DiveSMART Baltic Guideline/SOP version 1.0

National and municipal dive task force for participation in and/or Operational command during maritime rescue operations.

This guideline consist of:

- DiveSMART Baltic Guideline version 1.0.
- DCO, for JRCC`s/MRCC`s use.
- Dive Master Checklist, (plastic covered).
- Medical and Chamber treatment.

DiveSMART Baltic Guideline/SOP version 1.0

National and municipal dive task force for participation in and/or Operational command during maritime rescue operations.

1. Introduction

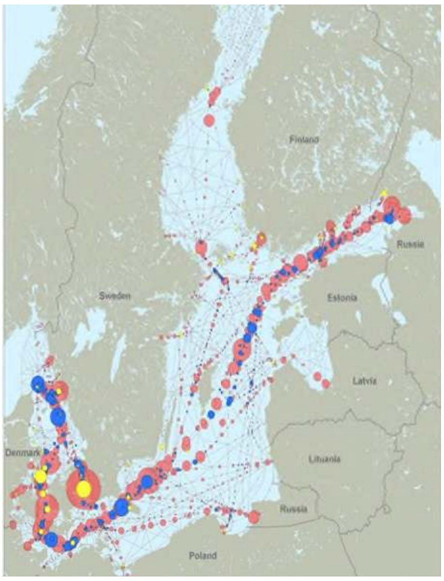
The DiveSMART Baltic module possesses underwater diving competence and Skills specific to SAR missions and environmental tasks where the situation requires greater knowledge and skills than are generally available. This manual describes the purpose of the DiveSMART Baltic module and its mobilization.

Overall principles

This manual contains guidelines, which can – and in some cases, must - be modified as necessary in the actual situation. Nothing written in this manual takes precedence over common sense and should never be allowed to prevent units to take the necessary initiatives to ensure dive safety and mission accomplishment.

This manual does not substitute the requirement for development of national plans for conduct of mass rescue missions, including the support of participating nations SRUs

Risk is increasing!



World Population

The world's population is increasing day by day with large numbers of people living close to water and utilizing water for transportation. The population growth of the world is approximately increasing by 80 million/year.

Global warming

The result of global warming may lead to more regular large storms and tidal surges affecting people.

Growing trade

As world trade increases more ships are being used to transport cargo and people. About 90 % of world trade is carried by the international shipping industry. Approx. 50 000 merchant cargo ships are operational on the world's sea as we speak

Growing terrorism threats

The possible impact of terrorism must never be underestimated.

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APPENDICES:

3. General purpose of the DiveSMART Baltic module

The main objective of the project is
To increase maritime safety and security based on advanced capacity of maritime actors.

The general purpose of the DiveSMART Baltic module is to increase capacity and efficiency for searching for and saving lives in an underwater environment where local resources are not sufficient. This is carried out by means of clear collaboration between the rescue services, the RCC`s, Coast Guards, fire departments, police, armed forces and others of those participating in the project.

The set depth limitation is set to a depth of 30 meters.

The quality of rescue operation is foremost depending on that we can carry out during first response, due to the time factor which many times is critical due to the weather conditions and cold water in the Baltic sea. Other important factors are what needed equipment that we can get in time to the accident site together with what endurance that we can establish. This also must be practiced on a regular basis, decided by the participated countries.

4. Module mission

The DiveSMART module possesses unique skills and equipment (see appendices) to combine resources above and below the water surface and in complex environments such as in enclosed spaces. Mobilization of a module will primarily be for life-saving purposes: in situations where the seriousness of an incident requires expert underwater technology and operational skills, and reinforcement of command units for underwater rescue operations.
Secondarily, a module can be mobilized to search for missing persons and to protect the environment when incidents occur.

5. Required qualifications/certificates

National certification and qualification requirements must be met in accordance with the module's mission. Each country is responsible for the qualification, training and insurance of the participants of the rescue mission.

6. Module structure

6.1 Phases

The module comprises three operational phases: phase 1, phase 2 and phase 3.

If possible, an Intelligence team should be sent out as quickly as possible for information gathering/report. If possible such a team should be a part of a 24/7 first response team. This could rotate among the participating countries. It would be useful if this team has the competes to travel by helicopter and has winching capability.

Staff/MRCC Phase 1 – High readiness 0–24 hours

Objective: quickly ascertain the scope of the incident, gather more information to assess the situation, perform a risk analysis to aid in further decisions to fully activate phase 2, and can assist local resources with diving expertise. Phase 1 should primarily be implemented by parties within the module who have trained together although (external) local resources can carry out some parts, Consists of.

- Reinforced command structure for SAR Mission Coordination (SMC) – JRCC – primarily information gathering and logistics.
- Dive team (on rescue service readiness alert) for fast life-saving operations and information gathering.

Phase 2 – Low readiness

Objective: Reinforcements to increase diving capacity, sustain operations, and support casualty management. The level of readiness is high at the technical level with staff skills equal to those working daily. Consists of.

- Phase 1 with reinforced command (JRCC), with diving related medical support.
- Reinforced command (OSC) according to required coordination and operational requirements.
- Dive teams according to operational requirements. With helmet diving capacity to carry out more penetration work which could involve.
- Technical rescue operations (TRT/International term is TRO). They should have the capacity to transport/hoist divers and equipment to the incident as well as the capacity to assist in getting injured people from the scene/incident, *see Appendix 2.2* TRO.
- Organization for managing multiple casualties.
- Units with portable hyperbaric chambers.
- The technic to preform penetration in to ship/incident in closed compartments.
- The technic to keep people alive in closed compartments.
- The technic to transport people from a closed environment to the surface for further treatment.
- Strategies for media management and liaison.

<u>Phase 3- Navy diving/submarine rescue vessels and/or Navy/ civilian Saturation Diving ships.</u>

Most likely they cannot be in place of an incent during the first 24 hours, but if they are available they could be sooner in the area. They have diving and hyperbaric treatment with most likely diving medical capacity. Some Navy´s have saturation diving system with e.g. meeting bell, habitat or a smaller Submarine rescue vessel.

6.2 Levels of Alert

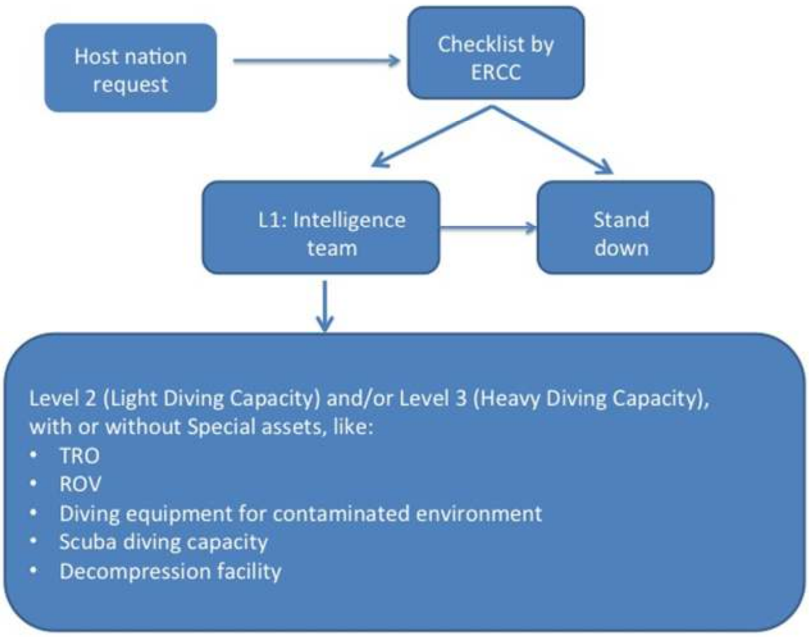
Module structure is based on three levels of alert. Levels are based on JRCC staff training.

Level 1 alert: Consists of local resources such as emergency services and/or SAR organizations, (not necessarily part of the DiveSMART module).

Level 2 alert: High pressure situation: Activate module: Phase 1 and 2.

Level 3 alert: MRO (Mass Rescue operations): Reinforce and activate module: Phase 1, Phase 2 and Phase 3.

- Level 2 alert: Activate PHASE 1 module. This includes high readiness for PHASE 2 and Phase 3 modules.
- Level 3 alert: Activate PHASE 2 module.
- Level 4 alert: Activate PHASE 3 module

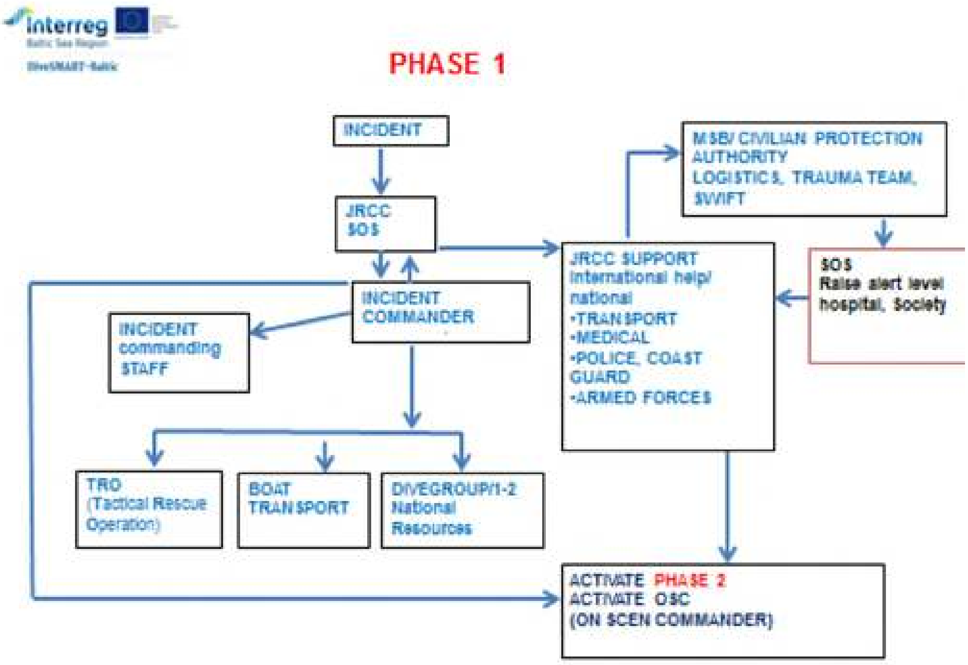


Module structure

PHASE 1

6.2.1 Levels of alert

In the event of an incident contact SOS and/or JRCC. Alarms to be acknowledged by the relevant alarm Centre and assessed according to the current incident alarm plan, see section 13.1.



<u>Special Assets – Technical Rescue Operation (TRO)</u>

Will include –

- Rope access systems to enable ascending, descending, traversing both inside and outside the vessel or structure.
- Rescue equipment to gain access to all parts of the vessel including relocation of cargo and the provision of addition access points through bulk heads for additional access.
- Lighting and power generation – to support service rescue and recovery operations on a 24/7 basis.
- Technical search equipment to support rescue and recovery.
- Stabilisation of Structure – equipment to stabilise parts of building or cargo to support safe systems of work.
- Stabilisation of Vessel – expertise of equipment to ensure safety of personnel when working on vessel.
- Confined Space Working – to support internal working for long duration without the need for respiratory protection or O2 supply.
- Communication capability to communicate with,
  - Intelligence team
  - Module team leaders

In the Data base for the DiveSMART Baltic there is an up to date list of ships that can be used and in what time.

A picture from the TRO work within the rescue operation of a football team trapped inside a cave in Thailand in the summer of 2018.

7. Module capacity

The DiveSMART module possesses unique skills and equipment to combine resources above and below the water surface, rescue persons from enclosed spaces, and undertake protective environmental operations under water capacity is based on the various levels of alert.

