RESCUE BOAT SAFETY MECHANISM

Methodology Flowchart

1 Identifying accident types for each boat type

2 Prevention of oncoming collison through the usage of Ultrasonic sensor

3 If prevention is not possible then,Impact sensor detects and activates the mechanism

4 Ignition of chemical reaction:-
1. $2 NaN3 \rightarrow 2 Na + 3 N2 (g)$
2. $10 Na + 2 KNO3 \rightarrow K2O + 5 Na2O + N2 (g)$
3. $K2O + Na2O + 2 SiO2 \rightarrow K2SiO3 + Na2SiO3$

5 Deployment of nitrogen filled lifeboat

6 Simultaneous transmission of SOS to nearby emergency authorities

7 Detaching of lifeboat from the original vehicle

8 If by chance, the impact sensor doesn't work, manually override using emergency switch

For power supply, Hydroelectricity through turbine will be used to charge battery, which will power all the electronic components
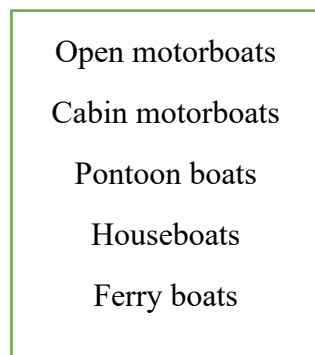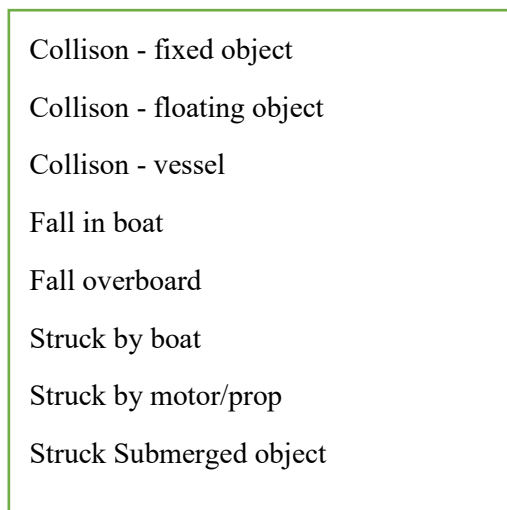
Methodology

This methodology takes a look at the model " RESCUE BOAT SAFETY MECHANISM" that will take place during emergency accidents:
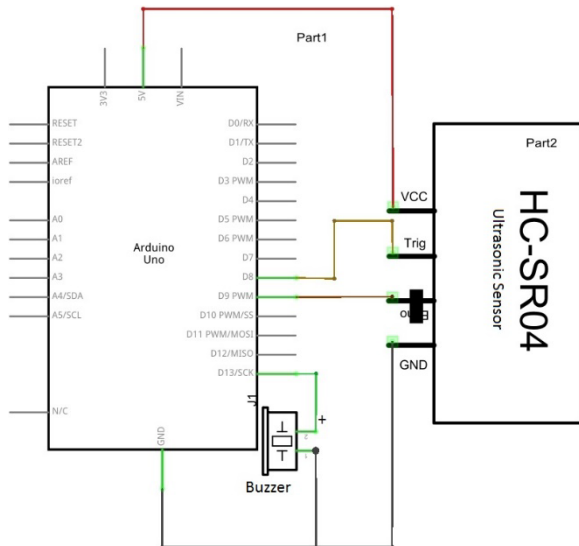
1. Identification of accident :

SUITABLE BOAT TYPES

Open motorboats

Cabin motorboats

Pontoon boats

Houseboats

Ferry boats

PREVENTABLE ACCIDENT

Collison - fixed object

Collison - floating object

Collison - vessel

Fall in boat

Fall overboard

Struck by boat

Struck by motor/prop

Struck Submerged object

# 2. Prevention of oncoming collision through Ultra-sonic :

The HC-SR04 ultrasonic sensor uses SONAR to determine the distance of an object just like the bats do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package from 2 cm to 400 cm or 1" to 13 feet.

