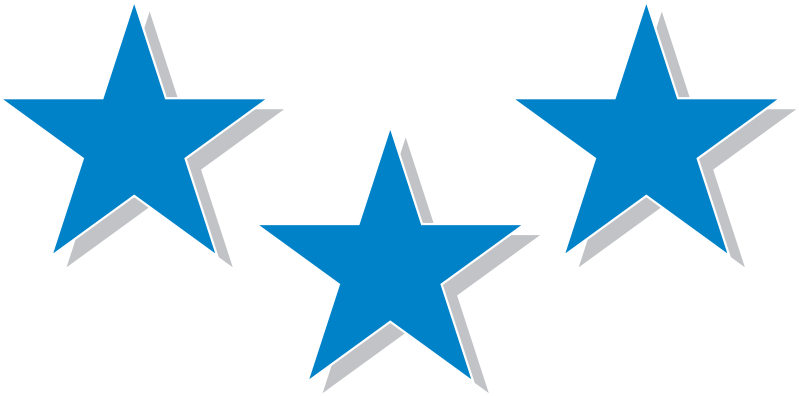
LESSON 1

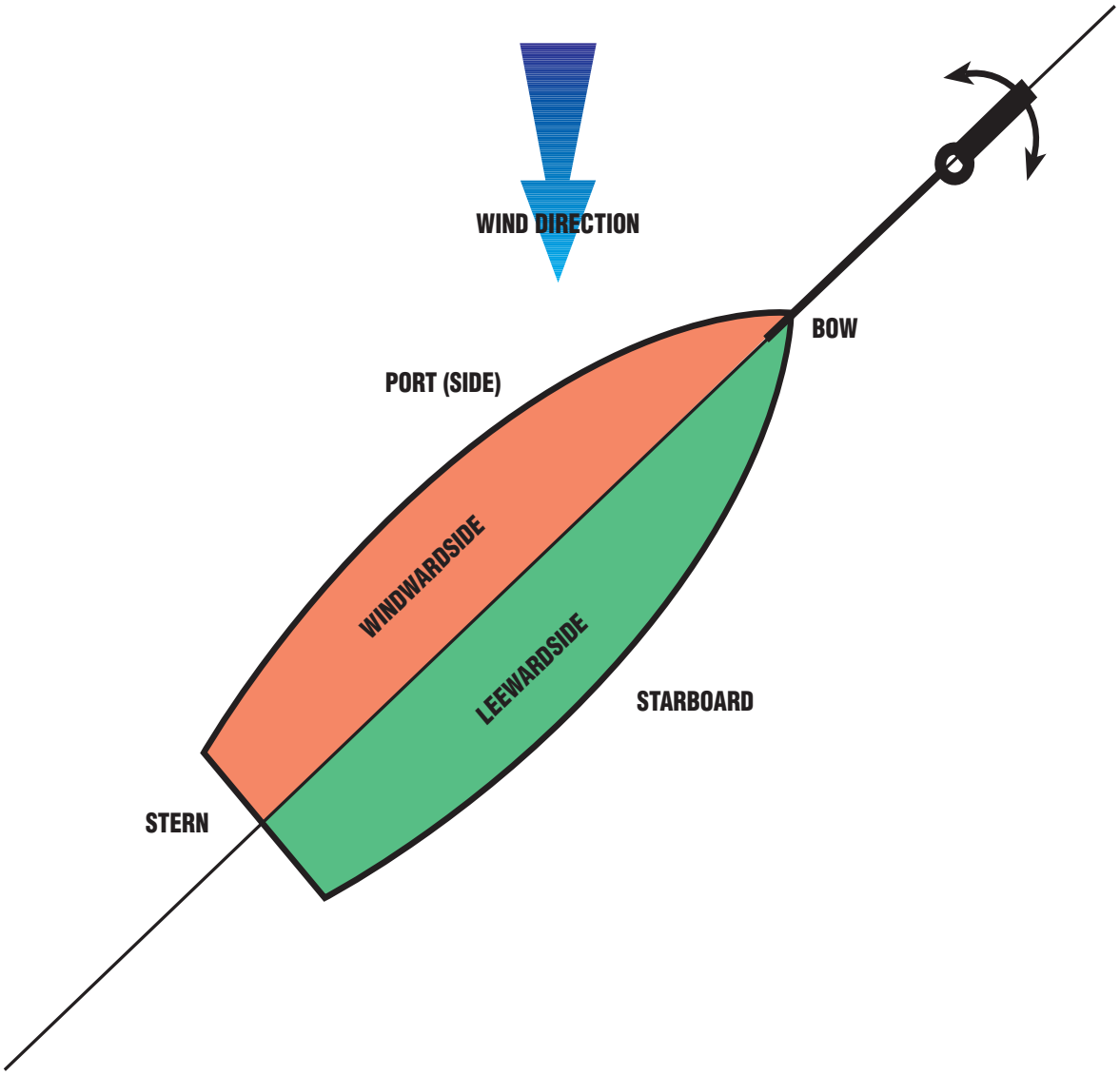


CMAS

WORLD UNDERWATER FEDERATION

Boat

TERMINOLOGY



Bow	**front or forward end of a boat**
Stern	**back end of a boat**
Port	**the side of a boat that is on the left when one is facing forward**
Starboard	**the side of a boat that is on the right when one is facing forward**
Aft	**direction towards the stern of a boat**
Forward	**direction towards the bow of a boat**
Windward	**the side the wind comes from**
Leeward	**the opposite side the wind comes from**
Helm	**handle or wheel for moving the rudder of a boat**
Steering-gear	**area of a boat where helm is**
Upper works or top side	**no underwater area of a boat**
(Ship's) bottom or quickwork	**underwater area of a boat**
Keel	**structure along the bottom of a ship where the framework is built up**

Types of boat

INFLATABLE DINGHY

Inflatable dinghy is a solid and safe boat with relatively cheap operating costs, it is used by divers and diving centres for its capacity of transport , speed and others facilities.
Inflatable dinghy consists of air filled tubes divided into sections, so it can float in case of puncturings too.
The tubes are linked to the keel that it is usually rigid or inflatable.
The stern area is called transom and it very often supports the outboard, so called because all propulsion apparatus is outside of boat.
Inflatable dinghy can be coxed by steering gear, a control system far from the engine, or by helm situated on the outboard, this sistem is present only on small inflatable dinghies.

RIGID HULL BOATS

daily boats
The boats of this category have a proper area for scuba equipment and suitable provided entrance and exit areas. They are not very long and include: ligurian fishing boats, water skiing boats or open boats.
cabin motor boats
These are bigger than daily boats. They can give accomodation for few days excursions. They are boats with a large transom and a boat deck where to put tanks and all other scuba equipment.
cabin cruiser
This type of boat includes underwater charter boats on which it is possible to accomodate in large cabins.
As these boats are used for cruises a filling apparatus is, often, present on them.
A smaller boat is sometimes employed to arrive at diving sites.

