MONALISA 2.0 – Activity 4

Report on Requirement Specifications for OLRS

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Table of contents

1 List of Acronyms .......................................................................................................................... 4
2 Document objective ......................................................................................................................... 7
3 Executive summary .......................................................................................................................... 7
4 Introduction ........................................................................................................................................ 7
5 Industrias Ferri S.A. ......................................................................................................................... 8
6 Rescue operations ............................................................................................................................. 8
   6.1 Introduction .................................................................................................................................. 8
   6.1.1 Rescue at sea .............................................................................................................................. 9
6.2 Technical specification .................................................................................................................... 9
   6.2.1 General issues ........................................................................................................................... 9
   6.2.2 Specific issues .......................................................................................................................... 11
   6.2.3 General arrangement ............................................................................................................... 16
   6.2.4 Prototyping and testing ........................................................................................................... 16
7 Conclusions ........................................................................................................................................ 17
1 List of Acronyms

ACO  Air Co-coordinator
AS  Abandon Station
ATM  Air Traffic Management
BLEVE  Boiling Liquid Expanding Vapour Explosion
CEO  Chief Executive Officer
CLIA  Cruise Lines International Association
DNC  Digital Nautical Chart
DNV  Det Norske Veritas
DSC  Digital Selective Call
DVM  Dynamic Voyage Management
EBS  Emergency Breathing System
ECDIS  Electronic Chart Display and Information System
ECTS  European Credit Transfer and Accumulation System
EMSA  European Maritime Safety Agency
EOC  Emergency Operations Centre
EPIRB  Emergency position-indicating radio beacon
EQUASIS  European Quality Shipping Information System
ERCC  Emergency Rescue Co-ordination Centre
ESD  Emergency Shut Down
ETO  Emergency Towing Operation
FAL  The Convention on Facilitation of International Maritime Traffic
FiFi  Fire fighting
GMDSS  Global Maritime Distress Safety System
GPS  Global Positioning System
HMI  Human Machine Interface
HUET  Helicopter Underwater Escape Training
IALA  International Association of Marine Aids to Navigation and Lighthouse Authorities
IAMSAR  International Aeronautical and Maritime Search and Rescue
ICAO  International Civil Aviation Organization
ICS  Incident Command System
ICT  Information and Communications Technology
ILO  International Labour Organization
IMO  International Maritime Organization
IMO NAV  IMO Sub-Committee on Safety of Navigation
<table>
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<tr>
<th>Acronym</th>
<th>Definition</th>
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<tr>
<td>IMO MSC</td>
<td>IMO Maritime Safety Committee</td>
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<tr>
<td>JRCC</td>
<td>Joint Rescue Coordination Centre</td>
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<td>LNG</td>
<td>Liquefied Natural Gas</td>
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<tr>
<td>LSA</td>
<td>Life Saving Appliance</td>
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<td>LT</td>
<td>Local Time</td>
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<td>LPG</td>
<td>Liquefied Petroleum Gas</td>
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<tr>
<td>LRIT</td>
<td>Long-Range Identification and Tracking</td>
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<td>MARPOL</td>
<td>International Convention for the Prevention of Pollution from Ships</td>
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<td>MCC</td>
<td>Mission Coo-ordination Centre</td>
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<td>ME</td>
<td>Major Event</td>
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<td>MET</td>
<td>Marine Education and Training</td>
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<td>ML 2.0</td>
<td>MONALISA 2.0 Project</td>
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<tr>
<td>MOB</td>
<td>Man overboard</td>
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<tr>
<td>MOC</td>
<td>Maritime Operations Centre (Spanish Maritime Safety and Rescue Agency - SASEMAR)</td>
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<td>MOR</td>
<td>Means of Rescue</td>
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<td>MMSI</td>
<td>Maritime Mobile Service Identity</td>
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<td>MRCC</td>
<td>Maritime Rescue Coordination Centre</td>
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<td>MRSC</td>
<td>Maritime Rescue Sub-Centre</td>
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<td>MRO</td>
<td>Mass Rescue Operation</td>
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<td>MSI</td>
<td>Maritime Safety Information</td>
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<td>MST</td>
<td>Maritime Safety Training</td>
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<td>OBP</td>
<td>Open Bridge Platform</td>
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<td>OLRS</td>
<td>On-board life raft recovery systems</td>
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<td>OSC</td>
<td>On-Scene Co-ordinator</td>
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<td>PLB</td>
<td>Personal Locator Beacon</td>
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<td>Port CDM</td>
<td>Collaborative Decision Making within and in relation to Ports</td>
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<td>PPE</td>
<td>Personal Protective Equipment</td>
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<td>RCC</td>
<td>Rescue Coordination Centre</td>
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<td>RFID</td>
<td>Radio Frequency identification</td>
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<td>Search and Rescue</td>
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<td>SCBA</td>
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<td>Search and Rescue Unit</td>
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<td>STCC</td>
<td>Sea Traffic Coordination Centre</td>
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<td>Acronym</td>
<td>Description</td>
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<tr>
<td>STCW</td>
<td>International Convention on Standards of Training, Certification and Watch keeping for Seafarers</td>
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<td>STM</td>
<td>Sea Traffic Management</td>
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<td>SVM</td>
<td>Strategic Voyage Management</td>
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<td>System Wide Information Management</td>
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<td>TFEU</td>
<td>Treaty on the Functioning of the European Union</td>
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<td>TKPI</td>
<td>Training key performance indicators</td>
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<td>VHF</td>
<td>Very High Frequency</td>
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<tr>
<td>VTMIS</td>
<td>Vessel Traffic Maritime Information System</td>
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<td>VTS</td>
<td>Vessel Traffic Service</td>
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2 Document objective

