



National Institute of Ocean Technology

Ministry of Earth Sciences, Govt. of India
web:<http://www.niot.res.in>; e-mail:auv@niot.res.in

NATIONAL COMPETITION ON STUDENT AUTONOMOUS UNDERWATER VEHICLE (SAVE) – INDIA-2012 REGISTRATION FORM

Name of the Student:

Year of Studying:

Address & phone no:

Email Address:

College/University:

Name of Principal / Director with
address of College & Phone /Fax no:

Name of faculty/Guide with
Phone no and Email :

List of participant's name of AUV Team (5 persons only):

Sl.No	Name of the Student and address	Year of Studying	Engineering Discipline	Email address and Phone No

Instructions:

1. How to apply:

Register through online: <http://www.niot.res.in>

2. List of documents need to be enclosed:

1. Registered application Form
2. Letter from college in letter head duly signed by V.C/Dean/Director/Principal should be enclosed with PDR document otherwise the application should be rejected
3. Design documents
4. Submit application form with preliminary design documents on or before 3 December 2011

3. Important dates

- | | |
|--|----------------------------|
| 1. Announcement | 4 November 2011 |
| 2. Registration and Submission of Preliminary Design Report (PDR) | 31 December 2011 |
| 3. Announcement of Phase I selected teams | 05 January 2012 |
| 4. Review of Conceptual Design Report (CDR) and presentation at NIOT | 23 January 2012(tentative) |
| 5. Announcement of successful teams Phase II | 26 January 2012(tentative) |
| 6. Demonstration of AUV by Student Teams | 19 March 2012 (tentative) |
| 7. Announcement of winning team | 19 March 2012 (tentative) |
| 8. Winning team will have an opportunity to participate in international competition to be held in SAN DIEGO, USA. | July 2012 |

4. Hard copies could be sent to the Address:

The Co-ordinator- SAVe
National Institute of Ocean Technology
Velachery Tambaram Main Road
Pallikaranai, Chennai
India – 600100
Phone: 044-66783533 / 66783547
Website: www.niot.res.in

****Please look at our website <http://www.niot.res.in> for any updates.***



NATIONAL COMPETITION ON STUDENT AUTONOMOUS UNDERWATER VEHICLE (SAVe) – INDIA-2012

Design document details:

1. Objective

National Institute of Technology (NIOT) announces a competition for students pursuing engineering degree to visualize and design **STUDENT AUTONOMOUS UNDERWATER VEHICLE (SAVe)**. The focus is on developing innovative underwater water technologies needed for ocean observation.

2. Ocean Observation

Coastal areas are among the most vulnerable of all regions to global climate change. Projected impacts from global warming include rising sea levels, intensification of tropical cyclones, larger storm surges, increasing sea-surface temperatures, and – as the oceans absorb more of the carbon dioxide human activities emit to the atmosphere – growing acidification of surface waters. For coastal ecosystems and coastal communities, the consequences of such developments could be considerable. Warming water temperatures and acidifying oceans risk degrading the ecology of coral reefs and may threaten the artisanal and commercial fisheries that provide livelihoods for many coastal communities.

With an estimated 50 percent of the world's population now living within 60km of the coast and 60 percent of cities with population over 5 million located within 100 km of the coast, the potential impacts of climate change on coastal development and infrastructure is considerable. Ongoing development has manifested in the form of urban centers, tourist resorts, ports and industrial areas. The rising sea levels and larger storm surges caused by climate change threaten to compound such risks. In order to understand the Ocean systems, continuous time-series observation is essential and development of innovative Autonomous Underwater Vehicle with suite of sensors would be very useful

3. System

The conceptual basis for SAvE, is a highly mobile autonomous underwater vehicles (AUV) to be built on sound but simple engineering principles. It is envisaged to facilitate oceanographic observation using suitable underwater vehicles. New technologies are needed to enhance surveillance and inspections of marine activities in the coastal zone that includes major ports, small inlets, beaches, remote coastal areas and their approaches.