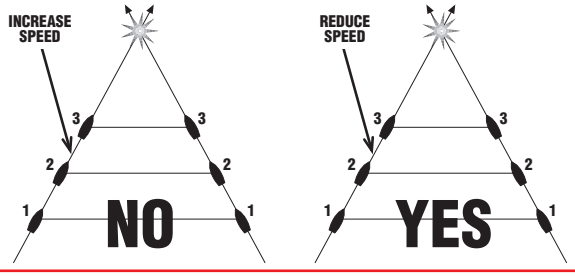
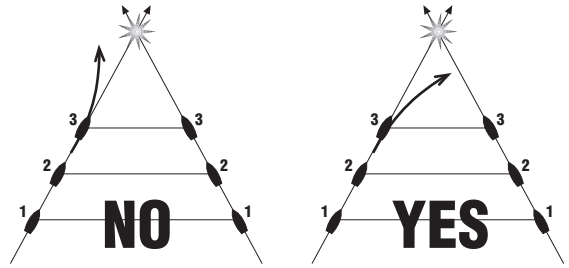
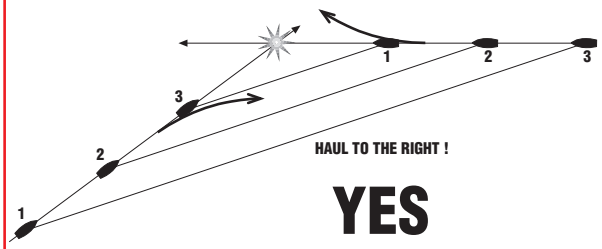
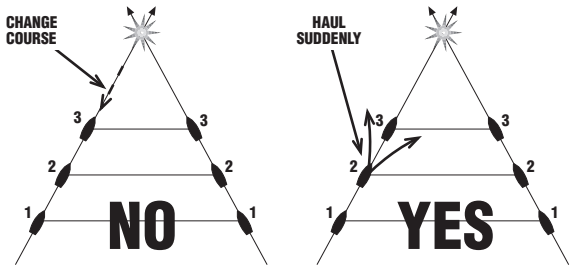
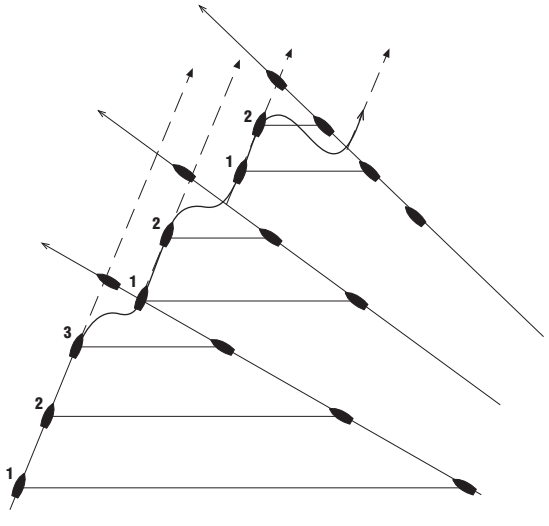
STEERING OF BOATS

When you steer a small or a big boat you must behave so as to safeguard the boat and people or things on it. Consequently if you know the main procedures to avoid collision at sea, you will be able to solve problems which might occur.

BEARING

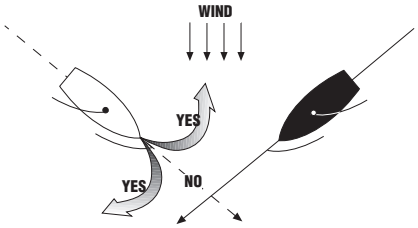
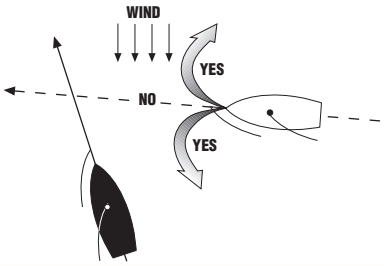
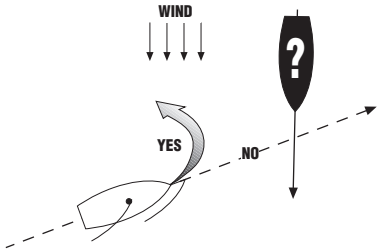
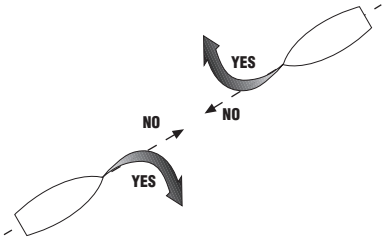
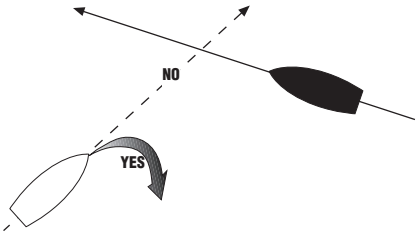
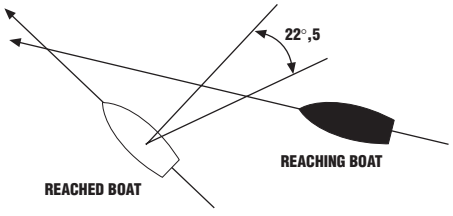
Every boat holds its course with a proper speed, these two elements are called boat barycentre course.
During the sailing it is possible to establish if there could be a risk of collision by observing the courses of the nearby boats.
This is possible thanks to a series of successive bearings so as to establish if boats are getting closer dangerously.
Bearing is taken by means of a proper instruments or by means of objects in line on own boat, at regular intervals.
If the bearing is costant the collision may take place, while if after an interval the other boat is in different position,collision may not take place . It could be dangerous when two boats are getting closer at about 200 metres and there is a good visibility.

BEARING PROCEDURES

CONDITIONS	CONDUCTS	MANOEUVRE
COSTANT BEARING	It is better to choose courses that avoid the bow passing on to others boat	
	If you must haul suddenly you should handle your boat towards the stern of the other boat	
	Things being uncertain it is better that both boats haul to right	
	You get better results if you haul at proper time instead of altering course suddenly	
	If you fall foul of two or more boats solve one problem at time, starting from the nearest boat	

COUNTERMANOEUVRE TO AVOID COLLISION

There are proper rules to avoid collision at sea but some problems may arise if the boat that should not manoevre to avoid collision it is at risk of collision too.

CONDITIONS	CONDUCT	MANOEUVRE
SAILING BOATS	**When two sailing boats are getting closer and each of them have wind from different sides, the boat which have wind from its left shoul vacate the course**	
	When both boats have wind from the same sides, the boat which is to windward should vacate the course to boat which is on the leeward	
	If a boat which has wind from left and sees a windward boat, if it cannot establish if the other boat has wind from right or left, it should manouvre so as to vacate the course	
MOTOR BOAT	**When two motor boats sail with opposite courses and the risk of collision may occur, each of them should change their course on the right so as to be on the left of the other boat**	
	When two motor boats sail with crossing courses and the risk of collision may occur, the boat which sees the other boat at right should vacate the course and, if it is possible to avoid passing at the bow	
REACHING BOAT	**A boat that is reaching another boat, should vacate the course to other boat. A reaching boat is the boat that is getting closer from a direction above 22,5° abaft of the beam of the reache boat. The reaching boat is that boat which would make out- only the stern lights of the reached boat at night.**	

ANCHORS AND ANCHORAGE MANOEUVRES

ANCHORS – ANCHORAGE – MOORING

NOMENCLATURE OF ANCHOR

1 **SHANK**
Straight and sleder part of the anchor

2 **SQUILL**
Ring placed at the end of SHANK

3 **FLUKE**

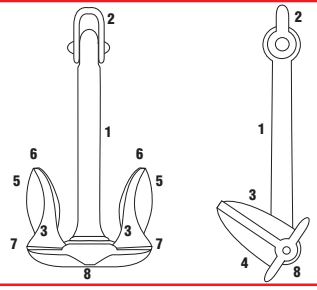
4 **CONTERSHAKE**

5 **PATTA**
The end of FLUKE

6 **ANCHOR BILL**
The end of palm

7 **PIVOT**

8 **CROWN**
Joint between flukes and shank



TYPES OF ANCHOR

1 **Hall**
with articuled flanks,
it is used by average or big boats

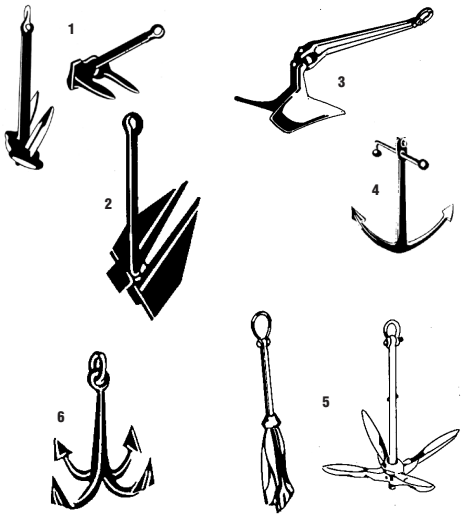
2 **Danforth**
It is used by small boats especially
on sandy or muddy bottoms