Level 1 alert (local rescue services) First response

- Life-saving operations under local rescue service regulations.
- Information gathering to support decision-making for level 2 and 3 alerts

Level 2 alert (DiveSMART Module 1) Operational capacity 24/7

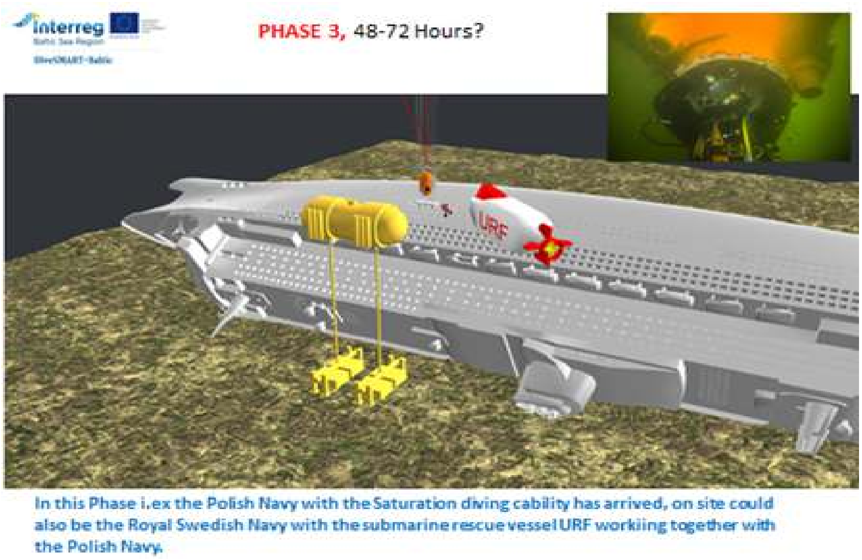
Level 2 alert divers wear a helmet or full-face mask and surface supplied gas and communications. SAR diving to a depth of 30 m.

- Perform life-saving operations in enclosed spaces which are accessible using surface supplied gas.
- Work involving light hand tools.
- Could involve Sidemount diving
- Information gathering for level 3 alert.

Level 3 alert (DiveSMART Module 2)

Level 3 alert divers wear a helmet and surface supplied gas and communications 24/7 or other predetermined time frame.

- SAR diving to a depth of 30 m.
- Perform life-saving operations in enclosed spaces which are non-accessible.
- This could mean finding and keeping people alive in closed compartment while planning for their rescue is taking place.
- Perform transportation of victims/survivors through the water till safety.
- Perform life-saving operations in contaminated water category 1 and 2*
- Work with hydraulic and pneumatic tools such as for cutting through/penetrating the hull.
- Operations to limit environmental damage.
- Hyperbaric chamber treatment available at the scene of the incident.



8. Module equipment

The DiveSMART module Level 2 and 3 alerts are responsible for ensuring that equipment is available to maintain life-saving capacity for level 2 and 3 alerts 24/7 or other predetermined time frame. For the countries/members there is a possibility to practice with some of the equipment used in the module.

See DiveSMART Baltic Country DATA update at JRCC or www.coastguard.se.

9. Communications and follow-up

Communication during operations shall be carried out using, however, exemptions may be made should the SMC request transition to VHF/. Dive teams' internal communication is carried out in accordance with its own organizational procedures. Liaison and communications are established by the central command unit, this includes cooperation with other countries involved.

Preparedness:

- Use allocated Call Signs.
- Have a capacity to communicate internationally i.e. from affected country to home country.
- Have access to field internet.
- Have access to and be trained in the use of GPS.

10. Safety and Risk Assessment

Overall principles

This manual contains guidelines, which can – and in some cases, must - be modified as necessary in the actual situation. Nothing written in this manual takes precedence over common sense and should never be allowed to prevent units to take the necessary initiatives to ensure dive safety and mission accomplishment. This manual does not substitute the requirement for development of national plans for conduct of mass rescue missions, including the support of participating nations SRUs. Before a diving operation begins the mission coordinator in charge of the DiveSMART modules shall carry out a risk assessment for the unit and the mission, so that the risks to which they are exposed is reasonable in relation to what can be achieved by the operation.

Individual dive masters shall officially carry out the final risk assessment for his/her dive team. This assessment to be valid for 1 day, or for new/changed information or conditions and is to be reported up in the organization.

Introduction

A major part of risk reduction is trained personal, teams and support ships. A part of the risk reduction is to establish.

- Are the surroundings as safe as possible due to weather a.s.o?
- How is the Vessel secured?
- Is the vessel moving, how much can be accepted?
- What can we do before we send in the divers?
- How do we get the information that safety level has changed?
- Abandon the vessel in case of emergency and how quick can/must we do it?

Organization

Generally, to reduce risk you need to reinforce the resources on site. Focus on medical staff, communication staff and fast transport. Monitoring of the vessel in distress need careful attention and external expertise could be needed.

a) Vessel moving:

To reduce the risks associated with entry into capsized, damaged, or ditched craft, ensure that:

- the craft is afloat evenly at both ends, there are no obvious air leaks, and there is no change in the draught for at least 30 minutes;
- measures for the prevention of foundering, such as side support and fitting of floats, have been fully carried out;
- the craft is sitting on the seabed and there is no danger that it may turn over;
- the portion above the waterline is more than one meter and the vessel is floating in a stable manner without air leaks;
- there are no fishing nets or other debris which may hamper diving;
- leaking hazardous materials and fuel are avoided;
- the rolling and pitching of the craft is under control so that diving will not be hampered; and no lifting is conducted until the divers return to the surface.

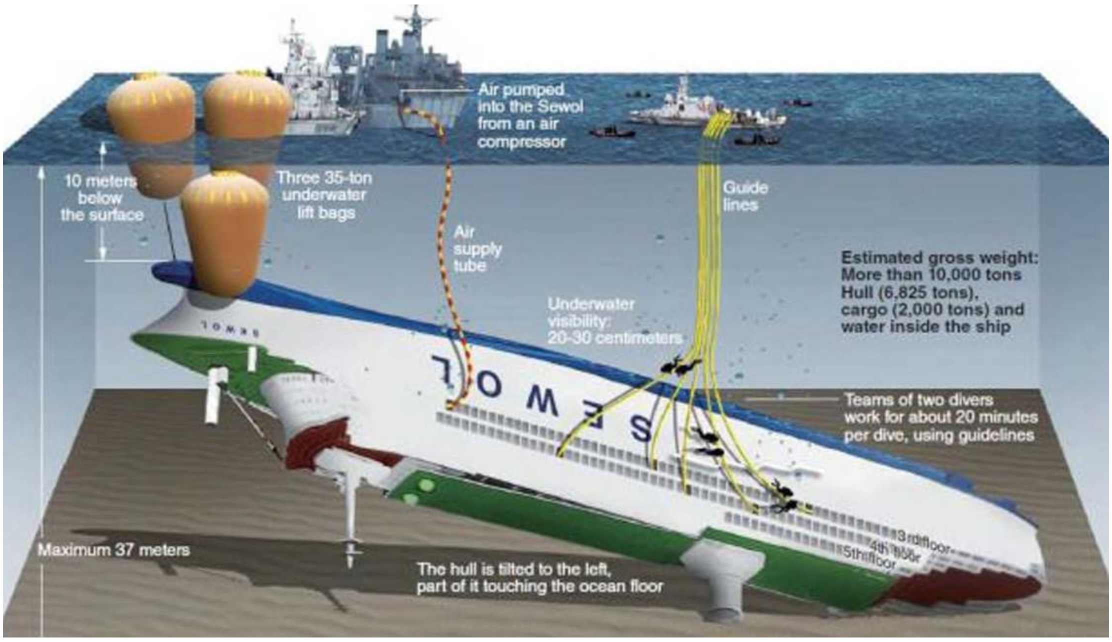
b) Position off the divers:

- The divers need to report their position continuously. Use Deck name or number and cabin number or follow the Safety plan.
- A common risk analyze regarding the umbilical length is not to use more than half the length for penetration, and the rescue diver should have longer umbilical than the penetrating diver.
- If umbilical with communication isn´t available use of observing ROV should be used.

c) **Hazardous environment/Contamination**:

- When contamination levels are believed to exceed health limits of the planned dive exposure time it is declared Hazardous environment.
- Experts in chemical response should be consulted concerning Personal protection level for diver and support personal.
- Decontamination station needs to be prepared before start of diving in Hazardous environment.
- Risk reduction activities should be performed.
- Setup of hot, humid and cold zones is needed.
- Used contaminated equipment should be destroyed or placed in sealed containers.

(Reference IAMSAR Manual, DykSMART SOP, JFWEDROP SOP, UNDAC Handbook, Baltic ACO manual, NATO Submarine rescue, NATO SAR).



Search and rescue operations are dependent on multiple resources (with different capacity and capability) working in close concert with each other. These operations take place in environments that can be both dangerous and hazardous. Anyone assigned to a work site that fails to carry out their respective assignment in a safe and secure manner, increases the risk of injury or death to themselves or a team member. Although the risk of injury or death is greatest during disaster operations, it’s always relevant. Though the government of the host country is responsible for the safety of international responders, DiveSMART team management is ultimately responsible for safety and security of team members. However, all team members are personally responsible for their own safety and security and that of other team members including the need to identify, isolate, report and mitigate unsafe or insecure situations.

Preparedness

Personnel — team management should ensure all team members:

- Are physically able to perform their tasks.
- Have appropriate immunisations for working in the affected country.
- Have appropriate documentation (i.e., passport, visa, Certificate of vaccination, emergency contacts for next-of-kin).
- Work in appropriate PPE for the incident environment.
- Have appropriate clothing for the climate.
- All personnel are cleared medically prior to deployment.

Equipment and supplies — team management should ensure:

- Safety practices are incorporated into the packaging, labelling, storing, and movement of personnel and equipment.
- Operator manuals should accompany specialised equipment.
- Team members must be trained in the use of their equipment, PPE, hazard identification and mitigation procedures.
- Sufficient quantities of food appropriate for entry into the affected country is available and will not adversely affect personal health and performance.
- Adequate water is available for the initial phase and that there is sufficient water purification equipment to support the team 's needs.
- Sufficient sanitation and hygiene provisions are available for deployment.

Security — team management should ensure:

Team members are trained to understand and conform to security practices as specified by the UN Department of Safety and Security. Depending on the security levels in place it may be necessary for teams to be escorted by security services.

11. Code of Conduct

All personnel in a DiveSMART module shall behave in accordance with the code of conduct and core values of their own authority or organization. The participants are expected emphasize good judgment and aware of any form of harassment due the sex, religion, origin or other basic values is prohibit. All communication with the press should be through the commanding staff or by them an appointed person. Refer to other related policies (for example: handling of confidential information, harassment and conflict of interest.

12. Module preparations

12.1 Training and exercises

Every organization or authority that provides DiveSMART module personnel is obliged to keep team members informed of any updates to the SOP or other guidelines that alter module regulations. All module members to maintain operational readiness by participating in all planned exercises. All module members to maintain operational readiness by having updated passports, health checks and any vaccinations, and be approved for the position they uphold by their authority's/organization's regulations. They are to be employees of and insured within the authorities/ organizations which they represent.

Practical diving exercises. The module must, at least once a year, organize and practice/ perform practical diving exercises in all aspects of the DiveSMART module alert levels.

Training exercises to be planned to involve all the authorities and organizations that have underwater divers, logistical missions and medical missions to improve coordination/collaboration and capability. The team shall also practice under its regular exercise schedule – especially operational methods – according to the training plan.

Table Top/command unit exercises
The module to, at least once a year, practice and carry out a command exercise.
The exercise to be carried out jointly with JRCC/SOS to practice response forces pool and alerts. Recommendations are for command unit training to be arranged approximately one week prior to the practical diving exercise to work with the same scenario. Training objectives to be changed from exercise to exercise so that skills and experience are developed and kept up to date.

12.1.1 Exercise planning and responsibility
Planning of – and responsibility for – exercises is carried out by the DiveSMART module administration with support from the authorities involved.

12.2 Module equipment: care and maintenance
Each organization or authority that provides equipment for the DiveSMART module will be responsible for its care and maintenance in accordance with the service intervals recommended by the manufacturer.