The objective of this document is to explain all the requirements and technical characteristics that the On-board life raft recovery systems (OLRS) must fulfill in order to perform the recovery operations for which it has been conceived.

This document corresponds to the deliverable D4.2.4, and it reports on the conclusion of the “Requirement specifications for onboard life rafts recovery systems”.

3 Executive summary

The overall objective of MONALISA 2.0 contributing to the development of Motorways of the Sea (MoS), is to strengthen efficiency, safety and environmental performance of maritime transport, at the same time as reducing the administrative burden on the maritime sector.

This global objective has been broken down into a number of immediate objectives, the guarantee of operational safety in ports and coastal areas being one of main challenges. In this context, the proposal of implementing the OLRS system has focused on minimizing the number of marine accidents and optimizing the response when incidents do occur. The objective of this system is to provide a complementary recovery system to maximize the rescue capacity (i.e. rescues per time unit).

In this report rescue operations are analyzed in order to provide the main requirements that the OLRS system must meet to guarantee rescue operations in a safe and efficient way.

4 Introduction

The OLRS is a system capable of recovering life rafts an MOB afloat in the water, and place them safely onboard the rescue ship, in a very short time, particularly advantageous in bad weather and cold water conditions, and minimizing the risk to people during the recovery operation.

This is in contrast to the usual SOLAS procedures that involve launching a rescue boat, with the added risk to rescuers inherent in launch and recovery operations, and the added risk of hypothermia to the man overboard.

The OLRS system has the capability to extend the boom and recovery hook towards castaway or the life-raft, so the rescue vessel in which the equipment is installed does not have to be too close to them, thus avoiding jeopardizing the entire operation.

In conclusion, the OLRS system is proposed as an alternative and/or complementary method to existing ones in order to minimize the risk and maximize the number of rescues per time unit.
5  Industrias Ferri S.A.

INDUSTRIAS FERRI, S.A. was founded in 1965, in order to satisfy the growing demand for ancillary deck equipment for the marine sector. Over the years, FERRI has achieved prestige as a leading manufacturing of high quality, reliable equipment as an experienced, innovative company providing solutions to customer requirements.

In fact, FERRI's naval equipment is scattered throughout the world on all types of ships, warships, fishing fleets, tugs, oil platforms, research vessels, cable companies, merchant, luxury cruises and many more.