Through the usage of this ultrasonic sensor, the vehicle will also be able to detect nearby & prevent oncoming objects that are on the trajectory of the boat.

Why Ultrasonic?

Till now Ultrasonic technology has been the most efficient in anything regarding the waterbodies, infrared are not effective in underwater due to high amount of reflection.

3. Utilization of Car Air bag mechanism for lifeboat deployment :
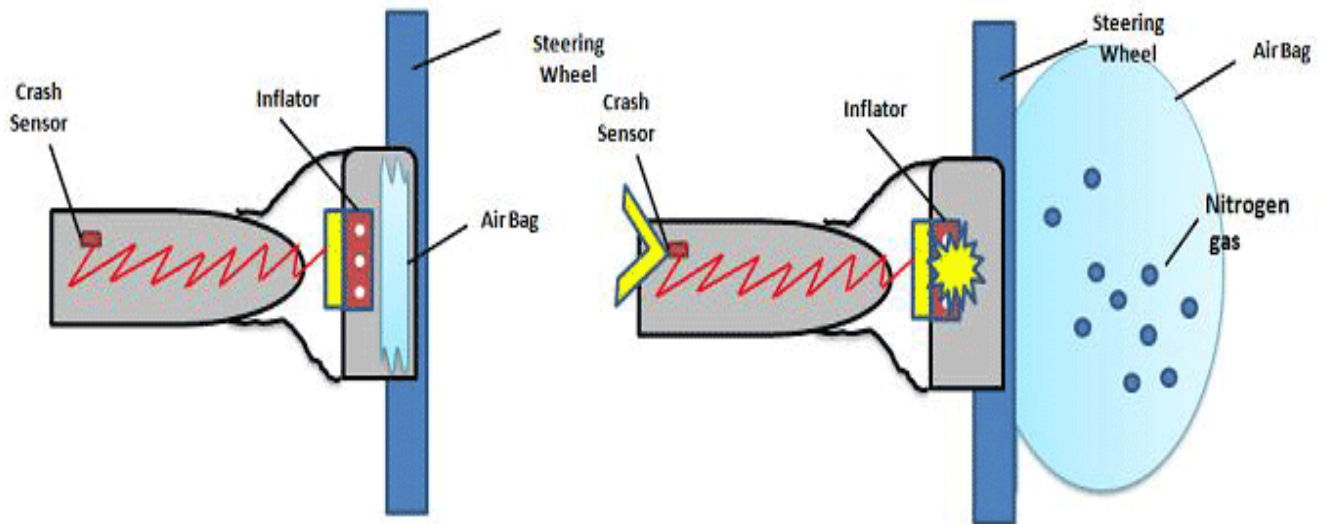
We'll be using the concept of airbags that are used on all cars during emergency accidents, which consists of the mechanisms, detecting the onset of crash through the necessary sensors placed, and sending a signal for the inflator to fill the air bag with nitrogen in rapid succession ,

to implement it on a BOAT as an ADD-ON device/modification that can be attached on and removed when as willed

Why Car air bag mechanism?

The safety air bags of a car are able to be deployed within milliseconds, similarly the lifeboat will get deployed almost instantaneously from the original boat.

4. Ignition of chemical reaction :

The following reactions will take place during the mechanism:

1. $2 \, NaN_3 \rightarrow 2 \, Na + 3 \, N_2 \, (g)$
2. $10 \, Na + 2 \, KNO_3 \rightarrow K_2O + 5 \, Na_2O + N_2 \, (g)$
3. $K_2O + Na_2O + 2 \, SiO_2 \rightarrow K_2SiO_3 + Na_2SiO_3$

Why we use nitrogen?

Any kind of small damages occurring on the boat will not affect the nitrogen gas's intergrity which is filled inside the lifeboat,

i.e, leaking of nitrogen gas from the lifeboat will not happen.