13. Procedures
13.1 Alarms
In the event of an incident contact SOS and/or JRCC. Alarms to be acknowledged by the relevant alarm Centre and assessed according to the current incident alarm plan. JRCC to instigate a level 1and/or level 2 alert. Depending on the information the level will be set either to 'cancel' or level 3 alert. JRCC AND SOS to use the regular response force/check list to raise the alarm.

13.2 Before deployment, operational readiness
The DiveSMART module is obliged to be in a state of operational readiness in accordance with the following:

- Maintain a very high readiness for deployment through training, exercises and routines.
- Report module capacity levels to the national response forces pool on an annual basis. Report any changes in the structure of the module to the national response forces pool.
- Ensure available equipment in accordance with appendix 4, Report any deficiencies or damaged equipment to the response forces pool.

13.3 Division of responsibility

Each link in the module structure shall ensure that readiness is maintained – this includes ensuring compliance with qualification and certification requirements. Each organization within DiveSMART shall appoint a Resources person responsible within their own organization. This person shall possess current expert knowledge and act as liaison to the DiveSMART module.

13.4 Operation

13.4.0 Launch

Activate in accordance with 13.1 Alarms.

When there is insufficient basis for assessment: activate Phase 1 with a dive team experienced in technical rescue operations (TTE) which is mobilized to search for and secure information for further decision making. Upon activation, internal command is reinforced e.g. JRCC) with the necessary support functions to evaluate intelligence information. An initial risk assessment is carried out for further decision making.

INTERNAL COMMAND COMPOSITION UPON MODULE ACTIVATION
(each function can comprise several persons except for the SMC).

Function Task

SAR Mission Coordinator (SMC) • In charge of the operation in accordance with the
operational plan

• Gather and analyses information on the incident
• Communicate internally and interact with
involved authorities and organizations

Deputy SMC • Manage logistics flow for the module
• Media management
• Support the SMC

Technical operations experts • Evaluate information and identify what is possible
to achieve with operation
(Stability expert, object expert, • Examine the plan for the operation
technical rescue operations, etc.) • Identify requirements and resources to support the operation.
• Acquire available information about the object (safety plan, etc.)
• Assess the resource requirements for sustainability.

Experts in underwater work/diving • Evaluate information and identify what is possible to achieve with the operation

(Dive master, divers, cutting-/ • Evaluate information to identify requirements and resources for launching dive.

Explosives (tools-expert)
- Examine the plan for the operation identify requirements and resources to support the operation
- Acquire available information about the object (safety plan, etc.)
- Assess the resource requirements for sustainability.

Medical expertise
- Diving related medical expertise.
- General medical care for victims.
- Emergency care.

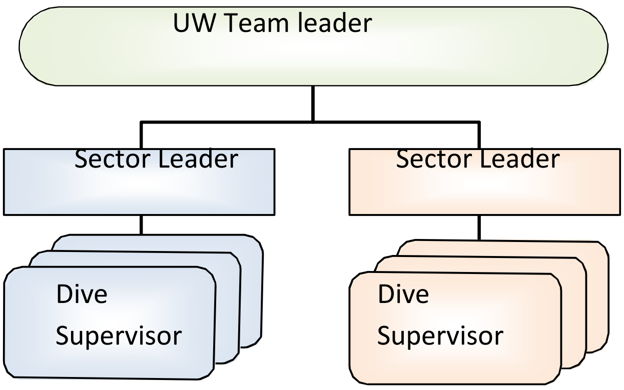
13.4.1 Transport and arrival:

General

To get the correct information from the incident a Sub-OSC/Team leader should be appointed to coordinate the UW SAR operation as fast as possible. This information is crucial to be able to make a rough risk analysis and define the UWSAR plan of action with specified objectives.

Organization

The Team leader for UWSAR must coordinate with the Sector leaders.
The incident should be divided into suitable sectors like forward/aft or by water tight compartments. Dive Teams are controlled by the Supervisor, and Supervisors are coordinated by the Sector leaders.



The use of helicopters may be a timesaving option.

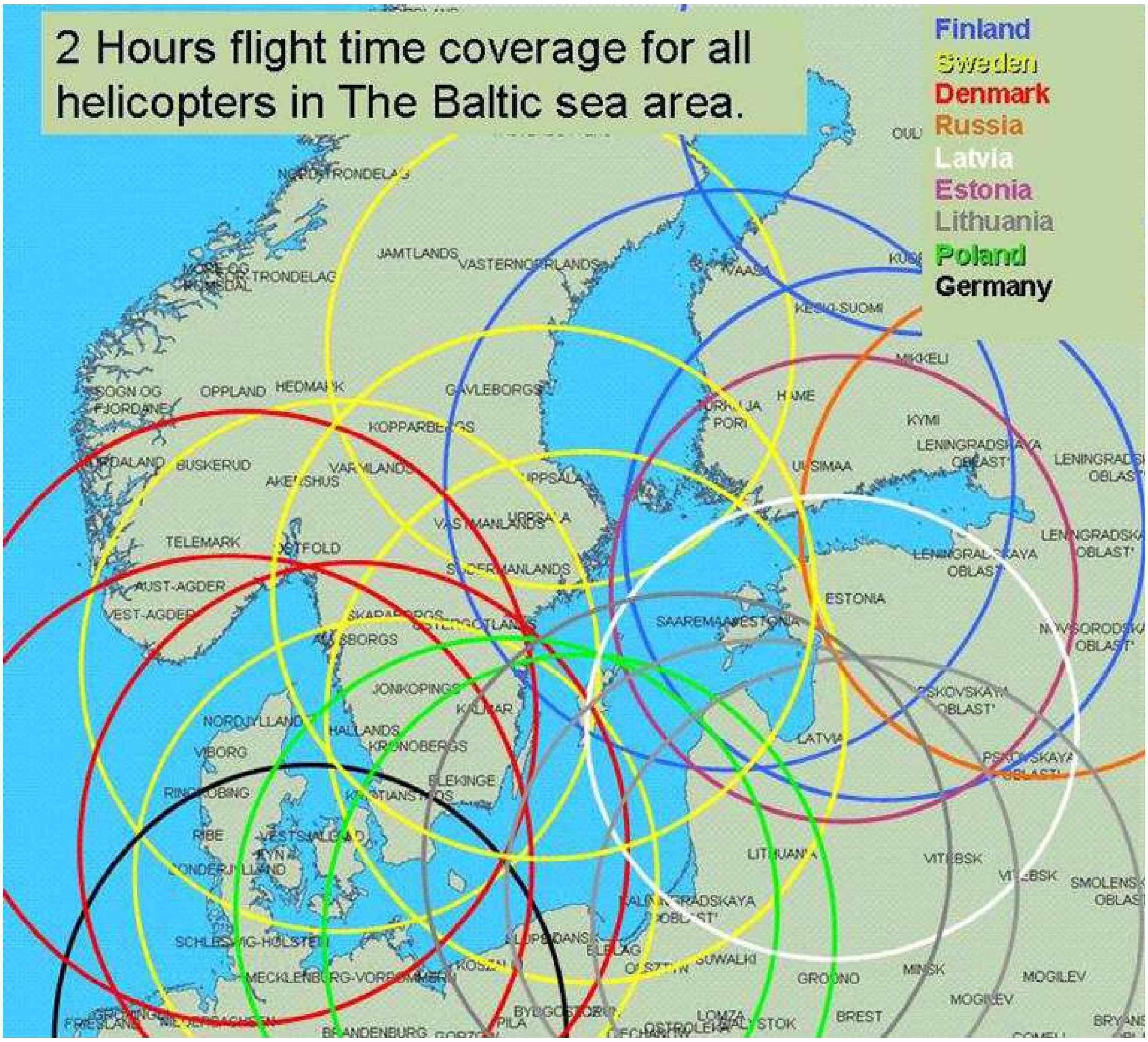
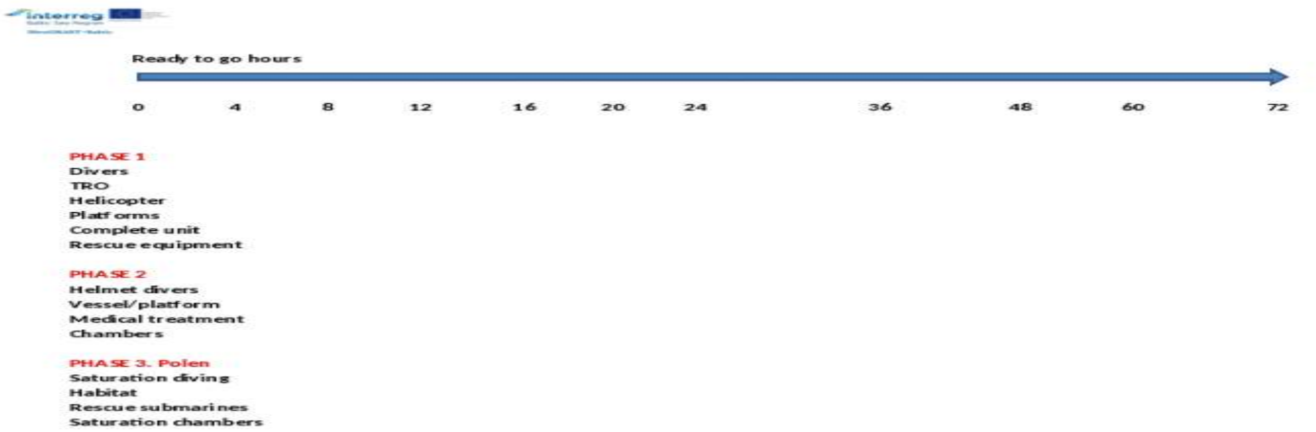


Diagram to be used/found in to Database



Transport:

- Environmental conditions at the disaster area are identified.
- All personnel check in with the required PPE and appropriate clothing for the environment.
- All personnel are cleared medically prior to deployment.
- Identify and brief the team on the hazards associated with modes of transport that will be used to travel.
- Any special hazard considerations.
- Identify local medical capabilities.
- During transit dive teams shall monitor and enforce compliance with established safety and security practices.

Arrival:

- Update risk analysis and Plan of Operation in cooperation with the OSC.
- Establish BoO and work site perimeter control procedures.
- Ensure that all team personnel have reliable means of communications.
- Setup and communicate the warning system and evacuation plan.
- All Sector Leaders shall have clear understanding on the green, yellow, red alert levels and what will determine change of level.
- If possible a Team Leader or liaison officer for UWSAR should assist OSC at BoO.
- Define restricted water space if needed.
- Setup logistic support.

Alert phase

Prioritize First response and medical recourses for hyperbaric treatment. Second priority is to get endurance and the next level of competence and dive platform. TRO?

Locating/stabilize phase

Recourses to secure the incident and survey the movement of the boat/ship in distress.

Coordination/logistic phase

13.4.2 At the site of the incident

Before or during arrival, a command Centre, operational base (and work platforms) to be designed. The first OSC on site is to lead the operation, or in consultation with the SMC, someone more suitable for the task.

- Establishing operational logistics management should be determined at the time of activation (e.g. transportation to hyperbaric chamber, air depots, fuel, etc.).
- Upon activation of phase 1, the local rescue organization to be reinforced with a mission coordinator and the dive teams and to cooperate with any ongoing SAR operation (Search and Rescue).
- The module´s mission coordinator is subordinate to the OSC (On Scene Coordinator) during ongoing operations or directly under the orders of the SMC (e.g. JRCC).
- Upon activation of phase 2, capacity to be increased and integrated into already established structure.
- Safety procedures to be established and announced before operations begin.

During operations and activation of level 2 and level 3 alerts, a 24-hour operation may be carried out as follows.

24/7 EXAMPLE SCHEDULE

		00–06	06–12	12–18	18–00
Operative	Team A	Work	Rest	Stand-by	Work
	Team B	Stand-by	Work	Rest	Stand-by
	Team C	Rest	Stand-by	Work	Rest
	Logistic	Work / Rest		Rest / Work	

13.4.3 Operational procedures, by johan.genestig@kustbevakningen.se (Swedish Coastguard)

- SMC with reinforced command Centre to continuously evaluate and update the situational awareness to effectively develop a sustainable strategy for managing the operation.
- SMC oversees establishing procedures for securing placement and tasks of operational personnel during operations, and set barriers that follow established safety procedures.
- SMC oversees developing procedures to suspend activities due to, for example work, or other hazard or risk.
- Upon activation of phase 2, a service engineer should be commandeered to join the logistics group.