3 **C.Q.R.**
with transversal structure
that forces at least one fluke
to hold on the bottom

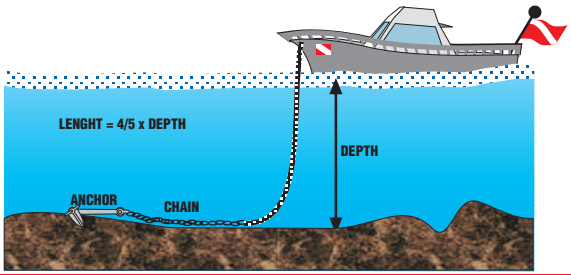
4 **Ammiragliato**
with three flexible flakes and fixable
to shank for a confortable stawage

5 **Umbrella**
with three flexible flakes and fixable
to shank for a confortable stawage

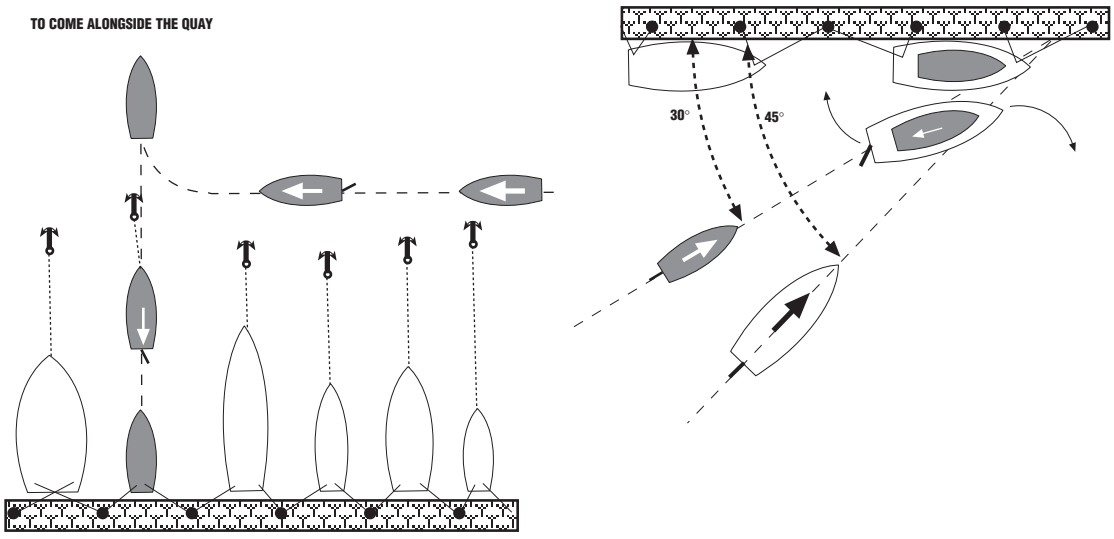
6 **Grapnel**
with fixed flukes, it is used
to rescue cables or objects



ANCHOR MANOEVRE



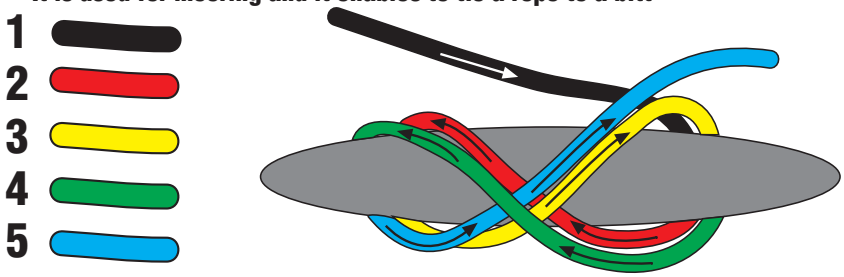
TO COME ALONGSIDE THE QUAY



KNOTS

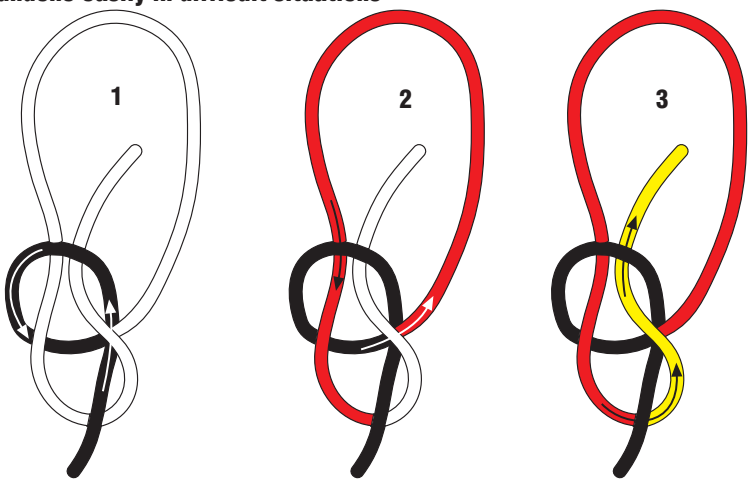
BITTER OR BOLLARD

It is used for mooring and it enables to tie a rope to a bitt



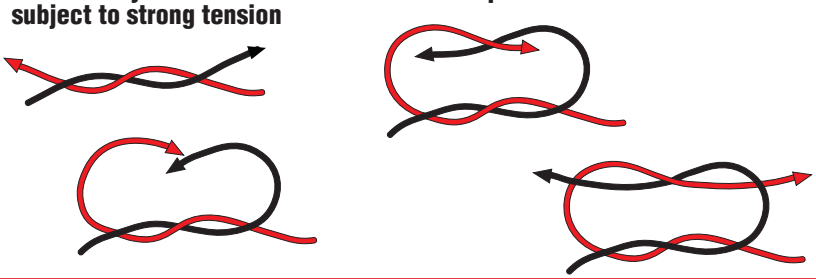
BOWLINE KNOT

It is one of the most famous knots, it is firm and it comes undone easily in difficult situations