4. AUV- Subsystems

4.1 Payload

An innovative payload is to be designed by the students which shall serve as the primary purpose of the mission. The students have to develop a single instrument or a group of sensors to monitor significant oceanic parameters like ambient temperature, pressure to name a few or even high resolution photos

4.2 Power

AUV will be self powered.

4.3 On Board Processor

An integral part of the AUV is its powerful onboard computer, which is based upon a processor board. This computer should execute a control program based upon a flexible high-level behavioral language to be developed indigenously by students, and support vehicle control in a wide range of conditions and mission profiles. It should be a robust yet flexible platform so that new mission profiles can be quickly configured, tested and entered into the computer's library.

4.4 Propulsion system

Easily maneuverable, energy efficient, simple propulsion control is required. Thrusters are to be designed. To monitor the attitude (orientation) of the AUV sensors have to be developed along with a control algorithm to control & orient its attitude to facilitate efficient data acquisition and precise navigation.

4.5 Communication

Another pivotal unit is a sophisticated acoustic modem responsible for reliable two-way digital communications between docking station and AUV after it surfaces.

4.6 Structure

A robust, reliable, hydro-dynamically stable, maneuverability structure has to be evolved to support the mission and withstand the hostile conditions of sea environment.

5. GENERAL REQUIREMENTS

5.1 Docking

SAVe should surface in a circular area marked by a floating ring of 4 m diameter

5.2 AUV

- Payload : an underwater camera , depth sensor, temperature sensor, navigation system
- Total weight: Optimum weight satisfying all the operational condition.
- Size: < 2 m in length & 0.5 m in dia
- Depth rating : 25 m
- Associated signal processing methods to be developed
- a single hardware device to support multiple applications
- Propagation paths.
- Hardware for data communications after surfacing
- Efficacy of selecting a system's architecture to take maximum advantage of expected technological evolution.

6. ELIGIBILITY CRITERIA

- Pursuing all under graduate and post graduate engineering students are eligible for the competition
- A team should contain maximum 5 students and 1 guide from their faculty

7. SCOPE OF STUDENT TEAMS

All the expenses related to design, fabrication, hardware, software of Autonomous Underwater Vehicle (AUV) for this competition would be of the responsibility of individual student team. NIOT would not bear any expenses relating to the Student Team Autonomous Underwater Vehicle (AUV).

8. SCOPE OF NIOT

NIOT would select a best team through this Competition and sponsor that team to participate in International Competition to be held at SAN DIEGO, USA.

9. SELECTION PROCESS

- Students through their educational institution can apply for this project
- Team should have 5 students and should be multidisciplinary

10. PRELIMINARY DESIGN REPORT (PDR)

Upon announcement of this student project through NIOT web site and communication to Academic Institutions, entries are expected to be submitted to NIOT through educational institutions with forwarding letter from Head of Educational Institution (Director or Vice Chancellor or Principal) along with a Lead Faculty (LF) who will coordinate with NIOT. The entry should have the list of students and their affiliation / specialization with their brief CV (not more than one page).

A Preliminary Design Report (PDR) comprising of the concept, literature review, design methodology, 3D simulation depicting the concept, brief theoretical substantiation of the design proposed, block diagram of the concept, , Project document, with theoretical modeling, methodology of operation, design, 3D model, Video simulation .

- Report format : max 10 pages; A4 size; Arial 10; 1.5 spacing; pdf
- NIOT through a panel of experts will scrutinize these entries and select the successful entries qualifying for Phase I
- A mentor will be identified who could associate with this group in developing the concept.