Green Alert: Normal Operational Status
Full diving operations can be undertaken

Yellow Alert: Degraded Operational Status
Where a yellow alert is signaled by a flashing light or an audio alarm/message, the audio component should be capable of cancellation. The diving supervisor shall instruct the divers to suspend operations and, where practicable in terms of speed and safety, make safe any work or items of equipment that could offer a further hazard before moving to an agreed safe location. A safe location is a place that affords the diver a measure of protection as agreed by the diving supervisor, considering any other relevant information supplied by others and the diver before the dive begins. This location will vary for each worksite and may, for example, involve the diver retreating all or part of the way towards the descend line/spot or returning to the clump weight if a bell is used. This is an interim measure that allows the nature of the alert to be properly assessed before recalling the divers to the surface. After consulting with the Team leader/Sector Leader, the diving supervisor will decide on any necessary further action. This may involve the divers returning to the deployment device and preparing to return to the surface, or returning to the work site

If the Team leader/Sector Leader is unable to provide clear advice, the diving supervisor shall instruct the divers to return to the descend line/spot and prepare to return to the surface

The diver's safety is paramount. If there is any doubt about the appropriate course of action, the Team Leader and diving supervisor should both act to provide the greatest protection for the divers

Red Alert: Emergency Status
The diving supervisor shall instruct the divers to return to the descend line/spot and prepare to return to the surface. After considering any potential hazards, for example, fouling of adjacent anchor wires or jacket members, the diver/bell shall be recovered as soon as possible. The Team Leader must use all available means to limit the threat during the recovery of the divers. The diving supervisor is to decide about recovery of the deployment device after considering possible involvement of bell with subsea hazards such as platforms or anchor wires. The Team Leader/Sector Leader to be informed as soon as practicable but do not delay decisions until their arrival. **A red alert may occur at any time.** **It does not have to follow the sequence Green - Yellow - Red.** **Be aware of potential hazards to divers before they become actual ones**

Factors that will affect level of alert;

- Movement of distressed boat/hull that indicate that the situation is unstable
- Contamination is detected when routines for hazardous diving is not prepared
- Weather change
- Work on the hull or ship movement that may change the stability of the distressed ship
- Ship movement that may harm the umbilical/wet bell or dry bell

Reference IAMSAR Manual, DykSMART SOP, JFWEDROP SOP, UNDAC Handbook, Baltic ACO manual

13.5 Reports

A joint situational awareness report should be provided on a regular basis to everyone in the organization at the site of the incident.
After the operation is concluded a regular SAR report is made, and a Search Report is written and passed to the police force.

13.5 Cooperation with local organizations

Cooperation with local organizations to be carried out in accordance with regular procedures.

13.7 Concluding operations

When the life-saving operation is concluded, the DiveSMART module shall adhere to the following:

- Notify OSC and JRCC that the operation is concluded.
- Coordinate its withdrawal with OSC and JRCC.
- Be available/provide assistance to other dive missions outside the life-saving operation.
- Be prepared to participate in any criminal investigation.

13.8 After the operation

As each mission is unique feedback is always required, and procedures to enable changes to DiveSMART module routines to have a competent and updated emergency response module. The following steps must be followed the operation has been concluded:

- Launch a procedure that enables sharing the lessons learned after the incident.
- If applicable, introduce changes to routines/procedures to improve operations. Report "lessons learned" to the national response forces pool/database.
- Ensure that appropriate crisis management measures have been taken, during and after the incident, for module members.
- Reset/replenish equipment and materials to maintain readiness.

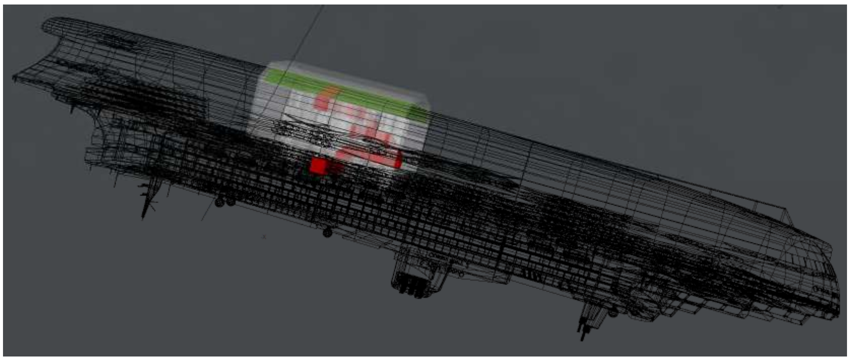
This takes place within each organization respectively, and the result is passed on to the “Council” for further development.

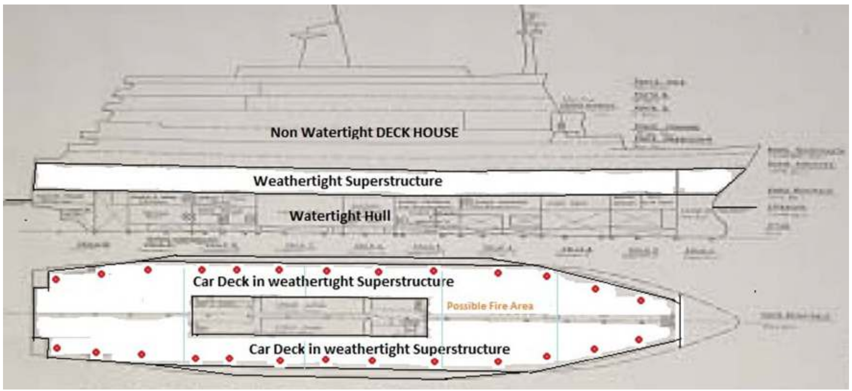
Appendix 1 Module capacity, Search mission

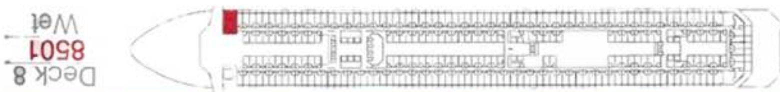
1. Search mission, in general.

Here are some of the difficulties to plan for, for more details se the DIVE MASTER Checklist.

- Finding the Wreck
- Conditions at the site, Weather a.s.o.
- Conditions on the wreck (visibility)
- Mooring/anchoring of the mother Ship
- Identification of safe routes/ways for divers and victims
- Find the entrance or where to make an entrance to the wreck







1.1. The use of ROV and SONAR?
ROV/AOV for divers safety and working together with the divers.

Remotely operated vehicle (ROV)
ROV can be used many different applications. There are 2 types of ROV's, working glass and observation ROV's. In this case we will only speak about observation ROV's. Observation ROV's should be equipped at least with camera, lights, multibeam sonar, acoustic navigation and recording systems. It is recommended also to have manipulator, scanning sonar, lowlight and color camera. ROV is used for inspections and documentations before, during and after the diving. ROV jobs can divide in 4 missions.

Mission 1: Create situation picture.
- Inspect the dive site.
- Research for dangers.
- Familiarize dive task to the dive team before the dive.
- make a video record of work done by divers.
- fix and record the location of items for "ass build", "ass found" and "ass left" surveys using an onboard beacon.

Mission 2: Secure the diver safety "guarding angel".
- Keep an eye on the diver and monitor environment round the diving site.
- Illuminate a work site.

Mission 3: To be a guide.
- Lead diver to the work site.

Mission 4: Situations when diving is too risky.
- Places that are not secured.
- Deep tasks.
- longtime last tasks.
- Narrow places.

ROV station consist:
- ROV- pilot.
- Sonar navigator.
- Cable man.
- Boat driver.
- Radio connection between personnel.
- Sub unit.
- Cable and winch.
- Surface unit (power transformer, recorder and monitors).
- Operator control board.
- Power distribute unit.
- Weather shelter (tend ore cabin).
- Launch and recovery system.

OPERATIONAL SAFETY

Before starting operations:

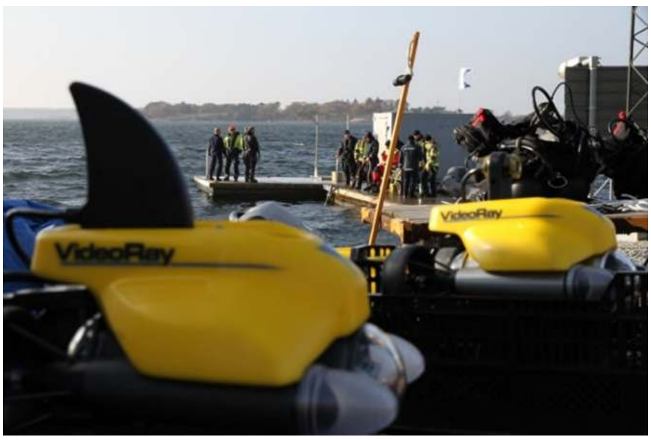
1) Diving supervisor goes through the diving task with diving and ROV team. (During diving, the diving supervisor must have authority over the ROV team.)
2) All members of diving and ROV teams should be aware of all potential hazards:
    - Entanglement of wires / umbilical's
    - ROV collision or thruster injury to divers
    - ROV's are potential electrical shock hazard
3) Emergency diving procedures should be understood by all ROV personnel

During operations:

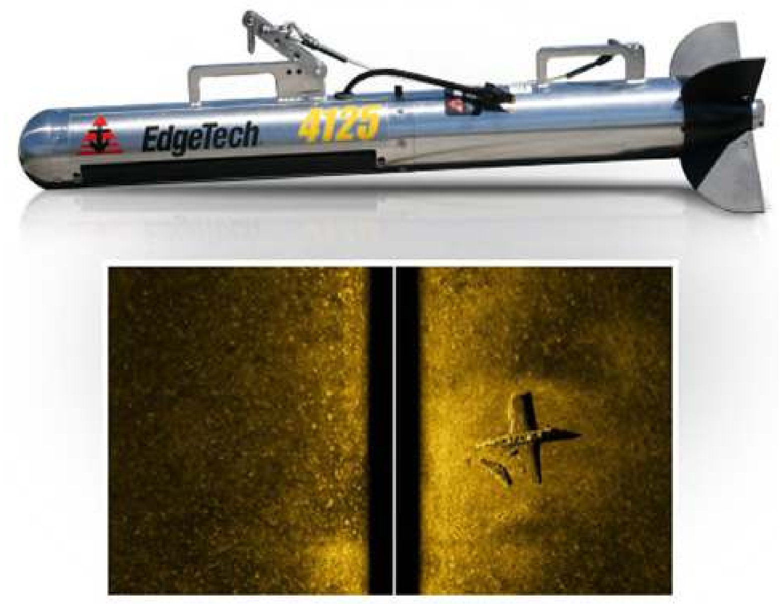
1) Only experienced ROV pilots should be used when divers are in the water.
2) There must be direct communication between the Diving and ROV supervisors.
3) Diving supervisor should also see the online ROV picture.
4) During diving ROV should only be deployed or recovered with authority of the diving supervisor.
5) Avoid that ROV tether becoming entangled with umbilical, wires etc.
6) If a diver is used to recover a trapped ROV the ROV power must first be turned off.
7) If ROV loses control pilot must inform the diving supervisor immediately.
8) Ideally is that ROV goes first on the working site and that diver leaves first the working site.

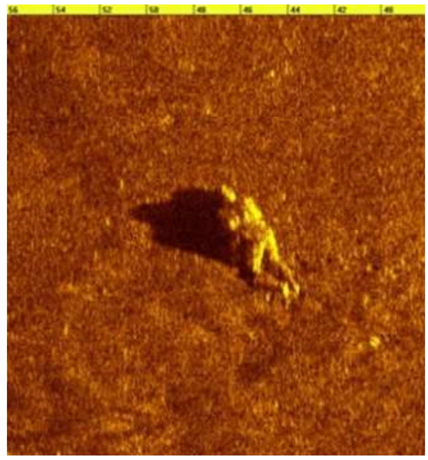
"Everything that you can do from surface don't do it by diving."