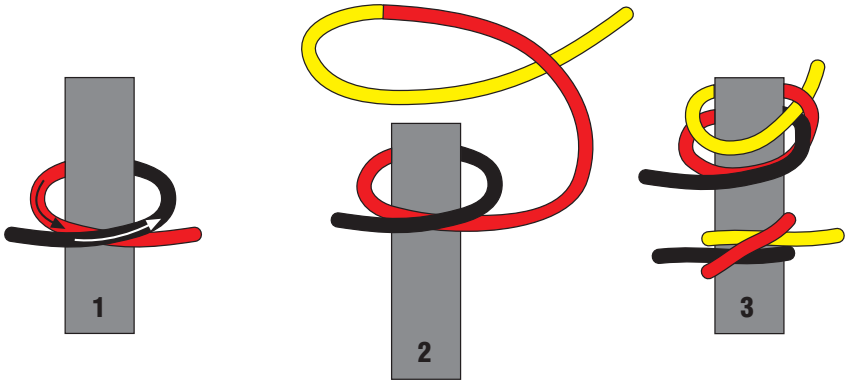
REEF KNOT

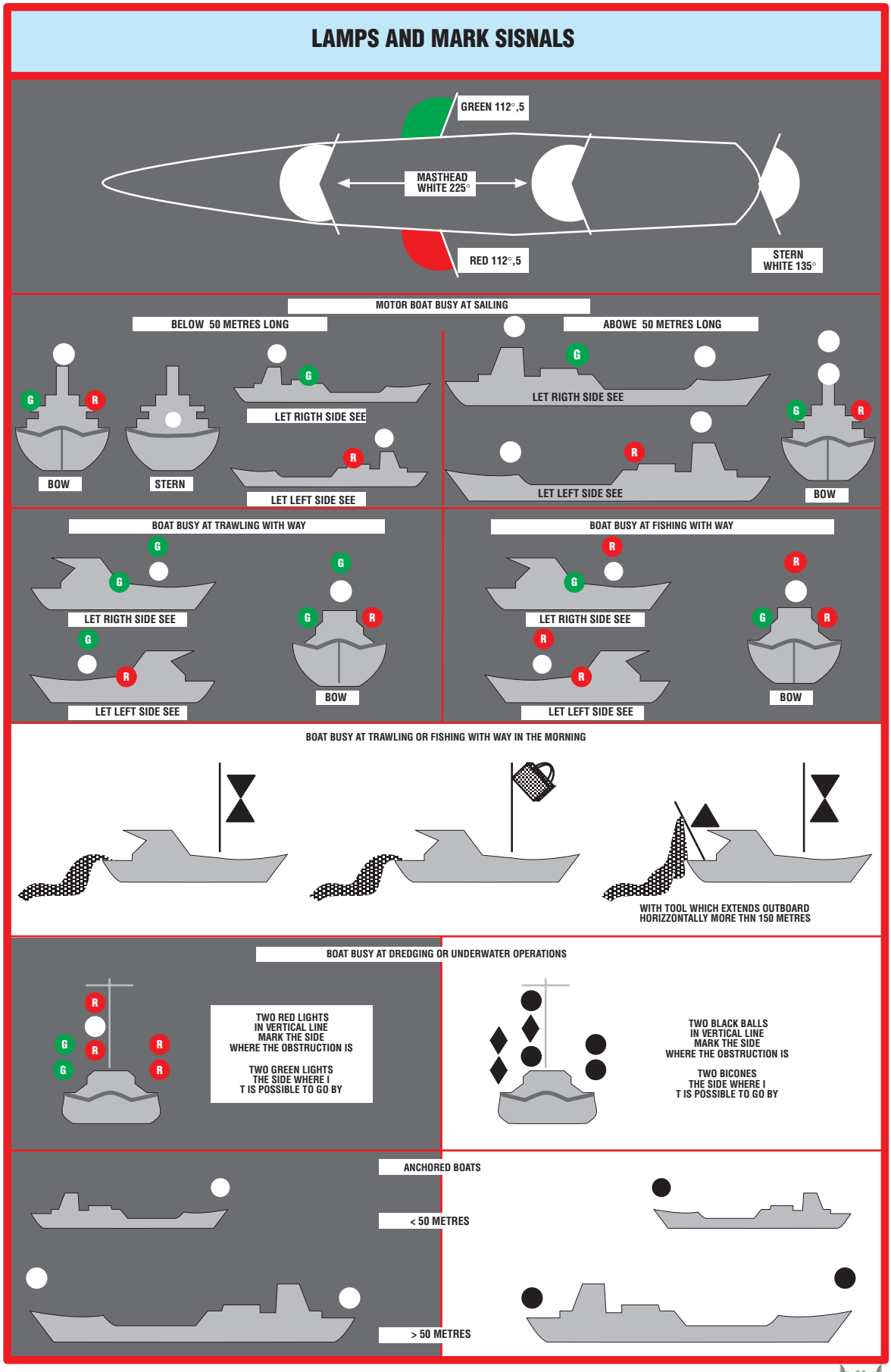
It is an easy knot that enables to link two ropes that are not subject to strong tension

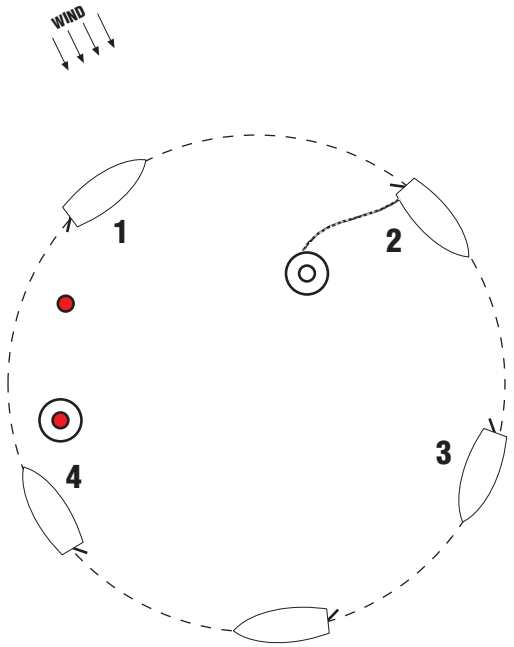
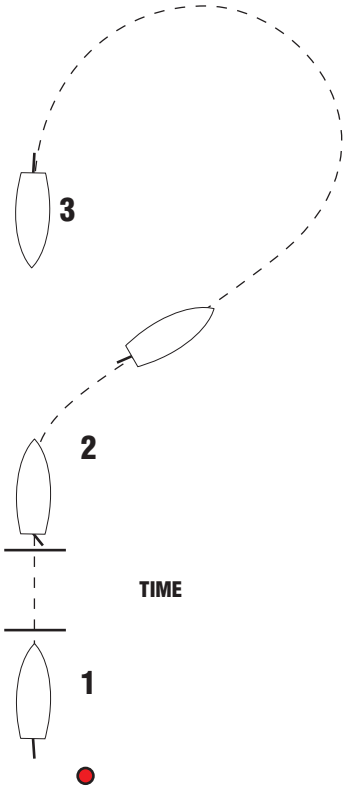


CLOVE HITCH

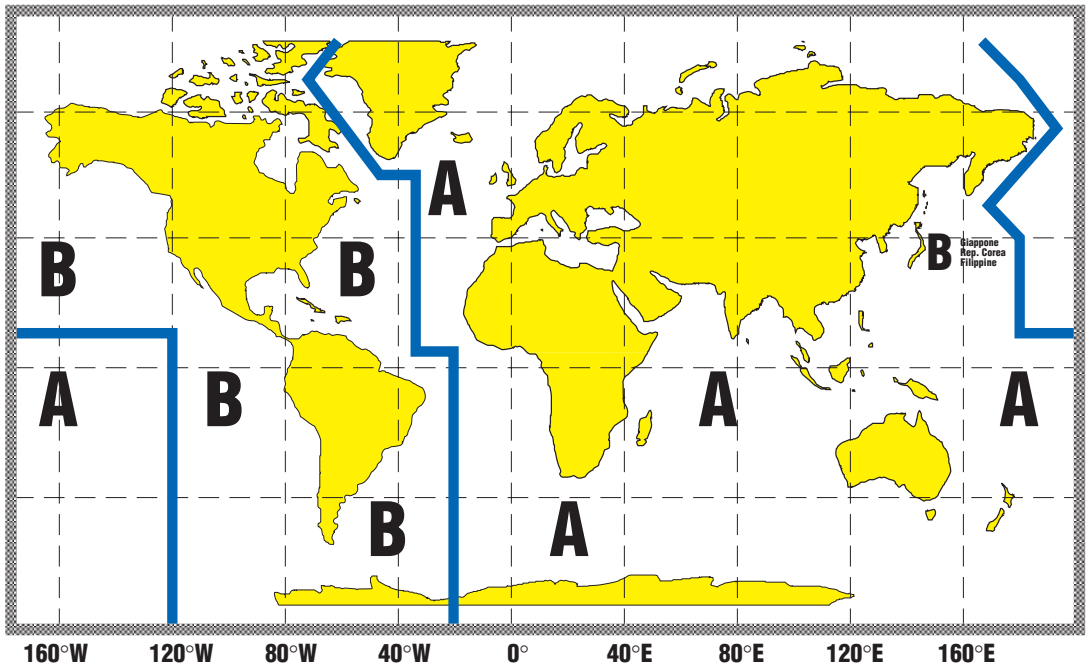
It is an easy knot, it can be used with various ropes, for mooring or other situation, when a rope must be tied to a ring or mooring post.