11. CONCEPTUAL DESIGN REPORT (CDR)

The selected team shall submit Conceptual Design Report CDR with detailed description of the concept including detailed specification, circuit level design, detailed mathematical modeling, Commercial Off-The-Shelf equipment (COTS) required. NIOT shall also extend his expert guidance through state-of-the-art facility and industrial experience. NIOT would appoint a Mentor who shall guide the team in preparing CDR. Then selected teams would be asked to make a presentation at NIOT

- On the basis of the CDR review next level of selection (Phase II) will be done
- Then successful teams would be asked to submit Engineering Design Model
- The winning team may be able to participate in the International AUV competition in USA
- NIOT s research vessel facility would be extended to understand the practical challenges involved while working offshore

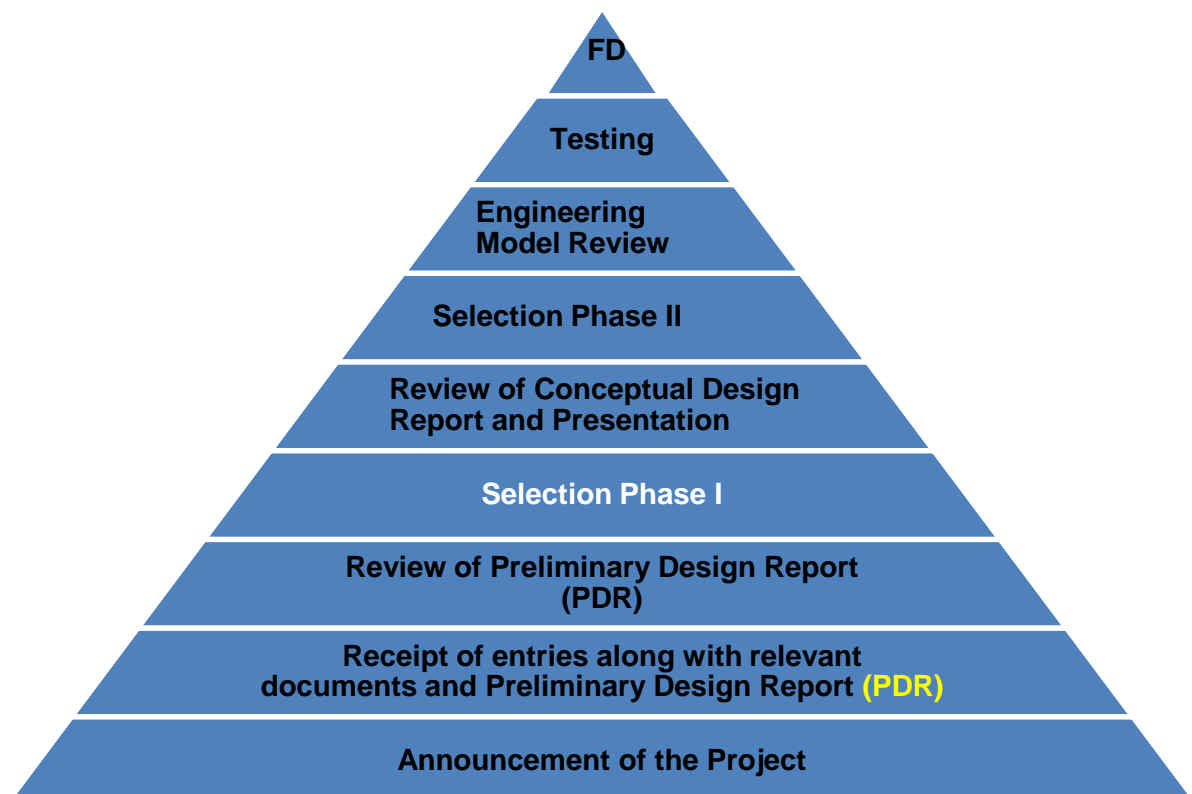
12. SPIN OFF

- In addition to research it can focus on research, simulation, and evaluation of coastal defense and marine domain awareness equipment, sensors and components.
- To be efficient and cost effective it is imperative to mount the surveillance systems and sensors on autonomous platforms that can operate unsupervised for extended periods of time.
- In future it could be possible to effectively integrate sensors with underwater, surface and airborne autonomous and remotely operated platforms and to incorporate video and image analysis and data mining methods to quickly and effectively identify threat events.
- The algorithms developed can automatically detect moving objects of interest, identify their location, track them through a video sequence, and classify them into semantic categories.