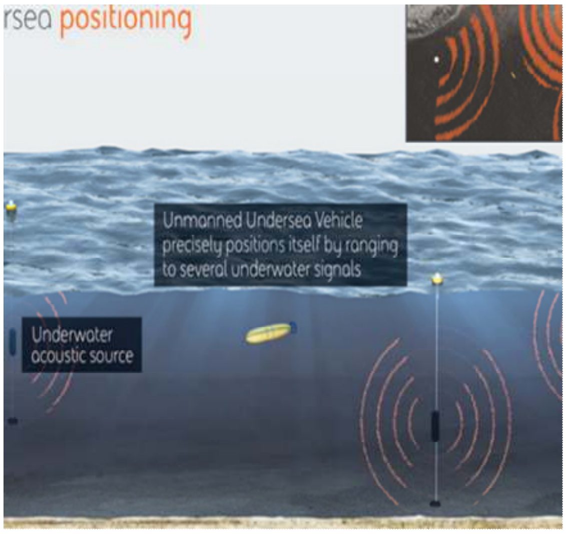
ROV`s



Side scan sonar







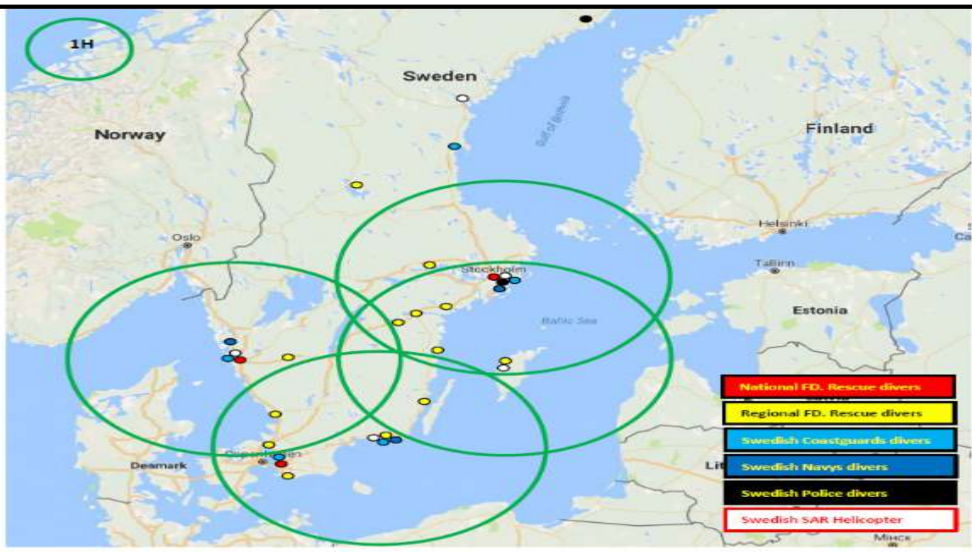
1.2. Helicopter transportation for Sweden's First Response Team.

UWSAR – UNDERWATER SEARCH AND RESCUE- UWSAR Sweden. Reconnaissance Team

- Response time 90 seconds. Airborne within 10 - 20 min.
- Capability to dive shorter dives inside or outside sunken vessels. Ability to save captured people. Reconnaissance.
- 2-3 rescue divers & 1 dive supervisor. 2 rigs with 60m surface supplied air system.
- Tactical rescue equipment.
- Glass punching tool.
- First aid equipment and oxygen.
- No winch capacity.

Ambulance helicopter typ Eurocopter EC 135.

Police helicopter typ Bell 429.

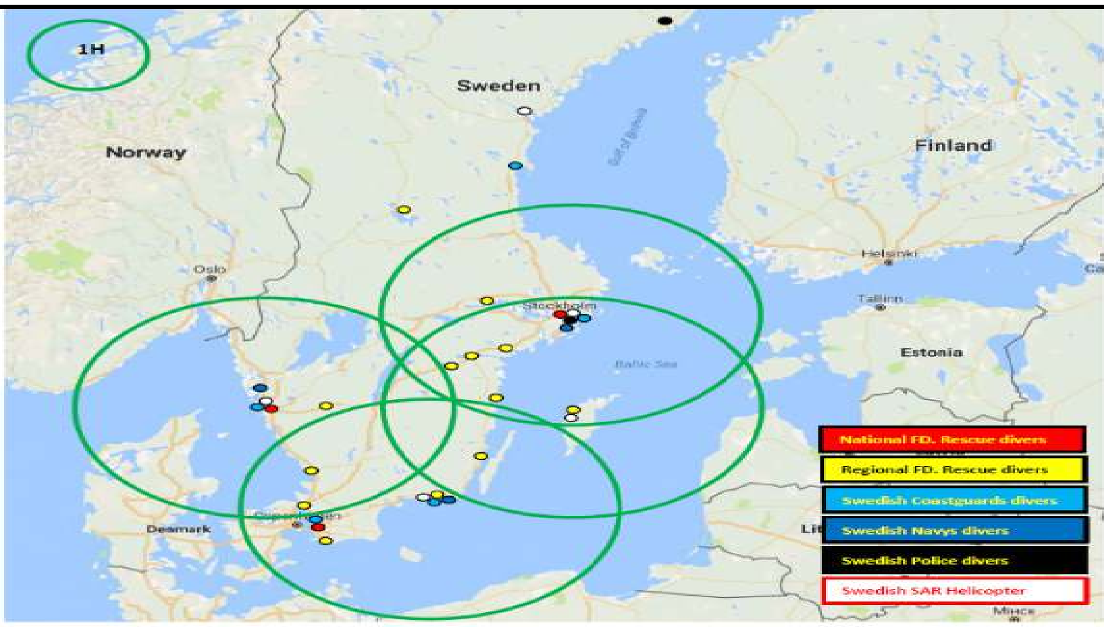


60 minutes flight time

UWSAR Sweden First Response Team

- Response time 90 seconds. Airborne within 10-30 min.
- Capability to dive inside or outside sunken vessels. Ability to save captured people.
- 4 rescue divers & 1 dive supervisor. 2 rigs with 60m surface supplied air system. 4 extra tanks 236 composite.
- Tactical rescue equipment.
- Glass punching tool.
- First aid equipment and oxygen.
- Winch capacity.

Agusta Westland AW 139

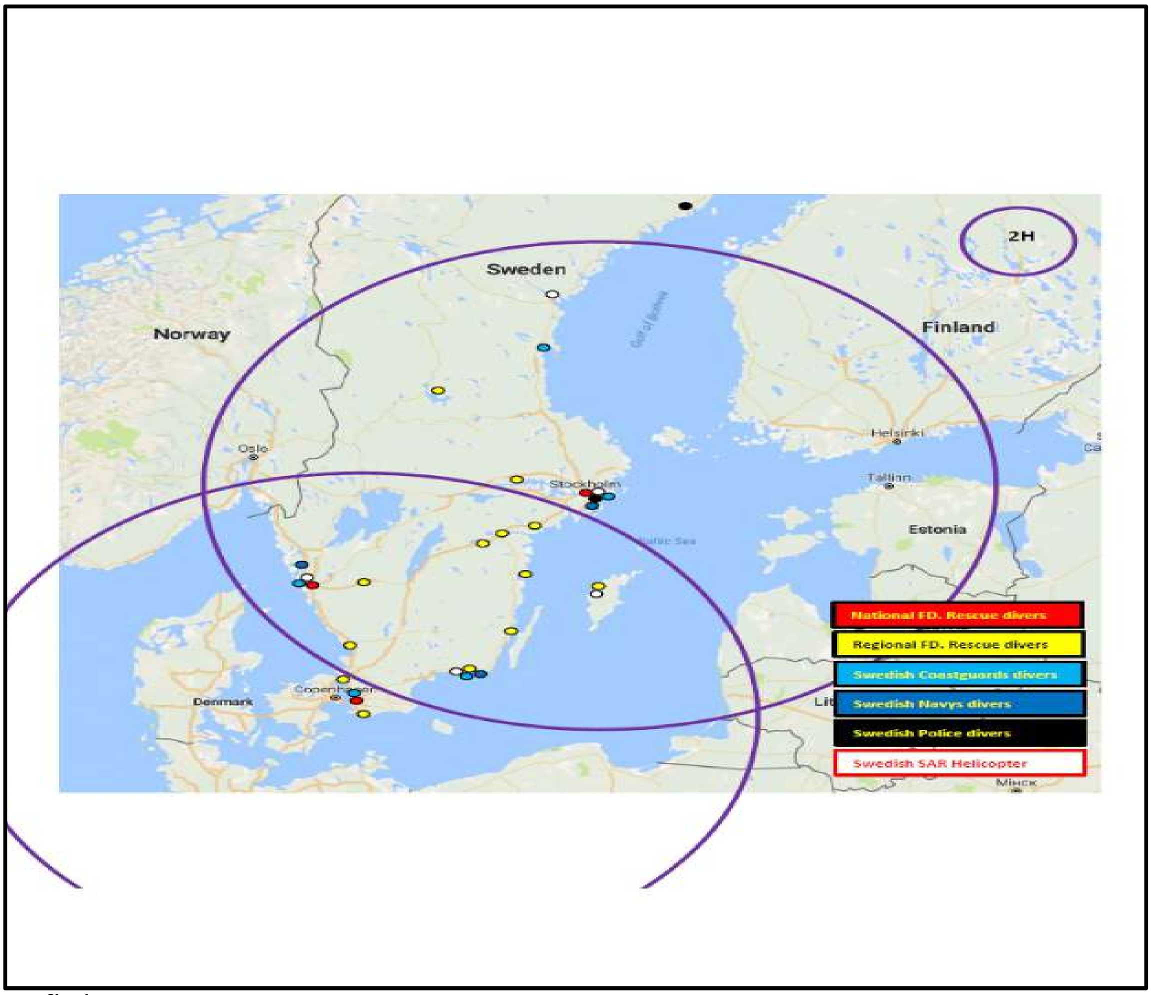


60 minutes flight time

UWSAR Sweden First Response Team

- Response time 1-60 minutes. Airborne within 90 minutes.
- Capability to dive inside or outside sunken vessels. Rescue equipment to provide oxygen and save captured people in sunken vessels.
- 10 rescue divers / dive supervisor. 2 rigs with 120 m surface supplied air/video system. 2 rigs with 60 m surface supplied air system. 20 extra tanks 236 composite.
- Tactical rescue equipment.
- Light penetrations tools.
- First aid equipment and oxygen.
- Winch capacity.

Eurocopter NH90



2 hours flight time.

Appendix 2 Module Diving and diving penetration mission

2. Diving mission

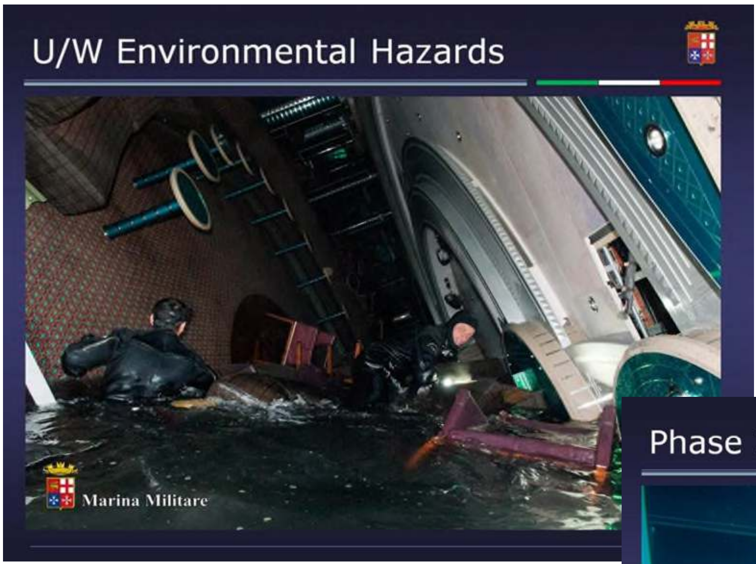
2.1 Tactics Penetration.