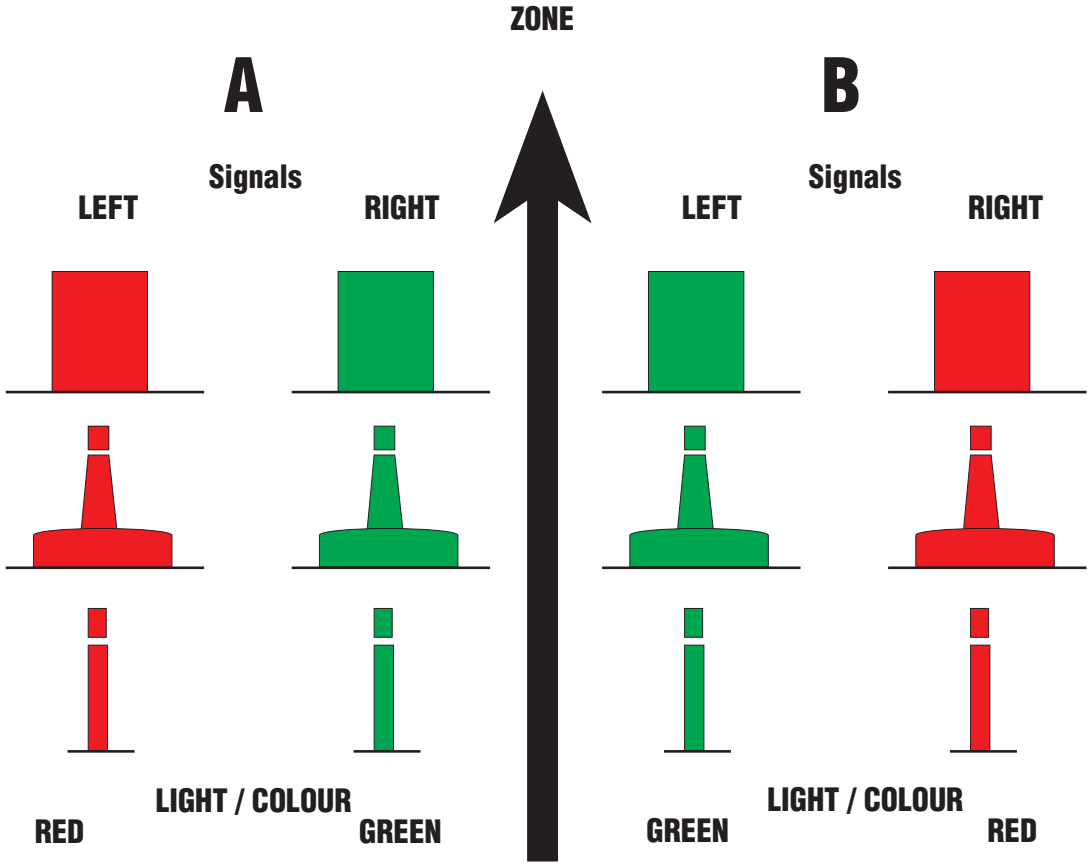



LAMPS AND MARK SISNALS
GREEN 112°,5
MASTHEAD WHITE 225°
RED 112°,5
STERN WHITE 135°
MOTOR BOAT BUSY AT SAILING
BELOW 50 METRES LONG
ABOWE 50 METRES LONG
G
R
BOW
STERN
LET RIGTH SIDE SEE
LET LEFT SIDE SEE
BOAT BUSY AT TRAWLING WITH WAY
BOAT BUSY AT FISHING WITH WAY
BOAT BUSY AT TRAWLING OR FISHING WITH WAY IN THE MORNING
WITH TOOL WHICH EXTENDS OUTBOARD HORIZZONTALLY MORE THN 150 METRES
BOAT BUSY AT DREDGING OR UNDERWATER OPERATIONS
TWO RED LIGHTS IN VERTICAL LINE MARK THE SIDE WHERE THE OBSTRUCTION IS
TWO GREEN LIGHTS THE SIDE WHERE I T IS POSSIBLE TO GO BY
TWO BLACK BALLS IN VERTICAL LINE MARK THE SIDE WHERE THE OBSTRUCTION IS
TWO BICONES THE SIDE WHERE I T IS POSSIBLE TO GO BY
ANCHORED BOATS
< 50 METRES
> 50 METRES

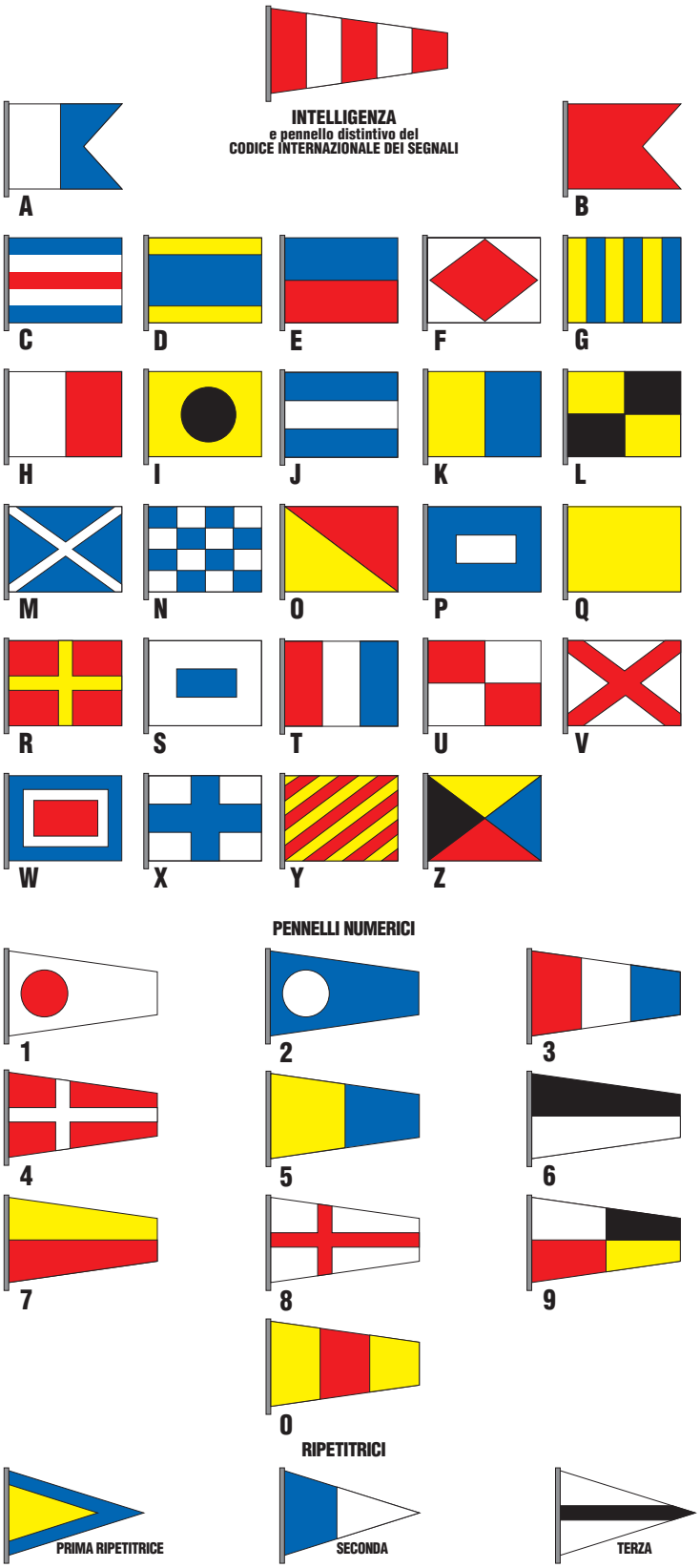
CONDITIONS	CONDUCTS	MANOEVRE
IF YOU WITNESS A SURVIVOR'S FALL OVERBOARD	SURVIVOR OVERBOARD COME ALONGSIDE THE SURVIVOR'S SIDE LIFEBUOY OVERBOARD FINISH THE TURN ~~GET CLOSER THE SURVIVOR~~ WITH STILL PROPELLERS	
IF YOU DO NOT WITNESS A SURVIVOR'S FALL OVERBOARD	SURVIVOR OVERBOARD BEGIN ~~CHANGING COURSE~~ BEGIN COVERING THE OPPOSITE COURSE	

