

# Man Overboard Detection System using RFID

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*The world is full of endless possibilities and these possibilities multiply when you are onboard ship. One such possibility is "man-overboard". The tragic event of Man-Overboard is one of the major causes of harm to life when one is at sea. Man overboard is harmful because one falls from a height of about 8-10m into a sea of enormous depth filled with creatures unknown, the man overboard is considered to be harmful because if one falls into the sea unnoticed, there is almost no chance of his survival.*

*The above mentioned situation is what is usually found in cruise ship. Many cases have been found where the person died because the notice of him not being onboard the vessel came after a considerable amount of time, and this time which is now lost, could have been used to rescue him. Hence the person who meets with such accident usually dies.*

*To combat with such a dangerous situation we have proposed a simple system that can be installed and run onboard any ship with minimum maintenance and cost. Safety comes first and to increase safety such a system is the need of the hour.*

*The mentioned system comprises of a RFID (Radio Frequency Identification) tag and the RFID readers. The tags collect energy from a nearby RFID reader's interrogating radio waves and the reader passes a signal which can be used to detect the person falling overboard. Basic principle on which this would work is that when a man with a Tag falls overboard, by falling down, his tag would cross the RFID reader and would pass a signal to the security system and hence which can be used to detect man overboard.*

*Installation of such a system will just require projections at some intervals around the ship to be constructed, and a simple electronic circuit which is capable of functioning as above. This can be achieved at very low cost. Safety is always given priority so by using RFID tags accidents can be reduced to a greater extent as the detection capability of this system is very accurate.*

**Keywords:** 1. RFID 2. UHF 3. Control Systems 4. MAN overboard.

## INTRODUCTION

As explained in the abstract the main aim of the paper is to design a system which could detect a man overboard.

Man overboard is a situation in which a ship's crew member or a passenger falls out at sea from the ship, no matter where the ship is. A seafarer has to be very careful while performing his duties onboard vessel as it can never be taken for granted. A person may fall off the ship due to bad weather, swell in sea, the accidents, or even during listing.

A man overboard is an emergency situation and it is very important to locate and recover the person as soon as possible as due to bad weather or rough sea, the crew member can drown or else due to temperature of the cold water the person can get hypothermia.

A person will get unconscious after 15 minutes in water with temperature of 5°C.

The main problem here is that the person who is falling down is generally not detected. The detection has to be quick, only then the chances of survival are much higher.

The conventional method used onboard has various limitations, so to overcome them I propose the detection of man overboard

using RFID. These chip are used in many fields and has very few limitations.

## THE RFID TAGS AND RFID READERS

### 1. RFID Tags:

RFID tags are of two types- active and passive, here passive tags serves our purpose. Active ones requires external power for the tag which provides better detection at long distances but the passive tags has no power of its own, so no charging or changing of the battery hence less distance for detection.

Here I would prefer passive tag, as the active tags may interfere with the equipment's onboard using the later tags.

The range of these passive tags varies from 3 feet to 20 feet and new Omni-id Ultra tag which ranges to 80 ft. We will use passive UHF (Ultra High Frequency) tags having a range of 20ft. The UHF frequency band covers the range from 300MHz to 3GHz. They are cheaper, responds quickly and have longer range than LF and HF.

Tags consist of a silicon device (chip) and antenna circuit. The purpose of the antenna circuit is to induce an energizing signal and to send a modulated RF signal to the reader. This basically

works like a mirror which reflects back the RF signal back to the reader and it detects the tag. Tag used can be worn or attached in following ways:

- As a wrist band.
- Can be carried in the form of a card.
- Can be attached or imbedded in the PPE (Personal Protective Equipment) and the uniform or the dress of the crew.
- In the form of keychain

The tags are capable of storing some data (around 2kb) in them so utilizing this property, each tag will have their own unique stored ID number which will be given by the control system. This ID plays a major role in storing the information of the person having the tag.

The ID will be stored in the control system with the corresponding information of the person, so when the tag reflects the signal back to the reader it sends the ID of the tag to the control system and the person having that tag is detected. So when the person falls down, this unique ID will help in identifying the person.

The method is simple but very effective. The tag covering is made fire and water proof so that it does not misbehave in the working conditions of the ship.

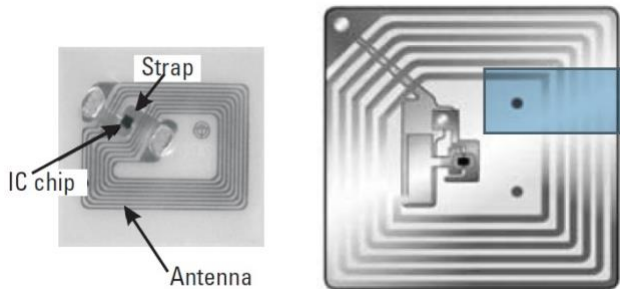


Fig.1: [The image above shows basic structure of a RFID tag]

## 2. RFID Readers:

RFID tags are interrogated by readers, which in turn are connected to a host computer (control system). In a passive system, the RFID reader transmits an energy field that wakes up the tag and powers its chip, enabling it to transmit or store data. The reader is equipped with antennas for sending and receiving signals, a transceiver, and a processor to decode data. RFID readers are used to activate passive tags with RF energy and to extract information from the tag. For this function, the reader includes an RF transmission for receiving and data decoding sections. Hence when a person falls with a tag attached the reader is triggered and it sends the signal to the control system and the alarm is raised.

The placement of the reader is very important as it should be able to detect the tag effectively and without any false alarm (wrongly reading the tag even when the person is not overboard). For this the first thing to be done is to direct the RF waves outside the hull of the ship. Second and the most important thing is the placement of the reader. The readers are placed just below the bulwark. There is no continuous row of readers as they may get effected

by the ship's hogging and sagging, hence, some space is provided between the readers. These gaps depends on the range of the reader. The arrangement should be such that the entire hull is covered and the bridge too should be covered. Due to the reader's compact size, no problem occurs during its installation.

## CONTROL SYSTEM

This is the brain of the entire system. The information of all the tags is stored here which helps to detect the person overboard. The readers are connected to the control system such that every reader has a location allotted to them so if a tag passes through them the location of the tag is sent to the system and it becomes easy to locate a person overboard. The system is to be quick enough to receive the information from the receiver and the alarm is activated. The system is to be installed in the bridge so that proper vigilance can be done.

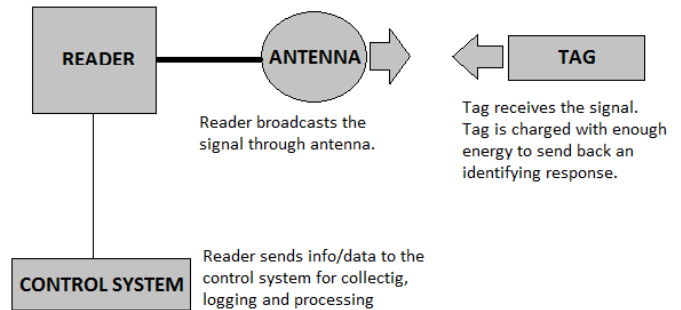


Fig.2: [The diagram above briefly explains how the RFID system works]

## THE ALARM SYSTEM AND INSTALLATION

The RFID reader is installed just below the bulwark facing outwards and also around the Bridge wing. The reader creates radio waves around the ship and whenever the tag passes through these waves it sends the signal to the computer which controls the reader and the alarm is activated.

A monitor is also installed on the bridge in which the location of all the readers is stored so whenever reader is activated the location can be detected which can be helpful in telling the location of the man overboard and can be rescued immediately. The unique id stored in the tag is displayed on the monitor.

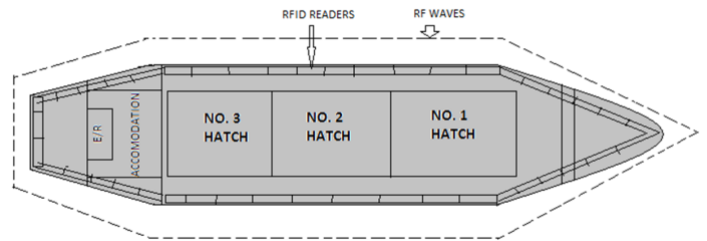


Fig.3: [The above diagram briefly explains where the readers are placed. In reality they will be spaced and installed according to their ranges and closer to the outer hull. The range is so adjusted that the waves are projecting outwards and not on the deck and also in a fashion such that the whole ship is surrounded by the RF waves.]

#### **MAN, OVERBOARD STATISTICS:**

- 90% MOB deaths have happened during calm weather
- 24% happened during night
- 76% happened during day time
- 63% were non swimmers
- Average age of causalities: 47

As in 2015, 256 deaths are caused due to disappearance of seafarers, which is a huge matter of concern.

#### **CONCLUSION**

The above-mentioned system is a simple application of RFID. The installation of this system is very simple and is also cost effective. This will benefit the crew and the passengers onboard as it is immediately detected and actions can be taken to save a life as soon as possible.

#### **REFERENCES**

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