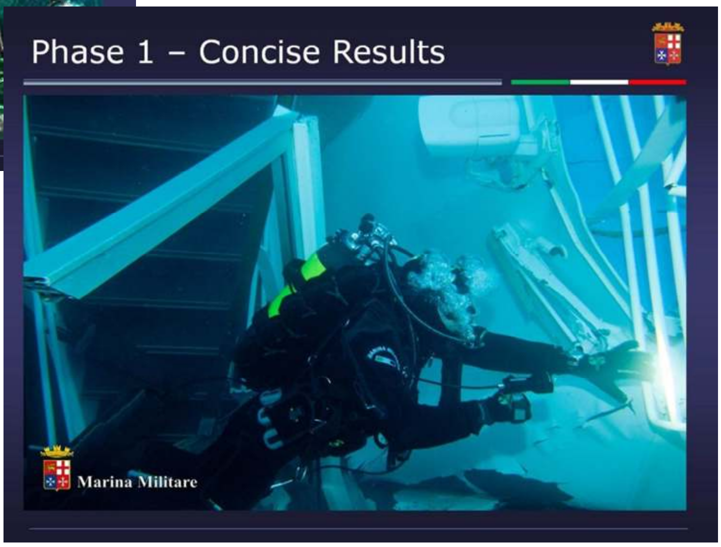
This chapter is generally held, details and know how is to some extend in our Proposal to Dive master checklist, se Appendix 5.

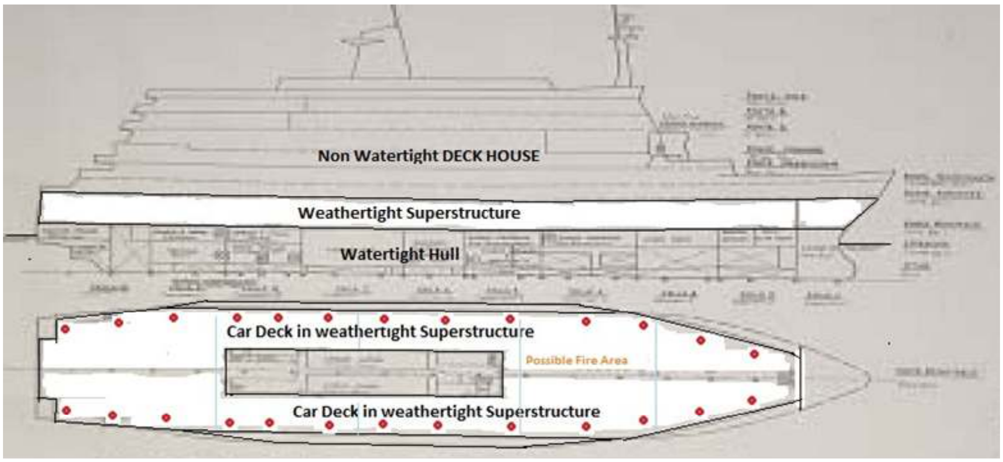
For units using SCUBA equipment there is an option to perform a diving operation with a 120 meter, surface supply gas umbilical. One of the reason for a long surface supply air hose is the rule of not using more than ½ the umbilical, this is in the event of you are getting snitched/ trapped, than you always have enough to make a safe return to the surface.

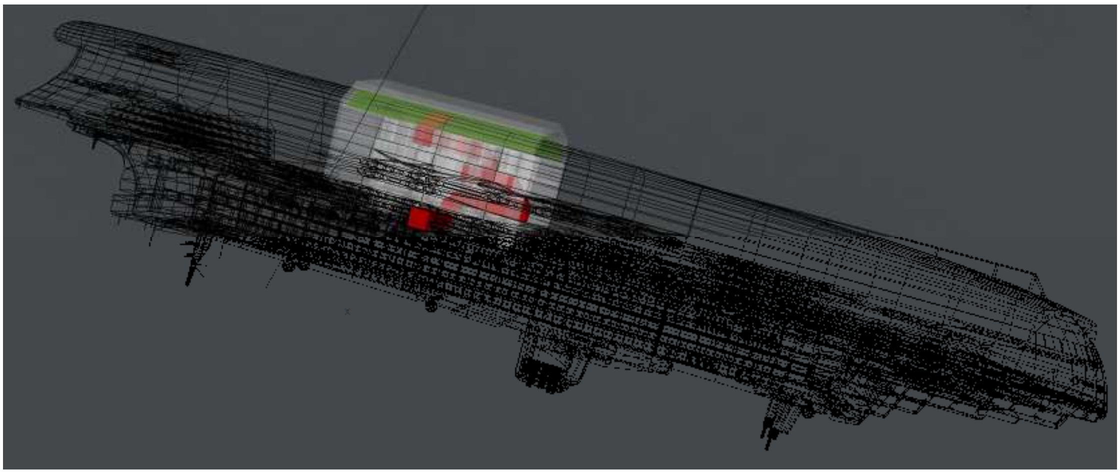
Another rule would also be that you don´t penetrate more than 25-30 meters, and then you make a new entrance. This could be extreme difficult due to fact that you could let air out of the ship and thereby effect the buoyance, which may sink the ship and drown the people inside. Therefore, everything that you can do to secure the buoyance with other ships or floatation is a necessarily to a successful operation.

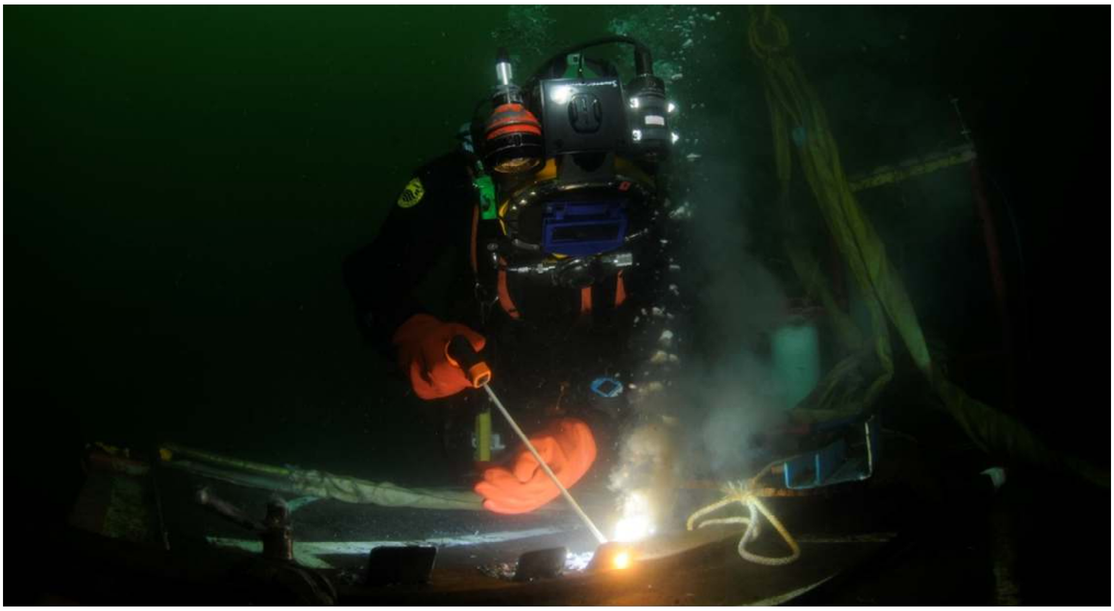
A difficulty is that every door that you pass as a diver must be secured to avoid rescue divers being trapped inside. If possible, you should also get rid of all the junk, floating/laying around. You must consider this while the clock is ticking…











Helmet divers could be used i.e. for underwater cutting. This is effective but probably take long time before they are prepared on the spot, and the vessel is “safe” to enter/work on. If you can make an entrance, you must make it big enough so that the rescue divers in a safe way can get the victim to the surface.

Photo of a diver bringing a victim to surface, taken during the DiveSMART Baltic exercise 2

Search and rescue divers help the victim out of the wreck.

Search and rescue divers helps the victim out of the wreck

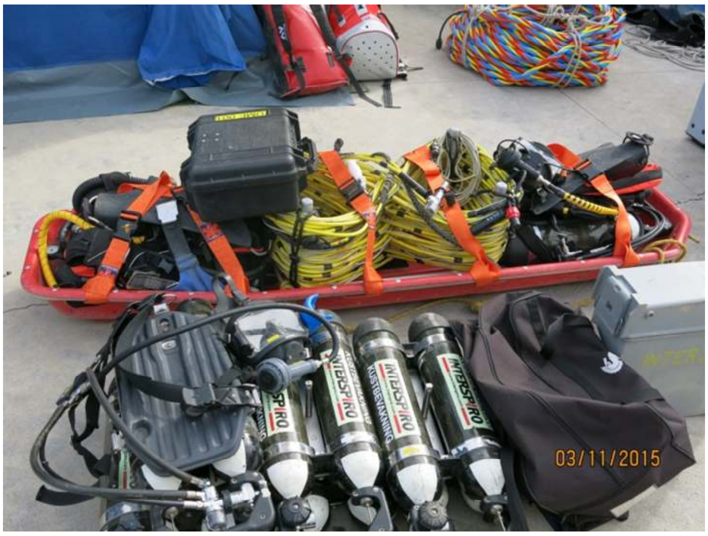
2.2. TRO.

The cooperation with tactical rope team could be essential to get divers and equipment in to emergency site.

Technical rescue refers to those aspects of saving life or property that employ the use of tools and skills that exceed those normally reserved for firefighting, medical emergency, and rescue. These disciplines include swift water rescue, confined space rescue, ski rescue, cave rescue, excavation rescue, and building collapse rescue,

Confined space like in a half sunken ship, is a term which refers to an area which is enclosed with limited access which make it dangerous. Hazards in a confined space often include suffocation by unbreathable gases which may be present but not visible. Often these spaces will have a predetermined rescue plan which incorporates the appropriate safety harness and other rescue equipment.

Photo Michael Elsberg, Swedish Armed Forces



Fire departments have assumed a major role as primary responders to rescue operations that involve, among other things, structural collapse, confined spaces, chemical accidents, water emergencies, and people trapped above or below ground level. These emergencies are grouped into a category of rescue called Technical Rescue Operations. **TRO**.

Technical rescue operations are often complex, requiring specially trained personnel and special equipment to complete the mission. Natural forces such as hurricanes, earthquake, extreme temperatures, and swift water currents often complicate the operations.
The presence of flammable vapors and toxic chemicals or the lack of oxygen can also increase the level of risk. The safety of crews conducting technical rescue operations is of special concern.
Fire departments and rescue squads perform technical rescues daily. Some complex technical rescue operations last for many hours or even days as rescue personnel carefully assess the situation, obtain and set up the appropriate rescue equipment, monitor scene safety, and remove hazards before they can finally reach, stabilize, and extricate the victims.
The presence of different types of hazards often forces rescuers to take additional precautions and time to ensure that operations are conducted safely. Experience has shown that hasty rescue operations can endanger the lives of both rescuers and victims. At the same time, rescuers know that a victim's survival chances are often dependent on quick extrication and transportation to a hospital. The cooperation with tactical rope team could be essential to get divers and equipment in to emergency site.

2.3 Penetration by Cold cut, High pressure Cutting.

The cutting technique consists of a mixture of water and cutting agent being ejected through a special nozzle at high pressure to cut very quickly through all known constructions materials. The cutting frame is attached by a diver, then the nozzle is propelled along a rail by a hydraulic motor. It is supplied and operated from the surface. The size of the hole is determined by the rescue operation task. The big advantage of this system is the safety considerations. The disadvantage is that you probably must combine the cutting method with other methods, such as hydraulic rescue saw to get through all the hulls, beams, etc.


