostatic release unit and/trigger mechanism of the EPIRB which the vessel theoretically carried out also did not work." (CPEM 1999)
- According to a report issued on 10th November, 2000, by the commission appointed by the Norway's Justice Department, on Friday, 26th November 1999, the newly built high speed ferry M/S SLEIPNER, while proceeding at 35 knots, from Leirkvik to Bergen, with 76 passengers and 9 crew members on board, ran on to the Store Blokse rocks. As a result 16 lives were lost. Among other deficiencies, the commission found that there was a serious defect with the life saving appliances arrangements: <u>the liferafts were not equipped with approved-type HRU</u>. These were specified in the original

drawings but were removed at some time. The Maritime Directorate approved the drawings and the absence were not discovered on subsequent inspections. The absence was a contributory cause of the two liferafts on the starboardside not being released. The portside liferafts were release manually by the Captain, from the Bridge, but one of them capsized and the other filled with water and went down with the ferry (Clark 2002) .

- In 2003, the crew of the Greek Registered M/V Talisman took their liferafts' disposable hydrostatic release units into a supplier to replace the broken plastic thimbles. The supplier noticed the units did not indicate any sort of certification and tested the units which failed, as seen in Figures 1.3 to 1.7, because the blades did not have enough force to cut the hope. (Alaskan Marine Safety Education Association , 2003)
- On 11th January 2005 the Danish Maritime Authority conducted a number of unscheduled surveys of liferafts and hydrostatic releasers on thirteen small fishing vessels in northeast Zealand. Defects were found on 6 of the surveyed ships. Three ships had exceeded the rafts' survey date, and for two of these ships, the HRUs' survey date was also exceeded. On board another ship, the survey date for the HRU was exceeded. And the HRU was installed incorrectly in the last two ships. When the survey date of rafts or HRU was exceeded more than five months, the Danish Maritime Authority detained the ship in question until evidenced that the subsequent survey had been conducted. At the same time, the police have been recommended to treat the case as a criminal matter. (Danish Maritime Administration, 2005)

Figure 1.1 - Starboard liferaft of a tanker.
Source: MARS.

Figure 1.2 -Portside liferaft of the same.
Source: MARS.

Figure 1.3 - Original certified unit (older model) on the right.
Source: AMSA.

Figure 1.4 - Not approved device.
Source: AMSA.

Figure 1.5 - Rusty blade.
Source: AMSA.

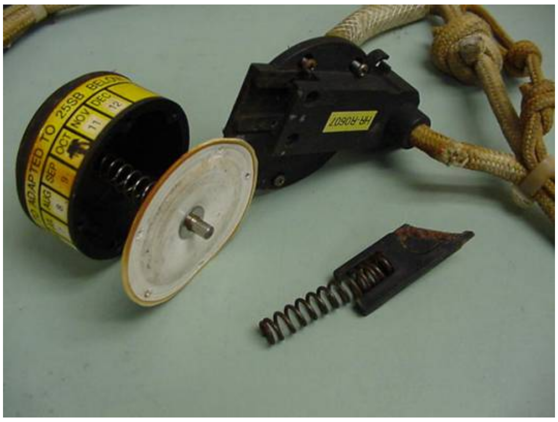


Figure 1.6 - Parts of the device.
Source: AMSA.

Figure 1.7 - Detail of incomplete cut.
Source: AMSA.

The above mentioned facts are indications of an outstanding problem, considering the long standing requirements set in the International Convention on the Safety of Life at Sea (SOLAS) for application, evaluation, testing, instructions, training, maintenance, and operational readiness of life saving appliances and arrangements; also considering the strong emphasis currently given to the safety culture onboard.

1.1 Value of the Dissertation.

Considering the above mentioned, this dissertation will at least highlight the fact that, for some reason, the issue "float-free arrangement for liferaft and EPIRB" perhaps is being overlooked. First by those on board responsible for readiness for immediate use, but also by those in charge of verification of compliance with applicable requirements, namely surveyors, inspectors and auditors. If this eventually proves to be true, then the current statistics represent underestimation of the problem.

On a vessel engaged in international voyages, procedures for risk assessment are included in the ship's safety management system, otherwise she would not be certified, neither the company, however the facts seem to indicate that the object of this dissertation are not properly addressed with regards to risk.

The purpose of this dissertation, therefore, is to try and find the root cause for the recurrence of deficiencies on float-free arrangements for liferafts and EPIRBs, narrowing to focus on shipboard procedures for training, familiarization, information and maintenance. The hypothesis to be worked is the lack of familiarization on board with the arrangements and poor implementation of the company's safety management system.

1.2 Literature Review.

For practical reasons, i.e. due to scarcity of academic papers on the topic, the task will be seen as "review of existing knowledge" rather than literature review *per se*, with emphasis on evolution of regulations, technical aspects, facts and data, rather than literature review *per se*. The relevant regulations to be approached include the following:

- The original regulations relative to life saving appliances as included in Chapter III SOLAS 1960.
- Amendments to SOLAS 1960 "Chapter III – Life Saving Appliances and Arrangements", by Resolution A.122(V)"
- The original regulations relative to life saving appliances as included in chapter III of SOLAS 1974.
- Amendments to SOLAS 1974 with regards to "Chapter III – Life Saving Appliances and Arrangements".
- Resolution MSC.48(66) "Adoption of the International Life-saving Appliance Code", adopted on 4 June 1996.
- Resolution MSC.81(70) revised "Recommendation on Testing of Life-Saving Appliances", on 11 December 1998.
- MSC/Circ.980 "Standardized Life-Saving Appliance Evaluation and Test Report Forms", dated 13 February 2001.

1.3 Objective and Methods.

Upon analysis of the above listed documents, results from an on line survey with questionnaires to Safety Officers and Port State Control Officers, and findings from databases the author intends to build considerations on the effectiveness of regulations, rules, recommendations, training and procedures, regarding life-saving appliances (LSA) in general and float-free arrangements for liferafts and EPIRBs in particular. The basic idea is to cross analyze the requirements with actual practice on board on vessels engaged on international voyages..

The on line survey with different questionnaires to and Saffety Officers (Appendix A) and Port Satate Control Officers (Appendix B), introduced by a cover letter (Appendix C), has been elaborated using the platform DotNukeNet, and hosted at the URL http://www.portals.wmu.se/hru. Potential respondents were given a username and password, under the assumption that they would be eagerly willing to spare some time to honestly respond.

Alternatively another version of the questionnaire in Word format has elaborated in order to be attached to e-mail messages, for the sake of those vessels without internet facilities.

CHAPTER TWO

2. The Concept of Float-free Arrangements for Liferafts and EPIRB.

As far as patented devices are concerned, the first record of float-free arrangement occurred on 16 March 1943, related to a “Safety Raft Slip Lock”, invented by Johan Frederik Carlsen, as result from lessons learned during the Second World War:

> Recent experience has shown, however, that in torpedoings where the ship is liable to sink in very short time the crew usually runs directly for the life boat and no one will take the time off to run forward or aft to loosen the life rafts. For this reason it had often happened that the life rafts have gone down with the ship and the boats may have been damaged and sunk thereby preventing the rescue of the members of the crew who had jump in the ocean. (Carlsen 1943)

The devised arrangement in fact was an improved slip lock associated with a float for releasing the type of rafts currently known as “floating apparatus” or “buoyant apparatus” not covered by SOLAS regulations, but very commonly used in inner navigation. Figure 2.1 shows on the left the slip lock in its closed position and on the right the slip lock in its open position.

Following that, on 14 December 1943 a “Hydraulically Releasable Mechanism for Life Rafts and the Like”, Figure 2.2, invented by William C. Sieverts and Hermam W. Holt, may be considered the precursor of the current non-disposable release devices (Sieverts and Holt 1943). Meanwhile, developments on inflatable life raft were continuous and rather welcome because signaled a solution for the question of space for life raft stowage. On the other hand, the issue of automatic deployment and inflation emerged.

On 24 October 1944 a “Life Raft Release Device”, Figure 2.3, invented by Austin U. Bryant claiming improvements upon Holt and Sieverts’ device as follows (Bryant 1944):

> The two sections **10** and **11** are attached together by two pins or bolts **17** and **18**, and normally these pins lock the sections together in such a manner that removal of either pin to a retracted position permits the two sections to separate completely.

Therefore automatic operation of the device occurs by action of the diaphragm mechanism upon pin **17**, whereas pin **18** serves the purpose of manual operation.

Another mechanism called “Releasable Coupling Device”, shown in Figure 2.4, was registered on 25 February 1958, invented by George D. McKenny, comprising two coupling members and a pin.

> Each of the coupling members is provided with means to facilitate attachment of lashing lines. The coupling members are attached together by virtue of the interlocking engagement of a latching dog, movably mounted on one of the coupling members, with a strike or hook-like latching portion on the other coupling member. (McKenny 1958)

The device also can be activated manually by pressing the knob **43** on top of pin **21**.

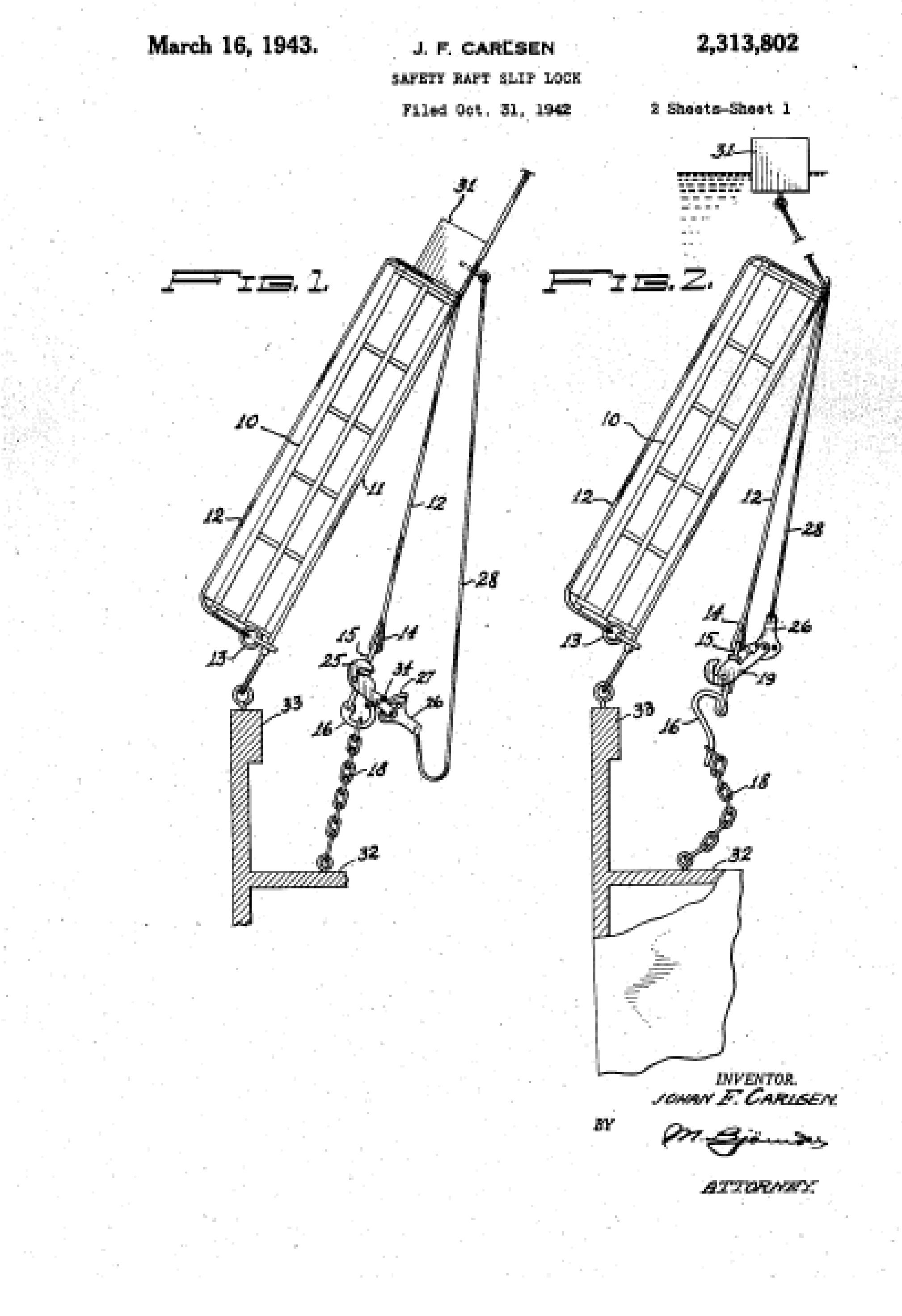


Figure 2.1 - Safety raft slip lock arrangement.
Source: J. F. Carlsen.

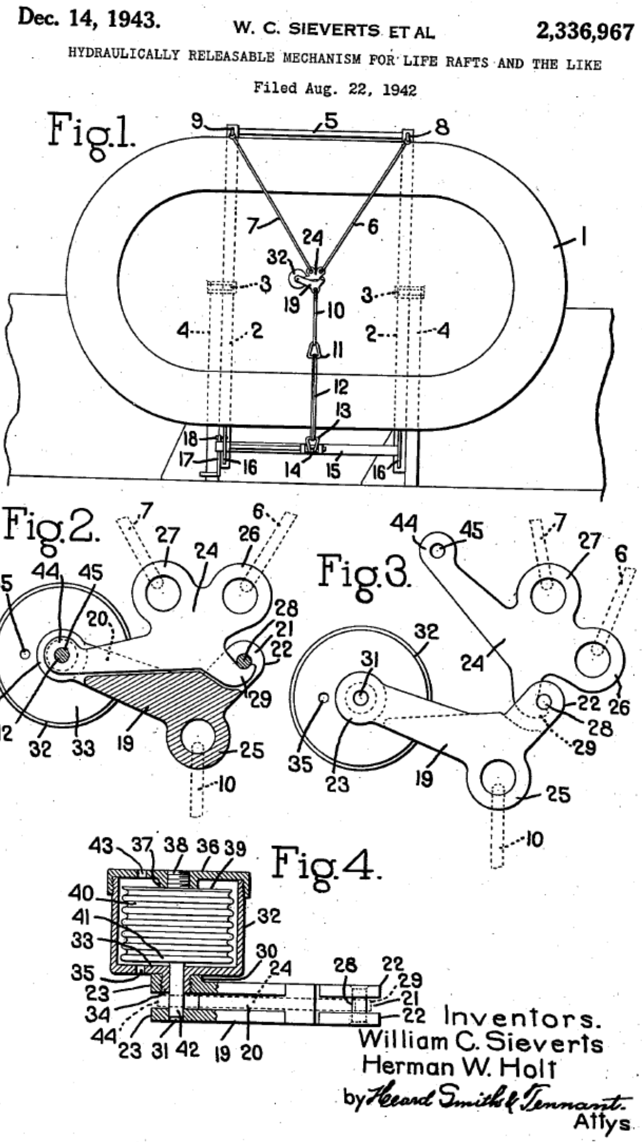


Figure 2.2 - Hydraulically releasable mechanism.
Source: William C. Sieverts, Herman W. Holt.

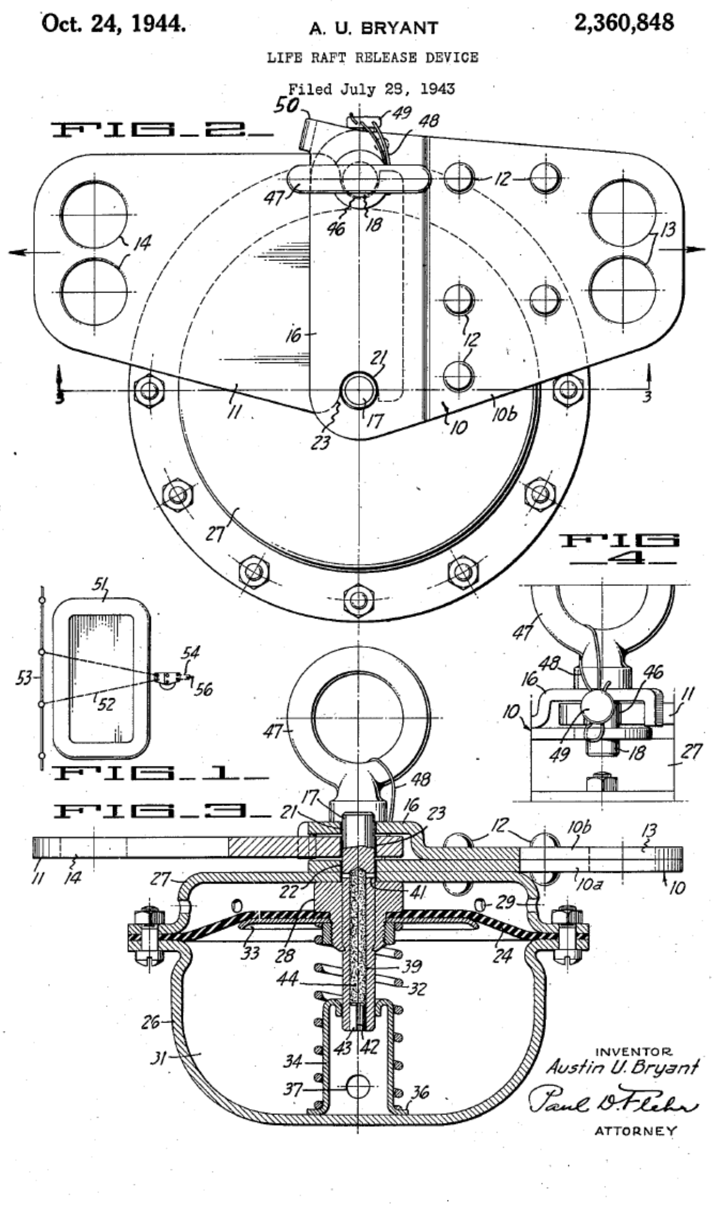


Figure 2.3 – Life raft release device.
Source: Austin U. Bryant.

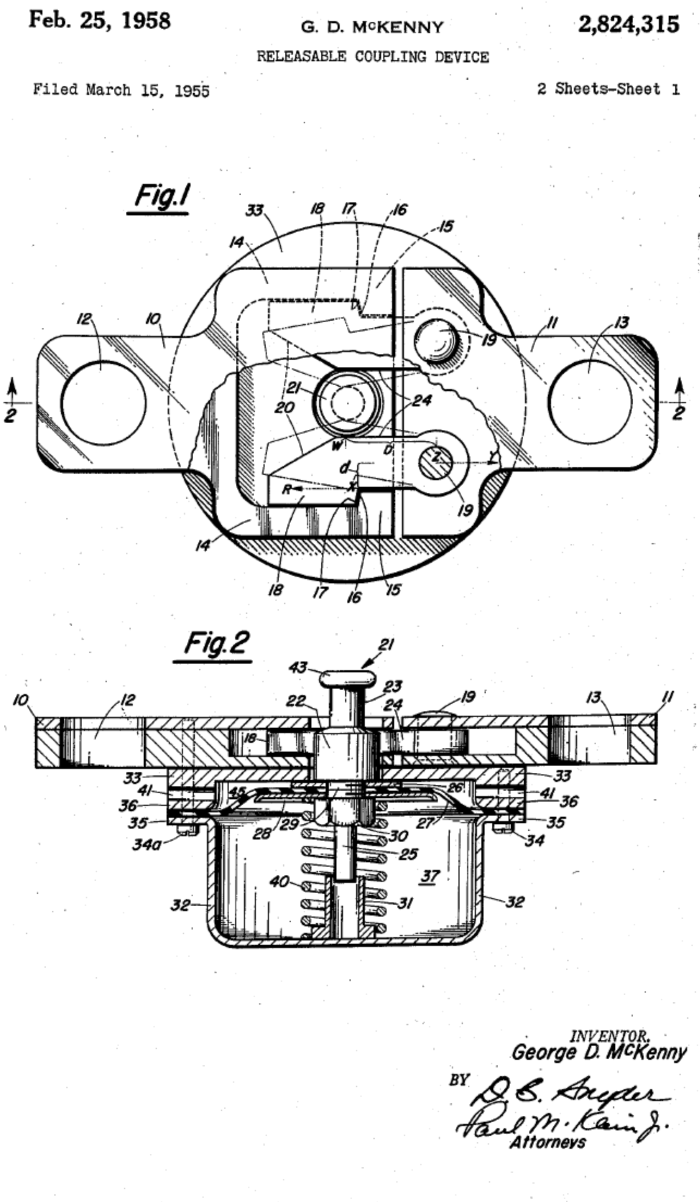


Figure 2.4 – Releasable coupling device.
Source: George D. McKenny.

2.1 SOLAS Requirements.

It was only with the adoption of SOLAS 1960 that for the first time provisions were made for the carriage of inflatable liferafts on cargo ships and passenger ships, as was then detailed in Chapter III, Regulations 35(a)(i) and 27(b)(i), among other provisions previously only applicable to passenger ships. The focal point was that "The convention took into account developments in liferafts and allowed for some lifeboats to be substituted with liferafts." (IMO 2000). However, there was no mention of automatic deployment of the appliances yet.

Soon after SOLAS 1960 entered into force a patent was granted on 26 September 1967 for "Stowages for Inflatable Liferafts and the Like", invented by Sidney Alfred Tuck assigned to Frankenstein Group Limited. The Abstract of Disclosure of the invention is below reproduced:

> A buoyant container for a deflated liferaft and means for inflation thereof wherein a tripline actuates the means and the closure for the container burst on inflation including hydrostatically actuated means of releasing the closure and causing inflation of the raft. (Tuck 1967)

The arrangement represents the typical configuration that has been in use on-board since then with minor variations, as seen in Fig. 2.5 where A is the extremity of the liferaft painter line; C is the webbing band for stowage of the container in the cradle; D is the releasable eyebolt; E is the hydrostatic device; F is the shackle for connection of the system to the deck; G is an aperture lug; H is a fixed eye plate; I is the ring at the extremity of the painter; J is the projecting spur; K is a cord of small diameter; and L is the senhouse slip. Starting from existing arrangements using the inherent buoyancy of the deflated liferaft in its container and a hydrostatic device, Tuck's insight was to devise the connection that later on came to be known as "weak link", as below described:

> A light cord connects the painter ring I to the permanently-anchored shackle F in a relatively weak manner, that is to say, it will break under a load substantially lower than the minimum breaking strength of the painter line A and shackle F. For example, in a case where such minimum strength is 1000 kg., the cord K may be designed to fail at 180 to 360 kg [4]. (Tuck 1967)

Eventually, on 20 November 1973, Resolution A.263(VIII) amended Chapter III of SOLAS 1960 and established requirements for float-free arrangements and hydrostatic release of liferafts similar to the Tuck's configuration, above mentioned. Regulation 15(p) was then replaced by the following:

> "(p) (i) The life-raft shall be so stowed as to be readily available in case of emergency. It shall be stowed in such a manner as to permit it to float free from its stowage, inflate and break free from the vessel in the event of sinking;
>
> (ii) if used, lashings shall be fitted with an automatic (hydrostatic) release system of a type approved by the Administration;
>
> (iii) the life-raft required by paragraph (c) of Regulation 35 of this chapter may be securely fastened." (IMO 1973)

Subparagraph (iii) refers to Regulation 35(c), as amended by Resolution A.122(V), which required an additional liferaft capable of accommodating at least six persons, to be stowed as far forward as reasonable and practicable. At that time, the requirement was applicable to ships having a registered length of 150 meters and upwards, with no amidships superstructure, however it has been amended since then. Currently the issue is dealt with in Regulation 31.1.4, whereby the additional liferaft is required for ships where the horizontal distance from the extreme end of the stem

[4] Currently, the weak link shall break under strain of 2.2 ± 0.4 kN (183.5 to 265.1 Kgf).

or stern to the nearest survival craft is more than 100 meters. Such "liferaft or liferafts may be securely fastened so as to permit manual release. (IMO 1974)

With regards to the rationale behind the Chapter III of SOLAS 1974 and LSA Code, aiming to determine the possibilities of golf-based regulations in the shipping industry, Niehius carried out an analysis of Chapter III of SOLAS 1974 and an overview of four current life saving appliances systems: free-fall lifeboats; davit launched lifeboat; inflatable rafts; and man overboard boat . Taking into account that "Obviously the top goal of LSA-regulations is to keep people from physical and psychological harm and thereby save their lives and prevent permanent or temporary disabilities". Niehius concluded, among others that "most of the regulations found in SOLAS Chapter III and LSA Code can be confidently translated into objectives and thence to their rationale." (Niehius 2004) According to the taxonomy used by Niehius, the objectives of section 4.2.7 *Markings on inflatable liferafts* are: to ensure adequacy, as primary objective; and to ensure useful assistance, as secondary objective. This certainly is also the case of 4.2.6.3.7 requiring that the container shall be marked with the length of the painter.

Wolf, in the same line of assessing goal-based regulations, approached Regulation 13.1.3 of Chapter III of SOLAS 1974 whereby each survival craft shall be stowed "in a state of continuous readiness so that two crew member can carry out preparations for embarkation and launching in less than 5 minutes". Considering the regulation under the human aspect, more specifically considering the human physical effort necessarily to accomplish the task, he indicates that "improvements are possible, however urgency is rated as not very high". (Wolf and Vredeveldt 2004)

With regards to urgency of improvements, seen from this author standpoint, based on his findings from *online* survey, Wolf somehow misses the point when rating the urgency as not very high. For manual launching of inflatable liferafts, a few other aspects must be considered, as follows:

- First, neither in SOLAS 1974 or LSA Code is mentioned as mandatory markings indicating the weight of the liferaft and its container.
- Second, online survey with questionnaire sent randomly to Safety Officers and Port State control Officers indicate that such information is not commonly available onboard, neither as part of the training manual required by Regulation 35 of SOLAS 1974 or in the certificate of servicing.
- Third, experience shows that during drills the ability to move the liferaft from its cradle is not normally exercised during monthly abandon drills.
- Fourth, indication of the liferaft weight also is not included in statutory certificates and annexes, such as Record of Equipment for the Cargo Ship Safety Equipment Certificate (Form E).

Thus, considering that the average weight of an inflatable liferaft plus the content of a SOLAS A Pack [5], it may happen that, when preparing to manually launch for instance a liferaft of 185 kg under adverse weather conditions, only then the two crew members will realize that the task is above their physical capacity.

---

[5] The normal equipment of every liferaft, as per LSA Code section 4.1.5.

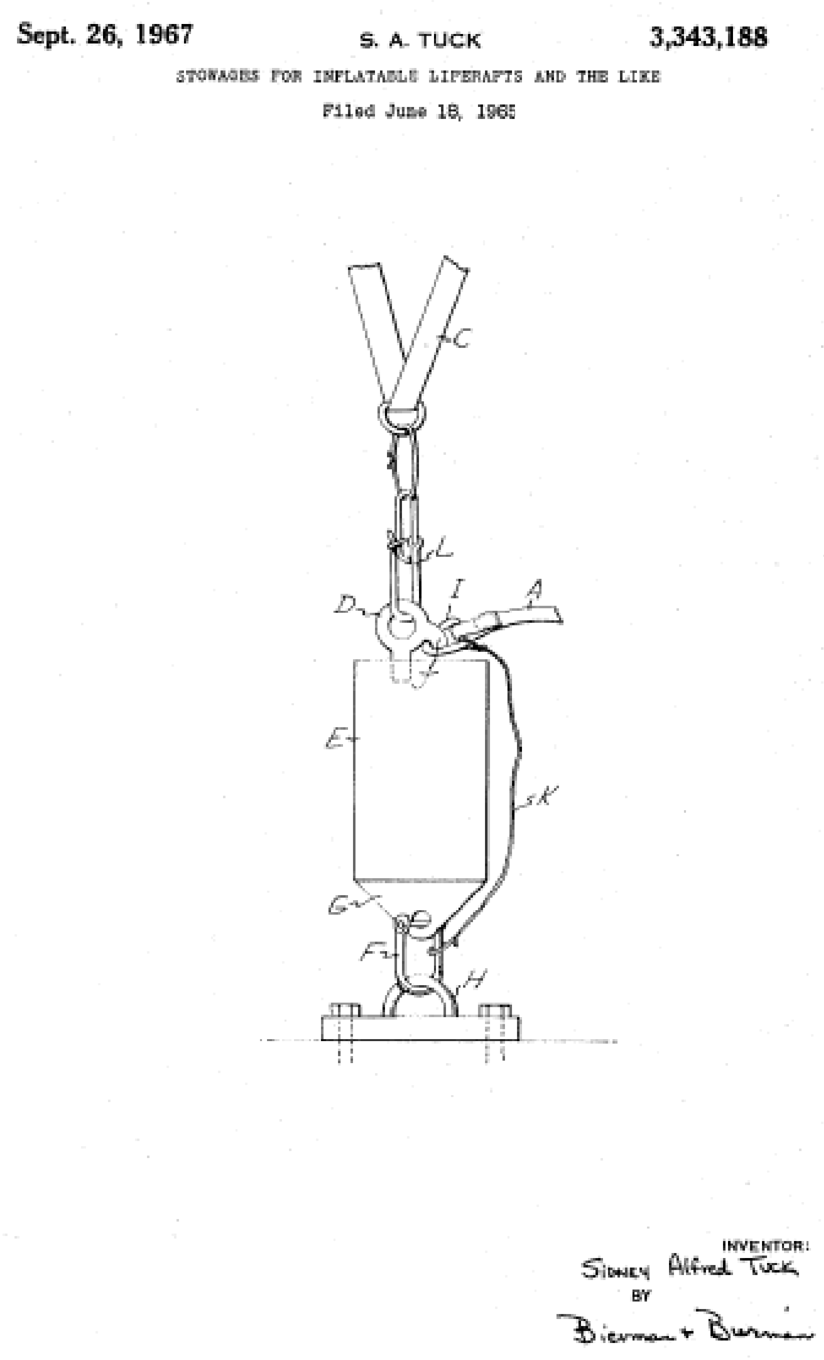


Figure 2.5 - Stowages for inflatable liferafts and the like.
Source: Sidney Alfred Tuck.

2.1.1 Float-free Arrangements with HRU for Inflatable Liferaft.

As seen in Figure 2.6, a typical float-free arrangement currently in use includes a hydrostatic release unit connected as an extension of the webbing band securing the liferaft container to the cradle and is designed to: release the liferaft in its buoyant container at a depth of no more than 4m; cause its inflation in the water; and then cast off the liferaft inflated in the water.

> In the event of a ship sinking before the liferaft has been launched, the HRU operates at a pre-set depth, releasing the liferaft from its lashings and allowing it to float to the surface, pulling out the painter as it does so. At the end of its travel, the painter operates the gas bottle and the liferaft is inflated. As the vessel continues to sink, the buoyancy of the raft is stronger than the weak link, which then parts, leaving the inflated raft floating on the sea surface. Thus the HRU allows the liferaft to be released and inflated in one automatic operation. (Hydrostatic release, 1989, pp. 35-39)

Regarding stowage of liferaft, Regulation 13.4.1 of Chapter III of SOLAS 1974 establishes that "Every liferaft shall be stowed with its painter permanently attached to the ship." However, this provision may lead to misunderstandings and hazardous conditions such as depicted in Figures 2.8 to 2.13, if it is approached separately from the overall context; in fact it is meant to be linked to Regulation 13.4.2: "Each liferaft or group of liferafts shall be stowed with a float-free arrangement complying with the requirements of paragraph 4.1.6 of the Code [6] so that each floats free and, if inflatable, inflates automatically when the ship sinks."

Therefore, when the float-free arrangement is dependent upon HRU, either disposable or non-disposable (serviceable), "permanently attached to the ship" means

[6] Life Saving Appliances Code.

the liferaft's painter has to be connected to the ship through the weak link of the unit.

Regarding operational readiness, maintenance and inspections, as required by Regulation 20.9 of Chapter III of SOLAS 1974, non disposable hydrostatic release units shall be serviced:

.1 at intervals not exceeding 12 months, provided where in any case is impracticable, the Administration may extend this period to 17months; and

.2 at a servicing station which is competent to service them, maintains proper servicing facilities and uses only properly trained personnel.

The last subparagraph is remarkable, in the sense that it does not require "approved" station for servicing hydrostatic release unit, as it happens with liferafts, as per Regulation 20.8.2.

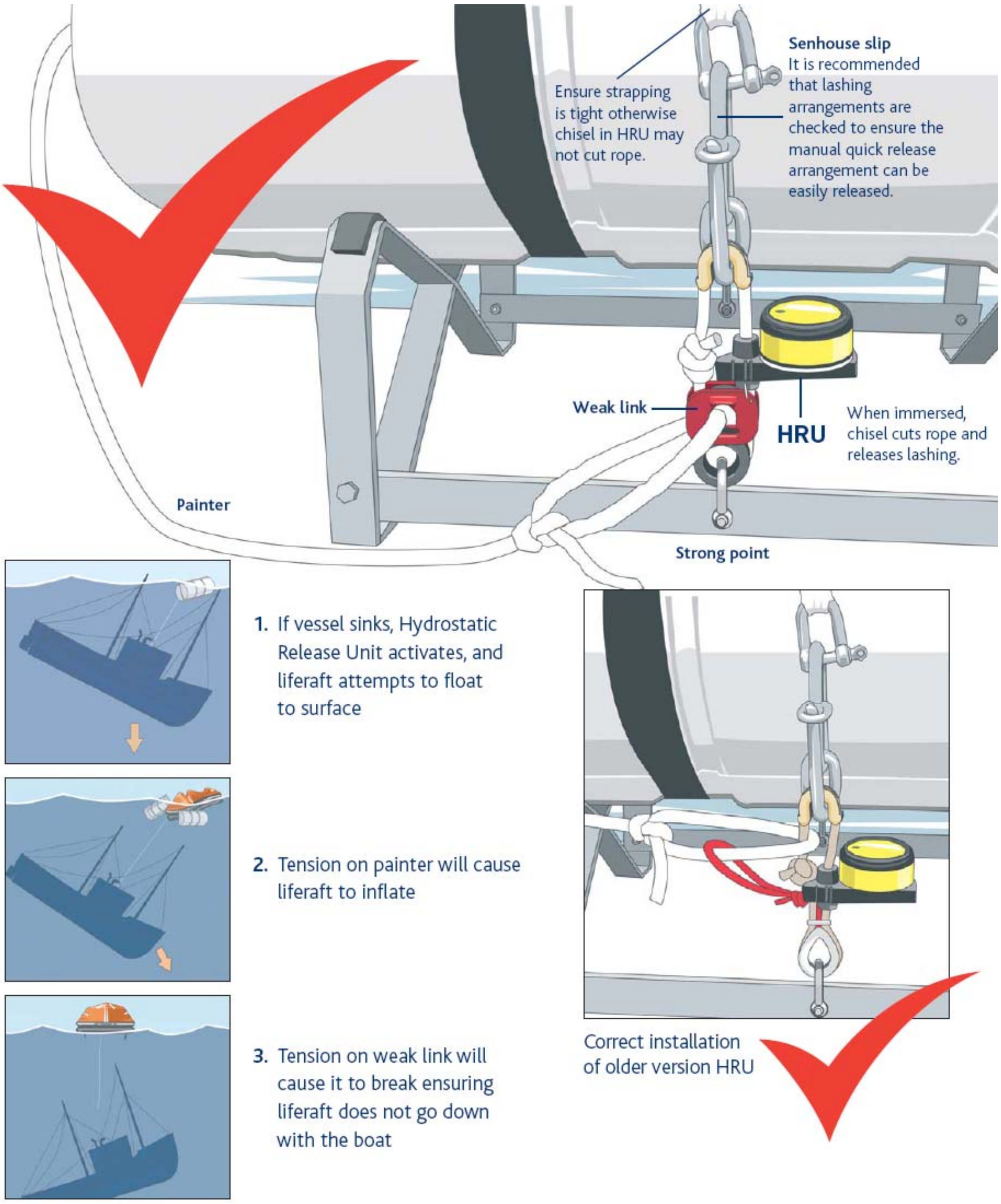


Figure 2.6 - Correct installation of a disposable HRU.
Source: RNLI

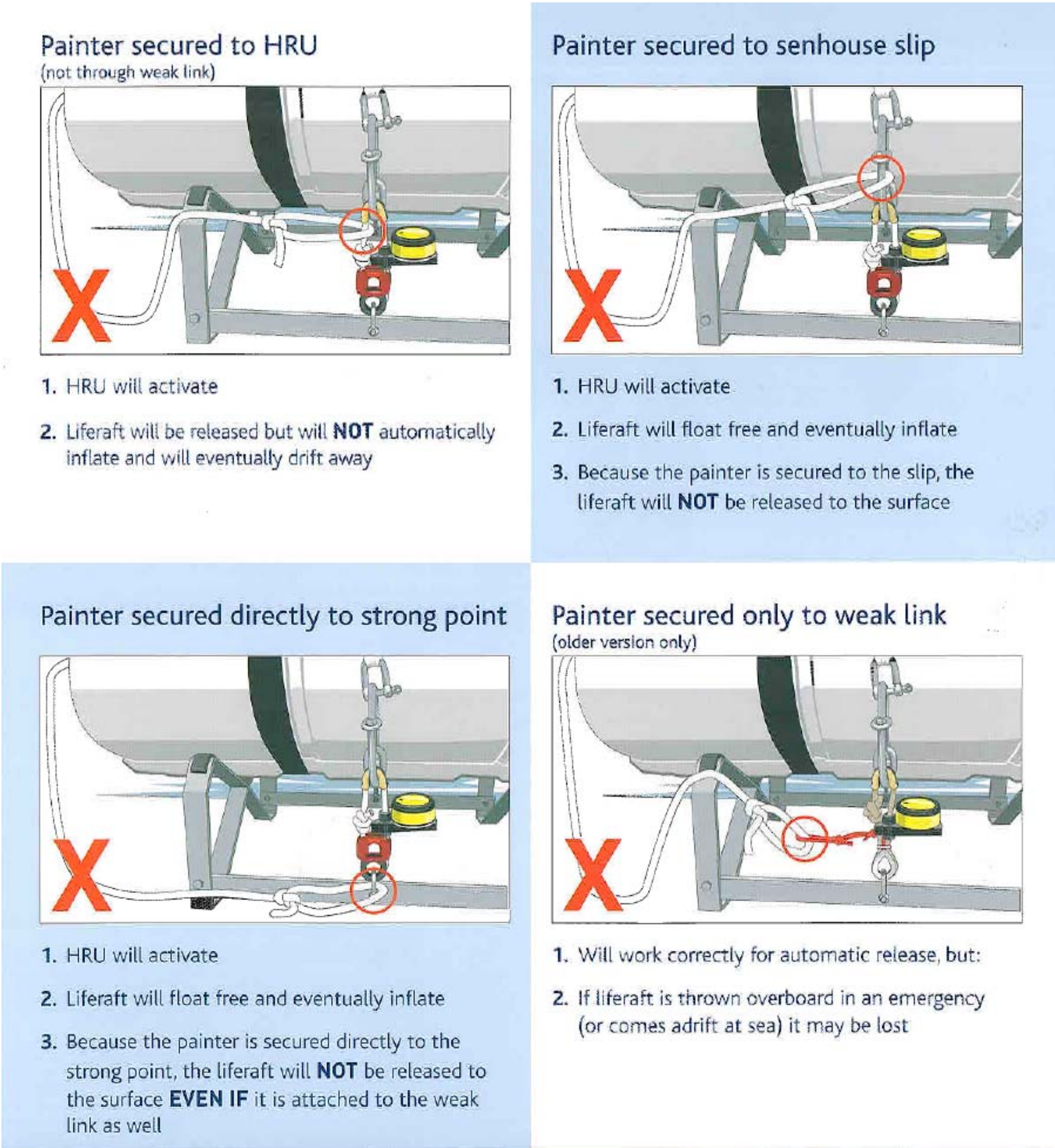


Figure 2.7 – Examples of incorrect installation of a disposable HRU.
Source: RNLI

Figure 2.8 - Incorrect installation.[7]

Figure 2.9 - Incorrect installation.

Figure 2.10 - Incorrect installation.

Figure 2.11 - Incorrect installation.

Figure 2.12 - Incorrect installation.

Figure 2.13 - Incorrect installation.

---

[7] Figures 2.8 and 2.9 refers to a 35,000 dwt bulk carrier flying the Brazilian flag where all four HRU were either expired or incorrectly installed, besides missing evidence of approval by the Administration.

2.1.2 Details of Hydrostatic Release Units.

Release devices in use for some time originally consisted of a rigid hollow box with a flexible membrane, sensitive to hydrostatic pressure, connected to the liferaft or other equipment and associated with a spring of a known force to trigger the release mechanism. However, records of granted patents or pending patents shows that several improvements and variations of design have been introduced, some of which are briefly describes herein. Although it is not the author’s intention to promote brand names, in some instances it will be possible to identify models commercially available, but it is fundamental for the purpose of this dissertation that to show the variety of possible arrangement as follows.

a. “Release Mechanism”, Figure 2.14 invented by Garrick Ross Johnson and registered on 29 July 2004. It includes an aneroid chamber (2) sealed by a flexible diaphragm (10) which normally maintains a latching mechanism (30) in a locked condition to prevent release of the article from stowage. When the diaphragm (10) is depressed either by ambient pressure exceeding the pressure in the aneroid chamber (2), or by a manual operation, the movement of the diaphragm frees the latching mechanism, releasing the liferaft or safety equipment from its stowage. (Johnson 2004)

b. “Hydrostatic Release Device”, Figure 2.15, invented by Paul D. Davis and Thomas S. Floate, dated 12 November 2006 and assigned to Simon Cash-Read as assignee. (Davis and Floate 1996)

c. “Hydrostatic Release Device for Safety Equipment”, Figure 2.16, invented by Jean-Christophe Richard and Kenny Cadoux, dated 5 January 1999. (Richard and Cadoux 1999)

d. “Hydrostatic Release with a Composite Plunger Assembly” shown in Figure 2.17, was invented by Ronald H. Day, registered on 8 August 1995, and assigned to Raftgo

Hendry Manufacturing Co. As stated in the summary of the invention: “Another object of the present invention is to provide such a coupling assembly which may be repeatedly tested to ensure that the hydrostatic release operates within the prescribed depth and tension load range.” (Day 1995)

e. “Release Unit”, Figure 2.18, invented by James Arthur George Simpson and David Peter Plewka, dated 1 May 2001 and European Patent Application EP 0937 639 A2, having Pains-Wessex Limited as assignee (Simpson and Plewka 2001). It is a dischargeable unit comprising a body with holding means for securing the body to the link; a mechanism for releasing the link; a pyrotechnic composition **113** activated by an electric squib [8] **19** actuating the releasing mechanism; an ignition means with electric stimulus **8** [9] activated by the pressure increase in hole **10**, for lighting the pyrotechnic composition; a pressure-sensing means **4**; and a sliding blade **24** [10]. Figure 2.19 shows the device **2** connected via a link 3 to an EPIRB[11]

f. “Hydrostatic Release Mechanism”, Figure 2.20, invented by Kerry R. Kohuth, dated 12 April 2005, having as assignee General Pneumatics Corporation (Kohuth 2005). It also operates by means of a pyrotechnic charge **62**, activated by a trigger mechanism **5**, actuating on the piston **66** and blade **68**.

g. “Hydrostatic Pressure Sensors”, Figure 2.21, dated 22 November 1994, invented by Richard I. Wigram, and having as assignee Smith Industries Public Limited (Wigram 1994). The device comprises a rectangular casing having an aperture **6** receiving a bolt **7,** which is attached to a liferaft or EPIRB. Siding the aperture **6** there are two bolt holes for securing the assembly to a fixed part of the vessel. The

---

[8] Small explosive device.

[9] Lithium battery.

[10] If the unit is submerged till the set up pressure, the electrical stimulus will be activated to ignite the pyrotechnic composition, which will activate the sliding blade, which then cuts the cable or bolt securing the liferaft or EPIRB.

[11] In current practice the weak link can be a plastic bolt with the same resistance to cut as the cable.

bolt **7** is normally held in position by means of a plastic slider **50** engaging a notch, and is released by action of the diaphragm **14** and retaining member **19**. It can also be released manually, by means of push-button **60**.

h. "Release Device for Emergency Sea Rescue Apparatus", invented by Birgitt I. Wildhagen, dated 14 November 1978, having as assignee Dunlop Limited, "designated to accommodate forces at any angle between the normal horizontal and vertical direction whereby the release will operate without jamming regardless of the angle of the ship's deck when the release is triggered" (Wildhagen 1978). See in Figure 2.22: water pressure release device **300**; eye hook **400**; restraining strap **420**; quick release shackle **421**; crampling shackle **600**; and weak link **901**.

i. "Method and Apparatus for Releasing a Submerged Liferaft", Figure 2.23, invented by James M. Parish, dated 19 February 1985, assigned to assignee The B. F. Goodrich Company, "whereby a davit launched inflatable liferaft in a rigid container fastened to a deck by releasable latches is released and the raft inflated at a predetermined depth in a float free mode." (Parish 1985)

j. "Securing Arrangement so Executed as to be Tripped on Actuation", dated 18 March 1986, invented by Sven-Erik Persbeck, having as assignee Mats Hermansson. The arrangement as seen in Figure 2.24 and 2.25 includes a blade (36, 37) with an edge arranged to be moved by force of the tensioned spring (42) in order to cut the cable (8).

> The actuating arrangement (20, 32) is so arranged as to hold the blade in its first position by means of a locking arrangement (26), and as to release the blade so that it will adopt its second position upon actuation by means of said factor [12]." (Persbeck 1987)

[12] A change in pressure.

k. “Dual breaking strength weak link” is another possible arrangement as per Figure 2.26, invented by Leland D. Adams, Jr., dated 12 July 1977. “In such an instance, the breaking strength is relatively large, i.e., strong enough to secure the raft to the vessel while afloat but still not so strong as to pull the inflated raft down with the sinking vessel ” (Leland, Jr. 1977). Furthermore:

> In order to manually separate the weak link, the bars **43** and **45** are grasped and pivoted about a fulcrum formed by the end edge **61** of one of the bars. The end edge 61 being quite close to the rods 47, a great deal of leverage is obtained and the rods **47** easily broken in tension.

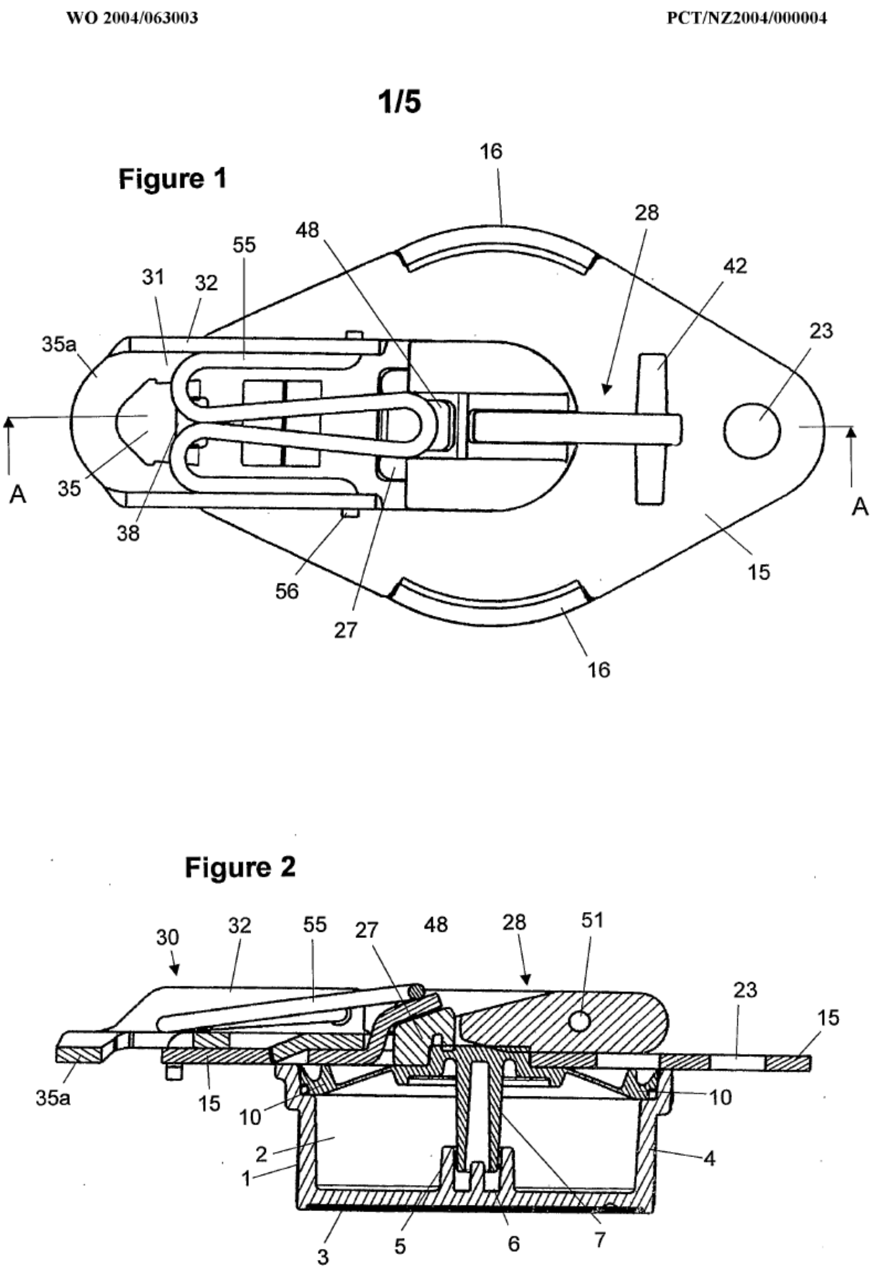


Figure 2.14 - Release mechanism.
Source: Garrick Ross Johnson.

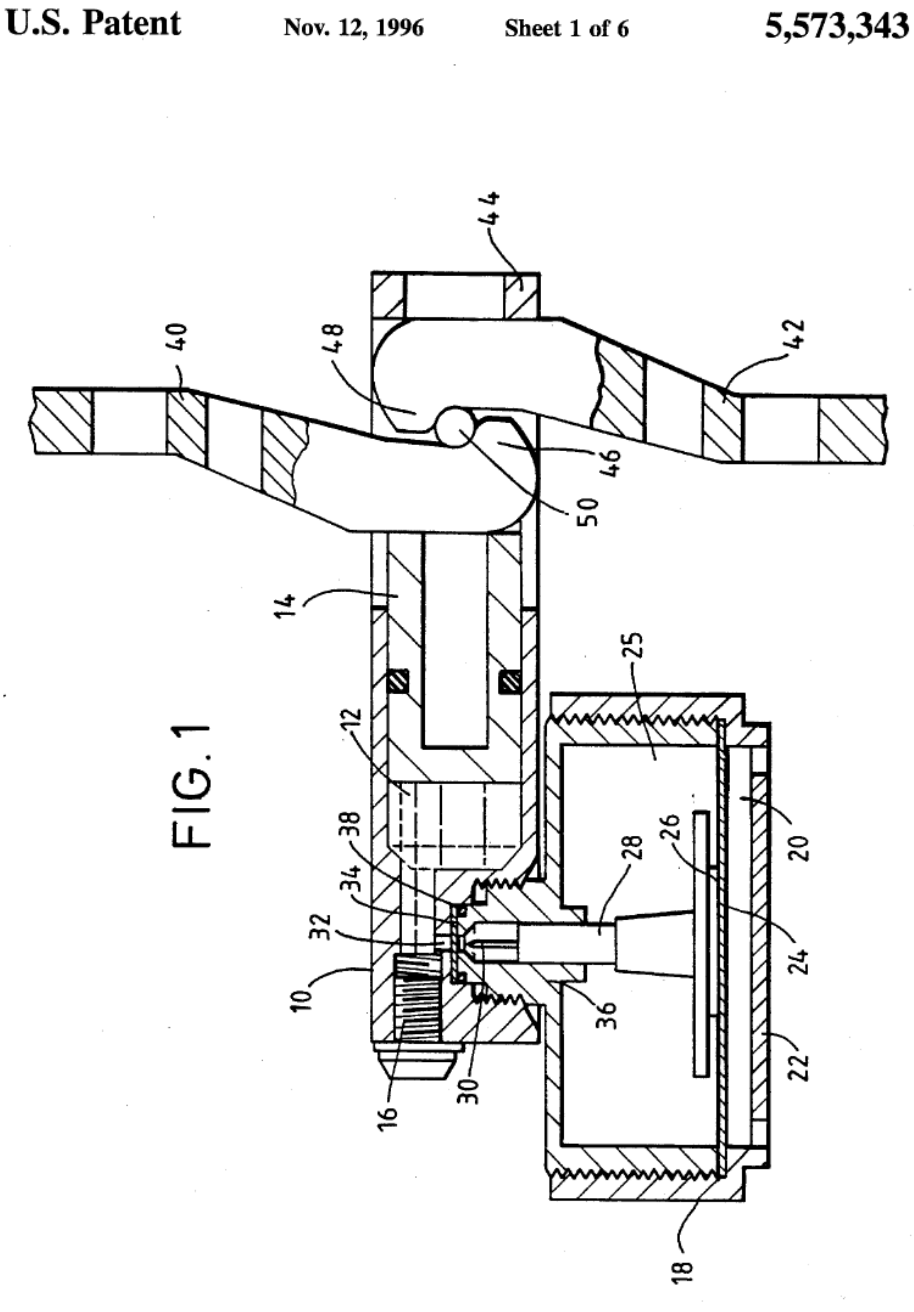


Figure 2.15 – Hydrostatic release device.
Source: Paul D. Davis; Thomas S. Floate.

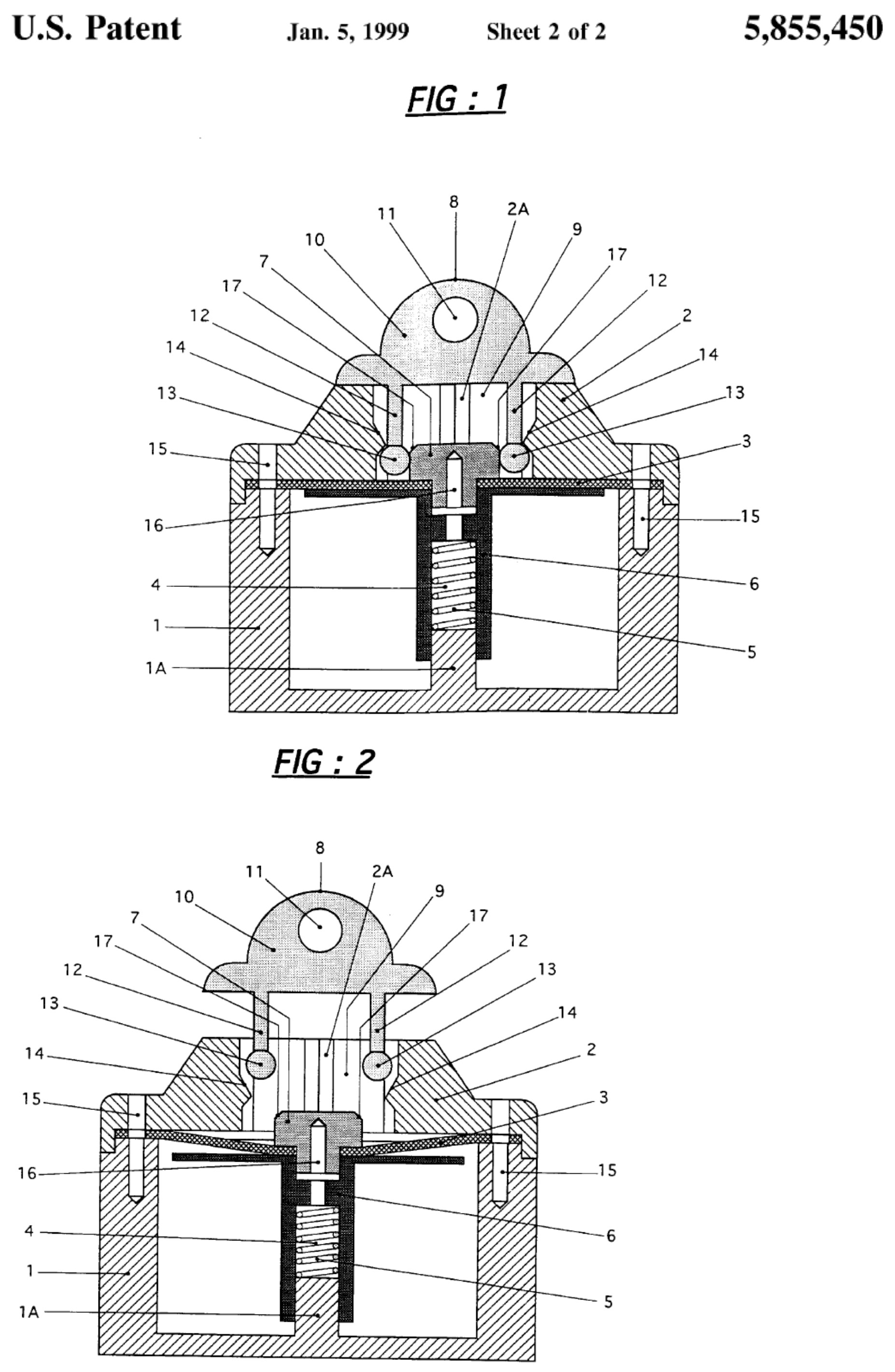


Figure 2.16 – Hydrostatic release devise for safety equipment.
Source: Jean-Christophe Richard; Kenny Cadoux.

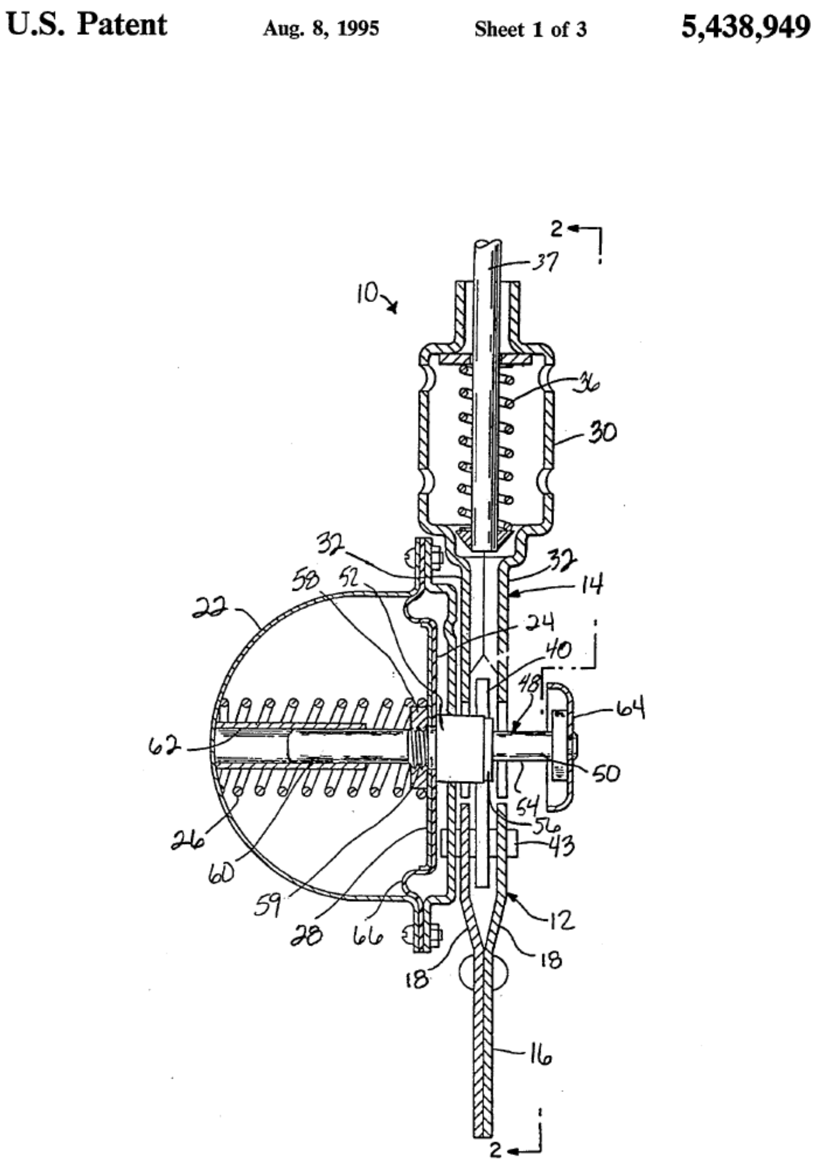


Figure 2.17 – Hydrostatic release with a composite plunger assembly.
Source: Ronald H. Day.

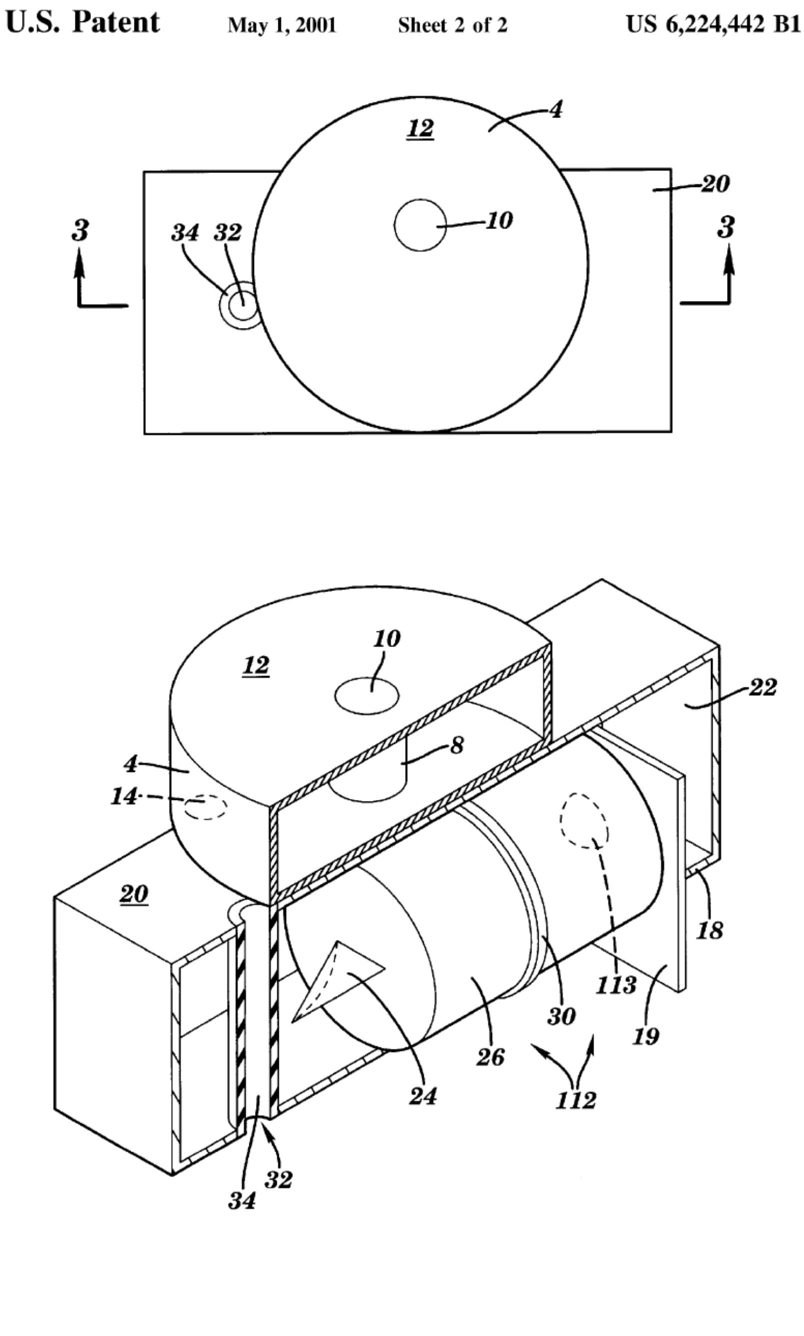


Figure 2.18 – Release unit.
Source: James Arthur George Simpson; David Peter Plewka.

EP 0 937 639 A2

FIGURE 1

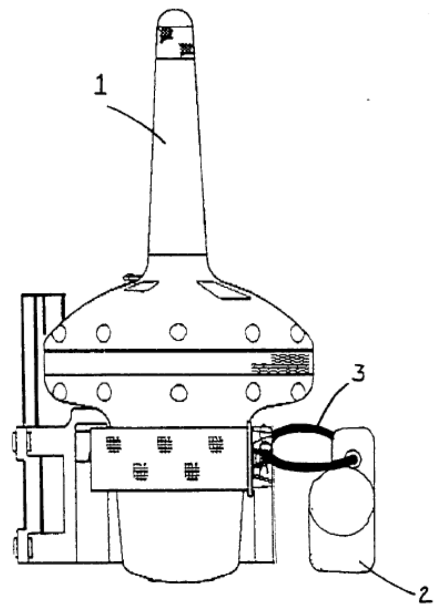


Figure 2.19 - Arrangement for EPIRB.
Source: European Patent Office.

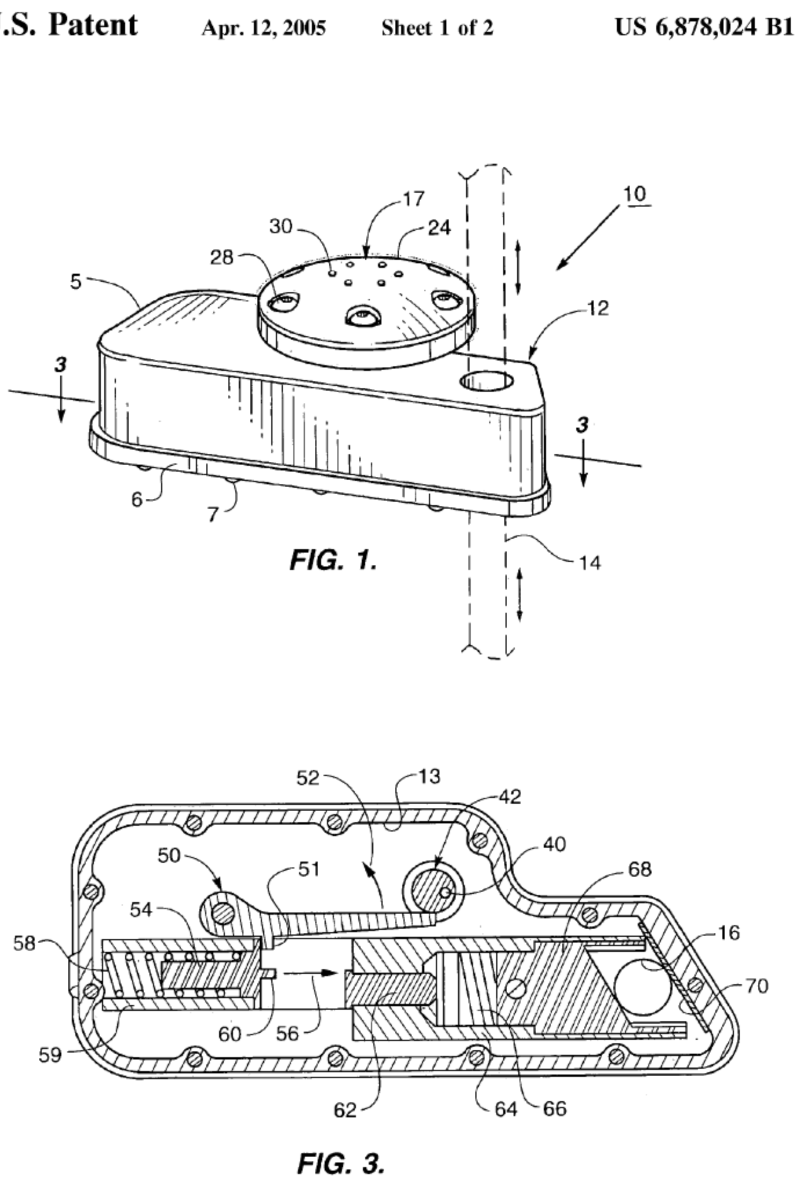


Figure 2.20 - Hydrostatic release mechanism.
Source: Kerry R. Kohuth.

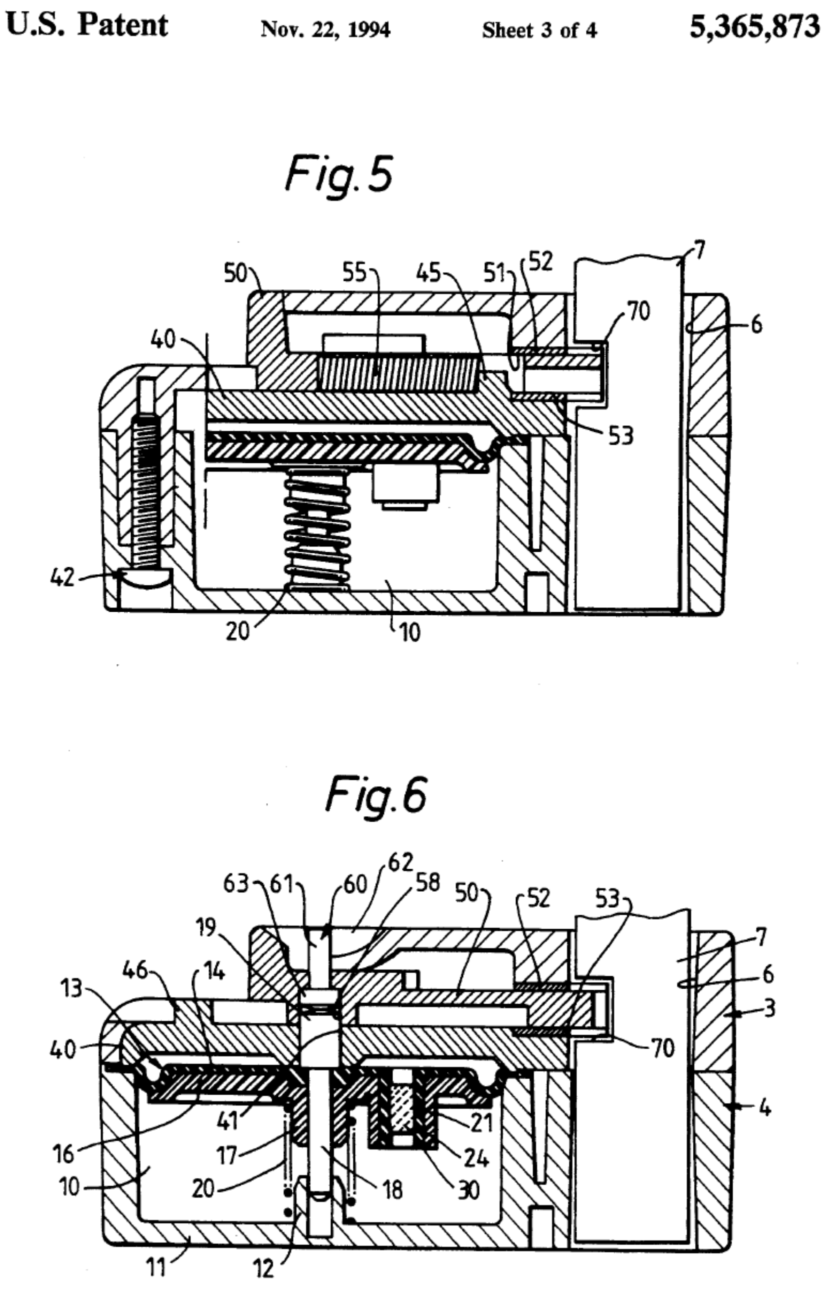


Figure 2.21 – Hydrostatic pressure sensors.
Source. Richard I. Wigram.

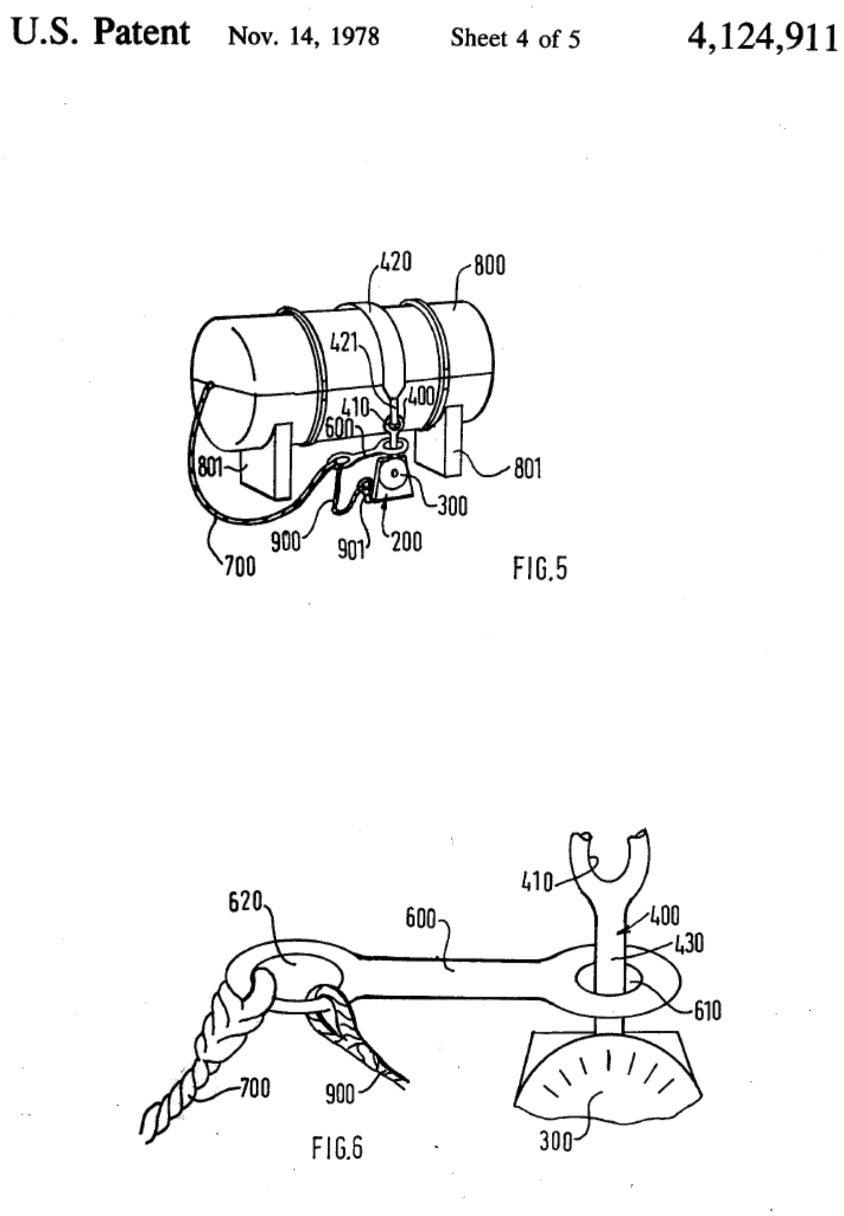


Figure 2.22 – Release device for emergency sea rescue apparatus.
Source: Birgitt I. Wildhagen.

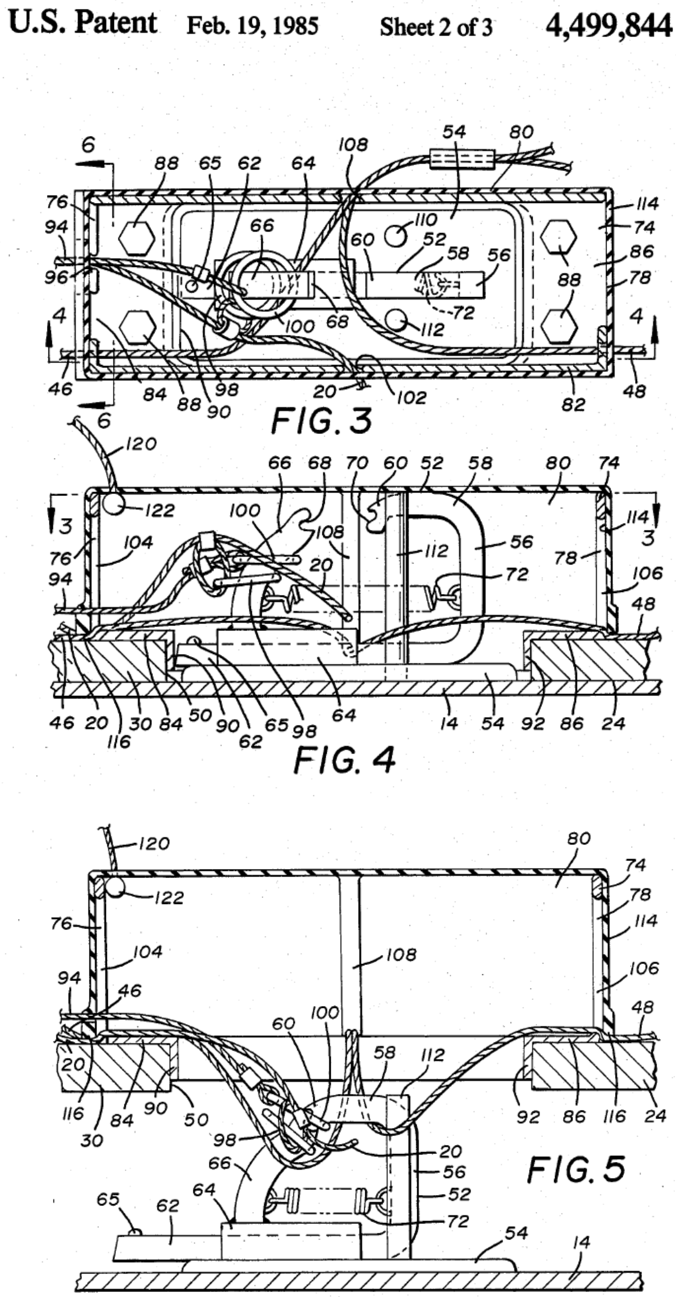


Figure 2.23- Method and Apparatus for Releasing a Submerged Liferaft.
Source: James a. Parish.

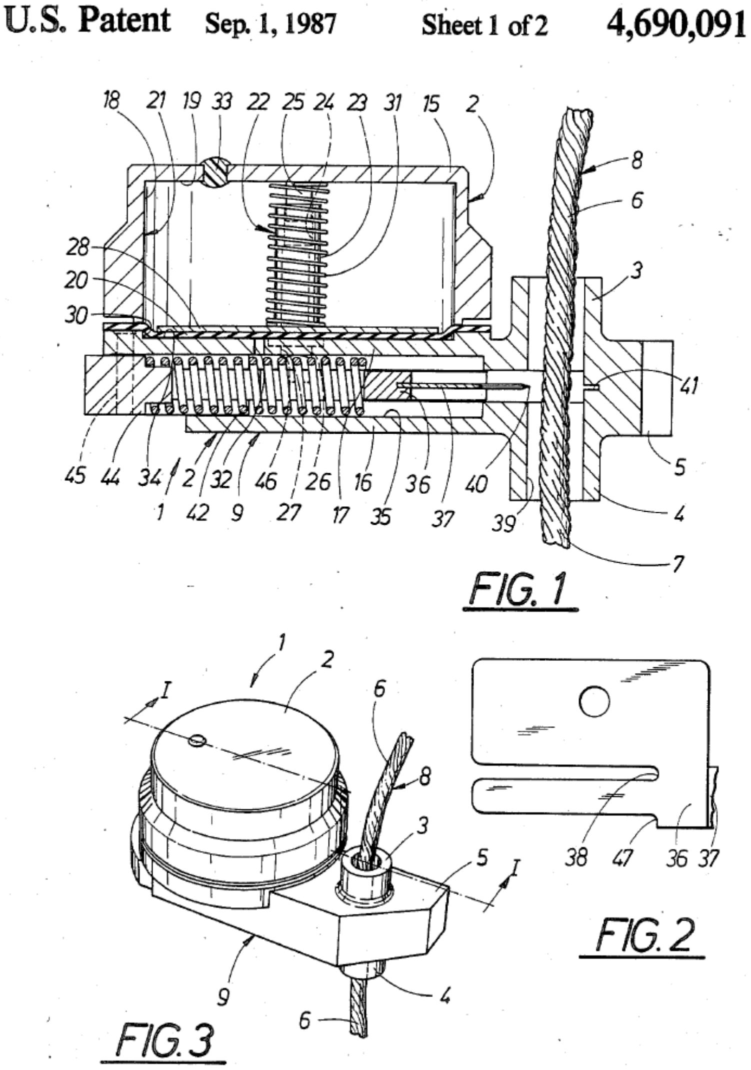


Figure 2.24 - Securing arrangement so executed as to be tripped on actuation.
Source: Sven-Erik Persbeck.

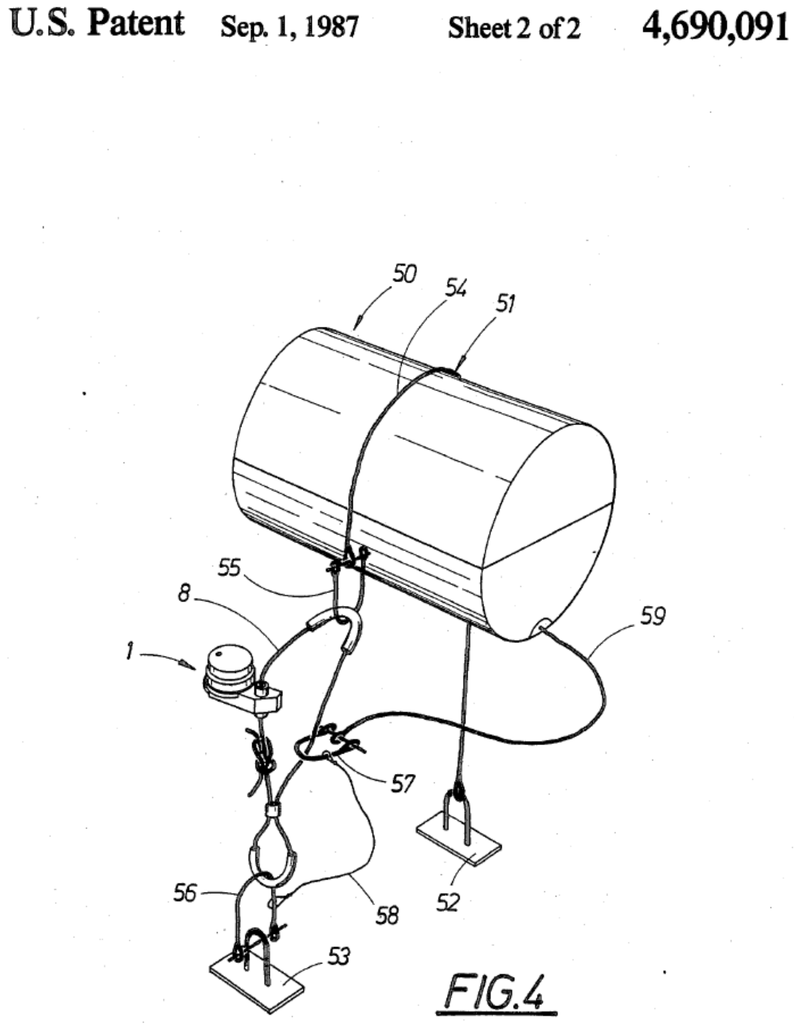


Figure 2.25 – Diagrammatic view arrangement ready for use with liferaft.
Source: Sven-Erik Persbeck.

U.S. Patent July 12, 1977 4,035,092

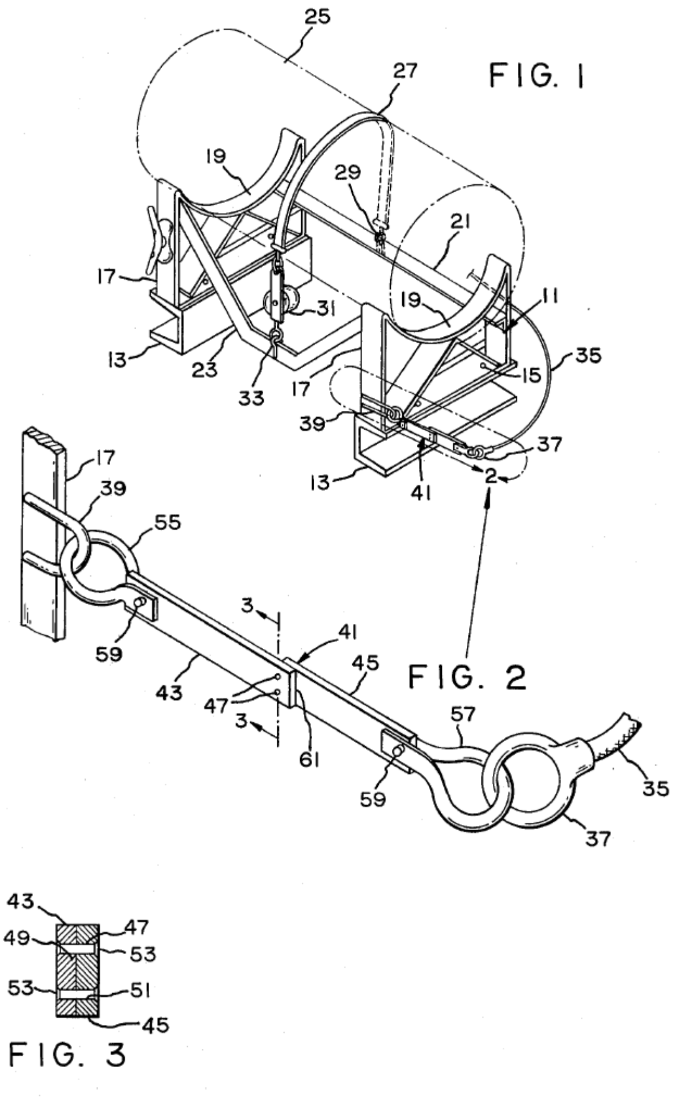


Figure 2.26 – Dual breaking strength weak link.
Source: Leland D. Adam, Jr.

2.1.3 Float-free Arrangements with HRU for EPIRB.

As part of the Global Maritime Distress and Safety System (GMDSS), an Emergency Position Indicating Radio Beacon (EPIRB) is a small radio transmitter whose signal is received by polar orbit satellite. The activation indicates that persons are in distress, detached from the vessel, and need immediate assistance. The EPIRB is usually mounted in a bracket by means of a hydrostatic release unit (HRU) as float-free arrangement in the event that the vessel is sinking. Therefore an EPIRB can either: be removed from its stowage bracket and manually activated, so that the location of the distress is determined; or be released by a HRU when submerged at no more than 4 meters, and activated by contact with the sea water which closes the electric circuit of activation.

A possible arrangement is shown in Figure 2.27 “Mounts for Buoys”, dated 20 September 1994, invented by Richard I. Wigram and having as assignee Smith Industries Public Limited . The assembly “includes a cast aluminum housing **1** in which is mounted a support frame **2** that carries an emergency position indicating beacon (EPIRB) or buoy **3.** The frame is retained in the housing by a hydrostatic release mechanism **4”** (Wigram 1994b). For manual release, the frame is in two parts so that, when the spring pin **24** is released, the buoy can be removed without activating the hydrostatic release mechanism.

Another innovation, a “Hydrostatic EPIRB Release”, invented by Mark Clark, registered on 02 June 2006, assigned t ACR Electronics Inc. Figure 2.28 is an explosive view of the protective housings **46** and **48**, the HRU **10** , the EPIRB **12**, and a cotter pin **50**. A distinctive feature claimed by the inventor is that the HRU uses a two-parts rod **34** and **36** instead of blade or explosive charge to release the EPIRB. As stated in the Abstract for Patent Application: “The elongated shaft is connected at one end to an EPIRB housing and at the other end to the EPIRB housing cover. Once the cover is release by the water pressure, the EPIRB will float to the ocean surface.” (Clark 2007)

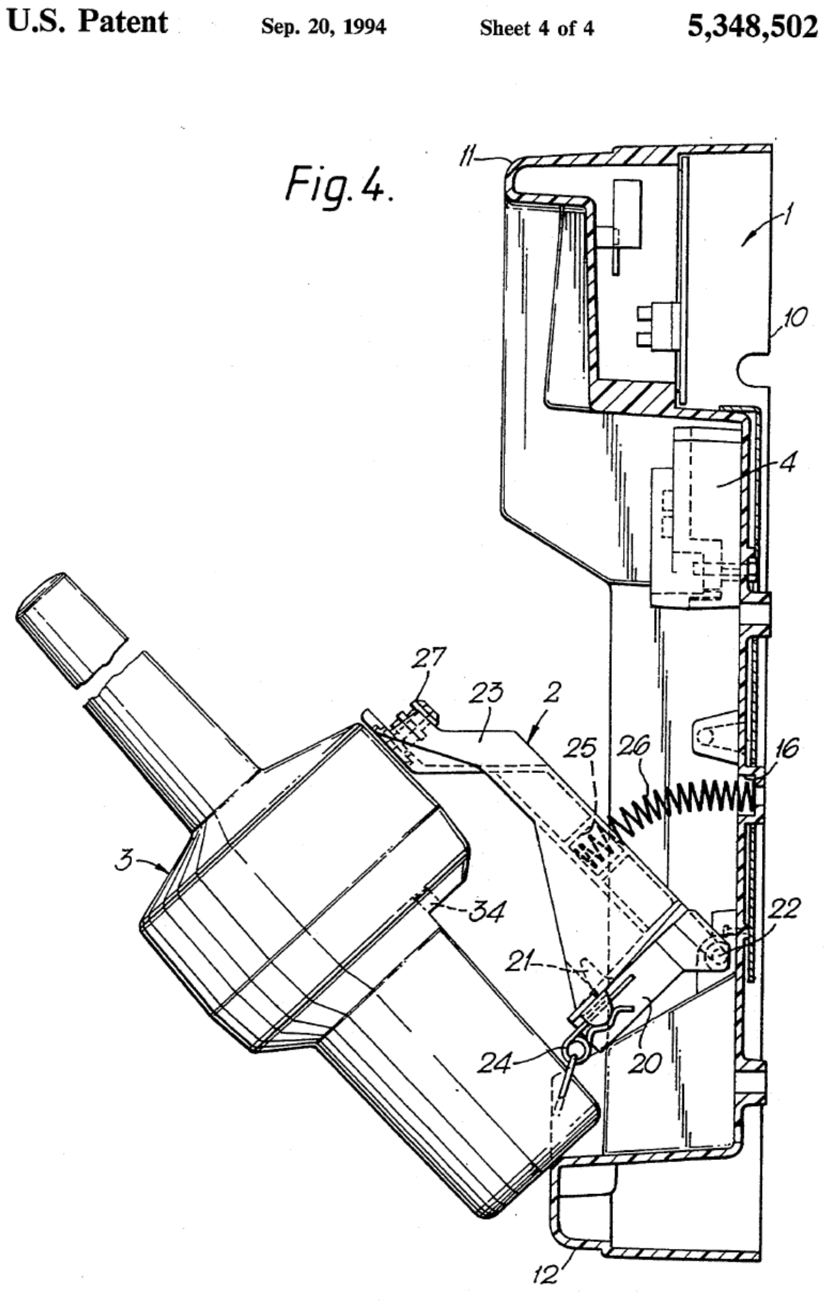


Figure 2.27 – Mounts for buoys.
Source: Richard I. Wigram.

WO 2007/067925 PCT/US2006/061686

8 / 10

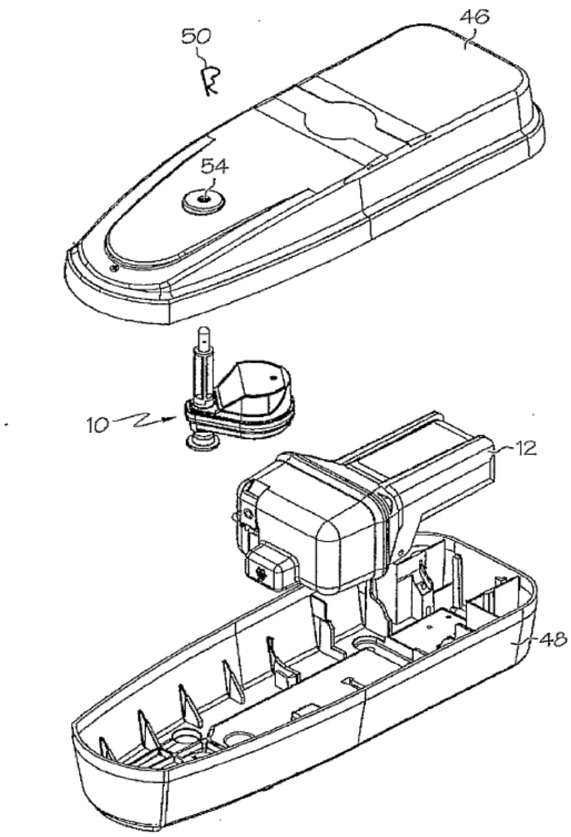


FIG. 10

Figure 2.28 – Hydrostatic EPIRB Release.
Source: Mark Clark.

WO 2007/067925 PCT/US2006/061686

5 / 10

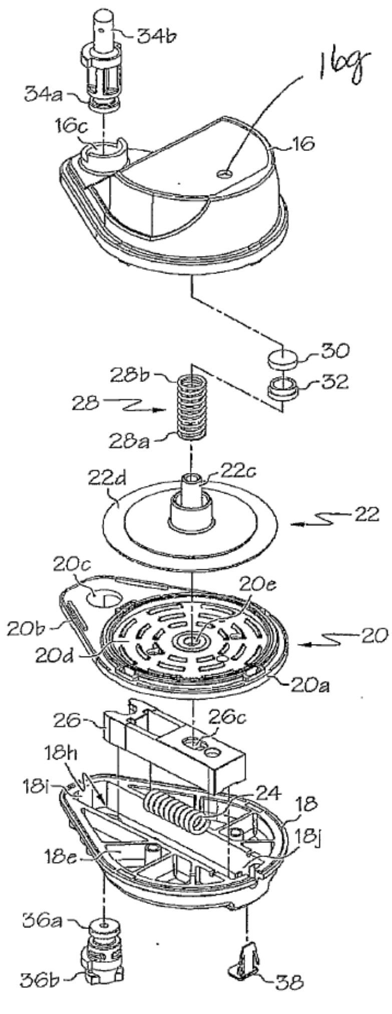


FIG. 7

Figure 2.29 – Exploded perspective view of the HRU.
Source: Mark Clark.

2.2 LSA Code standards.

The International Life-Saving Appliance (LSA) Code was adopted and made mandatory by means of resolution MSC.48(66) and MSC.47(66), entering into force on 1 July 1998, providing standards for the life-saving appliances required by chapter III of SOLAS 1974.

With regards to methods of deployment, normally a liferaft can be either manually thrown overboard or launched with its complement of people by means of davit, if specially designed for that. Currently on cargo ships provided with lifeboats the liferafts are of the type to be thrown overboard, whereas davit launched liferafts are required for ships where the embarkation station for abandon is more then 4.5m above the highest sea going condition, as per Regulation 16 of Chapter III of SOLAS 1974. Furthermore, when a cargo ship is equipped with free-fall lifeboat, the liferafts on at least one side of the ship shall be served by launching appliances, as per Regulation 31.1.2.2.

Nevertheless, for free-floating deployment the most commonly used configuration comprises three components, namely: the painter system, the weak link and the hydrostatic release unit, as specified in Section 4.1.6 of the LSA Code. The general principle is provided in section 4.1.6.1 *Painter system* of the International Life-saving Appliance Code (LSA Code):

> The liferaft painter system shall provide a connection between the ship and the liferaft and shall be so arranged as to ensure that the liferaft when released and, in the case of an inflatable liferaft, inflated, is not dragged under by the sinking ship. (IMO 1996)

As per section 4.1.6.2 *Weak link*, if a weak link is used in the float-free arrangement, it shall: ".1 not be broken by the force required to pull the painter from the liferaft container"; .2 if applicable, be of sufficient strength to permit the inflation of the liferaft container; .3 break under strain of 2.2 ± 0.4 kN[13].” (IMO 1996)

Section 4.1.6.3 *Hydrostatic release unit* requires that, if a hydrostatic release unit is used in the float-free arrangement, it shall:

.1 be constructed of compatible material so as to prevent malfunction of the unit. Galvanizing or other forms of metallic coating on parts of the hydrostatic release unit shall not be accepted;

.2 automatically release the liferaft at a depth or not more than 4m;

.3 have drains to prevent the accumulation of water in the hydrostatic chamber when the unit is in its normal position;

.4 be so constructed as to prevent release when seas wash over the unit;

.5 be permanently marked on its exterior with its type and serial number;

.6 be permanently marked on the unit or identification plate securely attached to the unit, with the date of manufacture, type and serial number and whether the unit is suitable for use with a liferaft with a capacity of more than 25 persons;

.7 be such that each part connected to the painter system has a strength of not less than that required for the painter; and

8. if disposable, in lieu of the requirement in paragraph 4.1.6.3.6, be marked with a means of determining its date of expiry.”

To meet these requirements, standards for approval of a hydrostatic release unit for the maritime branch can be found in ISO 15734 [14].

---

[13] 183.5 to 265.1Kgf.

[14] Manufacturers in Europe also follow ISO 9000/2001 and Marine Equipment Directive 96r/98/EC.

2.3 Testing Standards.

Among existing international instruments regarding test standards for float-free arrangements for liferafts with hydrostatic release units, the first to be mentioned is the Regulation 4 of Chapter III4 of SOLAS 1974 *Evaluation, Testing and Approval of Life-saving Appliances and Arrangements*, which sets up in broader terms the Administrations responsibility for approval of life-saving appliances. Then, Regulation 34, stating that "Al life-saving appliances and arrangements shall comply with the applicable requirements of the Code." (IMO 1974)

2.3.1. Testing of hydrostatic release unit.

As per Section 11 of resolutions A.689(17), *Testing of Life-saving Appliances,* and MSC.81(70) *Revised Recommendation on Testing of Life-saving Appliances* (IMO 1991) adopted on 06 November 1991, samples of hydrostatic release units should be given a visual and dimensional examination and undergo a sequence of technical tests: *.1 corrosion resistance test; .2 temperature tests; .3 submergence and manual release tests; .4 strength test; .5 resistance of the membrane to cold, to heat, to oil, to natrium chloride, and to detergents.* (IMO 1998)

2.3.2 Testing of weak link.

As per Section 5.11 of Resolution A.689(17), "The weak link system, should be tensile tested and should have a breaking strain of 2.2 ± 0.4 kN."

Having in sight the adopted standards, nevertheless some difficulties may be expected regarding compliance, as in many designs of hydrostatic release units the weak link is incorporated in the unit, under other conceptions the weak link is supplied separately. It has happened that, off the records, some experienced seafarers expressed the belief that the weak link supplied by the HRUs' manufacturers is only a commercial strategy to charge more for an otherwise less expensive material. Meaning that an ordinary small diameter cable commonly available on board, connected to the liferaft painter, and attached to a strong point on the vessel would serve the same purpose. However, from this author standpoint, this can not be accepted as good practice, as it does not guarantee compliance with regulations, as this kind of consumable is not usually accompanied by documental evidence of strength.

2.4 International Safety Management Code Requirements.

The purpose of the International Management Code (ISM Code) is to provide a standard for the safe operation of ships and for pollution. As per Mukherjee “Clearly the primary object of the Code is to exact adequate safety management responsibilities from the company both in terms of its shore-based and shipboard management” (Mukherjee 2007, pp. 147-166). In fact, a key element is that it distributes the responsibility for safety among public and private parties that form the maritime community, as it is signaled in paragraph 6 of the Preamble: “The cornerstone of good safety management is commitment from the top. In matters of safety and pollution prevention it is the commitment, competence, attitudes and motivation of individuals at all levels that determines the end result”. Being mandatory for a wide range of cargo ships and mobile offshore drilling units, it is recognized as the key element for the establishment and maintenance of the so called “safety culture” in maritime matters.

As stated in its Paragraph 1.2.1, “The objectives of the Code are to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment and to property”. However it is interesting to observe that nowhere in SOLAS or in the ISM Code *safety* is defined, but then again, as the development and maintenance of a Safety Management System is intensely associated with risk assessment, for the purpose of this dissertation it is suggested the following definition: “Safety is the condition whereby the degree of risk is deemed acceptable”.

Furthermore, the ISM Code requires in its section 1.4 that the Company should establish, implement and maintain a safety management system including the following functional requirements:

.1 a safety and environmental protection policy;

.2 instructions and procedures to ensure safe operation of ships and protection of the environment in compliance with relevant international and flag state regulations;

.3 defined levels of authority and lines of communication between, and amongst, shore and shipboard personnel:

.4 procedures for reporting accidents, incidents and non-conformities with the provisions of the Code;

.5 procedures to prepare for and respond to emergency situations; and

.6 procedures for internal audits and management reviews.

Coherent with the hypothesis of this dissertation it can be assumed that many deficiencies regarding float-free arrangements for liferaft and EPIRB are somehow related with non-conformities with the provisions of the ISM Code, recalling that "the safety management objectives of the Company should, *inter alia*, establish safeguards against all identified risks", and that for the purpose of maintenance of the ship and equipment "inspections of life saving appliances should be carried out regularly".

These inspections are required by Section 10 of the Code *Maintenance of the Ship and Equipment*: "10.1 The Company should establish procedures to ensure that the ship is maintained in conformity with the provisions of the relevant rules and regulations and with any additional requirements which may be established by the Company". As relevant it can be mentioned weekly and monthly inspections of life-saving appliances, as per Regulation 20.7 and Regulation 20.8 of the Chapter III of SOLAS 1974.

Once again recalling section 10 of the ISM Code, the company should ensure that: .”1 inspections are held at regular intervals; .2 any non-conformity is reported, with its possible cause, if known; .3 appropriate corrective action is taken; and .4 records of these activities are maintained”. Therefore, if so long standing regulations as the above mentioned are not complied with, there are strong reasons to believe that the safety management system of the failed both shorebased and shipboard, in the sense that the tools [15] therein provided prior to certification are not properly implemented.

2.5 Training Standards.

The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) establishes in its Regulation VI/1 that “Seafarers shall receive familiarization and basic safety training or instructions in accordance with section A-VI/1 of the STCW Code and shall meet the appropriate standard of competence specified therein.” (IMO 1978)

Section A-VI/1, in turn, sets that seafarers employed in any capacity on board ship, before being assigned to any shipboard duties shall receive appropriate approved basic training or instructions in personal survival techniques, among others, as per table A-VI/1-1. It is well understood that *approved* means approved by the Party to the convention, as it is common knowledge that the majority of the training institutions follow the Model Course 1.19 *Personal survival techniques* (IMO 2000b) in the preparation of courses.

Therefore, it is assumed that every seafarer is familiar with the basic knowledge on liferafts and EPIRBs, as included in the detailed syllabus of the above mentioned

[15] Safety meeting; safety committee; familiarization with life-saving appliances; drills; on board training; and reports on accidents; incidents, and non-conformities; among others.

Model Course, Part 1.3 and Part 8.2. Furthermore, it is assumed that every seafarer is aware that “training specific to the ship is documented in the SOLAS Training Manual”, as stated in Part 1.4, although there are reasons to believe that this manual is not given proper consideration by all the parts involved.

On the other hand, among the competences of a navigation officer, under Section A-II/1 it is included operation of life-saving appliances and knowledge of survival crafts, their launching appliances and arrangements. For a certificated person in charge of each survival craft, similar knowledge, understanding and proficiency is required, as per Table A-VI/2-1 of the STCW Code, for which the detailed syllabus of Model Course 1.23 *Proficiency in survival craft and rescue boats*, in Part 5.5 (IMO 2000c):

.1 describes the working of a hydrostatic release unit for a liferaft securing strap;

.2 explains the sequence of events leading to the release of the fully inflated liferaft in the case of a ship sinking; and

.3 describe the on board maintenance of hydrostatic release units.

Therefore, as far as minimum standards of competence is concerned, the basics of float-free arrangements should be covered on basic training before joining the ship. However, as the equipment and arrangements differ from ship to ship, specific on-the-job training is essential to ensure readiness for immediate use, as well as efficient use during emergencies.

CHAPTER THREE

3. The Role of the Maritime Community.

"Improvement in safety requires the ability to recognize and correct hazards."

(Manuelle 2003)

It should be clearly understood by all involved in maritime activities that the ultimate responsibility for compliance with the requirements laid down in the international maritime conventions lies with the shipowner or operator, whereas the prime responsibility to ensure compliance remains with the Flag State.

It cannot be denied the overall interest of the maritime community, including Administrations, shipowners, classification societies, education and training institutions, insurance companies, and protection and indemnity clubs, upon the so called safety culture in shipping. It is also generally accepted the need for control measures under two categories, namely: private control and public control. As viewed by Ulstrup, the private control comprises the surveys/inspections carried out by a Classification Society, although we dare include vetting inspections on tankers, performed by major oil companies. On the other hand, the public control is carried out on national flagged vessels by the Flag State or a by Recognized Organization acting on behalf of the Flag State, while the Port State Control comprises the inspections carried out on foreign vessels in a port of the Port State. (Ulstrup 2005)

The control carried out by the ship's classification society results from a private agreement between the shipowner and the society, in order to assure that the ship has been built and is maintained according to that class society rules, evidenced by a Class Hull Certificate and Class Machinery Certificate. Therefore, the same surveyor may approach the vessel for different purposes, either as classification Society or as Recognized Organization.

3.1 Maritime Administration Responsibility.

According to the United Nations Convention on the Law of the Sea (1982), Article 94 *Duties of the Flag State*: every State shall take such measures for ships flying its flag as are necessary to ensure safety at sea with regard, *inter alia,* to construction, equipment, seaworthiness of ships, manning of ships, labour conditions and the training of crews. Such measures shall include that the ship, before registration and thereafter at appropriate intervals, is surveyed; and that each ship is manned with qualified personnel conversant with and observant, *inter alia*, of the applicable regulations concerning the safety of life at sea .

3.1.1 Flag State Rules.

In Article 91 *Nationality of ships,* UNCLOS establishes that every State shall fix the conditions for the grant of its nationality to ships; that ships have the nationality of the State whose flag they are entitled to fly; and that every State shall issue to ships to which it has granted the right to fly its flag documents to that effect. Furthermore, in Article 94 *Duties of the Flag State*: “Every State shall effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag”.

According to SOLAS, Chapter I, Regulation 6 *Inspection and survey*, the inspection and survey of ships shall be carried out by officers of the Administration, however the Administration may entrust the inspections and surveys either to surveyors nominated for the purpose or to organizations recognized by it.

Consequently, an Administration establishes its own rules for nominating surveyors or recognized organizations, however it shall empower any nominate surveyor or recognized organization to as minimum: require repairs to a ship; and carry out inspections and surveys if requested by the appropriate authorities of a port State.

3.1.2 Port State Control.

Port State Control (PSC) is the control of foreign flagged ships in national ports, supported by international conventions such as:

- International Convention on Load Lines 1966, as amended, and its 1988 Protocol (LOADLINES 66/88);
- International Convention for the Safety of Life at Sea 1974 (SOLAS), its Protocol of 1978, as amended, and the Protocol of 1988, (SOLAS 74/78/88);
- International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978, as amended (MARPOL 73/78);
- International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended (STCW 78);
- Convention on the International Regulations for the Preventing Collisions at Sea 1972, as amended (COLREG 72);
- International Convention on Tonnage Measurement of Ships 1969 (TONNAGE 1969);
- Merchant Shipping (Minimum Standards) Convention 1976 (ILO Convention No.147)

As mentioned by Knapp, "Port State Control can be seen as a last resource of safety to eliminate substandard ships from the seas. Worldwide there are currently ten safety regimes in place to cover most of the coastal states" (Knapp and Franses). Therefore the effectiveness of Port State Control relies on these agreements (Germanischer Lloyd 2007) distributed as per Figure 3.1, namely:

- The Paris Memorandum of Understanding on Port State Control 1982 (Paris MOU), covering Europe and North Atlantic: Belgium, Bulgaria, Canada, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Great Britain, Ireland, Iceland, Italy, Latvia, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Slovenia, Sweden, and Spain.

- The Viña del Mar Agreement on Port State Control 1992 (Latin American Agreement): Argentine, Brazil, Chile, Cuba, Ecuador, Colombia, Mexico, Panama, Peru, Uruguay, and Venezuela.
- The Memorandum of Understanding on Port State Control in the Asia-Pacific Region 1993 (Tokyo MOU): Australia, Canada, Chile, China, Fiji, Indonesia, Japan, Republic of Korea, Malaysia, New Zealand, Papua New Guinea, Philippines, Russian Federation, Salomon Island, Singapore, Thailand, Vanuatu, Vietnam, and Hongkong (China).
- The Memorandum of Understanding on Port State Control in the Caribbean Region 1996 (Caribbean MOU): Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Bermudas, British Virgin Islands, Cayman Islands, Dominica, Grenada, Guayana, Jamaica, Monserrat, Netherlands Antilles, Saint Kittis & Nevis, Saint Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, and Turks and Caicos Islands.
- The Memorandum of Understanding on Port State Control in the Mediterranean Region 1997 (Mediterranean MOU): Algeria, Cyprus, Egypt, Israel, Lebanon, Malta, Marroco, Tunisia, Turkey, and Palestine Authority.
- The Memorandum of Understanding on Port State Control for the Indian Ocean Region 1998 (Indian Ocean MOU): Australia, Eritreia, India, Iran, Kenia, Maldives Islands, Mauritius, Oman, South Africa, Sri Lanka, Sudan, Tanzania, and Yemen.
- The Memorandum of Understanding on Port State Control for the West and Central Africa Region 1999 (Abuja MOU): Benin, Cape Verde, Congo, Cote D'Ivoire, Gabon, Gambia, Ghana, Guinea, Liberia, Mauretania, Namibia, Nigeria, Senegal, Sierra Leone, South Africa, and Togo.
- The Memorandum of Understanding on Port State Control in the Black Sea Region 2000 (Black Sea MOU): Bulgaria, Georgia, Romania, Russian Federation, Turkey, Ukraine.
- The Arab States in the Golf (Riyadh MOU). Still under construction.
- United States Coast Guard: U.S. as individual country.

The procedures for boarding and performing inspections are set up in IMO Resolution A.787(19) as amended by Resolution A.882(21) *Procedures for Port State Control*. With regards to the ILO 147 and the Protocol 1996 to ILO 147, although not included in the resolution, they are published as ILO guidelines and followed in some areas, e.g. Paris MOU. Besides the usual unannounced boarding of vessels, from times to times the regional MOU members agree to carry out special inspection campaigns, for a period of generally 3 months, laying special attention on certain details during inspections on board.

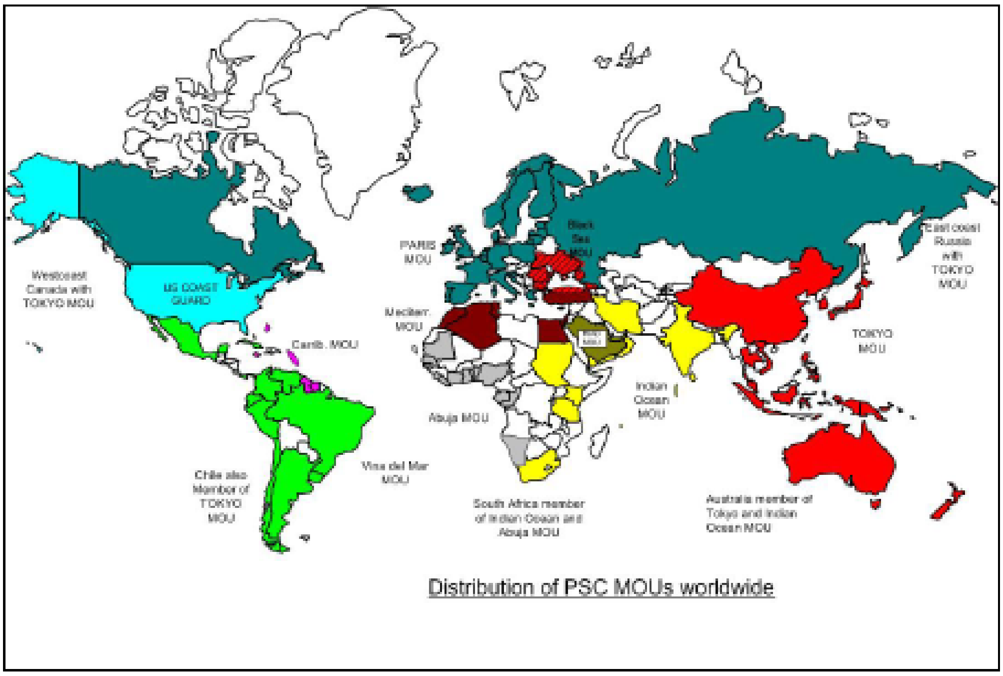


Figure 3.1 - PSC Regional Agreements.
Source: Germanischer Lloyd.

Although the formalization of regional agreements is relatively recent, the practice of port state control is not new under SOLAS convention, as follows:

> It was recognized by the drafters of the 1929 SOLAS Convention that a flag state could not constantly monitor every ship in its fleet wherever it sails in the world. Therefore, the states were given power to inspect a vessel's

> documentation. If there were clear grounds for suspecting that the condition of the ship did not meet the Convention standards, then an inspection of the ship could be carried out. (Özçair 2001)

Basically, the Port State Control provisions in the SOLAS convention are inserted in Regulation 19 of Chapter I:

> (a) Every ship when in a port of another Contracting Government is subject to control by officers duly authorized by such government in so far as this control is directed towards verifying that the certificates issued under regulation 12 or regulation 13 are valid.

The above cited Regulation 12 *Issue or endorsement of certificates* and Regulation 13 *Issue or endorsement of certificates by another government* relate to ship's safety certificates. But the actions of the Port State Control Officer are not limited to verification of certificates, as is clearly stated in SOLAS, Chapter XI-1, Regulation 4 *Port State control functional requirements*:

> A ship when in a port of another contracting government is subject to control by officers duly authorized by such Government concerning operational requirements in respect to the safety of ships, when there are clear grounds for believing that the master or crew are not familiar with essential shipboard procedures relating to the safety of ships.

The same requirements or principles appear in other IMO or ILO instruments, conditioned that the Port State has the necessary legislation in place. Furthermore, again recalling Article 94 of UNCLOS:

> A State which has clear ground to believe that proper jurisdiction and control with respect to a ship have not been exercised may report the fact to the flag

> State. Upon receiving such a report, the flag State shall investigate the matter and, if appropriate, take any action to remedy the situation.

Li and Zhen, in an article addressing effectiveness of PSC and the methods for selecting ships to be inspected by regional agreements, namely USCG, Paris MOU and Tokyo MOU, analysed data from ship total loss and PSC records, concluding: "The selecting methods are effective and have quite variant efficient levels and stability. The method adopted by the USCG has high stability and the methods used by the Paris MOU and the Tokyo MOU have high efficient levels". Furthermore, "As a general rule, an ideal method should not only have a high level of efficiency but also high stability. Therefore, a further requirement of selection methods is to possess both high efficiency and high stability." (Li and Zheng 2008)

As mentioned by Özçair, referring to common statements contained in nearly all the literature about the Port State Control, "in an ideal world Port State Control would not be necessary" (Özçair 2001). Among the inferences from his arguments, there is the fact that the *raison d'etre* of Port State Control is the ineffectiveness of some Flag States for eradication of substandard vessels from the seas.

> However, Port State Control is not, and can never be a substitute for the proper exercise of flag state responsibility. The primary responsibility to safeguard against substandard ships lies with the flag states. It is when flag states fail to meet their commitments that the port state comes into play. (Özçair 2001).

Then, considering the rationale behind the above setup, compared to situations on board, Figure 3.2 and 3.3, we can not but agree with Özçair that there is not failure in the adoption of the necessary international maritime legislation, but there is failure in the application and enforcement. The main reason seems to be due to the traditional, conservative and we dare say reactive rather than proactive nature of shipping activities. Clearly, those responsible for safety on board are passing on their responsibility to the inspector, or at lest thinking they are passing on the responsibility.

Figure 3.2 - Incorrect installation.

Figure 3.3 - Liferaft stowed 1.7m high. [16]

But then, as it seems that safety awareness will remain for longer time much dependent upon the Port State Control structure, for the purpose of this dissertation a questioning arises: does the actual control structure and procedures assure consistency in verification of compliance with the requirements for float-free arrangement for liferafts and EPIRBs? This certainly is a matter of concern, mainly considering that there is not agreement even on the methods used by different MOUs for targeting vessels to be inspected.

3.1.3 Recognized Organization.

Probably one of the most misunderstood roles, from the stand point of seafarers as well as shore personnel, is the position of the Classification Societies, as in practice the private control and public control merge. As already mentioned Classification Society may perform as Classification Society itself as well as Recognized Organization acting on behalf of the Administration, considering that:

[16] Although this additional liferaft stowed near the forecastle is not required to have float-free arrangement, as per SOLAS Chapter III, Regulation 31.1.4, it may not be very easy its launching in an emergency situation. Should be regarded as identified risk, demanding safeguards.

> … under regulation I/6 of the 1974 SOLAS and regulation 4 of Annex I and regulation 10 of Annex II of MARPOL 73/78, the Administration may entrust the inspections and surveys to nominated surveyors or recognized organizations and further that the Administration shall notify the Organization of the specific responsibilities and conditions of the authority delegated to nominated surveyors or recognized organizations, … (IMO 1993)

Nevertheless, despite written agreements delegating competence, formalized in accordance with the Guidelines for the Authorization of Organizations Acting on Behalf of the Administration, annex to resolution A.739(18), the overall responsibility for verification of compliance with regulations remains with the Administration.

A Recognized Organization then may be authorized to verify, among other things, life-saving appliances and radio equipment, obviously including float-free arrangements, as part of the process for issuance and endorsement of certificates such as: Passenger Ship Certificate; Cargo Ship Certificate; Cargo Ship Safety Equipment Certificate; and Cargo Ship Safety Radio Certificate.

3.2 Company's Safety Management System.

Safety management system is defined in the ISM Code as a "structured and documented system enabling Company personnel to implement effectively the company safety and environmental protection policy". It is also established in the ISM Code that the safety management objectives of the company should, *inter alia*, establish safeguards against identified risks.

Reflecting on the reasons behind the ISM Code, Vanagt concluded that: "For a vessel to become substandard, one reason alone suffice: she must be under a substandard management" (Vanagt 1997). Vanagt also recalls that, since the ISM Code lays down minimum requirements for efficient safety management systems, it is possible to detect and eliminate substandard management.

Taking into account the long standing regulations on float-free arrangement for liferafts and EPIRBs, then deficiencies therein related should be nearing nil by this time. In the "ideal world" of a properly implemented safety management system, a new hazard would be promptly detected by shipboard personnel; corrective action would be taken; the fact would be discussed during safety meetings; and a report on incident (near miss) would be disseminated, in order to avoid recurrence of the non-conformity somewhere else.

Theoretically, if Bird's pyramid (Figure 3.4) may be applied, for every 600 hazardous conditions reported at least one serious injury is avoided, as indicated by the accident ratio established from study of 1,753,498 reported accident in 1969 :

- 1 serious or major injury, including disabling and serious injuries;
- 10 minor injuries or injuries reported as less than serious;
- 30 property damage accidents of all types;
- 600 incidents with no visible injury or damage. (Bird, Jr et all)

In the same line of thinking, it is interesting to quote Steen:

> Incidents have a tendency to reiterate before the occurrence of an incident of a serious type, an accident. From the starting point it is absolute necessary for these responsible for safety to have access to the basics which can generate correct recommendations concerning prevention of similar accidents and incidents. (Steen 2005)

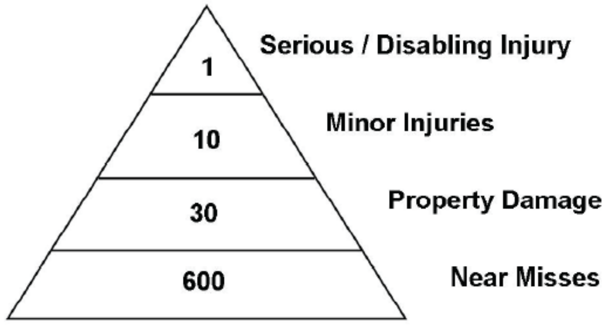


Figure 3.4 – Bird's Pyramid.
Source: Frank Bird

Furthermore, it is required in Section 1.2.3 of the ISM Code that the company's safety management system should ensure: "1. compliance with mandatory rules and regulations; and .2 that applicable codes, guidelines and standards recommended by the Organization, Administrations, classification societies and maritime industry organizations are taken into account". Therefore situations as below mentioned just as example, registered on different types of vessels and different occasions, indicate certain laxity of safety management.

- On the first event (Figure 3.5), on 24 September 2004 it was observed on board a bulk carrier: the liferaft painter connected to a point other than the weak link of the disposable HRU; the slip senhouse hook for manual release missing; and the liferaft container tied up in iron rope and clips, allegedly for "security reasons". Other three liferafts presented similar deficiencies.
- On the second event (Figure 3.6) on 20 September 2005 on board a product tanker, observed the 8mm plastic bolt of the EPIRB's HRU precariously fixed with flexible iron. As evidence of lousy safety management and lack of commitment, soon after it was found an original spare bolt in the life-saving inventory.
- On the third example on 24 August 2005, on board a bulk carrier it was observed the all four liferafts presented deficiencies such as: expired HRUs

without evidence of approval by the Administration; incorrectly installed HRU (Figure 3.7); liferaft painter not connected to the vessel; liferaft wrapped up in plastic bubble; and Safety Officer not familiarized with the EPIRB float-free arrangements using HRU designed for liferafts. Nevertheless the vessel's safety management system was certified and theoretically complied with requirements, including qualification of the shipboard personnel, abandon drills, internal audits, and records of periodical inspections of life-saving appliances.

- On the forth event (Figure 3.8), on 18 September 2007, on board another product carrier it was also observed the painter not connected to the weak link, although there was clear pictorial instructions nearby. It was also an example of "power distance" because, off-the-records, the Safety Officer informed that he had installed correctly but the Master himself had changed the arrangement, insisting that was the correct way. But then again it must be remembered that, if the shipboard safety management was for real, the Safety Officer should have insisted on discussing the subject in a safety meeting, and eventually approach the Designated Person, as certainly was established in the approved procedures.

Figure 3.5 - Incorrect installation.

Figure 3.6 - Damaged bolt for EPIRB.

Figure 3.7 - HRU incorrectly installed.

Figure 3.8 - HRU incorrectly installed.

Regarding the last mentioned event, most probably the Master previous experience referred to liferafts provided with internal weak link [17], a different arrangement demanding different procedures. As shown in Figure 3.9, this arrangement includes a supplementary painter and a safety belt (same concept of weak link, but with a breaking strength 70 to 100 Kgf.)

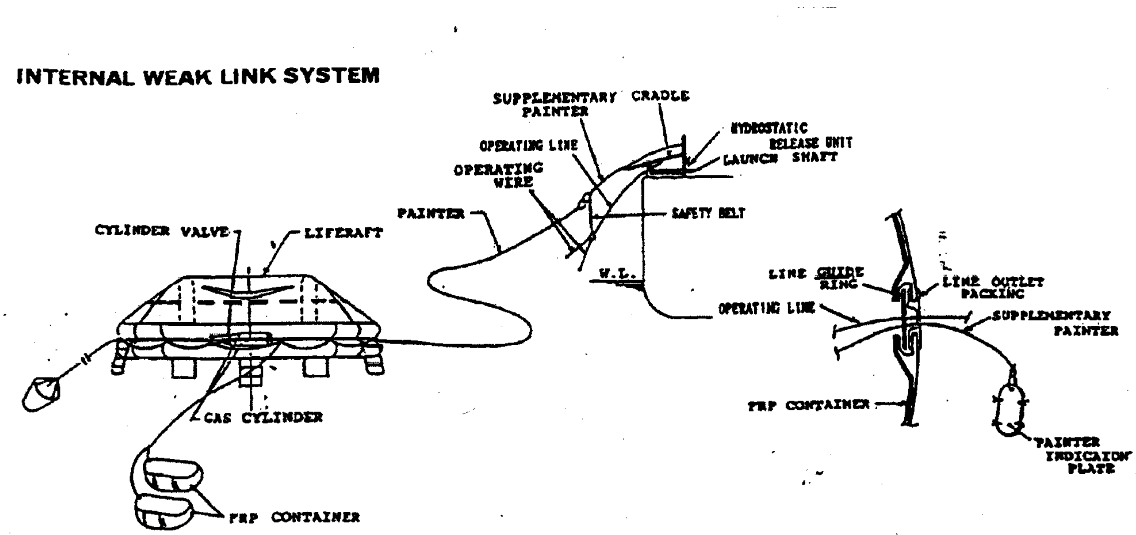


Figure 3.9 - Internal weak link.
Source: IMO MSC/Circ.811.

---

[17] If that was the case, the liferaft container should be marked accordingly, as recommended by MSC/Cir.811 *Identification of float-free arrangement.*

3.2.1 Designated Person.

The responsibility and authority of the Designated Person (DP or DPA) to ensure the safe operation of each ship, included in Section 4 of the ISM Code, can be broken down into three functions:

- To provide a link between the ship and the office ashore.
- To have access to the highest level of management.
- To monitor the operation of the SMS and to ensure it is adequately resourced.

In practice the plain text of the ISM Code does not specifically state the necessary background requirements for the DPA, however there are different possible approaches, as very appropriately shown by Anderson:

- Companies where the DPA sits at the right hand of the shipowner, holding a very senior position in the company, with many years sea service as well as shore management experience, who the Shipowner consults before making any major decision;
- Companies where the DPA is a young graduate who has never been to sea, who occupies a small room at the back of the office and is wheeled out once a year when the Recognized Organization appears on behalf of the Administration to conduct a verification to maintain the Document of Compliance (DOC);
- Companies where the DPA is also the Operations Manager or the Technical Manager, as well as being Safety Manager, Security Manager and wearing a number of other hats; and
- Companies where the DPA is sub-contracted and totally external to the day-to-day operations of the Company, sometimes residing in a different city.

Eventually, Anderson concludes that although occupying a key position, “the DPA has often received little or no training or familiarization in what is actually required to adequately and effectively perform the job” (Anderson 2006). Also according to Anderson’s view:

> The bottom line is that many Safety Management systems have stagnated because their DPA has not received relevant training in management systems and safety management in particular. Often the DPA is not aware he or she is lacking the knowledge – unfortunately the first time these deficiencies come to light is following a major incident when an external consultant of lower puts the Company SMS under the microscope. (Anderson 2008)

In response to similar observations, the IMO Marine Environment Protection Committee and the Maritime Safety Committee "developed Guidance on the experience, qualifications and training for the role of Designated Person under the provisions of the International Safety Management Code as set out in the annex."(IMO 2007)

As part of the solution to training needs, there is an initiative of the World Maritime University offering Professional Development Course for ISM Designated Persons, from 8 to 12 September 2008, taking into account that:

> It is the DP's responsibility to create the proper mind-set, attitudes and behaviour of the company employees working ashore in support of a vessel's operations. It is also the DP´s responsibility to support and promote a positive attitude to safety and environmental protection by those working on ships. (WMU 2008)

It should not be surprise when ruptures of the Company's safety management system somehow occur, at the same time that the DP fails in monitoring the safety aspects of each ship. Then, situations similar to the depicted in Figures 3.9 and 3.10 don't come to the attention of the DPA before reported by the Port State Control, if it ever comes to be reported, or before the casualty happens.

Figure 3.10 – “Watertight” HRU. Figure 3.11 - Liferaft not ready for use.

3.2.2 ISM Auditor.

The basic role of the ISM Code Auditor is to assess compliance of the Company’s safety management system with the requirements of the ISM Code. As per International Association of Classification Societies (IACS):

> The verification process involves interviews of Company personnel and review of SMS documentation and records. Audit is a sampling process and is not exhaustive in nature. Issuance of certification is based upon verification that the sample is in compliance with the ISM Code. Where non-conformities have not been found and reported, it does not mean that none exist. Basic procedures for performing ISM Code verification are contained in the IACS "Procedural Requirements for ISM Code Certification", PR. 9, which reflect the IMO "Revised Guidelines for Administrations on the Implementation of the ISM Code", Resolution A. 913(22), as applicable.

Among the verifications performed by the auditor, it is checked if the internal audits have been carried out as scheduled in the SMS and if necessary corrective actions have been taken. Therefore in practice we have two types of auditing, namely, one performed internally at intervals scheduled by the company and one external performed by official auditor of the Flag State or Recognized Organization.

The external official audit may not go into details scrutinizing life-saving appliances for instance, however the internal auditor should cross out ships reports, minutes of safety meeting, check lists, etc, with the actual status of the ship and equipment. Therefore, in well established systems, deficiencies regarding float-free arrangements for liferafts and EPIRBS should be detected during internal audits, at the latest, and the root cause should be identified. It does not make sense to wait for the casualty to happen it order to take action.

Among other qualifications it is required that the ISM auditor's formal education includes "qualifications from a marine or nautical institution and relevant seagoing experience as a certified ship officer", as per Appendix *Standard on ISM Code certification arrangements.* Consequently he or she should be conversant with mandatory rules and regulations as well as possess basic knowledge of shipping and shipboard operations.

3.2.3 Master.

In general terms the ship's master is the crew member who is responsible for the ship, the cargo and for the other persons on board. For vessels engaged in international voyages, some international regulations govern his or her ultimate authority on board, such as Regulation 8.1 of Chapter XI-2 of SOLAS 1974, as amended:

> The master shall not be constrained by the Company, the charterer or any other person from taking or executing any decision which, in the professional

judgment of the master, is necessary to maintain the safety of and security of the ship. (IMO 1974)

More specifically, the ISM Code in its section 5.2 requires that it should be clearly defined and documented in the safety management system the master's responsibility and authority:

> The Company should ensure that the safety management system operating on board the ship contains a clear statement emphasizing the master' authority. The Company should establish in the safety management system that the master has the overriding authority and the responsibility to make decision with respect to safety and pollution prevention and to request the Company's assistance as may be necessary.

Furthermore, as per section 6.1 of the ISM Code: "The Company should ensure that the master is: .1 properly qualified for command; .2 fully conversant with the company's safety management system; and .3 given the necessary support so that the master's duties can be safely performed." In the case of vessels for which SOLAS regulations do not apply in full, similar requirements are included in national rules.

Considering that "The master has the day to day responsibility for the safe operation of the ship and the safety of those on board" (MCGA 2006), it must be mentioned that, among other mechanisms at disposal, there are risk assessment methods depending on the type of the ship, and the nature of operation, hazards and risks. Basically, as per the Code of Safe Working Practices for Merchant Seamen (MCGA 2006), the main elements for the risk assessment process are:

(a) classify work activities;

(b) identify hazards and personnel at risk;

(c) identify risk controls;

(d) estimate the risk;

(e) decide on the tolerability of the risks;

(f) prepare risk control action plan (if necessary);

(g) prepare adequacy of action plans;

(h) ensure update of risk assessment and controls.

As already mentioned, risk assessment is part of the shipboard procedures, however it has been evidenced in this dissertation that the risks involving float-free arrangements are not properly addressed. Consequently, another obligation of the master is not adequately performed, i.e. "reviewing the safety management system and reporting its deficiencies to the shore-based management", as per Section 5.2 of the ISM Code.

3.2.4 Safety and Training Officer.

There is not international consensus regarding the capacity of "safety officer", however as recommendations from the maritime industry organizations should[18] be taken into account, the Companies generally establish procedures to be followed by the safety and training officer. The Code of Safe Working Practices for Merchant Seamen, mandatory for UK flagged ships, is a good example of recommendations that can be followed voluntarily by other ships. From its section 3.4.2 it can be seen that: "The safety officer is the safety adviser aboard the ship and can provide valuable assistance to the Company and to individual employer in meeting the statutory responsibilities for health and safety". (MCGA 2006)

On the other hand, with regards to mandatory provisions, Regulation 37.4 of Chapter

[18] "When reading the text of the code, one must therefore keep in mind that wherever the word "should" is found, it must be interpreted as "shall", that is having mandatory effect" (Steen 2005). The reason for the discrepancy if that the Code was originally drafted as recommendation and later on made mandatory.

III of SOLAS 1974 requires that “The muster list shall specify which officers are assigned to ensure that life-saving appliances are maintained in good condition and are ready for immediate use.”

Therefore it is normally delegated to the safety and training officer the task of periodical verification of the float-free arrangements for liferafts and EPIRB, as well as familiarization of the other persons on board with such arrangements. An essential document for the familiarization is the Training Manual required to be available in each messroom and recreation room or in each cabin, as per SOLAS Chapter III, Regulation 35. Recent amendments require that the manual be written in the working language of the ship[19], obviously taking for granted that the manual’s content is completely relevant and specific, which may not be always the case.

In fact it remains to be seen the validity of the content of the SOLAS Training Manual, as the on line survey set up for this dissertation failed to obtain a minimum number of responses from safety officers, in order to be statistically valid. From 66 invitations sent (Appendix E) only 5 safety officers responded the questionnaire (Appendix A). In a way, this is coherent with the dissertation hypothesis, so: why should somebody care about a research on a safety appliance if the appliance itself is not properly cared for. Nevertheless, three out of five safety officers responded that the contents of the SOLAS Training Manual is generic, not specific to the equipment provide on board (Question 3.3).

On the other hand, from the questionnaire sent to PSCOs (Appendix B), 14% responded that during more detailed inspection the content of the SOLAS Training Manual is not systematically verified during more detailed inspection(Question B.2). Other straightforward responses are shown in Figures 3.12 to 3.15, allowing no doubt regarding qualifications, experience and commitment of PSCOs.

3.2.5 Crew

[19] Established as per SOLAS Chapter V, Regulation 14.3.

As far as the objectives of this dissertation is concerned, safety issues on board are properly summarized in section 3.1.1 of the Code of Safe Working Practices for Merchant Seamen (MCGA 2006), in the sense that, among other things:

- The company is responsible for ensuring the overall safety of the ship and that safety on board is properly organized and co-ordinated.
- Each individual worker is responsible for his own health and safety and that of anyone affected by what he does of fails to do

In practice the shipboard procedures require, and in some countries it is mandatory by national rules, to report accidents, incidents and hazardous situations. But then again, regarding float-free arrangements, it is clear that generally either the crew:

- is not safety minded and therefore does not identify risks;
- is not properly familiarized with the shipboard safety appliances; or
- is safety minded, identify risks but for some reason still to be found does not use the system on its own benefit.

Clear evidence of the last mentioned option are the situations where near misses are reported to schemes such as The UK Confidential Reporting Program for Aviation and Maritime (CHIRP) and International Marine Accident Reporting Scheme (MARS), under assumption of anonymity, rather than discussed in safety meetings and forwarded to the company as required by the formally established and approved procedures. Consequently, the main safety management objectives, namely, safe practices, safe working environment, safeguard against identified risks, and continuous improvement, these objectives hardly ever are achieved.

Therefore, hazardous situations related to float-free arrangements such as depicted in Appendix F remains undetected, although by all means there are checklists, signed by the officer in charge, as evidence that everything is shipshape.

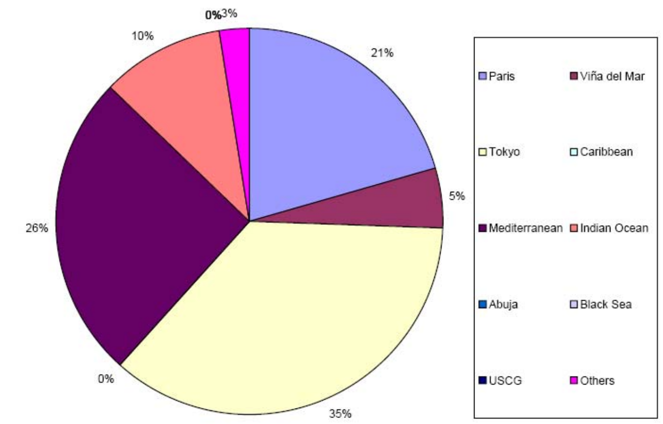


Figure 3.12 – Respondent PSCOs.

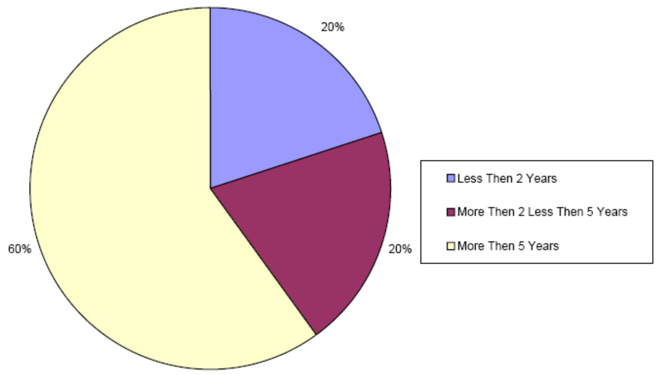


Figure 3.13 – Experience of PSCOs.

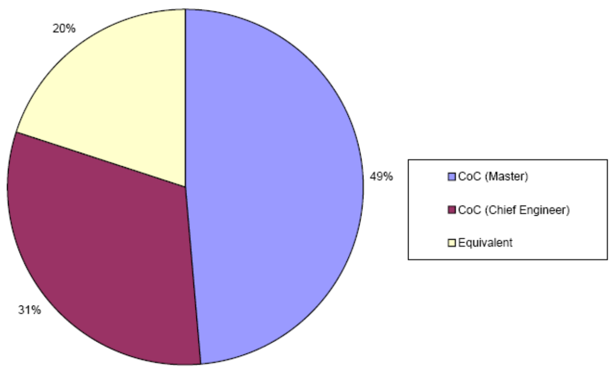


Figure 3.14 – Seafaring Qualifications of PSCOs.

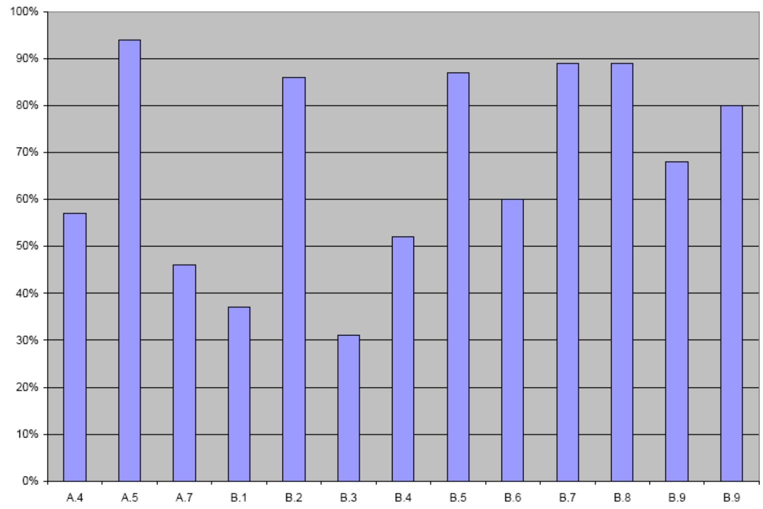


Figure 3.15 – Summary Chart PSCOs.

CHAPTER FOUR

4. Overview of Status of Compliance with Regulations.

Within the limitations of this dissertation, not much could be achieved in the way of official detailed data on deficiencies related to float-free arrangements. However it became clear the character reactive of the stake holders: Classification Societies react to casualties and records of detention by Port state Control, whereas Port States and Flag States react to casualties. Example is the emphasis placed upon accidents during lifeboat drills.

In order to enhance targeting of PSC, the sub-Committee on flag State Implementation, has been for some involved in studies regarding the pros and cons of the combination of casualties and PSC-related data, as reported in the document FSI 16/3 *Responsibilities of Governments and Measures to Encourage Flag State Compliance*, where from we quote:

> Most contributing members recognized that one of the main issues is the lack of completeness of the record of marine casualties that, to a large extent, depends on the good willingness of the flag State that may or may not cooperate in full transparency with the Organization.

This lack of transparency of some Administrations may also be found with regards to approval of hydrostatic release units. Only to mention an example very well known by this author, in Brazil, the Directorate of Ports and Coast keeps an on line record of approved safety material and equipment, wherein it cannot be found any kind of HRU. The closest of a certificate of type approval that could be found was an Authorization for Use of Foreign Material on Board[20], issued to Hammar on 31 May

[20] Free translation of the original in Portuguese “Autorização Para Uso de Material Estrangeiro a Bordo”.

1994 (Apendix C). This is a matter of extreme importance, as there are a great variety of appliances, with different features and possibilities of wrong use [21], as per Appendix I and Appendix J, but not at all limited to the examples therein.

A lesson learned during this dissertation process that different PSC regimes also present different degrees of transparency. During the stage of collecting e-mail addresses of PSCOs in order to invite them individually to participate, by answering the questionnaire (Appendix B), it happened that:

- some countries proactively passed on the information;
- others scrutinized the questionnaire before passing on to PSCOs, also not releasing the addresses;
- one country denied possess the information (Appendix F);
- some countries didn't even acknowledge receipt of the message; and
- in another country the Head of Inspection answered the questionnaire himself on behalf of eight inspectors under his management.

Therefore, it seems that the internal political aspects of the country or even security concerns influences the activities of Port State Control.

Reports of detention were also not much helpful, as rarely details of float-free arrangements appear as reason for detention. For example, from 88 vessels detained as per the Paris MOU detention list for July 2008, only two times it is mentioned “launching appliances for liferaft”, without further detailing.

A solution for the lack of detailed information may be the establishment of a World Fleet Database, as intended by the Sub-committee on Flag State Implementation, according to the document FSI.1/Circ.11, dated 31 January 2008, available in the ULR http://www.imo.org/Circulars/mainframe.asp?topic_id=767 .

[21] The disposable units Thaner DK2000 and DK2004 are very similar in appearance, bur with different expiry time.

> The Sub-Committee on Flag State Implementation, at its thirteenth session (7 to 11 March 2005), urged Member States to identify specific needs for a world fleet database for port State control (PSC) activities and to submit information to the Secretariat on the end-user needs (FSI 13/23, paragraph 6.30). In this context, the Secretariat prepared a questionnaire on the review of the potential needs of PSC regimes and Member States (FSI 147/7, annex 2).

Finally, life-saving appliances manufacturers maintain a reserved and independent approach, as if confident that to supply a reliable appliance, according to establish standards, is enough. One leading HRU manufacture, for instance, when asked if there is a “procedure to receive and process feedback from the ships on HRU?” replied: “No but if something wrong happens we certainly do learn about it”(Appendix G). Nevertheless, photographic evidences in Appendix H show a different perspective on board. Other aspects overlooked refer to the painter length, in some instance incompatible with the height of stowage (Figure 4.4) and the removal of plastic bubble sheet wrapping up liferafts (Figure 4.5).

Regarding misuse of hydrostatic release units, dishonest and criminal manipulation of expired disposable units have not been systematically addressed in this dissertation. The occurrences evidenced in Figures 4.1 to 4.3, observed in the Port of Natal, Brazil, were isolated instances of somebody unscrupulously trying to make easy money upon the lack of knowledge of small vessels fleet managers. The rough manipulation consisted in reutilization of expired Hammar H20 HRU after relabeling and replacement of lanyard cords and thimbles. The occurrences were detected by Flag State inspectors and promptly rectified, however official records were not maintained.

Figure 4.1 - Original unit on the right, manipulated unit on the left.

Fig. 4.2 - Manipulated HRU.

Fig. 4.3 - Manipulated and incorrectly set up.

Figure 4.4 – Painter length incompatible with stowage height (actually 10 m)[22].

Figure 4.5 – Additional liferaft wrapped up in plastic bubble sheet.

---

[22] As per LSA Section 4.1.3.2, it should not be less than 10 meters plus the stowage height, however it is not clear the consequences of a painter excessively long.

CHAPTER FIVE

5. Conclusions and Recommendations.

Taking into account the aspects approached in this dissertation, whereby the focus was placed on cross-referring regulations, rules and recommendations, with the actual practice on board regarding float-free arrangements, the outstanding conclusions are that:

Firstly, the mechanisms for enhancing maritime regulations are sound and practical in spite of the reactive character of the maritime industry as a whole, however any call for improvement of requirements is much dependent upon feedback from the maritime industry. Most of the times, the feedback is based on casualties or reports of detention from Port State Control, which are in considerable number, but the reports don't specifically highlight float-free arrangement for liferafts and EPIRBS; the usual heading is "launching arrangement for survival craft".

Secondly, there is a great variety of possible arrangements on board, with different makers and models of HRU, each one possible to be incorrectly installed, if proper instructions are not available, as per Appendixes I and J. At the same that there are considerable failures in the shipboard safety management regarding overall familiarization with life-saving appliances, as well as lack of specific information on the equipment effectively in use on board. It is also notable the low level of motivation, commitment and attitude for reporting and correcting deficiencies thereof related [23]. The SOLAS Training Manual is the main shipboard document for familiarization training; as such, its contents should be periodically reviewed and revised as necessary. However, this is not assured, since verification is usually limited to its availability; validity of its contents is not always assessed even during more detailed inspection or ISM audit.

[23] Probably due to fear of retaliation (power distance).

Thirdly, a possible reason for deficiency is that there is not a direct link between the ship and the HRU supplier, liferaft supplier or service station [24], for exchange of information; this becomes evident when the length of the liferaft painter is not compatible with the stowage height. Other essential information by and large unavailable, however essential to be disseminated on board, are: the exact weight of the liferaft; the treatment to be given to the straps around the container; and the inconvenient of maintaining the liferafts wrapped up in bubble plastic sheet.

On that account, the main conclusion is that this dissertation is not conclusive enough, as many questions remain to be answered. Nevertheless, some recommendations deserve to be taken into account, as follows.

- Further surveys on the subject should be promoted.
- The content of the SOLAS Training Manual should be periodically assessed, in the way of reliable information. Updating and adequacy to be done by the Safety Officer, whereas verification to be thoroughly performed by Surveyors, Port State Control Officers and ISM Code Assessors.
- Deficiencies eventually found with regards to readiness for immediate use of float-free arrangements should lead to further investigation on the shipboard and shorebased safety management system.
- Proper communication channel should be established between the ship and the service station for liferaft and HRU, for exchange of information such as height of stowage, so that appropriate painter length be provided.
- Information of the liferaft weight should be clearly marked on the liferaft container, as well as instructions with regards to the bands that encircle the liferaft canister.
- Ability to manually transport a liferaft should be exercised during monthly abandon drills.

[24] It is not clear if HRU service station is required to be approved (SOLAS III/20.9.2)

- Posters and signs in the vicinity of the liferaft launching stations, placed under emergency lighting, should be specific to the HRU effectively in use.
- HRU should not be painted or wrapped up, making it illegible or watertight, therefore obstructing automatic operation.
- Flag States should disseminate information of what types, models and manufacturers of HRU are approved.
- Expired disposable HRU should be returned to be tested by the manufacturer.
- Unified interpretation of SOLAS; Chapter III, Regulation 13.4.1 ("Every liferaft should be stowed with its painter permanently attached to the ship") should be disseminated.