More and more becomes more important for the company the custome-made equipment, designed and constructed following the strictest demands and regulations so that the equipment can function in the most adverse conditions while meeting requirements from customers in 5 continents.

Industrias Ferri offers a wide range of products to ensure that life on board is both functional and safe. The company is an innovative manufacturer of life-saving appliances, cranes, A-frames and other deck equipment and our goal is to provide our customers with the latest innovative, compact, high quality and safe life/rescue boat davit systems, RHIB recovery installations and marine /offshore cranes. The well proven product range of Industrias Ferri guarantees the future owner the pleasure of optimum reliability with a minimum of maintenance.

At present, in addition to these activities, we also develop technical assistance and maintenance services for highly specialized mechanical and industrial sectors.

6  Rescue operations

6.1  Introduction

One of the main purposes of any SAR action is the speedy return to a place of safety of the survivors of a distress situation at sea.

It is essential that from the start of any SAR action, the RCC (Rescue Coordination Centre) plans for the rescue of survivors and ensures that the appropriate resources, in the appropriate quantity, are alerted, briefed and positioned so that the rescue may take place with the minimum of delay after the location of the survivors.

The method of rescue to be used shall be decided after consideration of all relevant factors including: action taken by the sighting unit and the action that
can be taken by other units at the distress scene; the location of the survivors; the condition of survivors and medical considerations; the number of persons reported to be on board the craft and number who have been located; the environmental considerations; the available SAR facilities and their state of readiness; the effect of weather; visibility conditions; and any risks involved to SAR personnel at the crash site e.g. dangerous goods.

To reduce delay, the SAR facilities that are likely to be used should be alerted and deployed to a suitable location while the search is still in progress.

6.1.1 Rescue at sea

Rescue boats, due to their operational and manoeuvrability characteristics, can carry out many actions for the rescue of the survivors of a disaster. It is very common to use them to collect other survival "craft" and to tow them to a "safer" position, close to the SAR vessel, to await rescue by the rescue boat.

Most of the procedures used in these kinds of situations require the rescue boat to be as close as possible to the MOB, taking into account sea state, wind conditions and other risks. In fact, this type of rescue is always difficult, involving high risk to the rescue team.

In order to increase the rescue capacity of specialized rescue vessels (i.e. number of rescues per time unit), further to all rescues performed by means of launch and recovery of a rescue boat, additional life-saving devices may be developed to minimize the time and number of survivors remaining in the water.

It is desirable that the SAR vessel be capable of recovering survivors from the water without expecting any help from the survivors themselves.

It is in all these kinds of situations in which, SAR vessels are used, and the recovery time of the MOB is critical, when the OLRS system would be especially useful and efficient.

6.2 Technical specification

6.2.1 General issues

After an in-depth study of the usual methods of rescue, and existing problems during such operations, the specific technical features that the OLRS system must meet have been defined:

- **Low load at long outreach**

  Low load at long outreach allow the approach of a hanged rescuer riding, or a MOR with two rescuers on board, towards the survivors or the system
also permits a hook hanging from the crane’s boom near the life raft or survivor and away from the rescue ship.

Thus, it is possible to minimize the risk due to the proximity of survivors to the vessel, and the speed of rescue of the life rafts is maximize, since, instead of recovering persons aboard the life raft from the rescue boat, picking up 4 people at a time, the whole raft is recovered at one time.

Fig 1 - Rescue operation using OLRS sytem

- **High load at short outreach**

  High load at short outreach enables to hoist the whole “launchable” life-raft (with all the people on-board) and place it on the deck of the rescue vessel. Thanks to this, the risk to rescuers is minimized, because they will not have to make the transfer operation from the life-raft to the rescue boat, and the risk of collisions and falling overboard for rescuers and rescuers, due to bad weather and sea conditions is also considerably reduced.

- **Constant tension and quick response**

  It will also be necessary for the system to have the capacity to maintain constant tension both, while the MOR recovers the survivors, and while the life raft is being towed / pulled from the point of capture towards the rescue ship. A quick response of the system is needed and also a
release/retrieval speed of up to 2m/sec, in order to avoid sudden pull stresses on the wire and also to maintain control at all times.

A pay out device for the wire is needed when there is no load suspended (and no counterweight).

The system must be able to release the wire without a suspended load, avoiding the use of counterweight, so people aboard life-rafts will be able to take the hook and attach it to the life-raft. Wire and hook must have a minimum weight and the hook must also be manageable, padded and ergonomic, to avoid dangerous blows and to facilitate the operation in a chaos situation in the life-raft and severe sea conditions.

- **Ability to reduce the swing of suspended MOR/life raft**

The system must be able to reduce the swing of both MOR and life raft when they are suspended, in order to ensure no one is hit during the operation.

### 6.2.2 Specific issues

Regarding the requirements mentioned in the previous section, the development that Industrias Ferri, S.A.’s plan is as follows:

The system will consist of a marine telescopic boom crane, designed to develop rescue operations up to beaufort 8 (maximum dynamic heel of 12°, maximum dynamic trim of 6°).

The crane has a specific structural design for offshore use which follows the Lloyds Register of Shipping Code for Lifting Appliances in a Marine Environment (L.A.M.E.), Offshore Crane with man riding category and includes low temperature design, ship motions, high speed movements and specific safety and control systems.

The crane is designed for a minimum installation process and is supplied with a flange at the bottom of the column, ready to be bolted onto a skid on a reinforced deck.

It can be transported fully assembled, or in several parts. If fully assembled, it is only necessary to connect the power supply to the electric cabinet. Apart from the mechanical assembly, electric and/or hydraulic connections may be required.

The crane is designed for ease of maintenance and for accurate and safe operation. Elements such as handholds, steps and handrails are available to
afford safer access to the maintenance, inspection, setting and installation zones.

All materials used are new and suitable for operation in extremely corrosive environments.

The main parts of the OLRS system are:

- **Column**
  Built of high strength steel. On the top side, a flange is available to bolt the slewing ring, and on the bottom side there is another flange to bolt the crane to the skid on deck. There is an access door for interior maintenance operations.

- **Turret**
  A highly rigid structure, built with welded high strength steel plates. On the bottom side there is a flange where the slew ring is bolted and the slew arrangement is fitted. Each bolt is accessible for easier maintenance.

  The lugs to anchor the luffing hydraulic cylinder are located on the bottom side, and the lugs for boom articulation are on the top side.

- **Slewing ring**
  Ball bearings with outer gearing. There are several greasing points, and a marine environment seal.

  High strength, corrosion protected bolts fix it to the column and turret.

  The slew ring is protected all around with a cover, simplifying greasing and avoiding risk to personnel.

- **Slewing arrangement**
  Slew operation is by means of a hydraulic gearbox-motor with brake, which moves a pinion. The gearbox is planetary and the brake of negative type (slew movement is stopped in case of hydraulic failure). A steel-body brake valve is also mounted on the motor.

  The whole arrangement is bolted to the turret.
Fig 2 - Main components of OLRS system
• **Boom**

   It is built with welded high strength steel plates, forming a structural box. Each articulation is composed of steel shafts and sliding bearings. Thus, corrosion is reduced and maintenance is easier.

   One or two sheaves are mounted on the end of the boom for optimum load cable operation in every boom position.

   The boom will have a rope pay-out device.

• **Luffing mechanism**

   Each movement of the boom is carried out by means of double effect hydraulic cylinders. The rod is made of steel, with a coating based on chrome, with high corrosion resistance. The steel-body over-centre valves are mounted on the cylinder inlets/outlets, and prevent the load from falling in the case of power supply failure or pipe brakeage.

   Oscillating bearings are installed on cylinder lugs, allowing for optimum cylinder operation and minimum maintenance.

   The geometry of the crane allows all cylinders to be kept closed when the crane is in stowed position, reducing the possibility of corrosion on the rods.

• **Loading mechanism**

   The winch is composed of a hydraulic gearbox-motor, with a brake, frame and drum. The gearbox is planetary and the brake of negative type (preventing the load from falling in the case of power supply failure or pipe brakeage). The assembly is bolted on the primary or secondary boom.

   A limit switch is installed on the winch, limiting the hook throw, from the top through bottom position.

   The crane also has a constant tension system, with low pull and high speed capacity, in order to keep the MOR/liferaft hooked during the operation and avoiding sudden pulls on the wire due to both, vessel movements and wave action.

• **Hydraulic power unit (HPU)**

   The HPU is installed on the turret. It consists of a motor-pump, and an oil tank inside the turret structure. There is an access door for interior maintenance operations.
The electric motor is three-phases, alternate current and with a steel body. The main characteristics are:

- S6 service
- IP56 protection
- F class insulation
- B class temperature rise
- Heating resistances in each winding
- Thermistors in each winding
- The pump has a steel body.

All required hydraulic elements for correct operation (e.g. cut off and empty tank valves, suction and return filters, visual and electric oil level, thermostat, vented filler plug, etc.) are installed on the turret, each one accessible for easy maintenance.

Pipes and fittings are of carbon steel protected with paint and/or greased tape.

- **Electric cabinet**
  
  Built in AISI 316L stainless steel and with IP56 protection, it is installed on the column or turret. This makes for ease of installation and maintenance.
  
  All required electric devices for starting the motor and for security are fitted inside.
  
  An emergency stop button is placed on the cabinet door to stop the crane immediately if required.

- **Control platform**
  
  A platform placed on the turret, allowing for a clear vision of each operation. Crane control is by means of a manual hydraulic proportional distributor valve. Each crane movement is controlled by an individual module with its individual lever. Each lever returns to the standby position when it is not activated.
  
  Two movements can be carried out at the same time, at reduced speed.
  
  At the same time, the platform allows for easy access to the slewing mechanism and to each component of the HPU for easy maintenance.
6.2.3 General arrangement

The general arrangement of the OLRS system is shown in Fig 4 - 46591 drawing.

6.2.4 Prototyping and testing

In order to verify the main features of the OLRS system in real test conditions, Industrias Ferri, S.A. together with the other participants of Sub-activity 4.2 are currently defining the objectives and resources which will be available/needed for this testing phase.

Therefore, although the OLRS system has to satisfy all the above requirements, the prototype to be developed will be tested aboard a rescue vessel or similar, trying to reduce to a minimum the time the rescue vessel lifting appliance is unable to operate, in order to maintain the vessel ready for any rescue operation if required. In case this is not be possible, prototype testing will be performed in a pool simulating real movements and stresses.
7 Conclusions

Contributions provided by Industrias Ferri to the Monalisa 2.0. Project, in terms of improving the operational safety in ports and coastal areas, have focused on the implementation of the proposed system whose technical requirements have been set out in this report.

To establish such technical requirements of the system, the operation of rescues at sea has been studied and static studies and dynamic simulations have been developed. However, from contacts with organizations such as SASEMAR and other coastal and port authorities, it has been concluded that it is absolutely necessary to test the system under real conditions in order to prove to end users, who risk their lives every day using this type of systems, that it works properly and that it is perfectly reliable. At this point, it should be remembered that the ultimate goal of the OLRS system is to become a marketable reality to be installed onboard rescue vessels.

If the OLRS is installed on an existing system of on-board lifting appliances, the rescue vessels would not be required to apply for new classification or certification of the whole; they would only have to obtain approval of the OLRS system.

Potential users of OLRS system also have been studied and it has been seen that, apart from the main clients to whom the system was originally proposed, such as operators of search and rescue vessels, stand-by support vessels, patrol vessels and vessels of opportunity, other customers such as ship designers, shipyards and shipowners might benefit from this development.
39 partners from 10 countries
taking maritime transport into the digital age

By designing and demonstrating innovative use of ICT solutions
MONALISA 2.0 will provide the route to improved

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