2.4 Penetration by blasting/ explosives.

The main purpose is to quickly create a shorter and safer entrance for rescue divers. Explosive breaching is a tactical method to enter a structure where conventional breaching system are not sufficient or the emergency requires immediate entry to save lives. The disadvantages are that you must have well-established safety distances to ensure the safety of both rescue personnel and victims. The system is structured on frames that can be connected to the desired size of the opening. The explosive frame is then attached to the hull side with magnets by a diver.


This premade frame of styrofoam has a explovsivelist applied for quick use, i.e. for Firefighter to blast through roofs and doors. Of course the amount of explovsives can and will be changed for underwater penetration.

2.5 Diving mission, the use of Sidemount diving equipment.

To penetrate the disabled vessel/area to SAR, there could be a need to do "closed compartment diving". In places where diving with regular SCUBA equipment with large buoyancy wests there is a risk and the diver is limited compared with the Sidemount equipment. The Sidemount diving has it´s background in Cave diving, together with a specially technique. These divers can safely get longer/deeper inside the ship to leave emergency equipment to trapped people and assist in getting them out. You can make the Sidemount system surface supplied if needed by risk assessment or regulations. This in use with the Swedish Armed Forces and could be used on request.

In Sidemount/cave diving, it´s common to use underwater Scooters for transporting equipment (emergency equipment, like Oxygen treatment rebreather, light and heating by battery packs, First aid). You could bring escape suits packed in watertight bags, transported i.e. with scooters in to the people in need. You can make the Sidemount system surface supplied if needed by risk assessment or regulations. This in use with the Swedish Armed Forces and could be used on request.

Photo by Joakim Tenglin, the Swedish Armed Forces

Diving rescue operation within a cave in northern Thailand in July 2018.

A short summary is that a football team of 12 boys in the age of 10-14 together with their coach went into a cave, the water started quickly to rise and they went further into the cave, at last they were trapped approximate 4 km in the cave. They were there for nine days without food or water (they drank water from the cave wall).

They were found by cave/ Sidemount divers from the ongoing rescue operation led by the Royal Thai Navy. The tactics was to dive in with Sidemount diving equipment and underwater scoters with food, water, medicine and what was needed to keep them alive. They were also given Oxygen for booth medical reason and the lack of Oxygen in the environment in the cave. It was a critical time window to get them out of the cave, due to the possibility of the water rising due to the monsoon rain and the lack of Oxygen. The Royal Navy divers took them out of the cave by putting diving equipment on then and dive/hold on to them while they led them to safety.


The use of underwater scooters for transportation of divers, equipment, medicine, battery packs for light and heat, Oxygen for medical treatment, escape suite/diving gear for the victim’s transportation back to the surface/safety.

2.6 Module capacity, diving in HAZARD environment.

When working in an environment that could create a great risk for the underwater worker (diver), concerning chemical, biological and with the possibility of radioactive surroundings (water) and off course when working inside a complex and in other ways a high-risk environment. There are ways of minimizing the risks to an acceptable level. That is after a risk analysis has been made prior to the underwater work starts. And all found risks must be handled. Procedures in this can be found in an open document from US navy, www.navsea.navy.mil/Portals/103/Documents/SUPSALV/Diving/Contaminated%20Water%20Div%20Man.pdf

Prior to underwater work starts.

The easiest way of recognizing if there are any risks before entering the water, is to see and smell for contaminations. If you can see and smell contaminates, you must take these factors into consideration and handle these risks. To be certain of what types of substances that are in the water, a sample should be takes and analyzed. This will then give a clear answer of what levels of protection that needs to be reached.

Things to consider are, type of Drysuit, gloves and type of breathing system. It is well known that full face masks give a limited level of protection and therefore helmet diving should be used. The type of Drysuit that should be used must be recognized and certified according to the type of contamination that is present. Normally this is rubber suits (Viking). To have a higher level of protection the suit`s neck collar should be attachable to the helmet, this provides a high level of protection for the diver. The gloves should be a dry model, that resists water entering and meet the skin.

If the working environment, could be harmful to the diver, to a level that has been stated in earlier risk analysis. The option to dress the divers in Hazmat diving equipment and even a "Dirty Harry" diving system, should be a possibility.

Practical handling of a "Dirty Harry" system.

This diving system will need more space than a regular system due to the need of a second gas supply and the decontamination equipment "stations". A diving station for contaminated water needs to a minimum consist of:

- Diving supervisor.
- Assistant supervisor.
- Two divers.
- Two tenders.
- Rigging personnel.
- One "2 diver" diving panel.
- Two hazmat diving suits, (integrated neck dam).
- Two "Dirty Harry" diving helmets.
- Two diving umbilical's (with exhale hose).
- Chemical diving gloves (plenty).
- Hat mounted cameras (two).
- Hat mounted lights (two).
- Equipment for underwater communication to both divers.
- Two diving harnesses (certified for lifting). And included bailout system (calculated for the amount needed).
- Certified hoses for connecting the diving panel to the gas supply. And certified hoses between the vacuum pumps and their gas supply (long enough).
- Communication equipment between the diving supervisor and the tenders, (if needed). And spare parts according to risk analysis.

Picture by Arthur Heickell, Finnish Boarder Guard.

Gas supply:

There must be enough gas to the divers with calculations including, time and depth and with a higher than normal liters/minute consumption and this due to, strenuous underwater work. As an addition to these calculations the divers should adjust their breath valve so, that there always during the dive is a constant over pressure inside the helmet. This will also increase the consumption of gas.

The “Dirty Harry” system will also need a second gas/air supply, this to pump the divers exhale gas to the surface. This gas supply will need to be even larger than the volume of the breathing gas, as much as 5-6 times larger, this if the underwater work is planned to take place between 0-6 meters of depth.

If the underwater work will take place deeper than 6 meters the natural laws will take care of transporting the divers exhale gas to the surface. So, there will always be a need for a second gas supply when the diver/s will have to work/transport themselves from the surface to greater depths than 6 meters.

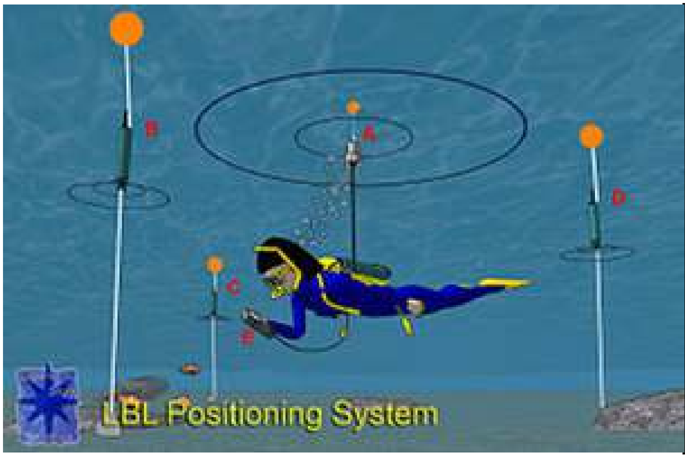
Other:

There is off course a need for decontamination after each dive made, and that will demand a station dedicated for that. This would be according to normal cleaning procedures for contaminated personnel.

2.7. Divers position system.

For the dive master to keep track on the divers both inside and outside the wreck the DiveSMART Baltic has tried a divers position system. This system can be used for safety, you can see that al the divers has returned to surface in case of a quick evacuation.

You can keep track of the divers, GPS position, so the Dive master can see where they have been, time and depth. For the search operation, you can program the lap top that the diver has with him, so you can easier control the search operation.



Appendix 3, Module capacity, Life support and evacuation

1.1. The use of a Habitat.

Due to the nature of diving, there is the fact that when you have been exposed to deep over time you cannot go directly to the surface. You must do decompressions stop depending of the time and deep that you have been on. If you have been trapped inside a ship you probably would need a long decompression, if you skip the decompression stop you most likely will end up with a serious decompression illness, this could be lethal.

Due to circumstance there are two options, one is to skip decompression stop and treat the victim at surface with oxygen and decompression chambers, the other option is to do compression stop in the water, preferably in so called habitats.

Oxygen treatment

An example of a habitat, used in Plura, Norway by cave divers.

3.2. The use of a rescue/escape/survival suit.

Escape suit is designed for transport the victim from air pocket by diver. Escape suite is dry suit with integrated weight belt and 1 liter air tank for buoyancy. It also has four exhaust valves two at shoulders and two in foots. There are several handles for the diver to grip on victim. Victim needs own gas supply and communication system. Escape suit has water proof bag for delivery.

OPERATIONAL SAFETY

Before transferring the victim:

1) Supervisor /diver needs to brief the victim.
    - Go through the procedure.
    - Remain victim to breath all the time.
    - Try to keep victim calm.
2) Assist the victim to put on the escape suit and diving mask.
    - Check the breathing.
    - Test communication.
    - Ensure the dry suit inflation valve and exhaust valve function properly.
    - Ensure the hip belt is tightened.

During the transporting, the victim:

- Both diver and the supervisor monitor breathing.
- Diver assist victim in to the water.
- Diver controls the victim buoyance.
- Diver assist victim to balance pressure in ear if needed.
- If possible transfer the victim face to face.
- that way diver can monitor victim all the time, it is more comfortable for the victim to concentrate on the rescue diver and not see the situation.
- Remind of breathing.
- At surface assist victim on lifting basket.

Escape suit system consist of:

- Diving supervisor.
- Supervisor assistant.
- Two Rescue divers.
- Assistant diver.
- Three Tenders.
- Crane operator if using lifting basket.
- Manned recompression chamber.
- Surface supplied units with communication, light, video and recorder for all divers (assist diver can be a scuba diver).
- Surface supplied units with communication for victim.

Risks when using an escape suit:

- If victim hold his breath during dive, it is big risk to damage lungs.
- Pressure balance in ear is hard to do for victim. It may damage eardrums.
- It is important to monitor victim all the time and secure that full face mask stays on.

3.3. The use of O2 rebreather.

The easiest way to accomplish optimum care for victims
In sea accidents is to use an oxygen rebreather.
If necessary take the trapped people to the surface and give them oxygen- Med Dr. Hans Örnhagen, Sweden.

- It saves gas, which, makes the logistics easier.
- It provides warm gas without the need for external energy

Oxygen is vital for the body cells. Oxygen has a clear place in the treatment of various dive-related injuries and diseases.

Appendix 4, Medical treatment.

Trauma Treatment

Medical equipment for emergency care according to ABCDE. Emergency bag and medication according to equipment and guidelines on board the platform.


Examples of equipment Trauma Treatment Armed Forces Sweden



C - Cardiac arrest, life threatening bleeding.

- Cardiac arrest, life threatening bleeding.
- If cardiac arrest is suspected, start CPR without delay
- External life-threatening bleeding is stopped by compression / tourniquet

A – Airway and Spinal Control Examine:

- Find and treat the airway.
  - Is there a risk of neck back injury?
- Correct treatment:
  - Create free airway.
  - Recovery position.
  - Oxygen 10-15 liter on machine with reservoir all 100% oxygen via rebreather electricity demand valve.
  - In case of suspected spinal cord injury, stabilize.

B - Breathing

Examine:
- Breath?
- Abnormal breathing / breathing noise?
Clearing:
- Facilitate breathing by loosening tight clothing
- Oxygen 10-15 liter on machine with reservoir all 100% oxygen via rebreather electricity Demand valve
- Support breathing with mask / blow all mouth to mouth method.

C – Circulation and bleeding

Examine:
- Pulse
- Impact / min
- Blood Pressure;

Sensible pulse wrist = Blood pressure> 80
Sensible pulse groin = Blood pressure> 70
Sensitive pulse = Blood pressure> 60

Treat:
- Stop bleeding with pressure bandage. Lower the head and raise the leg
- Keep the person lying down
- If necessary, inject intravenous drip if possible
- Transport in horizontal mode

D – Disability

Check the consciousness according to the AVPU
A - Alert (awake).
V - Voice - (reacts / wakes up call).
P - Pain - (Responds to pain).
U - Unresponsible (does not respond to pain / appeal).

E – Expose and protect

- Protect from weather and wind.
- keep warm.
- Prevent cooling.
- Check from top to toe if there are other injuries such as bone fractures or sores.