13. IMPORTANT DATES

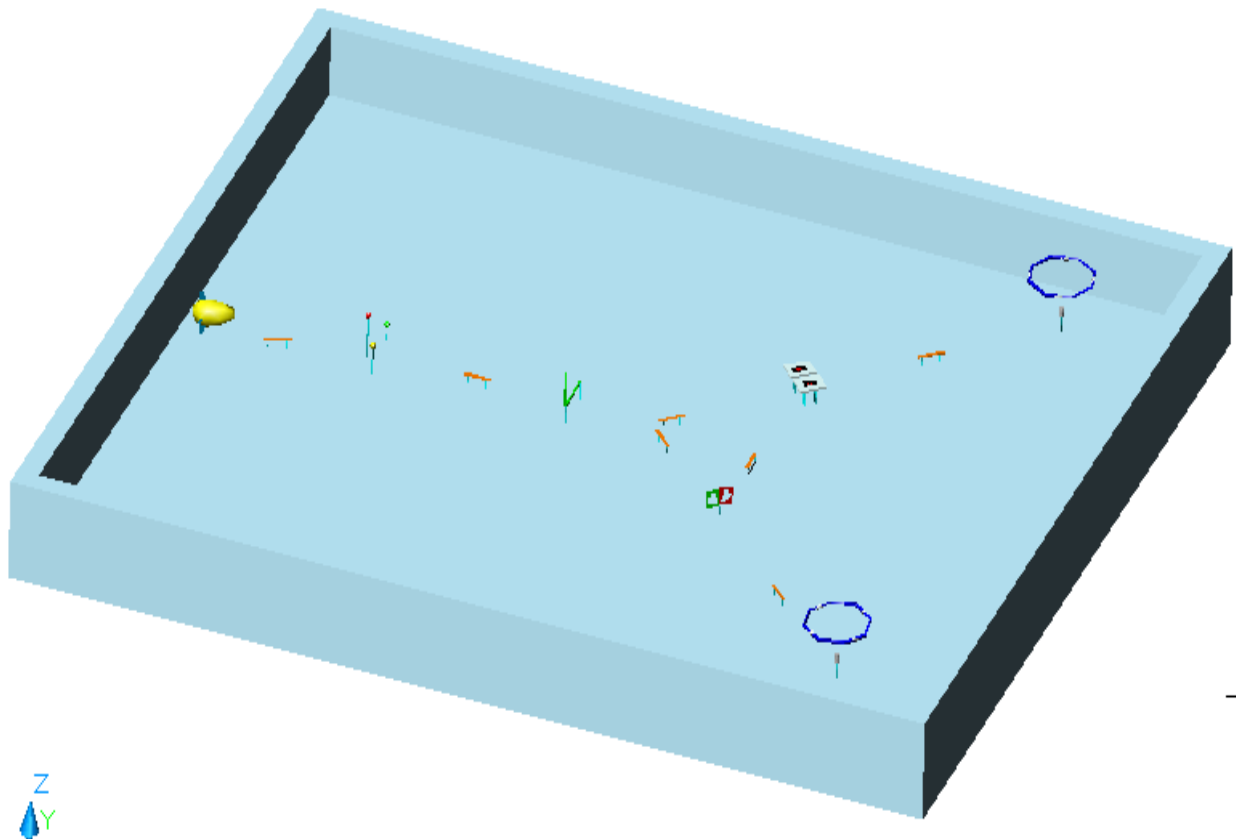
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14. STAGES OF SELECTION



NIOT would decide on all the above activities pertaining to this National Competition and its decision is final.

Operational Design criteria



Available Tank Specifications:

- **Length: 25 Meter**
- **Breath: 20 Meter**
- **Water height: 2 to 2.5 Meter**

Route

We will specify Launching point. Starting from that, AUV have to dive down and follow an “orange path”.AUV has to touch a buoy (meant for imitating “collect flowers”. Then, AUV has to follow the orange path and pass through a “L” shaped PVC bar (AUV has to pass over this) and have a choice of two direction.