SEA SIGNALING





FLAGS



A A diver is underwater. Stay clear and move slowly

B I am loading or unloading, or carrying dangerous goods

C Yes, positive.
Or The group that goes before must be understood in positive sense

D Stay clear. I am having difficulty in handling boat

E I am coming to starboard

F I am in damage, comunicate with me

G Require pilot. If it is a fishing boat it stands for:
I am hauling in the nets

H Pilot aboard

I I am hauling to left

J Fire aboard and i am carrying dangerous goods. Stay clear

K I wish comunicate with you

L Stop your boat immediately

M My boat has stopped and without way

N No, negative or Or The group that goes before must be understood in negative sense

O Man overboard !

P In port: all must come back aboard. The boat is going to sail.
At sea If it is a fishing boat it stands for my fishing nets are entangled in an obstacle

Q My boat is immune and I ask for pratique

R

S My engines are going astern

T Stay clear, i am fishing with two boat system

U We are sailing towards a danger

V Ask for assistence

W Ask for assistence

X Stop what you are doing and pay attention to my signals

Y My anchor is dragging

Z Ask for tow-boat. If it is a fishing boat in a fishing area:
I am lowering the nets.

EQUIPMENT ON BOAT

EQUIPMENT IN BOAT	
COMPRESSOR	Compressor is present especially on big boats. It allows to refill tanks aboard if there are two or more dives in a day
DRINKING WATER	It is better to have drinking water supply or other drinks for divers aboard so as to avoid illnesses due to dehydration
SAFE AND EASY ENTRY AND EXIT AREAS	Boats must have entry and exit areas equipped with boarding ladder and proper platforms. In case o smaller boats entry and exit places will be indicated by divemaster o the crew
DEPTH FINDER GPS	If you know the depth and the configuration of the bottom the depth finder is useful to locate diving point,s shallows or wrecks. GPS or Global position System gives informatione about boat position by a small mistake margin
EQUIPMENT STOWAGE	Diving equipment must be stowed so as to not to cause problems during navigation, following the divemaster's indication. Personal equipment can be put in a bag made of mesh nylon
FRESH WATER COINTAINER	If there are divers with photographic equipment it is better to have a fresh water cointainer where they will rinse their equipment
SEA WATER COINTAINER	To avoid the misting of the mask, rinse it with sea water before diving
SHOWERS	After diving, it is necessary to rinse the scuba equipment with fresh water. Big boats have showers of fresh water where divers can have a shower
SHELTERED ZONE FROM THE SUN	A sheltered zone from the sun will avoid problems due to sunstroke or sunburns

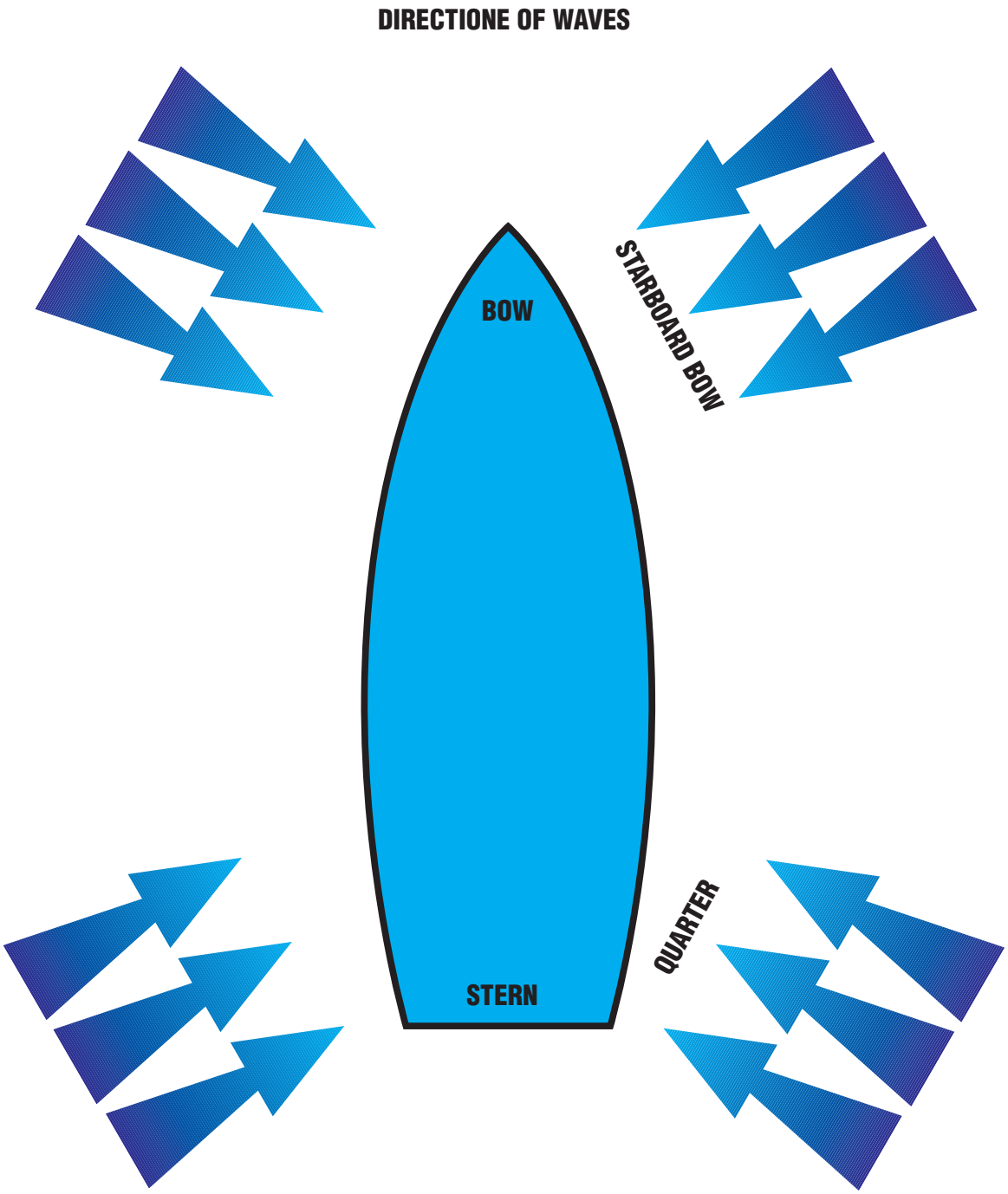
SAFETY EQUIPMENT ON BOAT

Boat should have a proper safety equipment and all people should know where they are and to be able to use them.