Appendix 4, Medical treatment.

Hyperthermia treatment

Cooling goes fastest in water. Water drains body heat 25 times more efficiently than air. Easy cooling when the body temperature drops below 37 degrees, the important hut comes in - a function that little children can miss. Herniation is involuntary, rapid contractions in different muscles to form heat. Then the body's heat output increases 2-5 times. Action easy cooling if the cooled person gets in touch, can touch, get dry clothes and come indoors, the body usually handles the cooling down. You should never leave a chilled person alone. Heavy cooling, severe cold-down with body temperature below 35 degrees, so-called hypothermia, can be a dangerous condition. Breathing and heart rate increase dramatically, while reducing blood flow to the brain and risking unconsciousness.

When body temperature drops below 35 degrees, temperature control is threatened and all body organ systems are affected. At 33 degrees, the important shivering ability also disappears. In the event of severe cooling, urine increases, but many cannot get rid of the clothes to pee due to stiffeners. Then the clothes will be wet of urine and heat loss will increase further. Symptoms of hypothermia already occur at 35-36 degrees. First, hunger, nausea, silence, fatigue, bad mood, impaired coordination and confusion are noted. Then there often comes anxiety and apathy that can pass into hallucinations. Consciousness drops and most become unconscious when body temperature is 30 degrees. A chilled unconscious person looks and feels dead. The pulse may be impossible to feel, the second day is not noticeable and the pupils can be big and stiff. The risk is great for cardiac arrest. In many cases, however, these persons have survived through qualified hospital care including cardiovascular lung machines. Therefore, never give up even if the person seems dead.

Measures concerning heavy cooling.

Due to the risk of cardiac arrest, it is the flat position that applies to the dressing or transport of the cold. Avoid unnecessary movements. Wet clothes can be cut away. To prevent continued cooling, the person is insulated with blankets, sleeping bags, dry clothes or the like. If possible, bones and arms wrap individually. Do not forget about caps and protection against soil cooling. If the person is unconscious, it is placed in stable side mode. Check breathing frequently.

Hyperbaric treatment

Decompression disease, is an umbrella term for two states: Decompression sickness (DCS) due to excess inert gas loose in the body, and arterial gas embolism (AGE) caused by pulmonary dysfunction due to expanding gas in the lungs. Both conditions may occur at the same time. When breathing air under increased pressure, oxygen is consumed while nitrogen does not participate in any processes. The nitrogen is a so-called inert gas. When ambient pressure increases, such as diving under water, the respiratory gases dissolve in blood and tissues as the atmospheric pressure drops (for example, ascension), the gases dissolved in blood and tissues expand. If pressure lowering occurs slowly, the gas is exhaled through the lungs. If the ascension goes too fast for some reason, integrases will not be wiped out. This creates gas bubbles that can prevent circulation, exert local pressure, and trigger tissue reactions. If the person lives for a very long time in a busy environment, it takes a long time to expel the respiratory gases from the tissues. In case of excessive decompression, arterial gas embolism (AGE) may also affect the diver. This occurs when lung tissue is defective due to pressure reduction - either due to improper nutrient increase or anatomic / functional aberrations in the lungs. Gas bubbles then spread into the bloodstream. The symptoms of AGE generally occur very quickly, even after the person breaks the surface, often causing unconsciousness and cramps. Lung rupture can also cause subcutaneous and mediastinal emphysema, as well as pneumothorax.

SYMPTOM AND CLINICAL:
The symptomatology of pressure fall disease is wide. Most cases occur within six hours after diving, but symptoms may occur until two days afterwards.

Drowsy symptoms

- Dive cloaks - Darkness prick / skin pricking (e.g. on the forearms)
- Marbles - bleached skin discolorations mixed with pale areas
- "lymph nodes" - bumps in the lymph vessels, edema. Mediocre symptoms
- "Bends" - joint pain. Joint or joint pain / numbness. Usually, the knee, elbow, shoulder or ankle is affected. Severe symptoms.
- "Chokes" - shortness of breath, chest pain, coughing (possibly bloody raising), unconsciousness
- Neurological symptoms (caused by AGE or tissue bubbles in the inner ear or CNS, especially sensitive to the lower spinal cord):
  Headache
- Fatigue; visual disturbances
  Ear; dizziness, nausea, vomiting
  - abdominal pain
  - weakness, paralysis and or other emotional disorders
- Urinary retention; confusion
  - cramps
  - unconsciousness
  The above mild and moderate symptoms are called in some literature DCS type I, while the severe symptoms are DCS type II.

DIAGNOSIS.
Pressure Disease is a clinical diagnosis. The most important thing is to suspect pressure drop illness almost regardless of the symptoms that affect the person during the first few days after diving. Careful clinical neurological examination is required to detect possible sensorikrubbningar.

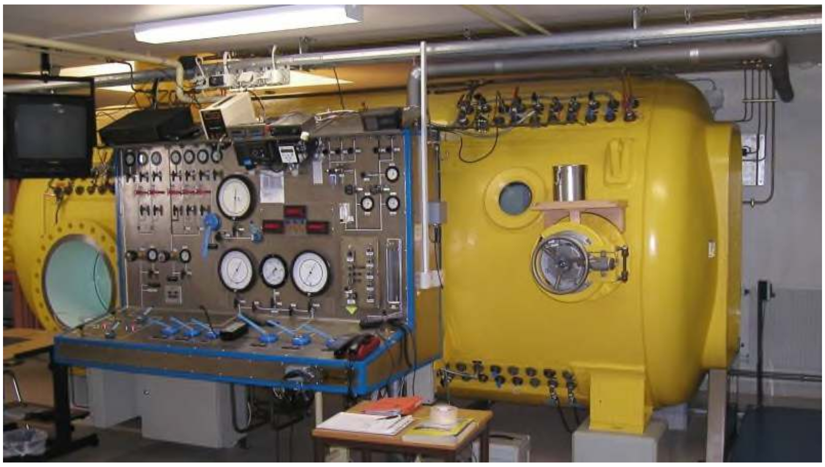
TREATMENT
At the scene of the accident.

- Wear, first aid and standard oxygen treatment (NBO) - preferably 100%, both at the scene of the accident and during transport. There is special equipment for oxygen treatment, such as Oxy-Box.
- If the person is awake he / she can drink up to a liter of water.
- Contact with dental care via emergency number 112 (Sweden)
- Neurological examination.
- For air transport, the maximum flight height is 300 m, otherwise the symptoms are exacerbated. Dive rinks require no special treatment, but may lead to worse symptoms.

  Other symptoms require pressure chamber treatment, recompression and hyperbaric oxygen treatment (HBO). The treatment unit should have intensive care resources (see www.sfai.se).

Hyperbaric oxygen treatment (HBO)

- The purpose of HBO is to compress gas bubbles, increase inert gas recovery, and increase oxygenation in damaged tissues.
- Typically, treatment with pressure conditions corresponding to 18 meters depth with intermittent oxygen breathing is given 100% according to special treatment tables.
- The treatment continues until the symptoms are gone. Symptomatic recurrence is common and then repeated treatments are required.
- A person who has stayed in water under increased environmental pressure has a relationship of fluid shortage due to of immersion and cold diuresis, is given fluid therapy.
- Contact for pressure chamber treatment is established via emergency number 112, (Sweden), which can also be reached by specially qualified diving consultant for consultation.



Example of pressure chamber, Naval base Karlskrona, Sweden

Pressure chambers are available in:

- Stockholm, Sweden. Karolinska University Hospital.
- Gothenburg, Sweden. Sahlgrenska University Hospital.
- Uddevalla, Sweden. NU-health care center.
- Karlskrona, Sweden. Blekinge Hospital.
- Gdynia, Poland, National Hyperbaric Center (part of Gdansk University Hospital) Contact person: prof. Jacek Kot, jkot@gumed.edu.pl or hyperbar@ucmmit.gdynia.pl
- Turku, Finland, TYKS - Turku University Hospital. Department of Intensive Care juha.perttila@tyks.fi
- Copenhagen, Denmark. Rigshospitalet University Hospital, hbo@rh.regionh.dk
- Kiel, Germany. 24119 Kronshagen.

The different defense forces around the Baltic also has several pressure chambers. And these could be asked for (if available) according to internal procedures in each country, (in Sweden SOS alarm 112) refers to availability and geographic location. In case of decompression illness, time until the patient is under pressure and breathing oxygen can be crucial, for more information see hyperbaric treatment.

Appendix 5, “DIVE MASTER” CHECKLIST

1. DIVE MASTER NEEDS TO CLARIFY, and possible risks are to be known before starting the rescue operations.

- The depth of the diving target.
- The size of the target and possibilities to enter the target (maps and drawings).
- The estimation of the number of people to be rescued.
- Ship leaking chemical/oil.
- Dangerous cargo.
- Vessel moving by waves and water possible flows out and inside the vessel.
- Is the target ship on position – or is there a danger that the target ships break in two pieces or more.
- All the things/particles floating inside the target ship – broken pieces of the vessel.
- Is there a possibility to enter the vessel in a safe diving route – is there time to do that, or do the personnel need to use all possible routes (considered safe enough) to save victims and to dive inside the vessel.
- Rescuing victims from "air pockets – the victim having a panic reaction is a danger to a rescue diver. (Regulator/full face mask to the victim, air from rescue divers bail out or from surface).
- Estimated diving time for a normal rescue diver according the diving tables.
- Diving equipment's needed in water rescue work (normal BA for water diving, air hose from the surface, helmet diving equipment, mixed gas etc...).
- The minimum number of divers to ensure that the rescue work can go on without breaks.
- The need of possible special equipment's. Gas cutting, hydraulic rescue tools etc.
- The amount of rubber boats that are needed, lifting balls/sacks working with air or any other type of special equipment, rescue suits, decompressure chamber.
- Preferred diving method and level of protection for the rescue divers.

2. Estimating the situation according to the task:

- Maintenance of diving equipment's, breathing gas etc.
- The safety plan of rescue diving" emergency" divers in case something happens to the rescue divers, a doctor, pressure chamber, helicopter.
- A possibility to mental help/psychic help to the rescue divers.
- Arranging a warm/good area for divers waiting their diving turn.

3. Dive Master Action decision:

Dive Master must decide and inform SMC /who is leading the whole rescue work:

- Is it possible to do the water diving rescue operation**?**
- Evacuation of personnel strategy.
- Estimation time of rescue work and when it is possible to start.
- Is there a need to alarm more divers; competences and number of divers.
- What kind of diving apparatus is needed.
- Is there a need to alarm more boats for diving?
- Is there a need for divers who are familiarized to gas cuttings?
- How to arrange maintenance of diving equipment's.
- Release a safety plan of rescue plan.
- Arrange how to handle rescued people on water surface -> people alive/dead people, and how to transport rescued people to the shore or to the rescue ship.
- How to arrange actions that are needed when more rescue divers are coming to accident site.
- Rough diving plan; diving groups, working areas, working points, decompression, etc.
- A deputy Dive Master and book-keeping.

4. Commands:

If the SMC accept the plan, the Dive Master should start the water rescue work. The target is divided to working sectors (diving group) and working points (a pair of divers) if needed and dive Master collect and order:

- Group leaders. Names and organization.
- Order divers to the groups.
- Order how to arrange those action that are needed when more divers are coming to accident area.
- Working channels.

5. Dive Master information to diving group leader:

- Situation.
- The depth of the target.
- The target and the task of the platoon and the task of group leader.
- Possible tasks of the other groups in near time.
- How to enter/move to diving/rescue area.
- How to keep connection to platoon leader.
- Diving book-keeping.
- The safety plan of the rescue task.
- Maintenance.
- Actions that are needed when the new group start the rescue work.
- Reporting after the rescue work to the Dive Master.

6. Handover:

- Area worked in.
- Last shifts working tasks.
- Challenges, (lessons learned).
- Progress.
- Safety issues, (rigging, diving equipment, contamination, stability).
- Emergency plans, (evacuation plan).
- Logistics, (transfer, gas supply, equipment, power supply, food, toilet).
- Communication.
- Next step.

7. Communication chart: