

# DIVE SAFETY PARTNERS

## *Lost Diver Procedure Guidelines*

*“Dive Safety should be the foremost concern for all divers. The adage that ‘there are old divers and there are bold divers, but there are no old bold divers’ is, unfortunately, quite legitimate. Unlike commercial divers, who are paid to take risks, we dive for pleasure. We should do all we can to minimize the risk of injury. Safety is paramount. There are widely recognized diving safety practices. All certified divers learn about the buddy system, dive planning, safety rules, and how to manage underwater difficulties. All too many divers fail to maintain skill proficiency, take unnecessary risks, and disregard accepted safety procedures.”*

**- Dennis Graver**

This document is intended to assist you in defining priorities and procedures in preventing and managing lost diver situations. Not all the recommendations will apply to your particular diving operation. This is merely intended as a guide to assist you with your planning. We have intentionally included additional and optional reference material which you are welcome to use and distribute as appropriate.



# TABLE OF CONTENTS

1).....	<b>PREPARATION – PREVENTING LOST DIVER SITUATIONS</b>	<b>3</b>
a) <i>Dive Briefing</i>	3	
i) Buddy System	3	
ii) What's Your Dive Philosophy?	3	
iii) Pre-Dive Orientation and Briefing (Essential components)	4	
iv) Post-Dive Activity	4	
2).....	<b>SIGNALLING DEVICES</b>	<b>5</b>
a) <i>Folding Flags</i>	5	
b) <i>Flashing Strobes</i>	5	
c) <i>Torches</i>	5	
d) <i>Decompression Markers (Delayed Surface Marker Buoys)</i>	5	
e) <i>Pyrotechnics</i>	6	
f) <i>Marker Dye</i>	6	
g) <i>Combined Devices</i>	6	
h) <i>Observers</i>	6	
i) <i>Observation Platforms</i>	7	
j) <i>Other</i>	7	
k) <i>Minimum Recommended equipment – DAN "Lost Diver Kit".</i>	7	
l) <i>Typical Ranges Of Relocation Distances From Inflatable And Hard Boats</i>	7	
i) (Adapted from HSE report, Divers Emergency Surface Location Devices, Table 18)	7	
3).....	<b>BOAT BRIEFING &amp; SAFETY CHECKS</b>	<b>8</b>
a) <i>Boating Safety Tips</i>	8	
b) <i>A Buddy on Board</i>	8	
4).....	<b>BUDDY SEPARATION PROCEDURES</b>	<b>9</b>
a) <i>Immediate actions</i>	9	
i) Lost buddy procedure	9	
b) <i>Subsequent actions</i>	9	
i) Reporting lost buddy to the dive leader	9	
ii) Lost Buddy Procedures	9	
iii) Head count	10	
iv) Alerting sequence	10	
v) Challenging situations	10	
5).....	<b>SEARCH &amp; RESCUE PROCEDURES</b>	<b>12</b>
a) <i>Identifying &amp; Managing resources</i>	12	
i) Problem recognition	12	
ii) Panic diver/divers; during and after the dive.	12	
b) <i>Practice Skills</i>	14	
c) <i>Planning, Equipment &amp; Procedures Requirements:</i>	15	
i) Emergency Assistance Plan	15	
ii) Emergency Equipment	15	
iii) Search patterns & techniques	16	
iv) Global Positioning System (GPS)	17	
d) <i>Communications</i>	17	
i) Immediate Communication	17	
ii) Prompt Action	17	
iii) Skipper communication with DM:	18	
iv) Boat and dive base communication systems	18	
v) Debriefing	18	
6).....	<b>RESOURCES FOR LOST DIVER SITUATIONS</b>	<b>19</b>

# 1) PREPARATION – PREVENTING LOST DIVER SITUATIONS

## a) Dive Briefing

### i) Buddy System

*“One of the basic tenets of safe recreational diving is observation of the buddy system. What we often forget is that buddies are a team. It is important for a buddy team to have a common set of objectives and to be turned into one another. Throughout the dive, it is important to observe one another, and monitor each other’s status. Regardless of your diving skills as an individual, your safety and performance as a buddy team will require both to focus on being good buddies.”*

- Robert N. Rossier

### ii) What is Your Dive Philosophy?

All too often, buddy pairs fall into one of two behaviour patterns: the "same ocean, same dive" philosophy (i.e., you pursue your ventures independent of another), or the "hey, get a room" style... Neither offers the best underwater experience.

The first buddy technique of independent diving is obviously flawed. Unless you close to a buddy with a problem you either don't know about it, or you can't fix it.

To avoid separation by divergent interest, preferably choose a buddy with the same diving objective to yours. In general, this leads to better buddy contact during the dive. It may not always work, however.

Choosing a buddy who shares an interest in underwater photography may ruin it for both divers. Photographers are distracted buddies at best.

Unless you happen to be in their viewfinder when you develop a problem, chances are, they will miss it happening. It is probably best to partner an experienced, non photographer diver with a photographer!

The second technique, based on close proximity, is not much better. When buddies are too close, divers can become entangled, kick and bump into each other, and even dislodge equipment like masks. Consider agreeing on who will lead the dive and who will follow.



*“All briefings must emphasize and improve the function of the buddy system. Violations of the buddy system should not be tolerated or minimized. “*

- Jeff Myers

### iii) Pre-Dive Orientation and Briefing (Essential components)

Pre dive briefings are vital and should include the following:

#### *Check dive qualification (C-cards)*

All divers should have C-cards. If not, it is often possible to find a diver's qualification level on the websites of the respective training agencies. Uncertified divers clearly should not dive. Match buddies according to experience, while arranging novice divers with the instructor or DM as other experienced divers may be irritated and tend to neglect their duties to a novice buddy.



#### *Environmental conditions*

Buddy separation is more likely in poor diving visibility and strong currents. This should be addressed in the briefing.

#### *Lost Diver Procedures*

The lost buddy procedure should always be discussed during pre-dive briefing. Essential features include: (1) how and how long to search; (2) who should be notified if one buddy is lost; (3) what to do if both are lost; (4) what to do after reaching the surface; (5) how to recall divers. Always be mentally prepared for a search in case you ever are separated from your buddy.

#### *Diver recall*

The diver recall procedures are essential for safety. Diver recall by the skipper to the surface may include revving the motors or pulling on the surface marker buoy. The dive leader or dive buddy can signal the other divers by banging on the cylinder or using an air horn or shaker. These will only work if divers are aware of them. These must be pre-arranged. Therefore, it is imperative to include the technique you will use in your dive briefings.

#### *Lost diver Signals*

Divers must know how to communicate lost diver as well as other basic communication signals.

### iv) Post-Dive Activity

#### *Post-dive roll call*

The post diver roll call is as important as the pre-dive activities. All the divers must be accounted for before leaving the dive site. Many methods exist. An easy but effective way to ensure that all the divers are accounted for is making use of DAN's Identification Tags. The skipper, dive leader and beach controller can easily mark off each diver after a dive on a slate with the help of the DAN ID Tags to be sure that no one is left behind. For more information on the DAN Diver Identification Display System (DIDS), consult the DAN website [www.dansa.org](http://www.dansa.org) under "products".

### *Debriefing*

If buddy separation occurred, this should be addressed in a friendly but firm way. Observance of buddy procedures is only respected when divers are called to account.

### *Lost Diver management plan*

While it is essential to have a lost buddy management plan, it is useful to discuss this in the debriefing, so that divers become familiar with it before it is required. It provides reassurance and confidence in the dive operation if there is knowledge of these procedures also.

## **2) SIGNALLING DEVICES**

There is sufficient data to support the following recommendations on diver location devices:

### **a) Folding Flags**

Folding flags with a day-glow yellow pennant are an exceptional location aid and are strongly recommended. This flag is highly conspicuous under a wide range of environmental and is considered by far the most reliable and cost effective location device. Flags with red or orange pennants also perform well.

### **b) Flashing Strobes**

Divers undertaking diving operations during periods of low light intensity should always carry a high intensity and good quality strobe. Sealing surfaces and o-ring seals require regular inspection prior to use and we recommend that two strobes be carried if this device is to be relied upon as a primary location aid.

### **c) Torches**

The use of a torch as a location device is strongly recommended. The torch should be able to provide an intense beam for a suitable period of time. It is recommended that a reserve torch is available as a signalling device since a main light source used during the course of a dive may have a severely depleted power supply.

### **d) Decompression Markers (Delayed Surface Marker Buoys)**

These devices are invaluable as location aids for particular diving techniques. In particular wreck, drift and decompression dives. These location devices should be as conspicuous as possible. If this device is sausage shaped, it should be wide and be able to provide a substantial height above sea level. Decompression sausages that can remain self-inflated will provide a more easily maintained form when the diver is on surface for any length of time under adverse sea states. These devices should not deflate if incorrectly deployed. Decompression markers may provide increased location distances if they are manufactured in the same day-glow yellow colour as the folding divers flag.

### **e) Pyrotechnics**

Pyrotechnics are not recommended for use by divers under a wide range of typical diving operations. Whilst they may provide substantial relocation distances, pyrotechnics are not specifically designed for excursion under water. These devices are relatively expensive and are not conveniently transported. The reliability of these devices after long-term exposure in a marine environment is not known.

### **f) Marker Dye**

Marker dye is unsuitable as an aid for sea level location. It has however demonstrated a substantial location distance by aerial relocation. The marker dye must however be able to produce a very dense and prolonged release of dye to promote aerial observation. The Presto Dyechem marker dye produced an impressive slick of dye that was easily observed by helicopter.

### **g) Combined Devices**

A combination of location devices should be considered in many circumstances. Whilst folding flags and some decompression markers perform well under normal daylight and some intermediate light conditions, a device that can consistently promote location in low light and darkness will often be required. On the basis of our findings a combination of a folding flag (yellow pennant preferred) and strobe is recommended. The strobe should be placed in an elevated position, preferably attached to the top of the folding flag.

### **h) Observers**

Our experience of device relocation over a protracted period found that the ability of individuals to relocate particular devices at, or close to sea level varies considerably. Similarly, we found this ability does improve for many observers after a frequency of device searches. Familiarity of the devices under a range environmental conditions, enhances the ability of observer to relocate them. Observers on board typical diver support vessels should ideally be competent in relocating location aids. Observers must be also aware of the location device/s carried by the diver/s at all times. This information may provide be an invaluable aid in those incidents where SAR facilities are required. As far as reasonably practicable, it is recommended that more than one observer should remain on a support vessel. If a dive plan, assessment identifies a high risk of in-water divers becoming separated from the diving support vessel, particular consideration must be taken of the prevailing environmental conditions, the number of in-water divers at any given time, and the location devices that the divers should carry. Divers performing shellfish diving operations should always undertake a risk assessment on a daily basis considering the above factors with particular attention focused on the dive site, number of divers to be deployed and the separation distance of deployment.

### i) Observation Platforms

It has been demonstrated that many devices are more easily observed from elevated platforms. Under many circumstances, elevated observation positions on hard boats do provide an enhanced relocation potential over inflatable boats. Observation platforms must also be considered in terms of the search capabilities of lifeboats or helicopters for diver location devices. Folding flags, plastic buoys, SMB sausages and bags were relocated by aerial observation, though no one consistently more so than another. Variations in search altitude, search aspect, and in particular the limited number of relocations that were undertaken, do not provide sufficient results to recommend the most suitable location aid for aerial relocation

### j) Other

Numerous accessories are available today that add an increased level of safety to our diving. The accessories to consider depend primarily on the style of diving you prefer, and the locations where you typically dive. Getting help when you need it is also a primary safety concern, so consider some sort of signalling equipment. All divers should be encouraged to have their own appropriate diver signalling devices or dive operations should issue these to manage lost diver emergencies.

Audible – whistles and air horns.

Visual – mirrors, torches, flares, strobe, water marker sheet, smoke generators and surface marker buoys.

Electronic – Emergency Position Indicating Radio Beacons - EPIRB

### k) Minimum Recommended equipment – DAN “Lost Diver Kit”.

Sausage  
Signal mirror  
Whistle  
Cyalume stick



### l) Typical Ranges Of Relocation Distances From Inflatable And Hard Boats (Adapted from HSE report, Divers Emergency Surface Location Devices, Table 18)

Location Devices	Min/Max Observation Range (meters)	Location Devices	Min/Max Observation Range (meters)
Pyrotechnics	4401 – 9323	Orange / Red Flag	206 – 1591
Dive Lights	975 – 8962	Safety Sausages	201 – 1191
Strobe on Flag	1666 – 4639	Decompression Buoys	378 – 1032
Yellow Flag	279 – 2148	In-water Diver	254 – 678
Diver's Head	197 - 230		



### 3) BOAT BRIEFING & SAFETY CHECKS

It often seems that diving and boating are inseparable. No matter how great the shore diving may be, divers always seem to be drawn offshore in search of grander underwater adventure.

With most pre-dive planning focused on underwater safety, it is easy to overlook the dangers that lurk on the surface. Whether we're passengers (paying or otherwise) on someone else's boat or piloting our own, every now and then it's important to review some of the basic tenets of boating safety.



#### a) Boating Safety Tips

Before leaving port, always ensure the vessel is properly maintained, fuelled, and stocked with the necessary emergency equipment.

Always file a float plan with friend, relative or other responsible party.

Know your boat, its systems and handling characteristics.

Always maintain a high degree of situational awareness: know where you are and what are surrounding or nearby hazards.

Keep a keen eye out for weather changes.

Know and practice navigation rules.

Know and obey all state and federal regulations and waterway markings.

Never overload the vessel. Overloading lowers the distance between the water line and the top deck (freeboard) and hampers performance, increasing the risk of a boating accident. Never exceed the limits posted on the vessels.

#### b) A Buddy on Board

*Any time we are exploring the world below, it is important to have a "watch" or lookout - a responsible person to stay on board to manage the safety scene. The watch has primary responsibility for keeping an eye on the weather, manning the radio, watching for things like a dragging anchor and keeping an eye out for surfacing divers. This person should be trained not only to safely operate the boat, but in first aid and accident management. Another important responsibility of that "buddy on board" is to ensure that nobody is left behind. The DAN Diver Identification System (DIDS) is a great tool for keeping track of divers, but other strategies can also be effective depending on the size of the boat and the number of crew and divers.*

- Robert N. Rossier



## 4) BUDDY SEPARATION PROCEDURES

### a) Immediate actions

Discuss reunion procedures in advance with your dive partner. If you and your partner will agree on a direction to go until you both agree on a new heading, it will be easier to relocate your partner if you become separated.

#### i) Lost buddy procedure

Diver Separated from group

Ascent 5m

Rotate 360 degrees looking for bubbles or any indication of other divers.

Abort after 1min. and ascend if you do not see anything.

Ascend slower than your own bubbles.

Remember your safety stop at 5m for 3min.

Use inflatable surface marker buoy.

Do not continue diving when lost and separated from the dive group.



### b) Subsequent actions

Never assume – If a diver did not descend at the beginning of a dive or disappears during the dive, that the diver is onboard the dive vessel. It is not worth taking the risk of assumption. The diver might be missing or in need of assistance. Safe diving practices helps to prevent divers being lost.

#### i) Reporting lost buddy to the dive leader

Tell the DM that buddy is missing and point to the place last seen.

Dive buddy should ascend along the buoy line to the surface and check if the dive buddy is on board the dive boat. If not alert the skipper about the lost diver.

If the dive buddy is on board the dive vessel and the conditions allow it and you have enough air, descend and rejoin then dive group and inform the dive leader.

In case the lost diver is not onboard the dive vessel, do not descend down the buoy line. Tug on the buoy line or ask the skipper to rev the motors as a recall for the dive group.

#### ii) Lost Buddy Procedures

##### *Diver Recall*

The dive leader should have a signalling device that can be used to recall divers under water such as an air horn or shaker. Before ascending to the surface, the dive leader should count the remaining divers to ensure that the rest of the group are all together. The dive leader should be

able to communicate and inform the skipper that a diver is lost by using an inflatable buoy or by tugging on the surface buoy. This procedure should be discussed with all the staff and implemented by all staff members (skippers & DM's).

### iii) Head count

The dive leader should have a slate that identifies every member of the dive group. Simple but effective and easy to store in BCD pocket. Skipper should have a slate on board the dive vessel that identifies every member of the dive group. The slate should have the following information on it: Time entered the water. Time out of the water.

### iv) Alerting sequence

The lost diver should use the inflatable surface marker buoy that will help the skipper to locate the lost diver. The lost diver could also use a mirror to reflect the sun light, which will help the skipper or pilot locate the lost diver. A smoke generator or water marker sheet will help both a skipper/pilot locate a lost diver. If a diver is lost at sea at night the lost diver should use a cyalume stick or torch that will help a skipper locate the lost diver. All divers should at least have a whistle or air horns that will help the skipper locate the lost diver.

### v) Challenging situations

Diving environment – Surroundings is the synonym for environment – the aggregate of all the external conditions and influences affecting the life and development of an organism. All the external conditions and influences we encounter while diving comprise the dive environment.

The diving environment varies. We dive in oceans, lakes, rivers, springs and quarries; in calm, still waters and in rough, moving waters; in clean and turbid waters; cold and warm waters; during different seasons of the year; at varying altitudes; around various underwater plants, animals and formations; in different parts times of day and night.

Our aquatic environment is a vast, wonderful playground for recreational diving. Because the diving environment varies greatly from place to place, we need area orientations. We need to know how local conditions affect our diving and how to deal with the environment effects.

The aquatic environment is too strong to fight. It helps to "go with the flow", literally. When water moves, we need to know how to use the movement to our advantage and how to avoid the diverse effect of water movement.

The animals we encounter while diving rate high as attractions. A few animals are dangerous and can cause serious injury. There are keys to avoiding aquatic life injuries. We need to know the keys and then use them whenever and wherever we dive.

Bad visibility – Limited visibility diving exists when a buddy cannot be discerned at a distance greater than 3meters. To dive safely in turbid water requires preparation and skills beyond that required for clear water diving.



Strong currents under water and on the surface – Currents in water are like wind in air – fluid in motion. The most significant difference is that water is 800 times denser than air, so even a slight water current is extremely strong. A fully equipped diver can sustain a swimming speed slightly more than one knot only briefly. If you fight water movement, you lose. You must understand currents and use them to your advantage.

Tides – Changing tides affect nearly all divers at some time. There is more to the subject than just the rising and falling of water. Knowledge of the tides can increase your diving safety and enjoyment.

Strong winds – The wind has a profound impact on the surface conditions of the ocean or any other open water surface. Surface currents from winds develop at a rate of two percent of the wind speed every two hours, provided the wind blows continuously in the same direction.

Solo divers – People do dive alone, but diving alone is not necessarily safe, which means literally “without risk.” It is true that only one person can get into trouble, but it is also true that if the individual gets into trouble, there will be no one available to assist or rescue him/her. There are circumstances in which experienced, self-reliant divers choose to dive alone. When they do this, they are accepting the possibility that something could go wrong. Accepting a risk does not mean an activity is safe.

Night dives – Do not attempt night dives in strange areas or under poor conditions. Diving at night in rough or turbid water is hazardous. Seek ideal conditions when diving at night.

Drift Diving – Drift diving is a specialized activity requiring an orientation from an experienced diver, preferably an instructor. There are several types of drift diving, and unique procedures and rules for this exciting activity. The preferred method for a boat skipper to maintain contact with drift divers is to have the divers tow a surface float. Items recommended for drift divers include a surface float, line and reel, a whistle, delayed surface marker buoy, waterproof flares and a mirror.

Deep Diving – Deep diving is serious diving, and should not be attempted by going deeper with standard diving equipment. You need additional equipment, training and supervision to increase safety as you gain experience and adapt to new sensations. Do not attempt deep dives without these essential elements. Do not base your diving prowess on how deep you have dived. If you have a need to dive deeply, approach it the right way. Otherwise, stick to depths less than 30 meters and enjoy the longer bottom time and reduced risk than the shallower water offers.

Wreck Diving – Mystery, excitement and the thrill of adventure attract divers to wrecks. Diving safely on wrecks requires knowledge and preparation. Wreck diving poses more hazards than regular diving, especially when penetrating is involved. The worst mistake a diver without proper training and equipment can make is to succumb to the temptation to enter a wreck. Too many divers do not understand the hazards of wreck diving, cave diving, ice diving, deep diving or other higher-risk by divers who know the proper techniques, have the proper equipment, and follow established safety practices for the specific activity.

Altitude Diving – Altitude diving is hazardous and technical. You can minimize the risks if you know what to do and do what you know. Training is essential.

Cavern and Cave diving – Caverns are less hazardous than caves, but you should not enter into a cavern without exercising good judgment and self-discipline. The skills acquired in a cavern diving course are good skills to have for diving in general, and the minimum equipment for cavern diving can also be useful for all dives, so why not complete a sanctioned cavern diving course?

*You will be a better diver who can safely enjoy the beauties and mysteries of underwater caverns. If that intrigues you, cave diving training can prepare you to enjoy deeper penetration into underwater formations safely. Trained cavern and cave divers dive and live. Untrained divers who enter underwater labyrinths often do not survive.*

- Dennis Graver

## 5) SEARCH & RESCUE PROCEDURES

### a) Identifying & Managing resources

#### i) Problem recognition

Before the dive – The key to detecting stress is communicating. In the pre-dive phase, communication between you and your buddy is much easier than it is under water. You are able to detect subtleties in your buddy's behaviour that wouldn't be as apparent in the water. Communicate your own unresolved problems – such as uncertainty about a dive plan – to avoid stress personally, but also be very attentive to your buddy. A certain amount of nervous anticipation before a dive is to be expected, but abnormal behavior should warrant concern. In learning how to detect and deal with stress, we begin to express the real importance of our role as a safe diver and a good, reliable buddy. As you learn more about diver stress and how to notice its causes and its onset, you are further enabling yourself to reduce or eliminate it

#### ii) Panic diver/divers; during and after the dive.

At the start of the dive – If stress does occur during this phase of the dive, it can still be dealt with. The earlier it is detected, the better your chances of continuing the dive. Stress is more dangerous under water. The further stress builds, the more conspicuous these become. Be alert for signs of stress and remember -- it is not the presence of one sign, but the combination of signs that should warrant concern.

#### *Signs of a panic diver during a dive*

Diver does not want to let go of the boat or contact point.

Poor buoyancy control.

Excessive behaviour – rapid breathing, a sense of being over weighted, continuous use of arms and legs or dumping air from the BCD continuously.

Inability to communicate – wide-eyed expression and loss of skills.

Signs of a panic diver after a dive

Failure to achieve positive buoyancy.

Mask off, regulator removed.

Shortness of breath.

Signs of drowning.

*Preventing stress while diving*

Use the easiest entry and descent – a descent line or surface buoy provides a good reference point.

Monitor instruments.

Be aware of physical stress and monitor limitations.

Keep in contact with your buddy.

Preventing stress at the surface after a dive

End your dive with air to spare.

Control your ascent.

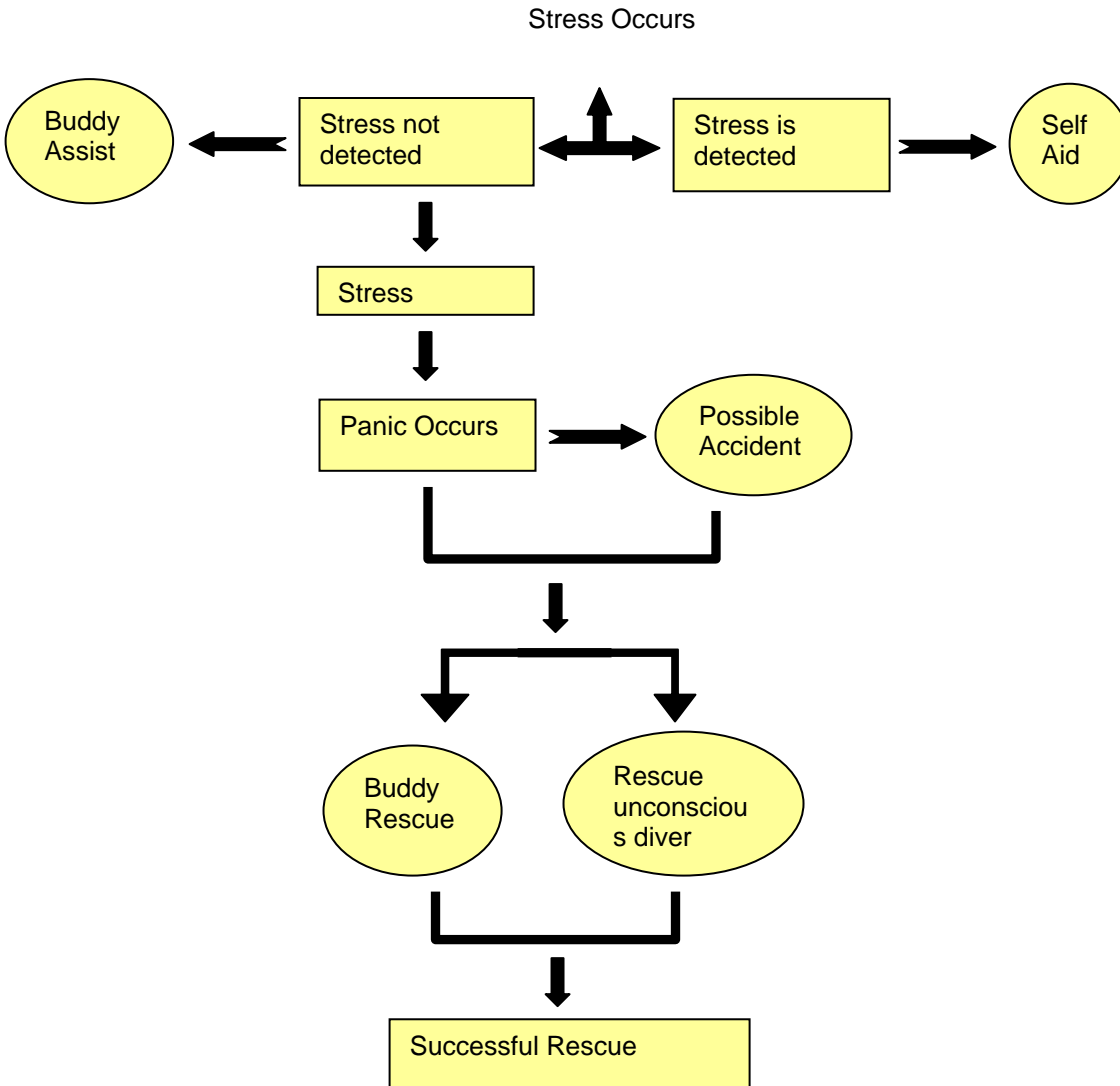
Stop at 5m for 3 min. – safety stop.

Become positively buoyant on the surface.

Use the easiest method of swimming and breathing on the surface.

Use the easiest method of exiting the water.

Self rescue



*Do not assume your buddy will always be there for you. Practice self-rescue skills, and hone them in the controlled setting of a refresher program, a continuing education course or practice them regularly in a pool. This may not only help you avoid a minor inconvenience; it may help you pre-empt a full-blown emergency.*

*Practice mask-clearing skills. This is often considered the most difficult skill to master during scuba training, starting with partial flooding and moving through to full flood to removing the mask and replacing it. Even if your mask is never removed from your face, the chances are good that a small amount of water will leak in during any given dive. Performing this skill comfortably will surely come in handy.*

*Consider how you might handle sudden changes to your buoyancy, for instance, if your automatic inflator gets stuck in the inflate position. Simply disconnecting the mechanism should stop a continuous inflation of your buoyancy compensation device, but doing so will require you to then deal with the inability to inflate automatically. Practice disconnecting your inflator and then orally inflate your BCD while underwater. Keep in mind that although this is not in itself necessarily a life-threatening situation, it could easily be the catalyst to other problems.*

*If such a scenario presents itself, then, you should immediately abort the dive and slowly make your way to the surface, following all normal ascent procedures, including making a safety stop.*

**- SSI Diver Stress and Rescue Manual**

## **b) Practice Skills**

In self-rescue, you may have to deal with an occasional leg cramp, not an unusual event. With stretching and rubbing the area, you should be able to work through the discomfort. You will also need to pay attention to your buoyancy as you work through the cramp. In your haste to recover from the cramp you could unknowingly find yourself descending or ascending too quickly or even uncontrollably.

Practice stretching your leg while maintaining your relative position in the water. If practicing in a pool, pick out a spot on the side and focus on this while you work on the cramp. At the same time, concentrate on maintaining a consistent breathing rate, as this can be helpful in buoyancy control. Practicing rescue skills with your favourite buddy is also important to better prepare both of you to respond efficiently and appropriately to any emergencies that may happen when you're diving together.

Review skills with your buddy periodically. You learn to master skills such as air-sharing during entry-level training, but the maxim "if you don't use it, you lose it" comes to mind. Performing these skills during training allows you to get focused instruction on the proper techniques, but with the passing of time, your skills will get rusty.

The circumstance that requires you to share air - someone has run out of air - increases your stress level. Performing this skill in the heat of the moment is much different from during practice sessions in a controlled setting. By spending some time refreshing your skills with your buddy you'll increase both competence and confidence to perform them.

The 2004 Report on Decompression Illness, Diving Fatalities and Project Dive Exploration reported, "the average injured diver was not newly certified." While 46 percent of injured divers had five or fewer years experience since certification, 20 percent had five to 10 years' experience since certification, and 34 percent had more than 10 years' experience since being certified. This

may lead one to believe that on average those represented in this injury data were experienced based in part on the total years since certification. When you consider recent diving experience, however, the data may point to those who were a little rusty in their skills. The report also indicates that 40 percent of the men injured and 50 percent of the women injured had made fewer than 20 dives in the previous 12 months.

*No diver really enjoys practicing removing and replacing the mask, especially in cold water, but this is exactly what divers should practice before it happens without warning. While dive professionals are charged with the responsibility of looking after other divers, dive buddies have a responsibility to each other. In both instances, having the ability and confidence to respond to another and to oneself will better assure the dive will begin and end on a good note. Even dive professionals should practice the very skills they teach others how to perform. That includes remembering to dive with a buddy.*

**- Jeff Myers**

*Assistance - A typical CPR and first aid program is built around the understanding that EMS help will be available within a 10-minute window. Rescuers do not learn to provide care for extended periods: they simply learn to initiate care and then turn it over when professional help arrives. While this works fine in a land-based urban setting, it does not always apply to diving scenarios, where divers are at a lake, river, quarry, a beach or on a boat. Rescue times are often significantly longer than 10 minutes at most of those locations.*

**- Eric Douglas**

### **c) Planning, Equipment & Procedures Requirements:**

All operations must have a functional emergency plan, with appropriate equipment and emergency procedures. Land-based resorts should develop a working relationship with local emergency medical services (ambulance services, rescue squads, etc.) for safe and efficient management of diving emergencies.

#### **i) Emergency Assistance Plan**

Standardized format  
Components of EMS  
Action plan  
Emergency contact numbers  
(DAN, EMS, medical and emergency personnel)

#### **ii) Emergency Equipment**

Emergency Medical Oxygen must always be readily available and is required on every boat.

Emergency Oxygen supply should be adequate to ensure delivery to at least two, breathing or non-breathing injured divers simultaneously until local EMS arrive. First Aid Kit (appropriate for potential injuries in specific locale).



### iii) Search patterns & techniques

While diving is a statistically safe activity, there is some risk involved, and accidents do sometimes occur. Since diving takes place in remote locations, you need to know what action to take in the event you are called upon to perform a rescue.

*There is no single diver rescue procedure that works the best for all situations. The best you can hope for is proficiency with a variety of techniques that are effective, and selecting the ones that are most appropriate. The more methods you have available to you, the better your chances of performing a successful rescue. Learn as many techniques as possible by completing a diver rescue course. You owe it to your buddies to be able to rescue them if they should ever require your assistance.*

**- Dennis Graver**

There are a variety of search patterns and techniques available that are suitable for different rescue attempts. Before initiating any one of the various search techniques there are a few considerations to take into account.

1. Are there qualified divers to help with an underwater search?
2. How long has the missing diver/s been missing?
3. When was the missing diver(s) last seen and in which direction was he/she swimming?
4. At what depth was the missing diver/s last seen?
5. How strong was the current and what is the visibility like?
6. Are the divers conscious?
7. Do the rescue divers have enough air available to conduct an underwater search?
8. Do you have the right equipment available to conduct an underwater search?
9. Remember to delegate task to various people that are available and willing to assist in an emergency situation!

*Some underwater search patterns:*

U-pattern search: If there are enough rescue divers available a large area can be covered by using the mapping technique. For this method you will need enough rope and small weights to divide the search area into block.

The pivot technique is useful when there are limited rescue divers available.

NB. It is essential that all rescue divers are equipped with compasses.

*Some equipment recommended for underwater search's:*

- Rope (bow note, .....)
- Weights
- Torches
- Lifting bag or other devices

#### **iv) Global Positioning System (GPS)**

##### *What is GPS*

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defence. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day. There are no subscription fees or setup charges to use GPS.

##### *Man over Board (MOB)*

This function is useful to charter boats, as it will enable the skipper to mark a lost diver's last known position. The GPS will then help the skipper to initiate an organized search that will allow the skipper to return to the original point where the diver was last seen. This function will allow the skipper to drift from the MOB mark and determine the speed and direction of the surface current which will help determine the direction of the search.

##### *G-Charts*

Some of the GPS's like the GARMIN have G-Charts available. This will help you add more marine navigation data to your GPS chart plotter. GARMIN offers two different types of marine cartography data cards: inland and offshore. GARMIN G-charts features complete depth contours, nav aids, and port plans that show names of harbours, towns, marinas, inlets, hazards, and other data. This will assist you and other rescuers and rescue vessels or planes in the event of a missing or injured diver. With the information on your GPS, you can give accurate geographical information to other rescue vessels or planes.

**- GARMIN GPS GUIDE FOR BEGINNERS**

#### **d) Communications**

##### **i) Immediate Communication**

all missing buddy situations must be reported to the dive leader immediately, followed by a prompt response by the dive leader to confirm whether or not the missing diver has been located and is on the dive boat / shore or not.

##### **ii) Prompt Action**

failure to account for any missing person should immediately prompt a formal search which should include aborting the dive; using all local resources to locate the missing diver and; within a period no greater than 20 minutes, dispatching local rescue services. As emergency and search and rescue services require time to respond, they should be notified as early as possible. In general, it is better to cancel a call than to alert emergency services when it is too late to respond effectively. Importantly, if the diver/s are found immediately call off the search / dispatch.

### **iii) Skipper communication with DM:**

Weighted tags with message for the dive leader.

Inflating tags with message to the surface for the skipper.

Skipper tugging the buoy line in a sequence will relay a message to the dive leader.

Dive leader tugging on the buoy will relay a message to the skipper.

Skipper rev' the motors will relay a message to the dive leader.

### **iv) Boat and dive base communication systems**

Two-way radios

Satellite phones

Cell phones

Landline telephones

### **v) Debriefing**

The debriefing is as important as the pre-dive briefing. During the debriefing, the dive leader has the opportunity to ensure that all the divers have safely returned after the dive. This can be done with the help of the DAN ID Tags, an easy way to account for all the divers.

The debriefing will allow the dive leader to access the divers to find out if there were any problems that occurred during the dive or if there are any problems that arise after the dive. The debriefing is a valuable source of information for the dive leader because it will provide essential information for the following divers with special regard to visibility, water temperature, currents and marine life.

The debriefing will allow the dive leader to inform the divers of any problems he or she noticed while diving such as buoyancy control (too little or too much weight), equipment problems (gauges hanging loose and dragging along the bottom), disorientation, buddy separation, ascent rates and air consumption.

The divers will have the opportunity to share their experience with all the other divers and note valuable information (weighting, wetsuit thickness, cylinder type, air consumption, fin type and any other equipment) about their dive, which will be beneficial to them for future dives. Besides all the information that is shared between the dive leader and the divers, it is a wonderful way to end the dive.

## 6) RESOURCES FOR LOST DIVER SITUATIONS

DAN Emergency Handbook – John Lippmann & Stan Bugg

In the event, a diver does not resurface when expected:

Assess the degree of urgency. Consider time overdue, planned dive profile (i.e., maximum depth, total dive time), possible decompression, and air status.

Question the buddy, if available, to determine:

10. Any obvious problem;
11. Where and when the missing diver was last seen, what diver was doing and the direction in which diver was swimming;
12. Maximum depth reached;
13. Last known tank contents and likely consumption;
14. Experience and condition of the missing diver;
15. Diver's likely action in the event of separation and/or emergency;
16. Where buddy surfaced relative to separation point.

Reassess degree of urgency in light of information gathered.

Buoy the area where the diver was last seen.

Place a lookout at the highest possible vantage point.

Scan the surface/shoreline for divers and bubbles.

Check that the diver has not boarded any neighbouring boats.

Consider whether it is necessary to conduct an underwater search.

If it appears a search is necessary, recall all divers. If an underwater search is to be conducted, prepare the standby divers. Determine who can participate in a search without compromising anyone's safety.

If bubbles are visible, send in a pair of standby divers to investigate.

Phone or radio for help.

Utilize any available boats and divers and prepare an appropriate search.

DAN Emergency Handbook – John Lippmann & Stan Bugg  
Injured diver care and handling

Stay Calm

Check Airway, breathing, circulation.

CALL DAN SOUTHERN AFRICA

DAN is on call 24 hours a day to handle diving emergencies such as decompression sickness, arterial gas embolism, pulmonary barotrauma or other diving-related injuries.

24-HOUR HOTLINE

+27(0)11 254-1112 (INTERNATIONALLY)

Assess: Airway, Breathing, Circulation

Place diver in left lateral (recovery) position & keep warm

100% O<sub>2</sub>: Breathing patient via demand valve or non-rebreather mask @15Lpm. Non-breathing patient administer artificial respiration using a pocket mask @15Lpm.

Call DAN: +27(0)11 254-1112

Check consciousness, memory, muscle strength, skin sensation, balance and coordination

Give conscious divers non-alcoholic, non-caffeinated liquids

If trained – give 1000 mL Saline / Ringers Lactate over 60 minutes

Record all data:

Diver's Name; ID & DAN Membership No (if applicable)

Location of the emergency

Events leading to the diving emergency

Signs & Symptoms plus onset times

Treatment given

Dive Profiles

Keep diver's gear intact; turn air off; send gear with diver

Ensure no other divers are missing or injured

Please Note: Although DAN offers free, 24-hour advice and assistance to all divers, regional private companies who require a guarantee of payment for their services by means of validated emergency medical insurance or a financial guarantee from the injured diver or their next of Kin provide evacuation and treatment.

DAN members automatically enjoy full cover for evacuation and treatment of diving-related medical emergencies as well as medical evacuation for non-diving-related medical emergencies while away from home. This saves valuable time in an emergency. For peace of mind, join DAN today: +27(0)11 254-1991 /2 or 0860 242-242

+27(0)11 254-1993 (fax)

[mail@dansa.org](mailto:mail@dansa.org)      [www.dansa.org](http://www.dansa.org).



## Control severe bleeding

### Signs and symptoms

Extensive

Severe bleeding

Shock

Unresponsiveness

Death (can occur within minutes)

### First Aid

17. Apply direct pressure to the wound (use a pressure pad, packing or bandage).
18. Elevate the wound.
19. Resuscitate as required
20. Apply constrictive bandage, if necessary (see note 1).
21. Treat for shock.

### Cause

Lack of O<sub>2</sub> to the vital organs due to any cause, including decompression illness, haemorrhage, injury, infection. Illness, burns, dehydration, vomiting, diarrhoea or emotional distress.

### Signs and symptoms

22. Pale, cold, clammy skin.
23. Rapid, weak breathing.
24. Rapid, shallow breathing.
25. Weakness, collapse.
26. Thirst.
27. Nausea, vomiting.
28. Confusion, anxiety.
29. Unresponsiveness, death.

### First Aid

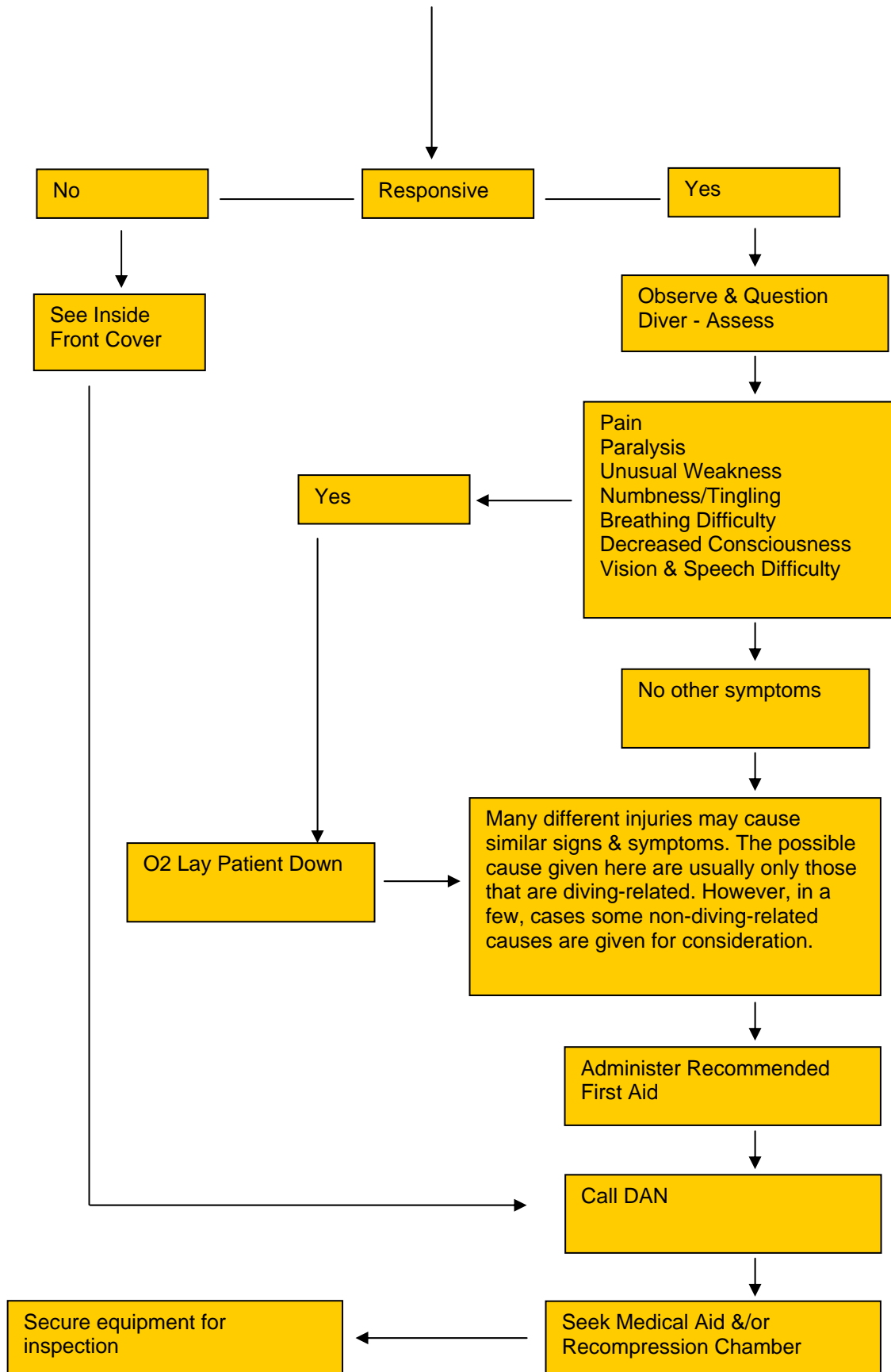
30. Monitor the airway, breathing, circulation and resuscitate if necessary.
31. Act to prevent further shock. Stop any severe bleeding.
32. Place the diver in a flat position or head down and legs slightly elevated.
33. Place unresponsive diver on the side to avoid aspiration of vomit and to maintain an adequate airway.
34. Administer O<sub>2</sub>.
35. Keep the diver still, quiet and reassured.
36. Protect diver from the environment (elements such as rain, heat, winds etc.).
37. Seek medical advice.
38. Give nothing by mouth.
39. Keep diver away from direct heat.

Avoid moving the injured diver unnecessary (see note 2).

Send for an ambulance or air transport.

*Note 1: An arterial tourniquet should only be used as a last resort when it is the only way to save the divers life. If used, a tourniquet should be made from wide, flat material. A pad should first be applied over the artery; the tourniquet is tightened until the bleeding stops and no further; it must not be covered; and the time of application should be recorded (e.g. written on the diver's forehead) and relayed to medical services.*

*Note 2: If transport of the injured diver is unavoidable, do so with the diver lying down, and with the legs elevated. The diver must be handled gently.*





Basic Life Support  
Sequence of Action\*

Ensure rescuer and injured diver safety.

Check the injured diver for response. Gently shake the diver's shoulders and ask loudly. "Are you all right!"

If there is a response, avoid moving the diver (unless he or she is in further danger), assess the diver's condition regularly, and get help if needed.

If the diver does not respond, activate the emergency medical system (EMS) and call for help. Open the airway by tilting the head and lifting the chin.

Assess breathing by keeping the airway open and look, listen and feel for breathing.

If the diver is breathing, place the diver in the recovery position and check for continued breathing.

If the diver is not breathing, provide two effective rescue breaths by blowing steadily until the chest rises and wait for it to fall between every breath.

If signs of circulation are present, continue rescue breathing until the diver starts breathing on his or her own. If available, add supplement O<sub>2</sub>. Every minute, recheck for signs of circulation. If the diver starts to breathe on his or her own but remains unresponsive, place the diver in the recovery position.

If there are no signs of circulation, begin chest compressions. Locate the lower half of the sternum (breastbone), and place the heel of one hand on top of the 1st. Press down on the sternum between 4 and 5 cm deep for adults and release evenly. Perform 30 compressions at a rate of 100 times per minute. Continue cycle of compressions and breaths at a ratio of 30:2.

Continue resuscitation efforts until:

Circulation and breathing resume.

Additional qualified help arrives.

You become too exhausted to continue.

## SEA SEARCHES (CRAFT, MOB OR MISSING DIVERS)

### Introduction.

There are a number of factors, which need to be taken into account prior to setting out on a search.

The time factor. Just when was the last sighting/ contact / visual of the missing person/craft.

Based on this time factor and taking wind, current and overall drift into account set an initial outer parameter.

Where – the location (Lat and Long) or position (distance and bearing).

Size of the object, its colour, shape and height above water.

The weather and visibility.

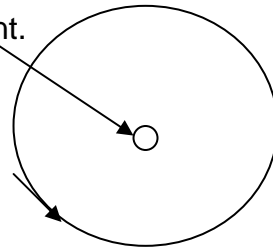
The sea state, other tidal and current information.

The wind and its direction.

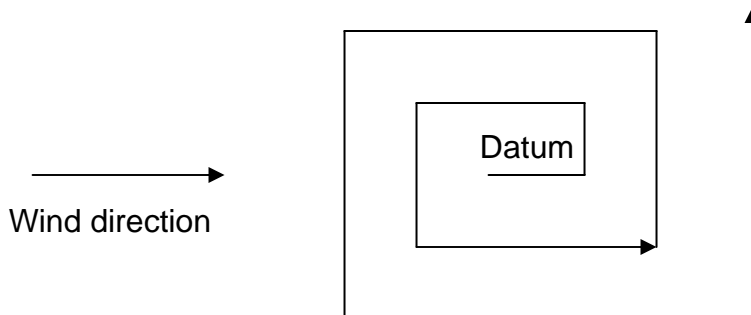
The number of vessels (size, speed, numbers of crew, height above water), aircraft and or helicopters available for search.

All the above along with the history of the happening will determine which search method/ pattern would be selected and then search speed and track space (where needed) would need to be considered. In the case of a missing diver, a simulated test drift should be considered to determine more accurately the drift rate in the current ( present) conditions.

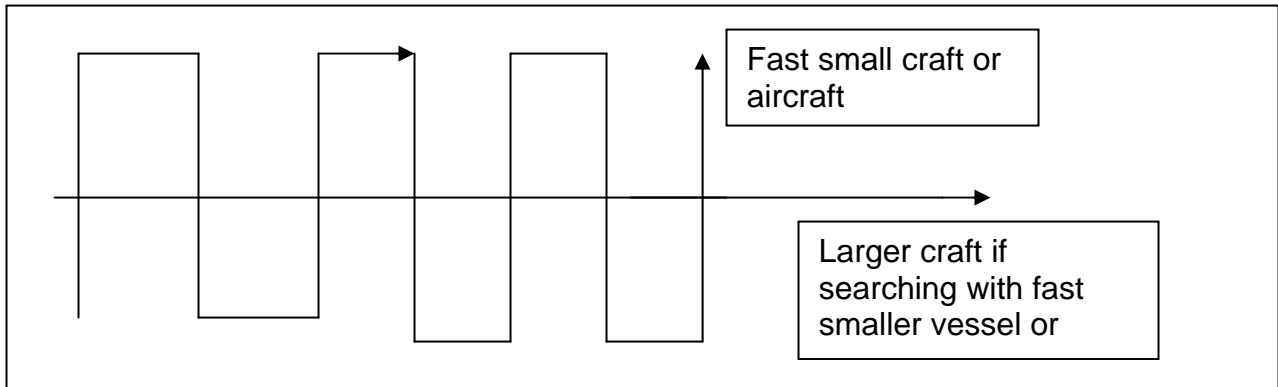
1. Circular search around a known datum point.



2. Expanding box search (first leg into the wind). Consider track space and speed.

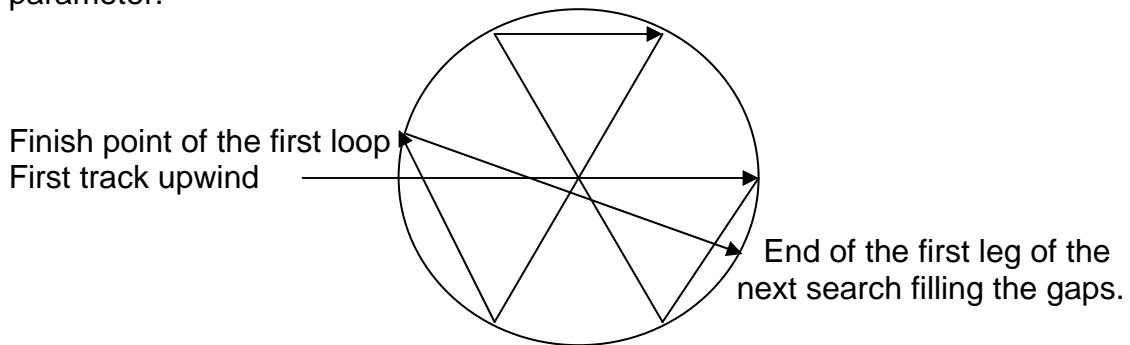


3. Creep line Search co-orientated with second larger vessel or aircraft.



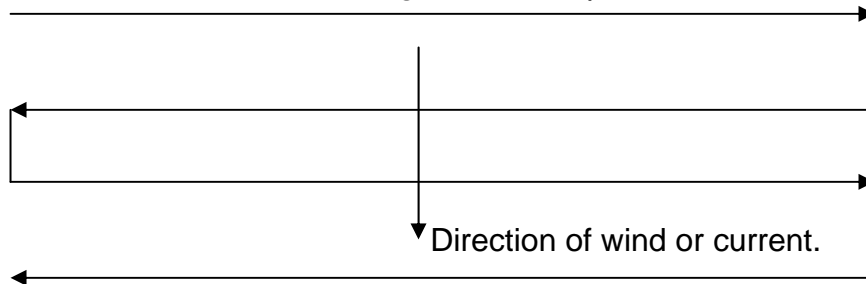
4. Sector Search parameter.

First establish to outer

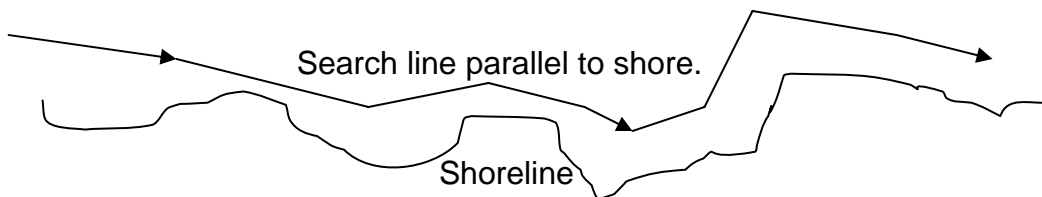


5. Parallel Track Search

○ Datum point.



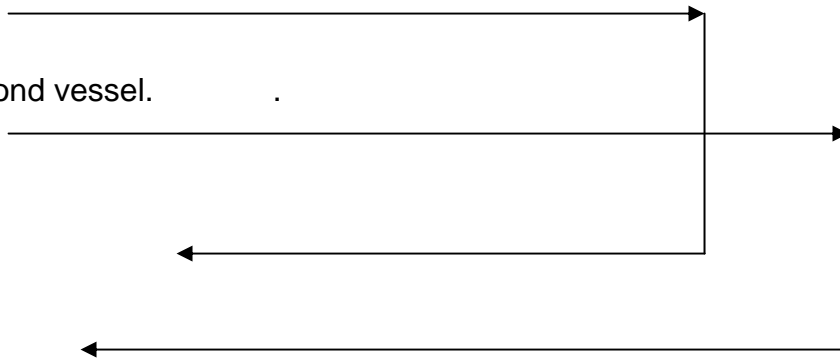
6. Shoreline Search.



Should there be more than one vessel searching, the vessels can run parallel and cover a larger quicker. Spacing needs to be monitored so that no gaps are left. This is difficult to do when turning. Vessels could cross paths to save time. See drawing below.

First Vessel.

Second vessel.



- Dave Sievwright