5. Simultaneous SOS Transmission :

When an accident takes place , nearby emergency authorities will be contacted through the usage of **GSM module.**
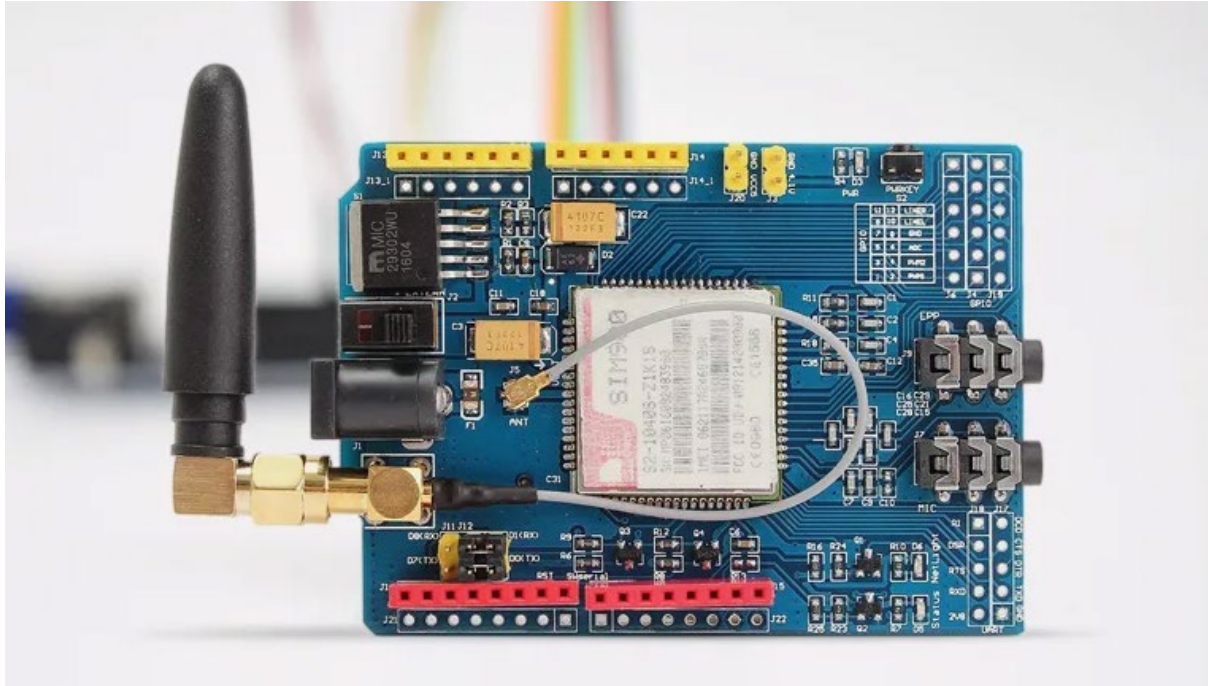

This GSM based Emergency Calling System (SOS) It is used along with the national highways. Users can push emergency call button placed on the SOS box, the call will be initiated to the control room.

Same time sms send to the patrolling vehicles and ambulance too. The Unit works with Battery as well Solar Panel. Its working is continuously monitored by service provider. Battery Status, solar status.It helps to keep the system running 24x7.

6. Ejection of lifeboat :

For ejection of the deployed lifeboat, *ejection sensor* DC 12 V electromagnetic cabinet door lock will be used
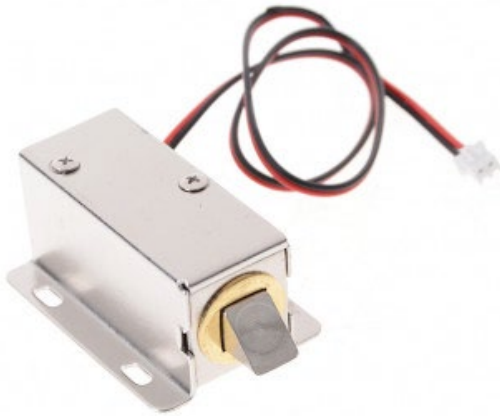
7. Emergency manual switch :

If by chance the impact sensor doesn't work, a manual button will be available to use the, the same will be available for the ejection sensor mechanism as well

Mini Hydroelectric power supply :

Hydroelectricity through the turbine will be used to supply the power to all the electronic components.

Why hydroelectricity?

As especially during cloudy days, solar panel will get very dirty as time goes & will not be able to generate sufficient voltage.
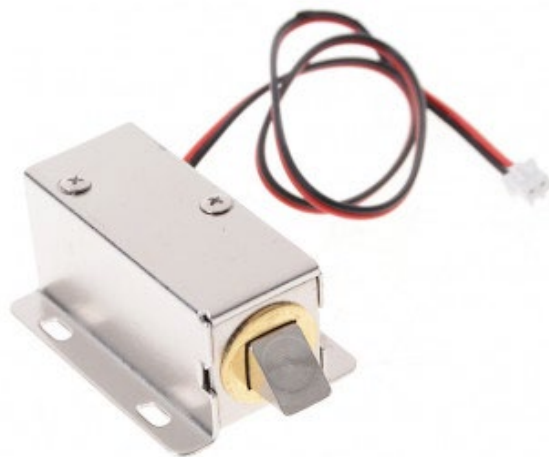
Parts

1. Arduino UNO

2. Ultrasonic sensor

3. Impact sensor

4.Ejector sensor
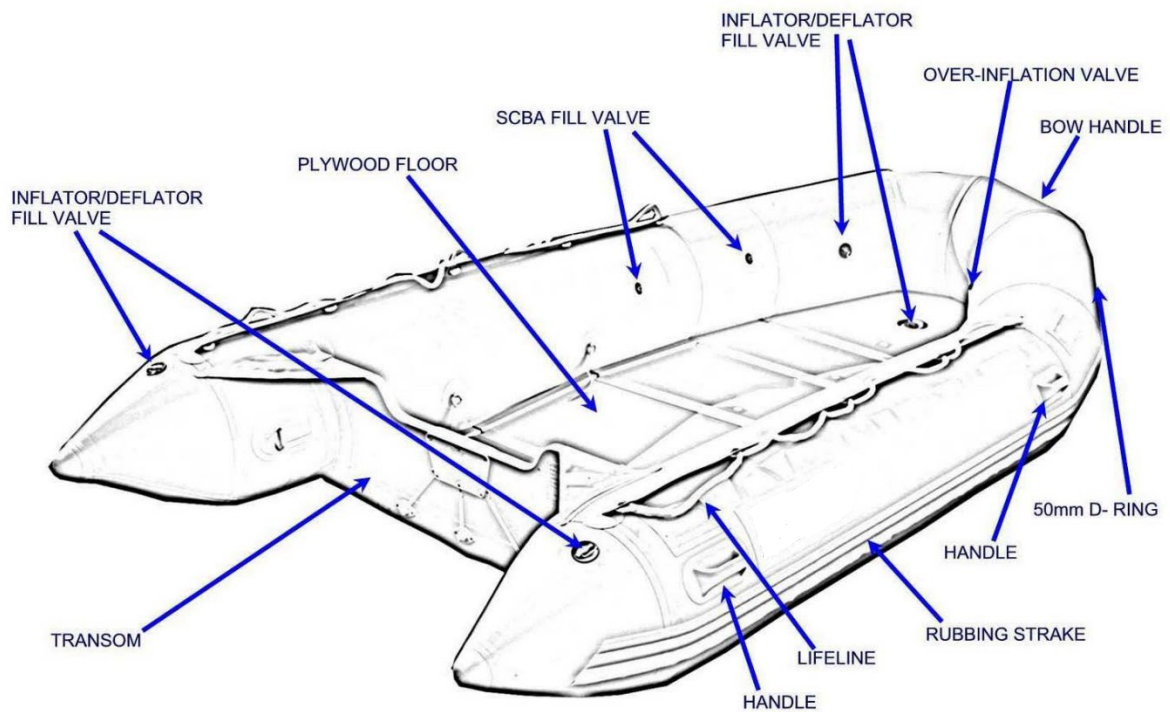
5. Chemical reaction box

6. Turbine

7. Battery

8. Mini DC inverter

INFLATOR/DEFLATOR
FILL VALVE

OVER-INFLATION VALVE

BOW HANDLE

SCBA FILL VALVE

PLYWOOD FLOOR

INFLATOR/DEFLATOR
FILL VALVE

50mm D- RING

HANDLE

TRANSOM

RUBBING STRAKE

LIFELINE

HANDLE

9. Nitrogen Rescue boat
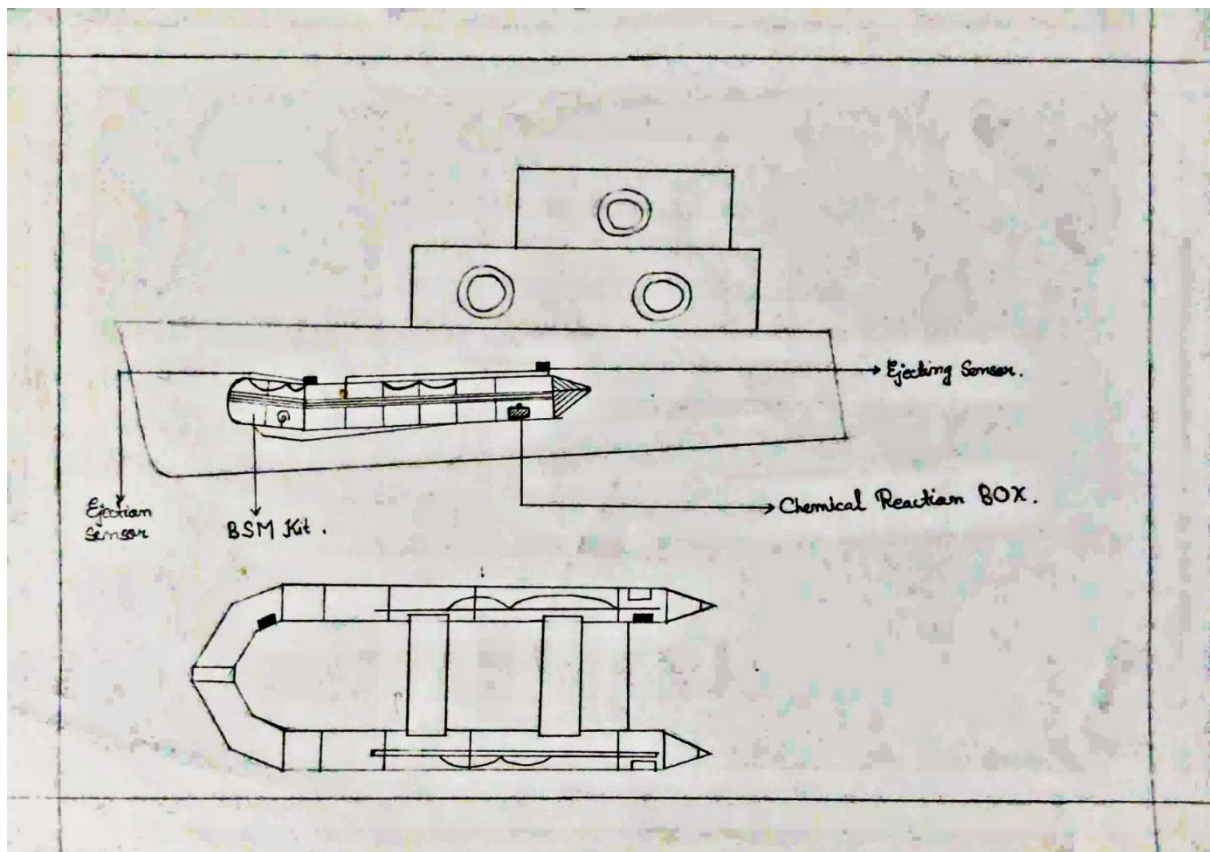
Scanned Hard copy Model
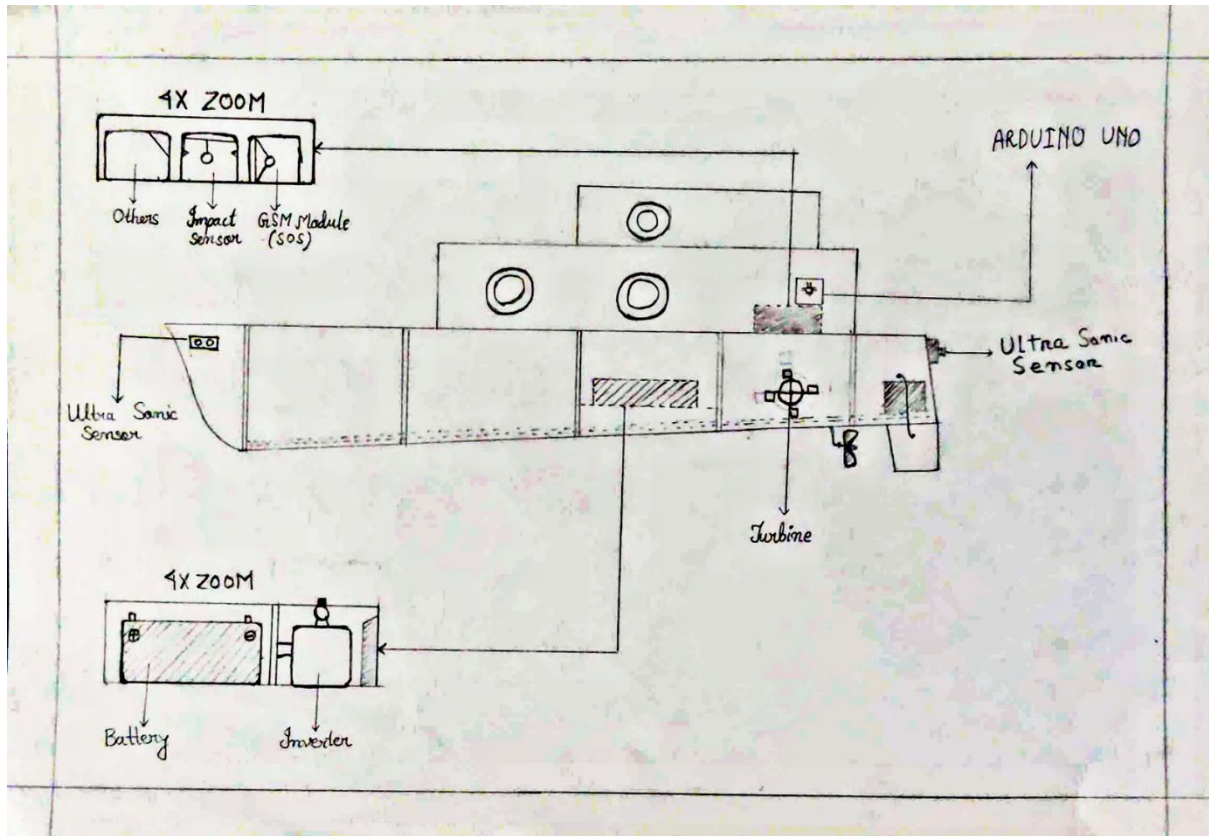
Fig 1.

Fig 2.

Reference URL

1. Object detection - https://arduinointro.com/projects/using-the-hc-sr04-ultrasonic-sensor-to-detect-objects

2. SOS GSM module - https://lastminuteengineers.com/sim800l-gsm-module-arduino-tutorial/

3.Car Airbag mechanism - https://cecas.clemson.edu/cvel/auto/systems/airbag_deployment.html#:~:text=In%20the%20event%20of%20a,potassium%20nitrate%20(KNO3).