- In the left side route, AUV has to drop markers in bins(Markers may be plastic /metal sheet boards).
- In the right side route, AUV has to fire an arrow through a heart shaped cut out (fire a “torpedo” through a heart cut out).

There exists a connecting path which joins these two routes. Depends on the time left, AUV can complete both route using the same time.

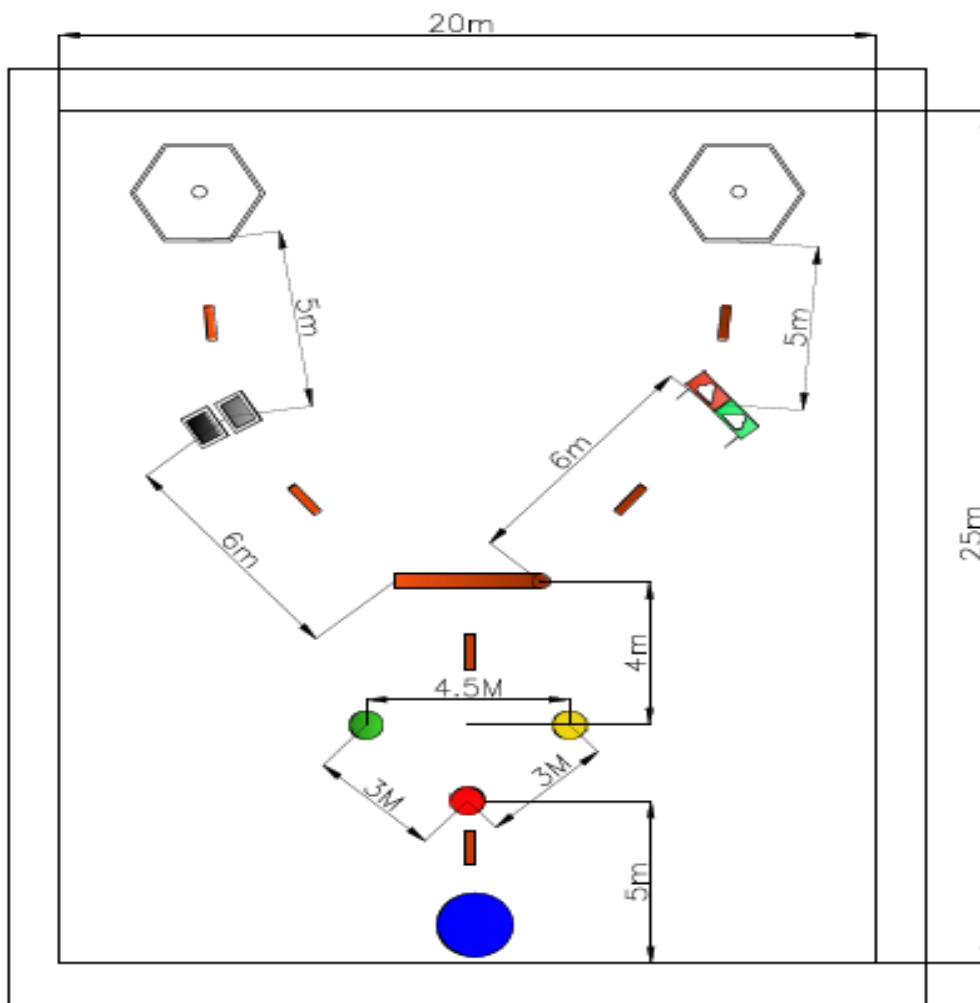
Finally, by following available path, they can surface with in the octagon.

AUV that at least one buoy places at least one marker in the bin and fires at least one torpedo through the heart cutout and surfaces fully within the octagons (no part outside the structure) that complete the mission 100%.