SAFETY EQUIPMENT	
LIFE BUOYS	**It is necessary that ther is a life-jacket for each diver aboard and it is important to know their location. Boat must be equipped with lifebuoys too if someone fells overboard**
EXITINGUISHERS	**Every boat must be equipped with exitinguishers. There are several types and size of them according to their use. Divermaster or the crew will indicate thei location and will explain how to use them**
SOUND SIGNALLING SYSTEM	**A good sound signalling system reduces the risk of collision in case of scarce visibility, besides to attract attention in an emergency**
VISUAL SIGNALS	**Visual signals or beacons are compulsory equipment. These signals include signal rockets launched by Very pistol, smoke signals and stratoscopic lights. These signals are used when the marine radio does not work**
OXYGEN KIT	**Giving oxygen to a diver in case of accident it is one of first aid procedures cosequently all diving boats must have an oxygen kit aboard and a qualified staff**
MARINE RADIO	**Marine radio is a very important equipment because it can sometimes be the only way to signal an emergency consequently all boats must be equipped with it** **These redios broadcast on average-short wave frequencies VHF between 156 and 174 MHZ; divided into channels, aid channel is Ch 16 to 156,8 MHZ.** **The procedure to send an emergency call will be:** **1. Mayday repeated three times** **2. Here once** **3. The name of the boat repeated three times** **The aid message must include** **Mayday** **The name of the boat** **Boat location in terrestrial coordinates, the type of aid and all type of information that can be useful.** **Alarm message for the safety of people or things will have the some procedures using the word PAN. This type of message takes precedence over all type of messages except for AID messages.** **A safety message like weather warning will have the same procedure using the word SECURITE**

STEERING A BOAT

In presence of waves it is good not to face them, neither forward or aft but it is better to breast them with some angle.



ENTERING THE WATER

Diving boats can have tall or low sides, consequently different entry techniques will be adopted, but the best entry is usually the safest.
Before arriving at the dive site the crew member or diving assistent will tell you when you have to prepare your equipment and yourself.
Once ready to enter the water If the boat has not arrived yet at the dive site, sit down because it is easy to lose yuor balance and to hurt someone, when the sea is rough.

WATER EXIT

If the boat is anchored it is better to use a line during the ascent.
In presence of current it is better to bend a line from the anchor to transom as so to help divers while at the end of a drift diving it is better to ease off a line from the stern to rescue divers . When all divers are in proximity of the boat it's better don't crowd the boat's exit area, exit one at time and stay clear of divers climbing the boarding ladder.
If, during the ascent, the engine is started up remember to keep regulator in your mouth and put the mask during all the period of yuor ascent on the bridge of stern.

Meteorology

ATMOSPHERE CHARACTERISTICS

- The more the height increases, the more temperature decreases, at 12.000 metres the temperature is about –55°C.
- Water vapour present, in relation to temperature, has some grades of humidity.
- Air mass exerts pressure on the earth's surface, given by its weight, measurable by proper instruments.

Among these elements could be noticed that::

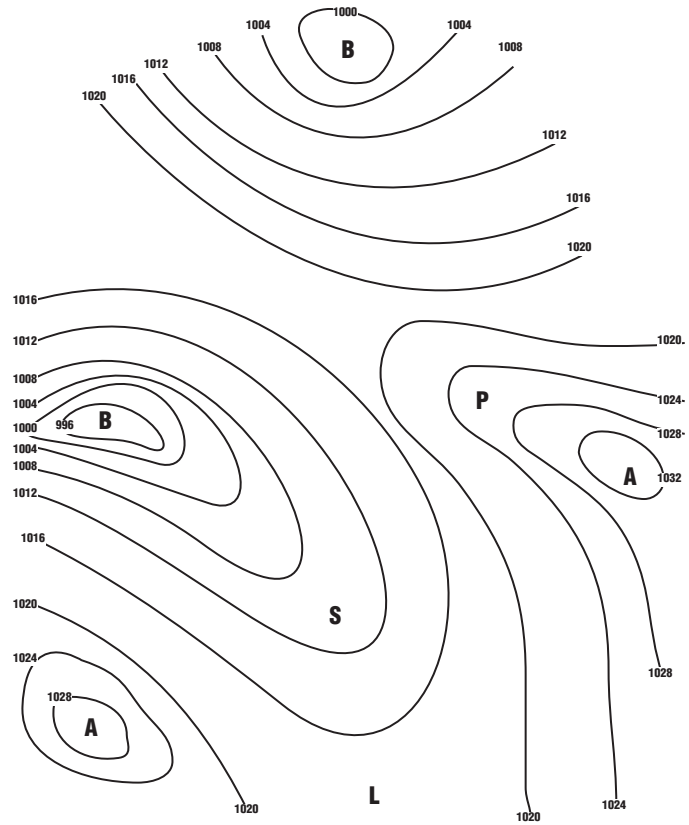
- The temperature of the earth's surface mainly depend on the heat of the Sun's rays and the heating up of the air is due to reflection of these sun radiations on the earth's surface.

It is also important to remember that the Sun's rays get to us with different angles according to latitude, they are perpendicular to the equator, tangent to the Poles, causing a difference in temperature, torrid at the equator, very cold at the Poles and this is the main cause of the formation of winds. The inclination of the earth's axis causes, during the revolution of the earth round the Sun, the cycle of seasons alternated between northern hemisphere and southern.

The heating up of the earth's surface also depend on its consistency , a desertic zone gets up warmer than a woodland, the dry land gets warmer than sea, besides, the air near the ground gets warm while the air at high latitude has always very cold temperatures.

Consequently in the atmosphere there is a costant termic rebalancing by means of frequent exchanges of heat from a zone to the other and among different altitudes of the same atmospheric mass.

- The evaporation of surface waters of sea and fresh waters enriches the atmosphere with water vapour, the gas that causes rain, snow, hail, etc.
- The instrument for measuring atmospheric pressure(kg/cm2) is called barometer. The scale of barometer can be divided in millimetres, in inches or, in hectopascal (called also millibar); At a temperature of 0°C , at sea level, at a latitude of 45°, the pressure is usually 1013.2 HPA (hectopascal). The more the height increases the more the pressure decreases (at 5000 mt. the pressure is about 500 HPA), but it could change according the different zones of the eart's surface. The lines on a weather chart that join places with the same atmospheric pressure are called isobars. The difference in pressure between the two points situated at the same level at a distance of 60 mgl is the horizontal barometric gradient or barometric gradient.



A **Anticyclone**
Complex of closed isobars that affect an area in which atmospheric pressure increases little by little one goes towards the middle of the picture

B **Depression or cyclonic area**
Complex of closed isobars that affect an area in which atmospheric pressure decreases little by little one goes towards the middle of the picture

C **Trough**
Cuneiform expansion of a depression that is between two anticyclones

P **Ridge**
Cuneiform expansion of an anticyclone that is between two depressions

L **Levelled pressure area**
Complex of isobars that are at some distance among them which affect a large area where pressure is uniform

CLOUDS

The formation of clouds is due

to the change of the state of water vapour present in the atmosphere, that because of the presence of motes, aggregates in very small water drops or in fine ice crystals according to the temperature, if the temperature is 0°C or more clouds will be composed of small water drops or ice crystals, if temperature is below -40°C, or from 0°C to -40°C clouds will be composed of ice crystal and small water drops.
There is a wide variety of clouds, consequently they are divided into ten different types:

a. low clouds (from 0 to 2000 mt.). Cumuli, strata, strato-cumuli and cumulonimbuses

b. average clouds (from 2000 to 6000 mt.). Altocumuli, altostrata, nimbostrata and cumulonimbuses

c. high clouds (from 6000 mt. in on). Cirri, cirrostrata, cirrocumuli and cumulonimbuses.

