

ANALYSIS OF THE PROCESS OF INSPECTION IN RECREATIONAL CRAFT IN SPAIN. SUGGESTIONS FOR SAFETY IMPROVEMENT

Jordi Torralbo Gavilán (Correspondent author and presenter) (I), Marcel·la Castells i Sanabra, PhD,

Department of Nautical Science and Engineering

Universitat Politècnica de Catalunya. BarcelonaTech (UPC)

Pla de Palau, 18 08003 Barcelona (Spain)

jtorralbo@cen.upc.edu

Abstract

Inspections of pleasure boats in Spain can be carried out by collaborating entities of inspection, entities that must be authorized by the Maritime Administration. This authorization allows to perform effective inspections and technical controls of recreational crafts. Recreational crafts are subjected to surveys that are based on the registration list and on the material used in the hull. In addition, required safety equipment of the recreational boat depends on the distance that the recreational boat is authorized to navigate. Following data obtained from inspections of recreational craft, this paper aims to analyze information about hulls within dry and afloat conditions, about the equipment for rescue and safety, and about other nautical equipment; as well as to perform and improve different verifications during the inspections. All this information points to several aspects relevant for the optimization of the inspection process, the ultimate target being increasing efficiency and effectiveness, and ensuring more safety in recreational craft.

Keywords

Recreational boat, recreational craft, inspection, safety equipment

Definitions of Terms

DSC	Digital Selective Calling
EN	European Norm
EPIRB	Emergency Position-Indicating Radio Beacon
Foul-Weather Suit	A foul weather suit is clothing designed to keep the wearer dry and maybe either a jacket and trousers worn together, or a single garment comprising jacket and trousers
GMDSS	Global Maritime Distress & Safety System
GPIRB – EPIRB	Emergency position-indicating radio beacon, with integral GPS position-fixing

GPS	Global Positioning System
INMARSAT	This is Inmarsat Global Limited, the private company that provides GMDSS satellite distress and safety communications, plus general communications via voice, fax and data
IMO	International Maritime Organization
ISAF	International Sailing Federation
ISO	International Standard or International Organization for Standardization
Lifeline	Rope or wire line rigged as guardrail / guard line around the deck
LOA	Length overall not including pulpits, bowsprits, boomkins etc.
PLB	Personal Locator Beacon.
SAR	Search and Rescue
SART	Search and Rescue Transponder
SOLAS	Safety of Life at Sea Convention
Safety Line	A tether used to connect a safety harness to a strong point

1. INTRODUCTION

Recreational craft marketed in the EU must comply with harmonized technical safety and environmental requirements defined by Directive 94/25/EC, as amended in 2003. Although Directive 94/25/EC [1] establishes safety issues, from the results obtained in previous research [2], we can state that there is no coordination and equivalence among the EU countries according to the survival and safety equipment compulsory for recreational crafts. In the case of the countries analyzed, we noted that each country establishes its own classification of pleasure boats, require different safety equipment and the frequency of the mandatory inspections are different. This lack of coordination in this area determines that further research is necessary to unify a common pattern in inspections/surveys and survival and safety equipment of recreational boats in the EU. So it will be necessary identify the best practices to be applied in order to implement this common pattern in technical inspections of recreational boats.

This paper will analyze Spanish case to identify current national surveys and if there is any topics to be improved in inspection process in order to assure safety in recreational craft, based on statistical data.

With the approval of the Spanish legislation (Real Decreto 1434/1999) [3], the government authorizes collaborating entities to perform the inspections and surveys that must be submitted in pleasure craft registered in Spain, regardless of the means of propulsion. These entities can survey recreational crafts with a hull length between 2.5 and 24 meters, designed and aimed for recreational and sports purposes (list register sixth and seventh), and not allowed to board more than 12 passengers.

The ship's registration in Spain is done by lists, which will be registered all ships, boats and floating structures. The sixth list is intended for sporting or recreational craft that

are operated for commercial gain. The seventh list is for non-profit pleasure craft or fishing boats unprofessional.

All yachts have a certificate of seaworthiness. This certificate is a document attesting that the craft is fit to sail and in which is shown information such as the name and port of register of the vessel, its technical features and navigation area (see Table 1).

Table 1 - Navigation areas based on distance of operation.

Navigation Area	Distance of operation
Area 1	Unlimited
Area 2	Up to 60 miles
Area 3	Up to 25 miles
Area 4	Up to 12 miles
Area 5	Up to 5 miles
Area 6	Up to 2 miles
Area 7	Protected waters in general

Source: Own based on FOM/1144/2003

Recreational crafts are subjected to surveys or technical inspections (see section 1) that are based on the registration list and the material of the hull.

2. TECHNICAL INSPECTIONS

Certificate of seaworthiness have expiry date and it depends on the registration list (sixth or seventh). The length and the material of the hull determine its validity. Table 2 details the types of inspections to be carried out in recreational boats according to the registration list and material of the hull:

Table 2 - Type of technical inspections for List 6th and 7th depending on the length and hull material.

INSPECTION	FREQUENCY	LIST 7 th	LIST 6 th CHARTER
REGULAR/PERIODIC	Every 5 years	•Length between 6 and 24 meters	•Length between 2.5 and 24 meters
INTERMEDIATE	Between 2nd and 3rd year (after the last regular recognition)	•Length between 15 and 24 meters •Length between 6 and 24 meters with wooden hull	•Length between 6 and 24 meters
ADDITIONAL	In case of repairs or modifications to the hull, engine and equipment. In case of grounding, collision or damage		

Source: Own, based on RD 1434/1999

It is important to note that boats that have less than 6 meters in length and registered in the 7th list, should not perform periodic inspections and certificate of seaworthiness will include the phrase "No Expiration".

The collaborating entities of inspection (approved by the Spanish government) can carry out periodic, intermediate, additional and extraordinary inspections. The periodic and intermediate inspection of the boat must be performed in a shipyard (dry) and floating. The inspection for boats less than 7 meters in length can be only performed in a shipyard (dry), if it is possible to start the engine of the boat.

Figure 1 - Hull inspection in a shipyard



The owners and / or user of recreational craft are responsible for keeping up to date surveys and inspections. Emphasize that the inspection aims to ensure personal safety and preventing marine pollution accidents. Therefore, it is of vital importance to navigate with valid certificate of seaworthiness. In addition to the security issues indicated, to have the current certificate can avoid the possibility of being fined by the administration.

3. INSPECTION PROCESS

The checklist to be performed during inspections of recreational craft covers different aspects According to the type of boat (motor / sail), all surveys are made considering the following points: hull and equipment, engine and auxiliary machinery, mast and rigging, electrical installation, radio communication equipment, survival and safety equipment, fire extinguishing equipment, nautical material, navigation lights and anchoring equipment and spill prevention according MARPOL Convention [4].

Table 3 shows the different aspects that are taken into account during the inspection of the hull and of the equipment, checking and verifying its condition.

Table 3 - Checklist of the Inspection: Hull and Equipment Items

HULL AND EQUIPMENT CHECKLIST
Name and registration number
Manual and other documents
Stanchions and hand line
Shipside cock
Water tightness in deck openings
Union propeller strut / hull
Chain of plate
Self-drain cockpit
Slip deck system
Kitchen ventilation and extraction
Circuit gas cooker
Steering, rudder and rudderstock
Cathodic protection
Condition of the hull
Buoyancy chambers

Figure 2 - Hull with osmosis



In the section of the main and auxiliary engine, it must be check the condition and operation of the engine, and others aspects related with the engine as exhaust gases or fuel system. Table 4 shows the complete checklist for the main and auxiliary engine.

Table 4 - Checklist of the Inspection: Main engine (ME) and Auxiliary engine (AE) Items

ME & AE CHECKLIST
Bilge pump
Fuel Tanks
Ventilation of the engine room (motor compartment)
Seacock
Coolant circuit

Fuel system
Exhaust gases
Shaft stuffing box
Anchorage of the engine
Line shaft and propeller shaft
Engine and auxiliary machinery

Figure 3 - Inspection of the propeller shaft



The inspection also includes aspects for the mast and rigging in the case of a sailboat. Table 5 shows the elements that must be considered during the inspection.

Table 5 - Checklist of the Inspection: Mast and rigging Items

MAST AND RIGGING CHECKLIST
Mast and spreaders
Bolt of the rigging screw
Tightening of the shackle
Rigging and running rigging
Diverse anchorages

Figure 4 - Inspection of the mast and running rigging



The electrical system is essential for the functioning of services of the boat and engine start. Inspection and proper operation is performed taking into account the points indicated in Table 6.

Table 6 - Checklist of the Inspection: Electrical Installation Items

ELECTRICAL INSTALLATION CHECKLIST
Batteries
Wiring, fuses and connections
Watertight plugs in decks
Earthing of equipment
Radio interference suppression

Figure 5 - Batteries in a motor boat.



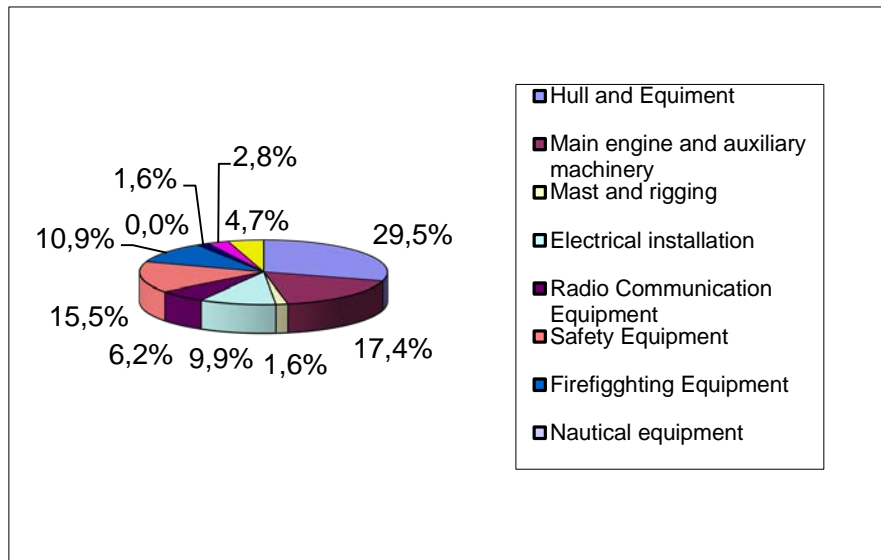
Other aspects taken into account during inspection are the following:

- Radio communication equipment: verify that the equipment is suitable for the navigation area, test it in the case of VHF with DSC that is connected to the GPS and MMSI assigned, and verify certificates and Expiry date in the case of the SART and EPIRB [5].
- Safety equipment: Presence of the safety equipment according to navigation area [6] [7].
- Firefighting Equipment: extinguishers and fixed fire systems reviewed.
- Nautical equipment.
- Navigation lights: Accordance with the type of boat and navigation and correct operation [8].
- Anchoring Equipment: operation of the windlass and condition of the chain.
- Spill prevention: check if the boat has wastewater tank.

4. STATISTICAL ANALYSIS

From 60 inspections of recreational craft realized by authors during 2013 in Spain and using the checklist defined above section, 322 deficiencies were detected (see Figure 6).

Figure 6 - Percentage of deficiencies detected during the inspection process



As can be seen, Hull and Equipment represents 29.5% of the total of deficiencies detected, followed by Main engine and auxiliary machinery (17.4%) and Safety equipment (15.5%). These three sections represents more than 60% of the total of deficiencies.

In particular, Hull and Equipment section is divided into 15 items, Main engine and auxiliary machinery into 11 items and safety equipment into 3 items. Deficiencies considering these subsections are (see Tables 7 and 8):

Table 7 - Deficiencies (in percentage) of Hull and Equipment items of the checklist

Name and registration number	10,5%
Owner's Manual and other documents	15,8%
Stanchions and hand line	6,3%
Shipside cock	4,2%
Watertightness in deck openings	10,5%
Union propeller strut / hull	5,3%
Chain of plate	1,1%
Self-drain cockpit	1,1%
Slip deck system	10,5%
Kitchen ventilation and extraction	0,0%

Circuit gas cooker	8,4%
Steering, rudder and rudderstock	2,1%
Cathodic protection	16,8%
Condition of the hull	7,4%
Buoyancy chambers	0,0%

From 15.8% (15 deficiencies in total) of item "Owner's Manual and other documents", the main reason is that compulsory civil liability insurance is not in force.

From 16.8% (total 16 deficiencies) related to cathodic protection, 8 are due to cathodic protection elements and 8 to installation and operation of the anodes (painted and excessive wear)

Table 8 - Deficiencies (in percentage) of Main engine and auxiliary machinery items of the checklist

Bilge pump	32,1%
Fuel Tanks	10,7%
Ventilation of the engine room (motor compartment)	7,1%
Seacock	10,7%
coolant circuit	0,0%
Fuel system	0,0%
Exhaust gases	5,4%
Shaft stuffing-box	5,4%
Anchorage of the engine	3,6%
Line shaft and propeller shaft	7,1%
Propulsion equipment and auxiliary machinery	17,9%

Deficiencies identified by Bilge pump (total of 18 deficiencies), 6 are due to the concept "Anomalies in the vicinity of the bilge pump", 6 are due to "Conservation of electric wires supplying the engine" and 6 due to "Operation of equipment in manual/automatic mode."

Moreover, from the 50 deficiencies detected of Safety equipment (15.5% of the total), 25 deficiencies were the inexistence of the safety equipment according to navigation area and 25 were elements without the periodic revisions and / or expired.

From the radiocomunication equipment, 10 deficiencies were due to "Radiocomunication equipment in accordance with the navigation area" and 10 deficiencies due to "Operation of the equipment".

From the firefighting equipment, 35 deficiencies were that the fire extinguisher did not have the proper charge or had expired. Of the 15 deficiencies related to the spill prevention, these were due to "wastewater tank - available and verification of connections, pipes, valves and seals and their functioning".

The statistical analysis discussed in this section revealed that one of the most common deficiencies is that the civil liability insurance is not in force. Emphasize that it is the responsibility of the skipper to have the insurance update.


Other deficiencies identified during inspections are directly related to lack of maintenance. An example are expired fire extinguishers, bilge pump not working, inadequate cathodic protection of metal parts of the hull or safety equipment according to navigation area without the periodic revisions or expired (for example the EPIRB - battery and hydrostatic release - or the liferaft that in Spain must be checked annually by an authorized station).


5. PROPOSAL ON IMPROVEMENT OF THE SURVIVAL AND SAFETY EQUIPMENT

In order to be able to deal more successfully an emergency situation, following improvements are detailed in the following list of the equipment and material, that should be required compulsory or recommended to be onboard.

From the deficiencies detected during inspections as well as safety and rescue equipment that is required in other countries of the European Union, we have developed a proposal for improving safety and survival equipment according to the navigation area of the recreational craft (Table 9.)

Table 9 - Proposal for improving safety and survival equipment

EQUIPMENT	NAVIGATION AREA COMPULSORY OR RECOMMENDED
SURVIVAL AND SAFETY EQUIPMENT	
A watertight, high-powered searchlight, suitable for searching for a person overboard at night and for collision avoidance with spare batteries and bulbs.	Areas 1 and 2. Compulsory
<p>Soft wood plugs, tapered and of the appropriate size, shall be attached or stowed adjacent to the appropriate fitting for every through-hull opening.</p> <p>Figure 6. Seacock with a soft wood plugs</p> 	<p>Areas 1, 2, 3, 4, 5 and 6. Compulsory</p>

Lifelines, and shall be taut, for example of stranded stainless steel wire or a material having a strength equivalent and with a minimum diameter).	Areas 1, 2 and 3. Compulsory in a sail boat.
Liferaft must be stowed on the working deck or in the cockpit stowed in a purpose-built rigid compartment containing liferaft that is designed and built to allow a liferaft to be removed and launched quickly and easily. Liferaft should be stowed in such a way that the liferaft can be dragged or slid into the sea without significant lifting. Figure 7. Exemple of a liferaft incorrectly stowed	Areas 1, 2 and 3. Compulsory
	
Towing line / heaving line with 15 m - 25 m length readily accessible to cockpit.	Areas 1 and 2 – Compulsory Areas 3 and 4 – Recommended
A strong, sharp knife, sheathed and securely restrained shall be provided readily accessible from the deck or a cockpit.	Areas 1 and 2 – Compulsory in a sail boat.
A drogue for deployment over the stern, or alternatively a sea anchor or parachute anchor for deployment at the bow	Areas 1 and 2. Compulsory
Safety Harness and Safety Lines (ISO 12401)	Areas 1 and 2 – Compulsory in a sail boat.
Personal Location Lights (either SOLAS [9] or strobe).	Areas 1 and 2 – Compulsory Areas 3 and 4 – Recommended
Foul Weather Suits with hood and fitted with marine-grade retro-reflective material, and should have high-visibility colours on its upper parts and sleeve cuffs.	Areas 1 - Compulsory Area 2 - Recommended
Watertight flashlight	Areas 1 and 2 – Compulsory Areas 3 and 4 – Recommended
All rechargeable batteries on board shall be of the sealed type from which liquid electrolyte cannot escape.	
An immersion suit (abandonment suits according the LSA Code Chapter II, 2,3)	Area 1 - Compulsory Area 2 - Recommended
RADIO AND NAVIGATION EQUIPMENT	
A class A AIS	Area 1. Compulsory

Echo Sounder	Area 1 – Compulsory Areas 2,3 and 4 – Recommended
Man Overboard Alarm capable of recording a position must be available at every helm station.	Area 1. Compulsory

6. CONCLUSIONS

Many of the deficiencies identified during the inspections are directly related to lack of maintenance. Lack of maintenance of the recreational craft leads to a reduction in safety.

Although inspections try to detect deficiencies, the skipper of the recreational craft must be responsible for keeping a detailed plan, avoiding safety equipment that has expired or has not been reviewed.

It's important to point out that inspections that are performed in Spain could improve many aspects related to safety and survival equipment.

The improvement should consider more effective and updated safety equipment, and best suited to each type of vessel inspections. The check list of the inspections should also include some aspects that are not currently covered.

Each country establishes its classification of pleasure boats, required different safety and survival equipment and types and frequency of the mandatory inspections are also different.

The diversity of criteria of the topics discussed states that it would be necessary to establish mechanisms to unify some aspects among countries of the European Union like:

- List of mandatory safety and survival equipment according to classification of pleasure boat.
- Periodicity of inspections and items to be inspected.

To conclude, we can state that there is a lack of coordination in this area and further research is necessary to unify a common pattern in inspections/surveys and survival and safety equipment of recreational boats in the EU.

REFERENCES

- [1] Directive 94/25/EC of the European Commission, 16 June 1994, on the approximation of the laws, regulations and administrative provisions of the Member States relating to recreational craft.
- [2] J. Torralbo, M. Castells: Analysis of Safety Inspections of Recreational Craft in the European Union. A Case Study - TRANSNV 2013 - 10th Jubilee International Conference on Marine Navigation and Safety of sea Transportation.
- [3] Royal Decree 1434/1999 (Spain), September 10, by which surveys and inspections of the boats are set to ensure the safety of human life at sea and determines the conditions to be met by collaborating entities of inspection.

- [4] International Convention for the Prevention of Pollution from Ships, 1973 and Protocol of 1978 (MARPOL 73/78).
- [5] Royal Decree 1185/2006 (Spain), October 16, establishing the Council Regulation to regulate maritime radio communications on board Spanish civilian vessels.
- [6] Order FOM/1144/2003 (Spain), April 28, by which regulates safety equipment, rescue regulate, fire fighting, navigation and prevention of from water waste discharges, to be carried on board the boats.
- [7] Order FOM/1076/2006 (Spain), March 29, modification of the Order FOM/1144/2003.
- [8] International Regulations for Preventing Collisions at Sea (COLREGs), 1972.
- [9] International Convention for the Safety of Life at Sea (SOLAS), 1974.
- [10] Walliser J., Piniella F., Rasero J.C., Endrina N.: Maritime Safety in the Strait of Gibraltar. Taxonomy and Evolution of Emergencies Rate in 2000-2004 Period. TransNav - International Journal on Marine Navigation and Safety of Sea Transportation, Vol. 5, No. 2, pp. 189-194, 2011
- [11] ISAF OFFSHORE SPECIAL REGULATIONS - JANUARY 2012 - DECEMBER 2013 US Version 2 - 2012