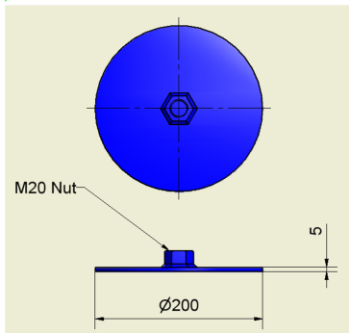
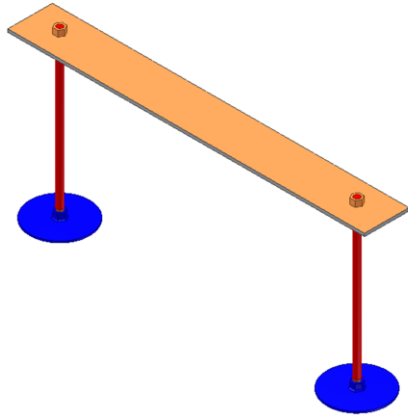
Note:

- We may reduce the final Octagon to one depends on the pool size
- In such situation we may place the targets, markers in bin and fire arrow in heart cutout may be series (one after other).
- With the flexibility we can check their AUV's adaptation capability

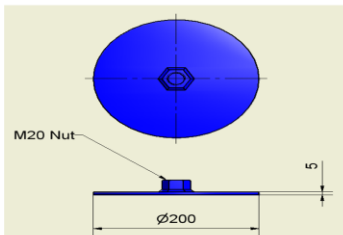
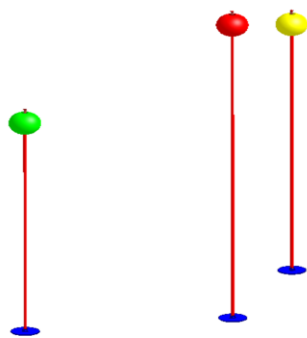
Targets Distance:



Targets used in tank:

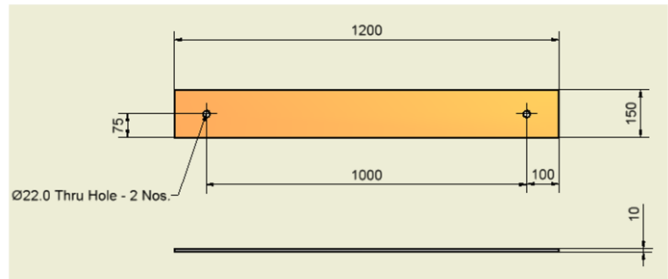


MS Base – 2 Nos.

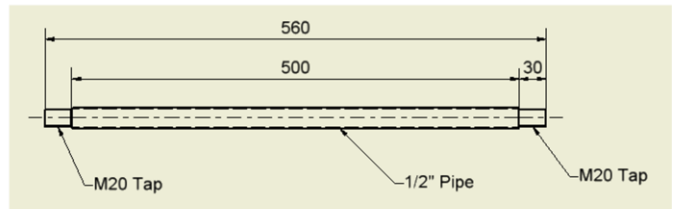


MS Base – 3 Nos.

PATH



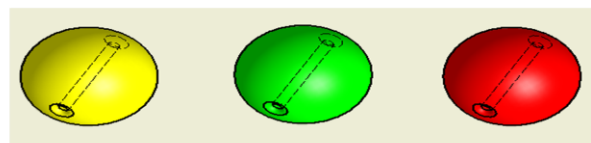
PVC PLATE – 1 No.



MS SUPPORT PIPE – 2 Nos.

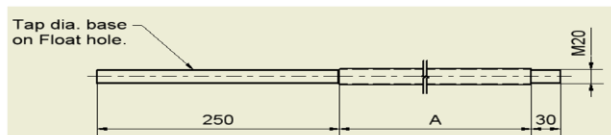
Qty.– 8 Sets.

Flowers



Yellow Float Green Float Red Float

Dia. 9" Float – Each 1 No.



MS Support Pipe		
Sl.No.	A	Qty.
1	2100	1
2	2500	1
3	3000	1

Qty.– 1 Set.