Finally, it must be kept in mind that liferaft, EPIRB, or HRU are not only items to be ticked on a check list in order to compose evidence for ISM certification. They are part of a system to safe lives in emergency. Therefore it is imperative that every crew member should be ready to report hazardous occurrences, as per procedures established by the Company. In particular, Safety Officers should consistently exercise to the utmost degree the authority delegated to him by the Master, among other things, to maintain the operational readiness of float-free arrangements for liferaft and EPIRB.

REFERENCES

Alaskan Marine Safety Education Association. (2003). *Hydrostatic release look-alikes fails to perform*. Retrieved May 10, 2008, from the World Wide Web http://amsea.org/pdf/v19n1.pdf.

Anderson, P. (2006). The ISM designated person - keystone or scapegoat. *Maritime Risk International 20(12),* 16-18.

Anderson, P. (2008). Training the DPA. *Report ISM*. Issue 10, P. 4. Retrieved May 20, 2008 from the World Wide Web: http://www.consultism.co.uk/ReportISM_February_2008_PDF.pdf.

Bird, F. E., F. E. B. Jr., et al. (1986). Practical loss control leadership, Det Norsk Veritas.

Bryant, A. U. (1944). Life raft release device. US Patent No. 2824315. Retrieved May 15, 2008 from the World Wide Web: http://www.freepatentsonline.com/2360848.html

Carlsen, J. F. (1943). *Safety raft slip lock*. US Patent Number 2313802. Retrieved May 15, 2008 from the World Wide Web: http://www.freepatentsonline.com/2313803.html

Clark, D. (2002).*Sleipner summary report*. Retrieved May 12, 2008 from the World Wide Web: http://www.captainclark.com/Pages/sleipner.html.

Clark, M. (2007). *Hydrostatic EPIRB release*. WIPO Patent No. WO/2007/067925. Retrieved 15 May from the World Wide Web: http://www.freepatentsonline.com/WO2007067925.html

CPEM. (1999). *Report of the Inquiry into the sinking of the Erika off the coasts of Brittany on 12 december 1999*. Retrieved July 10, 2008, from the World Wide Web: http://195.178.246.26/maritime/Erika_Final_Report

Danish Maritime Administration. (2005). Newsletter February 2005. *Unschedulled survey of liferafts and hydrostatic release units in fishing vessels*. Retrieved May 10, 2008 from the World Wide Web: http://www.dma.dk/sw6345.asp.

Davis, P. D. and T. S. Floate (1996). *Hydrostatic release device*.US Patent No. 5573343. Retrieved May 15, 2008 from the World Wide Web: http://www.freepatentsonline.com/5573343.html

Day, R. H. (1995). *Hydrostatic release with a composite plunger assembly*. US Patent No. 5438949. Retrieved May 15, 2008 from the World Wide Web: http://www.freepatentsonline.com/5438949.html

Director General of Shipping (1999, March 10). Maritime Safety Notice 4 of 1999. *Problem with installation of hydrostatic release unit.* Retrieved May 10, 2008 from the World Wide Web: http://www.dgshipping.com/dgship/final/notices/note4_99.htm.

Germanischer Lloyd. (2007). *PSC information Manua*.   Retrieved July 12 from the World Wide Web: http://www.gl-group.com/pdf/PSC_Manual.pdf.

Hydrostatic release unit development. (1989, March). *Safety at Sea International, 240*, 35-39.

IACS. *The role of the ISM Code auditor*. Retrieved July 24, 2008 from the World wide web: http://www.navy.mi.th/dockyard/doced/SD/training/thu12/pdf/REC_41_pdf189.pdfded

IMO (1973). *Resolution A.263(VIII): Amendments to chapters II, III, IV and V of the International convention for the Safety of Life at Sea, 1960*. Adopted on 20 November 1973 (Agenda Item 10). London: Author.

IMO (1974). *International convention for the safety of life at sea, 1974, as amended*.

IMO (1978). *International convention on standards of training, certification and watchkeeping for seafarers 1978, as amended*.

IMO (1991). *Resolution 689(17): Testing of life-saving appliances*. Adopted on 6 November 1991 (Agenda Item 10). London: Author.

IMO (1993). *Resolution A.739(18): Guidelines for the authorization of organizations acting on behalf of the administration*. Adopted on 4 November 1993.

IMO (1996). *International life-saving appliances code*. Resolution MSC.48(66) adopted on 4 June 1996. London: Author.

IMO (1998). *Resolution MSC.81(70): Revised recommendation on testing of life-saving appliances*. Adopted on 11 December 1998.

IMO (2000a). *Surviving disaster: life-saving at sea.* Focus on IMO January 2000. Retrieved March 24, 2008 from the Worl Wide Web: http://www.imo.org/includes/blast_bindoc.asp?doc_id=438&format=PDF.

IMO (2000b). *Model course 2.19: Personal survival techniques*. London: Author.

IMO (2000c). Model course 1.23: *Proficiency in survival craft and rescue boats*. London: Author.

International Maritime Organization. (2007, October 19). *Guidance on the qualifications, training and experience necessary for undertaking the role of the designated person under the provisions of the international safety management (ISM) code* (MSC-MEPC.7/Circ.6) London: Author.

Johnson, G. R. (2004). *Release mechanism*. WIPO Patent No. WO/2004/063003. Retrieved May 15, 2008 from the World Wide Web: http://www.freepatentsonline.com/WO2004063003.html

Knapp, S. and P. H. Franses (2007). A global view on port state control: econometric analysis of the differences across port state control regimes. *Maritime Policy & Management 34(5)*, 453-482.

Kohuth, K. R. (2005). *Hydrostatic release mechanism*. US Patent No. 6878024. Retrieved May 15, 2008 from the World Wide Web: http://www.freepatentsonline.com/6878024.html

Leland Jr, D. A. (1977). *Dual breaking strength weak link*. US Patent Number 4035092. Retrieved May 20, 2008 from the World Wide Web: http://www.freepatentsonline.com/4035092.html

Li, K. X. and H. Zheng (2008). Enforcement of law by the Port State Control (PSC). *Maritime Policy & Management 35(1)*, 61-71.

Lorenzen, J. W. and B. J. Schaefer (1978). *Hydrostatically activated release mechanism*. US Patent No. 4065823. Retrieved May 15, 2008 from the World Wide Web: http://www.freepatentsonline.com/4065823.html

Manuele, F. A. (2003). *On the practice of safety*. Wiley-Interscience. London.

Maritime and Coast Guard Agency (1999, March 1). Marine Guidance Note MGN 104. *Stowage and float free arrangements for inflatable liferafts*. Retrieved May 10, 2008 from the World Wide Web: http://www.mcga.gov.uk/c4mca/mgn_104.pdf

MCGA (2006). Code of safe working practice for merchant seamen. London: The Stationery Office.

McKenny, G. D. (1958). *Releasable coupling device*. US Patent No. 2824315. Retrieved May 15,2008 from the World Wide Web: http://www.freepatentsonline.com/2824315.html?query=2824315&stemming=on

Mukherjee, P. K. (2007). The ISM Code and the ISPS Code: a critical legal analysis of two SOLAS regimes. *WMU Journal of Maritime affairs, 6*, 147-166.

Niehius, U. (2004). *Reconstruction of the rationale behind the IMO International Life Saving Appliance Code as contained in Solas Chapter III and Resolution 48(66)*. Retrieved July 20, 2008, from the World Wide Web: http://www.verkeerenwaterstaat.nl/Images/20041130_Report%20Rational%20LSA%20Code_tcm195-192897.pdf.

Özçair, Z. O. (2001). *The role of port state control*. Retrieved July 10, 2008 from the World wide web: http://denizhukuku.bilgi.edu.tr/doc/oya_ozcayir_article.doc

Parish, J. M. (1985). *Method and apparatus for releasing a submerged life raft*. US Patent No. 4499844. Retrieved May 15, 2008 from the World Wide Web: http://www.freepatentsonline.com/4499844.html

Persbeck, S.-E. (1987). *Securing arrangement so executed as to be tripped on actuation*. US Patent No. 4690091. Retrieved May 15, 2008 from the World Wide Web: http://www.freepatentsonline.com/4690091.html

Richard, J.-C. and K. Cadoux (1999). *Hydrostatic release device for safety equipment*. US Patent Number 5855450. Retrieved May 15, 2008 from the World Wide Web: http://www.freepatentsonline.com/5855450.html

Sieverts, W. C. and H. W. Holt (1943). *Hydraulically releasable mechanism for life rafts and the like*. US Patent No. 2336967. Retrieved May 15, 2008 from the World Wide Web:http://www.freepatentsonline.com/2336967.html

Simpson, J. A. G. and D. P. Plewka (2001). *Release unit*. US Patent No. 6224442. Retrieved May 15, 2008 from the World Wide Web: http://www.freepatentsonline.com/6224442.html

Steen, G. (2005). *Manual on prevention and investigation of marine accidents and incidents*. Unpublished lecture handout, World Maritime University,Malmö, Sweden.

The Nautical Institute. (1998). MARS Report 98033. *Hydrostatic releases which would not release.* Retrieved May 23, 2008 from the World Wide Web: http://www.nautinst.org/MARS/MARS98/98033.html

Tuck, S. A. (1967). *Stowages for inflatable liferafts and the like*. US Patent No. 3343188. Retrieved May 15, 2008 from the World Wide Web: http://www.freepatentsonline.com/3343188.html

Ulstrup, A. (2005). *Lecture about port state control*. Unpublished lecture handout, World Maritime University, Malmö, Sweden.

UN Convention on the Law of the Sea. Retrieved from the World Wide Web on May 20, 2008: http://un.org/Depts/los/convention_agreements/texts/unclos/closindx.htm

Vanagt, R. (1997). Can substandard ships be eliminated through the ISM Code? *Safety at Sea International. May 1997*, 15.

Wigram, R. I. (1994a). *Release device for emergency sea rescue apparatus*. US Patent No. 5365873. US Patent Number 5365873. Retrieved May 15, 2008 from the World Wide Web: http://www.freepatentsonline.com/5365873.html

Wigram, R. I. (1994b). *Mounts for buoys*. US Patent Number 5348502. Retrieved May 15, 2008 from the World Wide Web: http://www.freepatentsonline.com/5348502.html

Wildhagen, B. I. (1978). *Release device for emergency sea rescue apparatus*. US Patent No. 4124911. Retrieved May 15, 2008 from the World Wide Web: http://www.freepatentsonline.com/4124911.html

WMU. (2008). *Professional development course for designated persons.* Retrieved 18 August from the World Wide Web: http://www.wmu.se/Conferences/Templates/PageTemplate1.asp?ConferenceId=1070&SectionId=1137.

Wolf, M. J. and A. W. Vredeveldt. (2004). *An overview of life saving appliances and rationale of regulations.* Retrieved July 20, 2008, from the World Wide Web: http://www.verkeerenwaterstaat.nl/Images/20041020_2005-CMC-R006Nienhuis1_tcm195-192894.pdf.

Appendix A – Questionnaire to Safety Officers.

Questionnaire to be answered by the officer assigned to ensure that life-saving appliances are maintained in good condition and ready for immediate use.

1. SHIP'S PARTICULARS.

1.1 Name of the ship:

1.2 Distinctive number or letters (call sign):

* 1.3 Port of registry:

* 1.4 Year of built:

1.5 IMO number:

* 1.6 Type of ship:

Other

* 1.7 Gross tonnage.

* 1.8 Sea areas in which the ship is certified to operate:

☐ A1 ☐ A2 ☐ A3 ☐ A4

Comments

2 LIFE-SAVING APPLIANCES.

---

* 2.1 Total number of persons for which life-saving appliances are provided:

* 2.2 Number of liferafts with float-free arrangements:

* 2.3 Number of rigid liferafts:

* 2.4 Number of davit launched inflatable liferafts:

* 2.5 Are all inflatable liferafts of the same maker?

Yes No

Comments

* 2.6 Stowage height of inflatable liferafts from light ship water line (the highest, if different):

* 2.7 Are the painters of inflatable liferafts of the same length?

Yes No

Comments

* 2.8 Length of inflatable liferafts painters (the longest, if different):

* 2.9 Weight of inflatable liferafts (the heaviest, if different):

* 2.10 The above stated weight is:

Estimated. Documented. Marked on the liferaft.

Comments

* 2.11 What is the system used in the float-free arrangements for inflatable liferafts?

External weak link system. Internal weak link system. Non weak link system.

Comments

* 2.12 In case of external weak link with Hydrostatic Release Unit (HRU), they are:

All serviceable. All disposable. Different types and/or makers.

Comments

* 2.13 Is case of disposable HRU, the expiry date is marked by ship's personnel?

Yes No

Comments

* 2.14 Is there on board documental evidence that the HRU in use are approved by the administration (Flag State)?

Yes No

Comments

* 2.15 What is the destiny given to expired disposable HRUs?

* 2.16 Number of EPIRBs with float-free arrangements:

* 2.17 Where is (are) positioned the EPIRBs with float-free arrangements?

* 2.18 Number of EPIRBs without float-free arrangements:

* 2.19 What kind of float-free arrangement is provided for the EPIRB(s)?

Disposable HRU. Serviceable HRU. Other.

Comments

3. TRAINING, INSTRUCTIONS AND MAINTENANCE.

* 3.1 What is your overall experience as seafarer?

Less than 2 years. More than 2 years and less than 5 years. More than 5 years.

Comments

* 3.2 The Training Manual (SOLAS III/35) is periodically reviewed?

Yes. No.

Comments/Last review

* 3.3 Instructions for float-free arrangements of EPIRBs and liferafts contained in the Training Manual are:

Specific to the equipment provided. Generic.

Comments

* 3.4 Monthly inspections of life-saving appliances include verification of float-free arrangement for EPIRBS and liferafts?

Yes. No.

Comments/Last insp.

* 3.5 Ability to transfer liferafts for either side of the ship has been demonstrated during drills?

Yes. No.

Comments

* 3.6 Ability to manual launching of the additional liferaft (SOLAS III/31.1.4) has been demonstrated during drills?

Yes. No.

Comments

* 3.7 Is there spare liferaft for on-board training?

Yes. No.

Comments

* 3.8 Do you have direct communication with the service station when sending and/or receiving liferafts or HRUs for servicing?

Yes. No.

Comments

* 3.9 Is there record of deficiencies and overdue corrective actions regarding float-free arrangements for EPIRBs and liferafts?

Yes. No.

Comments

* 3.10 As per your understanding, the straps the encircle the two halves of a liferaft container should be removed after installation on board?

Yes. No.

Comments

* 3.11 Is it clear to you how to mark the expiry date of different disposable HRU?

Yes. No.

Comments

* 3.12 What is your understanding of the requirement (SOLAS III/13.4.1): "Every liferaft shall be stowed with its painter permanently attached to the ship."?

Appendix B – Questionnaire to PSCOs.

A. QUALIFICATION, EXPERIENCE AND TRAINING.

* A.1 Under what agreement do you perform your duties as PSCO?

Other

* A.2 What is your overall experience as PSCO?

Less than 2 years. More than 2 years and less than 5 years. More than 5 years.

Comments

* A.3 What is your main qualification with regards to seafaring experience?

Certificate of Competence (Master). Certificate of Competence (Chief Engineer). Equivalent knowledge and experience

Comments

* A.4 Have you attended training based on the IMO Model Course 3.09?

Yes. No.

Comments

* A.5 Have you attended periodical seminars to update knowledge with respect to instrument related to Port state Control?

Yes. No.

Comments/Last attend

* A.6 Group of deficiencies mentioned as outstanding during PSCO training:

Lifeboats, liferafts and buoyant	Manning of survival craft and	Survival craft launching and recover	Float-free arrangements for EPIRB	Training manual (SOLAS	Requirements for inflatable liferafts.	Manning of lifeboats and the liferaft	Training in the use of the liferaft	Requirements for rigid liferafts.	Stowage of liferafts.

apparat us.	supper vision.	y arrange ments.	s liferaft s.	and III/35) .	s.	s.

Other

* A.7 Have you received specific training on different types of float-free arrangements and Hydrostatic Release Unit (HRU) for EPIRBs and liferafts?

Yes. No.

Comments

B. VERIFICATIONS. During more detailed inspection, is it systematically verified:

* B.1 if HRUs for EPIRBs and liferafts are approved by the Administration?

Yes. No.

Comments

* B.2 if the instructions and information of the training manual (SOLAS III/35) are updated and specific to the life saving appliances provided?

Yes. No.

Comments

* B.3 if the crew members are familiar with the weight of the liferafts, in case it is necessary to transfer to either side of the ship?

Yes. No.

Comments

* B.4 if the length of the liferafts' painter is compatible with the height of stowage (not shorter or longer in excess)?

Yes. No.

Comments

* B.5 if the muster list specifies which officer is assigned to ensure that life-saving appliances are maintained in good condition and ready for immediate use?

Yes. No.

Comments

* B.6 if posters in the vicinity of the liferafts are specific to the rafts and HRUs provided?

Yes. No.

Comments

* B.7 if the officer in charge is familiar with the float-free arrangements for EPIRBs and liferafts?

Yes. No.

Comments

* B.8 if the float-free arrangements for EPIRBs and liferafts are installed as per manufacturer's intructions?

Yes. No.

Comments

* B.9 if there are clear instructions with regards to the straps involving the two halves of the inflatable liferafts containers?

Yes. No.

Comments

C. GENERAL.

* C.1 Do you regard float-free arrangements for EPIBs and liferafts worth of special verification, even without clear grounds for more detailed inspection?

Yes. No.

Comments

* C.2 What is your understanding of the requirement (SOLAS III/13.4.1): "Every liferaft shall be stowed with its painter permanently attached to the ship."?

Appendix C – Cover Letter.

Malmö, 26 June 2008.

Dear Sir / Madam.

My name is Pedro Lima and I am Master of Science student at the World Maritime University, researching for dissertation under supervision of Lecturer John Liljedahl.

You are being invited to take part in the research aiming "Operational readiness of float-free arrangements for liferaft and EPIRB: analysis of implications on safety training standards and procedures". Your participation will be greatly appreciated. Enclosed is a questionnaire that should take approximately 20 minutes to complete. There are no known risks for your voluntary participation as the responses will be anonymous and the collected information will be strictly used for academic purposes. Completing and submitting the questionnaire constitutes your consent to participate.

Should you have any questions or concerns about this study, please feel free to contact me (s08108@wmu.se) or alternatively John Liljedahl (jl@wmu.se).

Sincerely.

Pedro S. Lima Filho.
Disponentgatan 6, Room 115B.
211 57, Malmö, Sweden.
+46 40 124 259

Appendix D - Authorization for Use of Foreign Material on Board.

06/09/94 14:25 ☎ 2165202 DPC-20 P.01

DEPARTAMENTO DO MATERIAL DA MARINHA MERCANTE
FAX: (021) 216-5202
RUA 1º DE MARCO, 118 - 13º ANDAR
CENTRO - RIO DE JANEIRO - RJ
CEP-20010-000

DESTINATARIO: UNITOR SHIPS SERVICE

ASSUNTO: AUTORIZACAO PARA USO DE MATERIAL ESTRANGEIRO A BORDO

ATT: SR. BJORN SKRODER

Nº DO FAX: 263 9019	DATA: 31/05/94
Nº DE PAGINAS: ESTA + 0	Nº DO DOCUMENTO:22173

MENSAGEM

EM ATENCAO A SUA CARTA 272/94 E O SEU FAX Nº AG.266/94, PARTICIPO QUE O DISPOSITIVO HIDROSTATICO DE ESCAPE - MODELO HAMMAR H2O, FABRICADO PELA C.M.HAMMAR HANDELS AB-SUECIA ESTA DE ACORDO COM A PORTARIA 076/91, DESTA DIRETORIA, ESTANDO PORTANTO, AUTORIZADO A DOTAR OS NAVIOS MERCANTES NACIONAIS.

ATENCIOSAMENTE,

DALTON CASTRO SEGUI
Capitao-de-Fragata
Chefe do Deptº do Material da Marinha Mercante

Appendix E - Ship's E-mail Addresses to Which Invitations Have Been Sent.

1	frotamanaus@docenave.com.br
23	frotamacau@docenave.com.b
4	frotabelem@docenave.com.br
5	frotario@docenave.com.br
6	loginamazonia.paranamSky@Skyfile.com
7	loginpantanal.panama-Sky@Skyfile.com
8	assoventisei@augustaoffshore.it
9	assoventitre@augustaoffshore.it
10	assoventisette@augustaoffshore.it
11	navio.camocim@transpetro.amosconnect.com
12	navio.gurupa@transpetro.amosconnect.com
13	msssecur@maersk.com
14	navio.neusa@transpetro.amosconnect.com
15	navio.norma@transpetro.amosconnect.com
16	navio.nara@transpetro.amosconnect.com
17	navio.marta@transpetro.amosconnect.com
18	navio.livramento@transpetro.amosconnect.com
19	navio.itamonte@transpetro.amosconnect.com
20	navio.nordicrio@transpetro.amosconnect.com
21	navio.stavanger@transpetro.amosconnect.com
22	navio.bergen@transpetro.amosconnect.com
23	navio.diva@transpetro.amosconnect.com
24	navio.gothenburg@transpetro.amosconnect.com
25	opr.aalves@transpetro.amosconnect.com
26	opr.cartola@transpetro.com
27	navio.lobato@transpetro.amosconnect.com
28	navio.nilza@transpetro.amosconnect.com
29	navio.lavras@transpetro.amosconnect.com
30	navio.lambari@transpetro.amosconnect.com
31	navio.lages@transpetro.amosconnect.com

32	navio.itabuna@transpetro.amosconnect.com
33	navio.itajuba@transpetro.amosconnect.com
34	navio.itabuna@transpetro.amosconnect.com
35	navio.dilya@transpetro.amosconnect.com
36	navio.reboucas@transpetro.amosconnect.com
37	navio.lorenabr@transpetro.amosconnect.com
38	navio.carioca@transpetro.amosconnect.com
39	navio.carangola@transpetro.amosconnect.com
40	navio.cantagalo@transpetro.amosconnect.com
41	navio.candiota@transpetro.amosconnect.com
42	navio.camocim@transpetro.amosconnect.com
43	navio.tangara@transpetro.amosconnect.com
44	navio.gurupa@transpetro.amosconnect.com
45	navio.guaruja@transpetro.amosconnect.com
46	navio.guara@transpetro.amosconnect.com
47	navio.grajau@transpetro.amosconnect.com
48	navio.potengi@transpetro.amosconnect.com
49	navio.pirajui@transpetro.amosconnect.com
50	navio.piquete@transpetro.amosconnect.com
51	navio.brotas@transpetro.amosconnect.com
52	navio.pedreiras@transpetro.amosconnect.com
53	navio.bicas@transpetro.amosconnect.com
54	navio.brotas@transpetro.amosconnect.com
55	navio.brotas@transpetro.amosconnect.com
56	navio.lindoiabr@transpetro.amosconnect.com
57	navio.nordicbrasilia@transpetro.amosconnect.com
58	opr.aalves@transpetro.amosconnect.com
59	navio.maisa@transpetro.amosconnect.com
60	navio.rodeio@transpetro.amosconnect.com
61	navio.pirai@transpetro.amosconnect.com
62	navio.guapore@transpetro.amosconnect.com

63	navio.gurupi@transpetro.amosconnect.com
64	avare.transpetro@Petrobras.com.br
65	navio.caravelas@transpetro.amosconnect.com
66	navio.lindoiabr@transpetro.amosconnect.com

Appendix F – E-mail Reply.

Sir,

We do not have a mail list for our PSCOs.

In any event, it is unlikely that our personnel will be able to participate in your survey, given our high operations tempo.

I wish you good luck with your dissertation.

Sincerely,

John S Sedlak, PE
Asst. Chief, Foreign & Offshore Compliance Division
Tel: 202 372 1240
Fax: 202 372 1917
email: John.S.Sedlak@uscg.mil

-----Original Message-----
From: s08108@wmu.se [mailto:s08108@wmu.se]
Sent: Friday, July 04, 2008 12:35 AM
To: HQS-PF-fldr-CG-543
Subject: Research On HRU

Malmö, 4th July 2008

Dear sirs.

I am a WMU student mastering in Maritime Affairs, dealing with the dissertation project "Operational readiness of float-free arrangements for liferaft and EPIRB: analysis of implications on safety training standards and procedures", which includes an on line survey (questionnaire) to be answered by PSC Officers. Therefore it would be very much appreciated if I could have e-mail address of PSCOs from U.S.A., in order to invite them individually to participate in the survey.

Thank you.

Pedro S. Lima Filho

Appendix G – Response from Manufacturer.

1.What is the maximum validity of the disposable HRU for liferaft from the manufacturing date? The date of manufacturing has no relation to the service life of our disposable HRU´s. The service life counts from the day of installation and is maximum 2 and 4 years.

2.Besides the conventional slipsen hook (pelican hook), is there any other quick release mechanism recommended? Our type DK2001 offers an integrated slip hook version.

3. Do disposable and serviceable HRU hold an European Patent Number? Serviceable no disposable yes.

5. Is it possible a copy of technical description and/or detailed drawing of the HRU (similarly to the claims in a Patent application)? No. You may find such from European patent web.

6. The installation instructions depict the painter with a thimble an shackle connected to the weak link. Is it allowed other arrangement? For instance the painter extremity knotted to the weak link? The connection must have at least the same strength as the weak link.

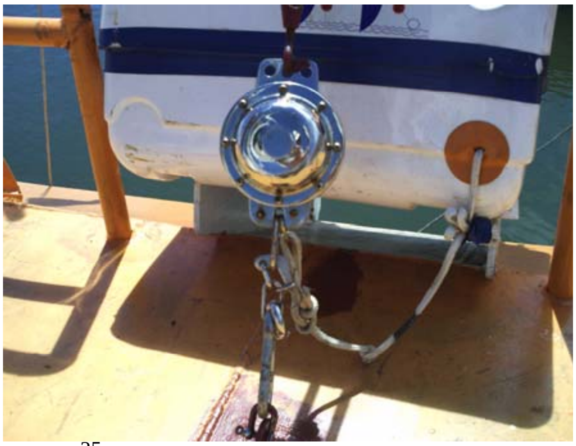
7. Is there special instruction for disposal of used HRU after expired? The units should be tested by the service station before disposal.

8. Is there a procedure to receive and process feedback from the ships on HRU? No but if something wrong happens we certainly do learn about it.

Best egards.

>>> "Richardt B. Nissen" <rbn@thanner.dk> 27/03/2008 09:16 >>>

Appendix H – Additional Evidences.

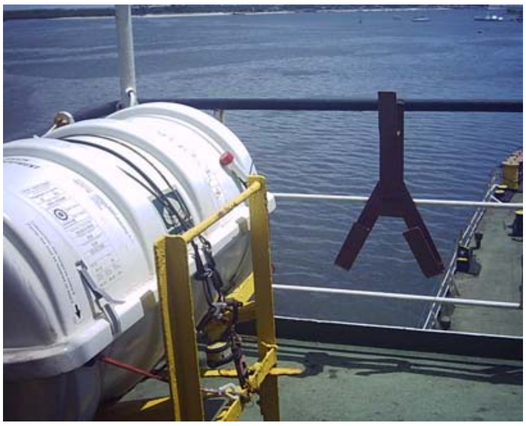


HRU [25] installed upside down.

Manipulated and incorrectly set HRU.

Painter connected to a fixed eye.

Painter connected directly to weak link.

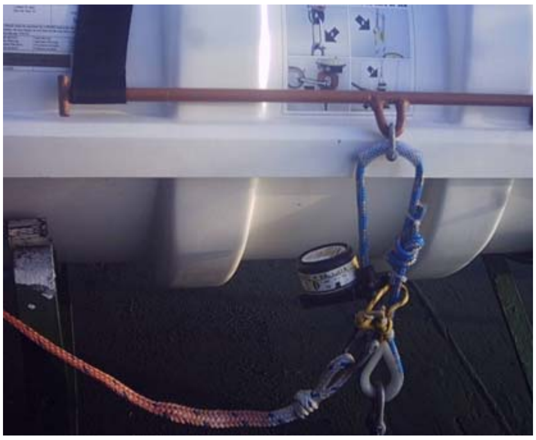


Painter shackled to the cradle.

Painter not connected to the HRU.

[25] Model without evidence of approval by the Administration.

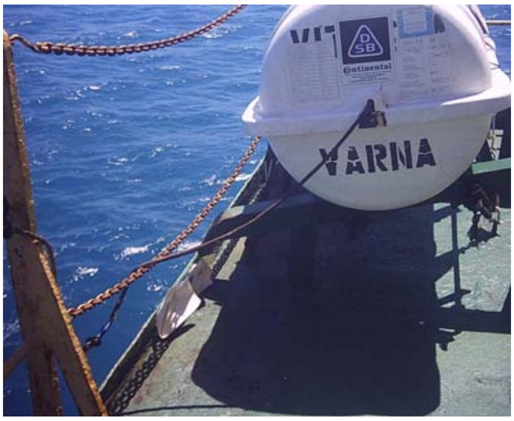
Painter not connected to weak link.



Manipulated and incorrectly set HRU.

Painter connected to a fixed eye.

Painter connected directly to weak link.



Painter connected to a fix point.

Painter connected to a fix point.

Painter shackled to the cradle.

Manual launching obstructed.

Painter not connected to the weak link.

Free-flotation hampered by nylon rope.

Painter connected to a fix point.

Expired date unmarked.

HRU and markings missing.

Painter not connected to the HRU.

Painter shackled to the cradle.

Painter connected to the cradle.

Free-flotation hampered.

Liferaft padlocked.

Painter and hook incorrectly connected.

Painter not connected to the HRU.

Painter incorrectly connected.

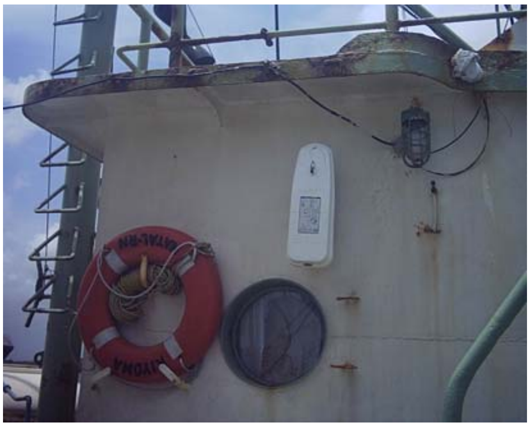
Painter connected to a fix point.

Painter not connected to the weak link.

Tied up raft.

Expiry date missing.

Raft tied up with nylon rope.

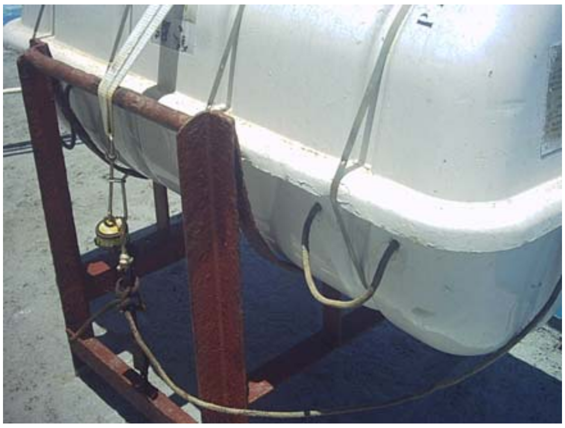


Obstruction to free-flotation.

Painter not connected to the HRU.

Painter and hook incorrectly connected.

Painter not connected to the HRU.

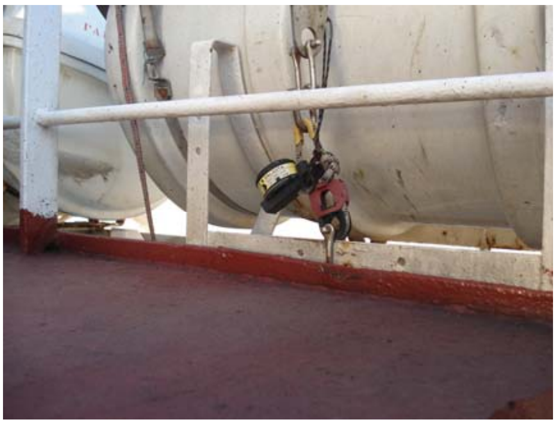


Instruction for metal band missing.

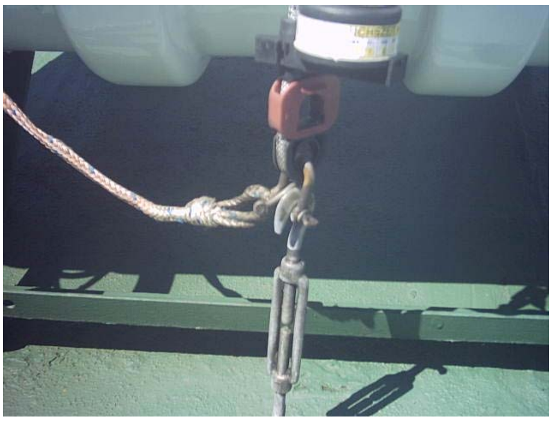
Painter incorrectly connected.

Painter connected to a fix point.

Painter incorrectly connected.



Painter not connected to the weak link.



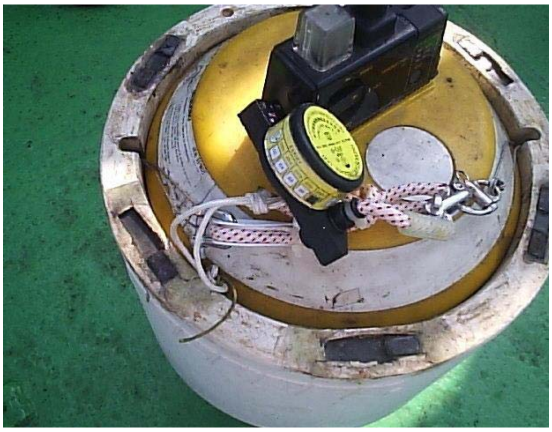
Incorrect installation.

Painter connected directly to the weak link.

Painter shackled to the cradle.

Internal weak link instructions missing.

Painter incorrectly installed.



Liferaft HRU used for EPIRB.

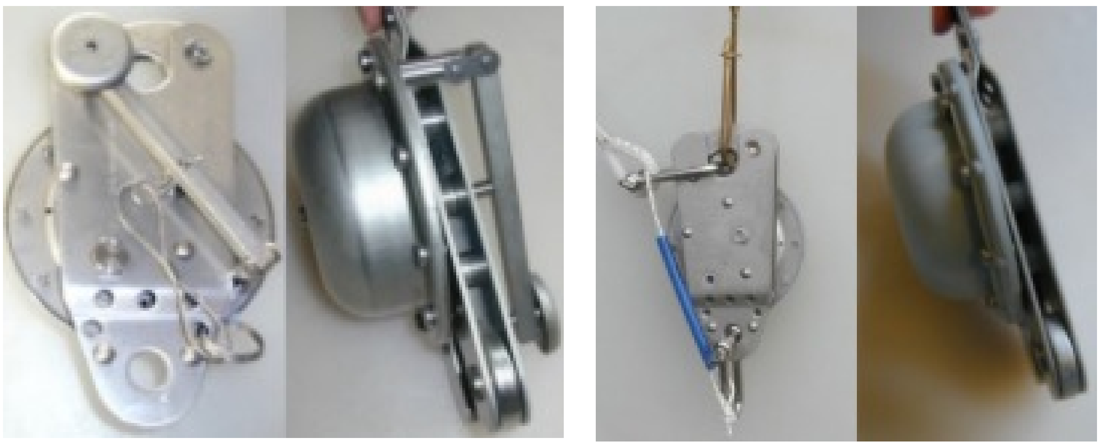
Safety Officer not familiar with the arrangement.

Appendix I – Different Models of HRU.

Berwin HRU Serie MK.

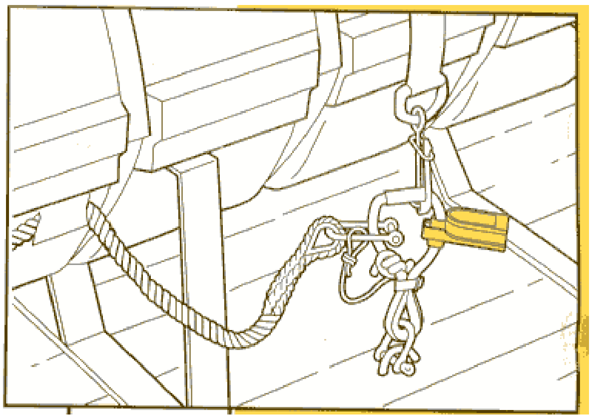
JSK HRU.

Salcom HRU.



Thanner HRU serviceable models.

Thanner HRU disposable models.

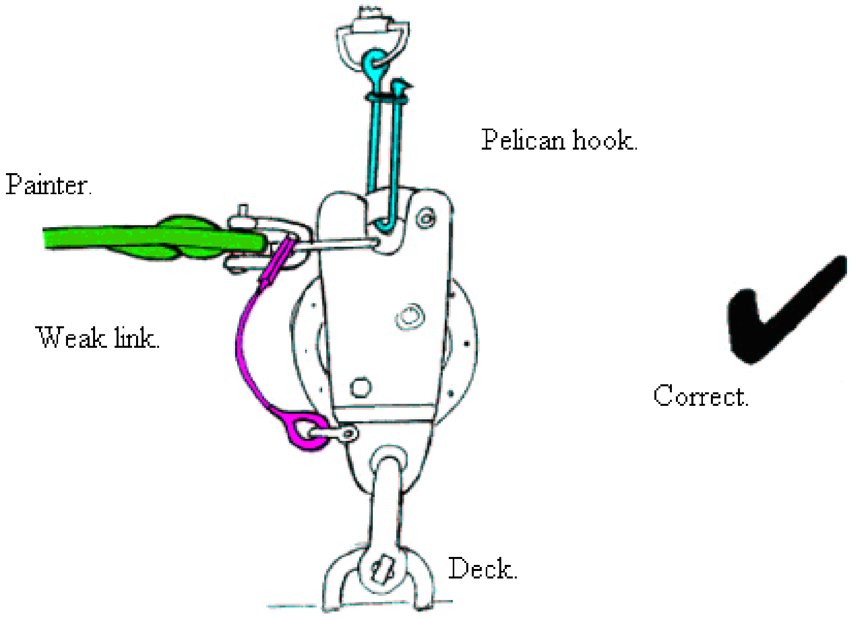


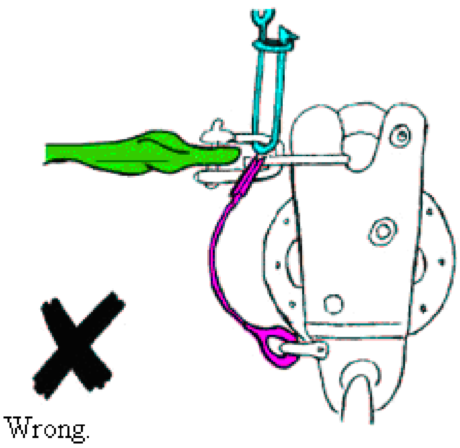
Pains Wessex HRU (pyrotechnic charge) and installation arrangement.

Hammar H20 HRU.

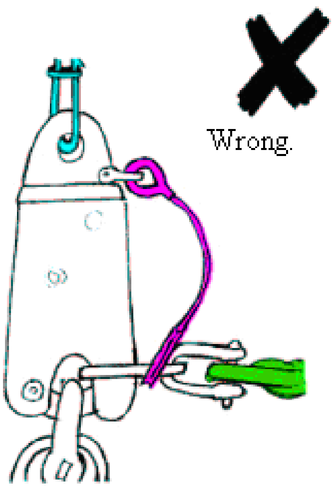
Hammar H20 HRU (new model).

Appendix J – Installation of HRU.

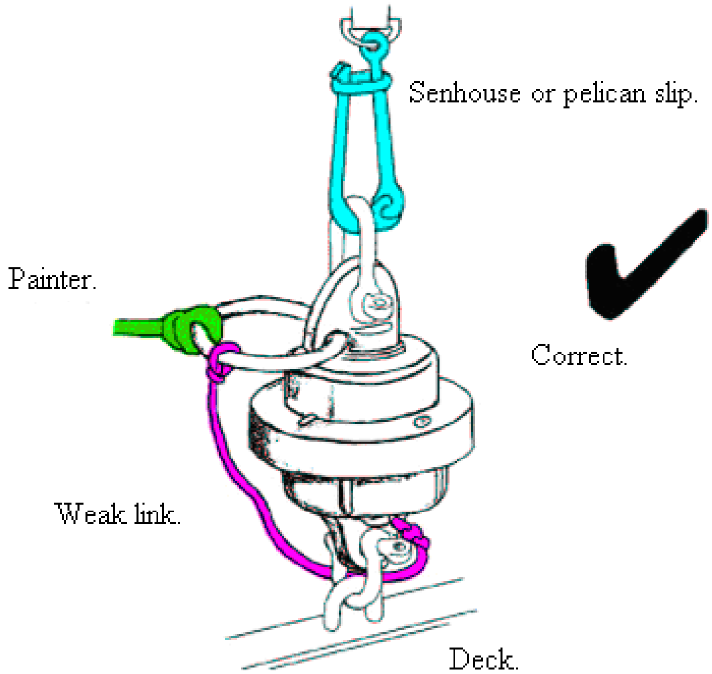


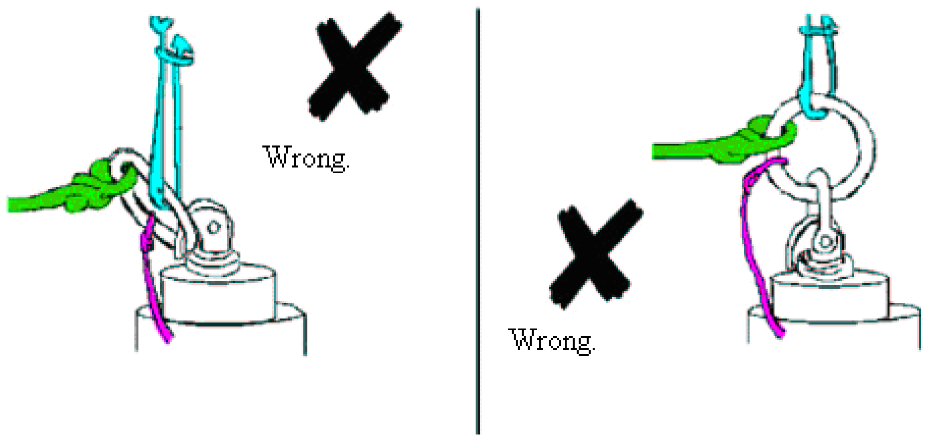


Liferaft will not release from cradle if ship sinks.

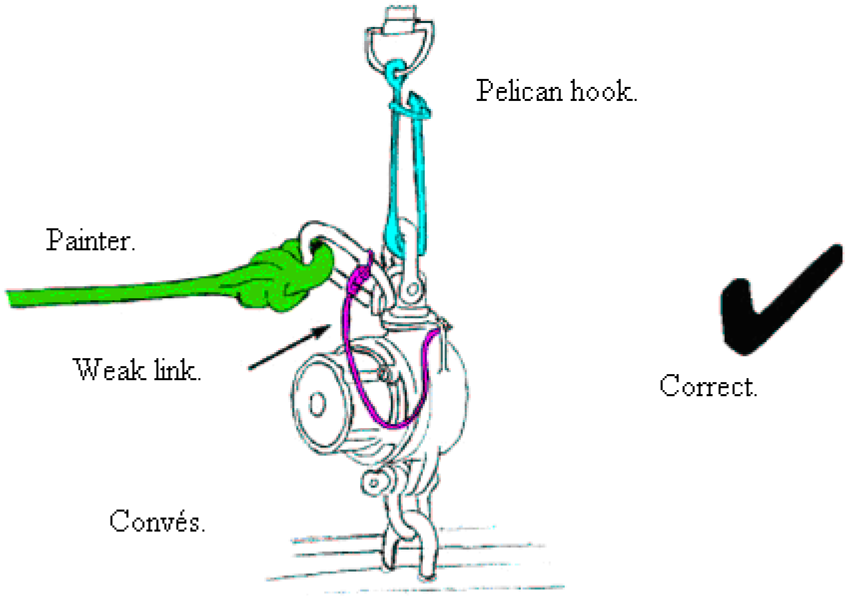


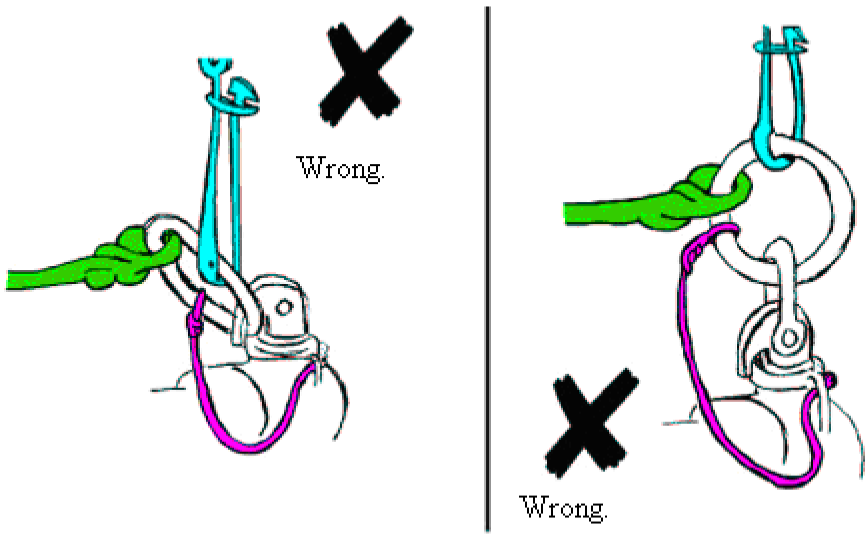
May foul when automatically released.



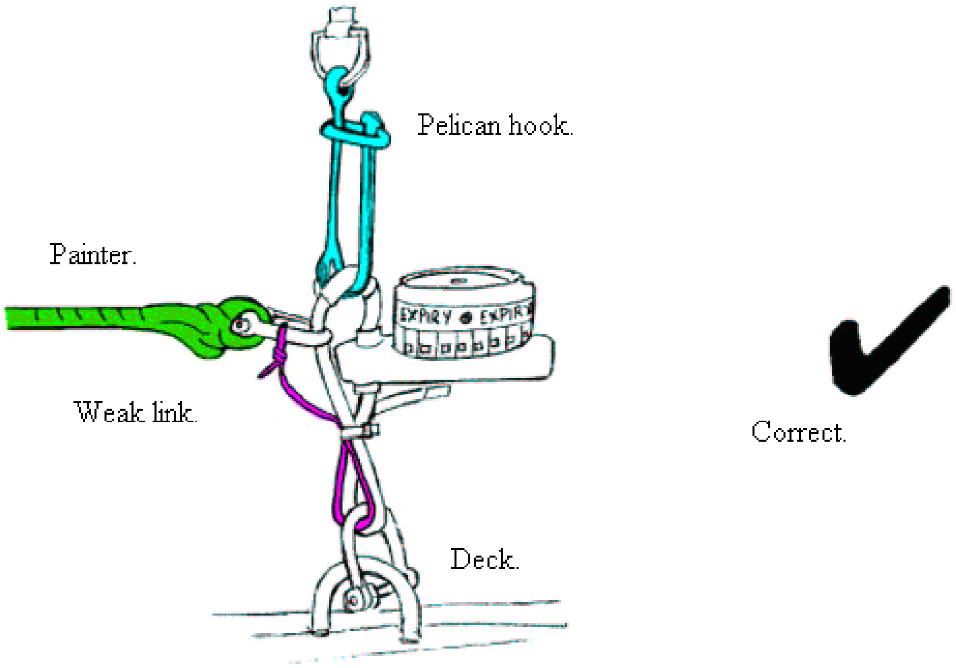


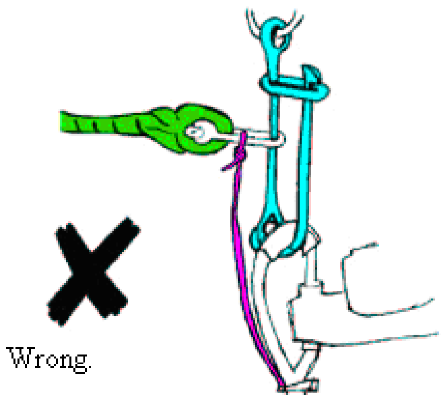
Liferaft will not release from cradle if ship sinks.



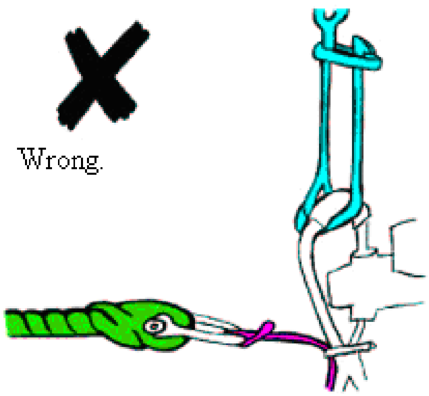


Liferaft will not release from the cradle if the vessel sinks.





Liferaft will not release from cradle if ship sinks.



- On automatic release, it will work correctly.
- On manual overboard launching, weak link may break and the liferaft will be lost.

Malmö, 25 August 2008