CLASSIFICATION OF CLOUDS

1. CUMULONIMBUSES (Cb). Dense and stately clouds, their upper zone is generally flat, fibrous or stre akead, while their basis isoften dark, they consist of unstable air and generate storms. Cumulonimbuses should be classified like low clouds as their basis is low, sometimes till ground level, but they are classified apart because of their vertical expansion.

2. CUMULI (Cu). Clouds formed of rounded masses heaped on a dark flat basis. If they are thick they cause rain, turning into cumulonimbuses, if they are thin they produce good weather.

3. STRATA(St). Clouds with an uniform grey basis, harbingers of drizzly or sleet.

4. STRATOCUMULI (Sc). White or grey clouds that are formed of parallel waves, they cover the sky entirely.

5. NIMBOSTRATA (Ns). Amorphous clouds, grey leaden coloured with a frayed basis. They are so opaque that hide the sun and the moon completely. They cause rainy or snowy precipitations.

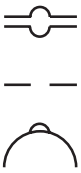
6. ALTOSTRATA (As). Greyish clouds, their appearance is fibrous, streaked or uniform, they appear as a great expanse that covers the sky entirely or partially. If they are thick they darken the sun and the moon, if they are thin it is possible to make the sun and the moon out in the sky like across a glass. They cause rainy precipitations.

7. ALTOCUMULI (Ac). White or grey clouds. They are roundish or lamellar, sometimes lenticu lar. They form great banks or layers.

8. CIRROSTRATA (Cs). Whitish and transparent clouds. They are filamentous or flat. They form a halo round the sun and the moon. If they appear after cirri a disturbance is going to get near.

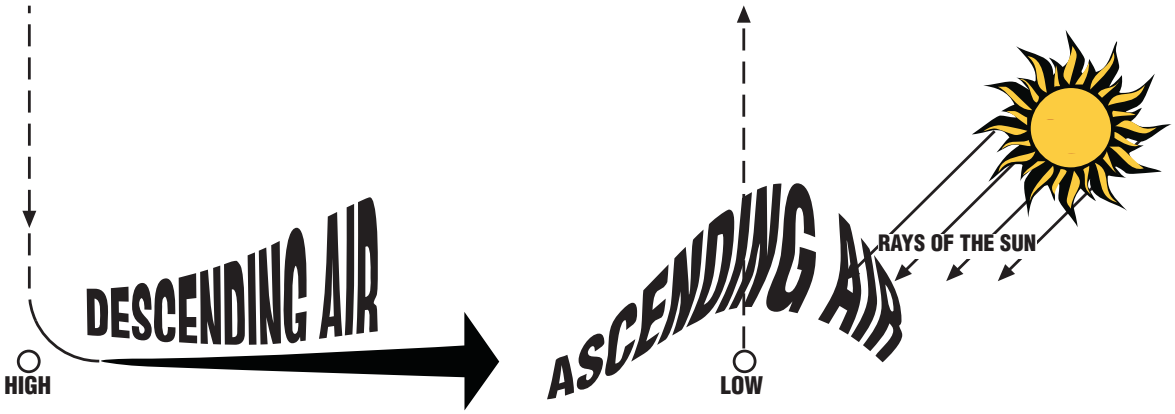
9. CIRROCUMULI (Cc). White and thin clouds, they appear as wide expanse consisted of small rounded granules. It is the famous Mackerel sky.

10. CIRRI (Ci). Clouds composed of ice crystals they appear separate, fibrous or silky and they form white, transparent banks or small curls. In the Mediterranean sea they go before disturbance.

	NAME	ABBREVIATION	SIMBOL	ALTITUDE
HIGH	CIRRI CIRROCUMULI CIRROSTRATA	Ci Cc Cs		6.000 mt
AVERAGE	ALTOCUMULI ALTOSTRATA NIMBOSTRATA	Ac As Ns		6.000 mt 2.000 mt
LOW	STRATOCUYMULI STRATA CUMULI	Sc St Cu		2.000 mt FROM SEA LEVEL
	CUMULONIMBI	Cb		FROM FEW METRES TO 18.000 mt

Atmosphere, exposed to solar heating up, moves upwards, consequently air layers that come into contact the heated zones , get lighter and the pressure decreases in these zones . Surrounding air masses, as they have a higher pressure, go towards the zone where the pressure is lower. This horizontal movement of air masses from a point to the other of the earth is called wind. We distinguish the speed , in knots or in mt/sec, and the direction the wind comes from, in grades or in winds.

Really the horizontal movement of the air, moving from the high pressure zones to the low pressure ones, has not a rectilinear course, because of rotation of the Earth, centrifugal force and ground frictions. These forces cause deviations of the wind that, at sea, they can arrive at 80°. Consequently the wind follows isobars instead of their perpendicolar direction. In northern hemisphere the wind veers right of the direction

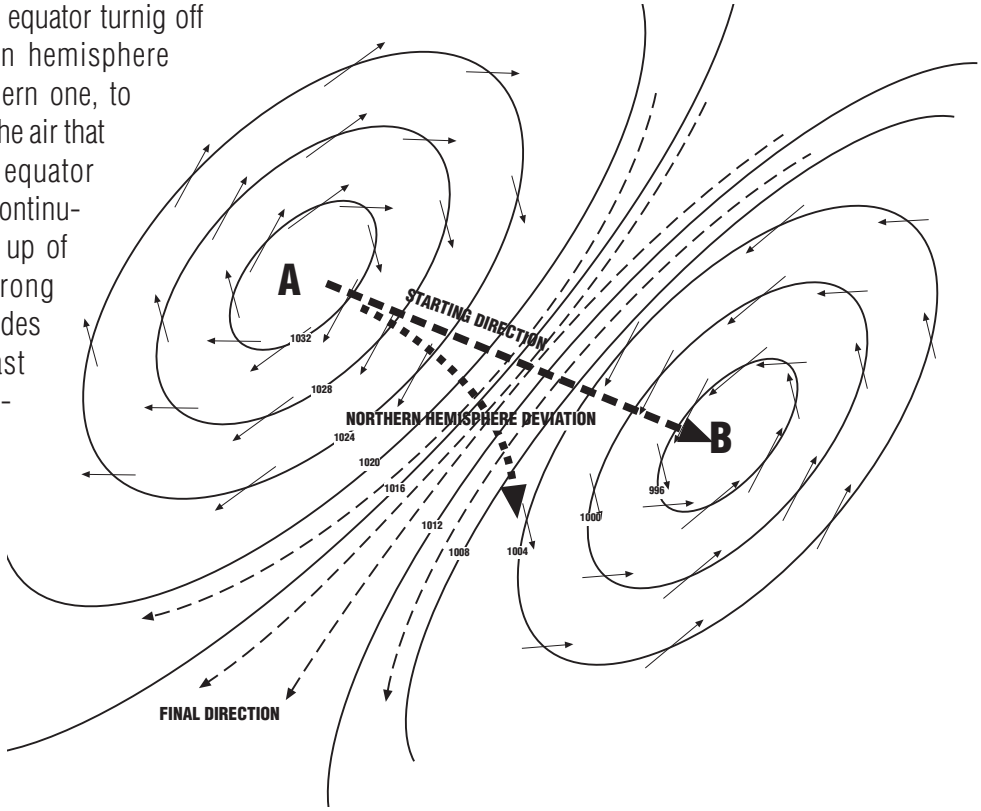


that displays on the gradient, in southern one the wind veers left. Besides in cyclonic areas the wind has a centripetal trend, in anticyclonic ones its trend is centrifugal.

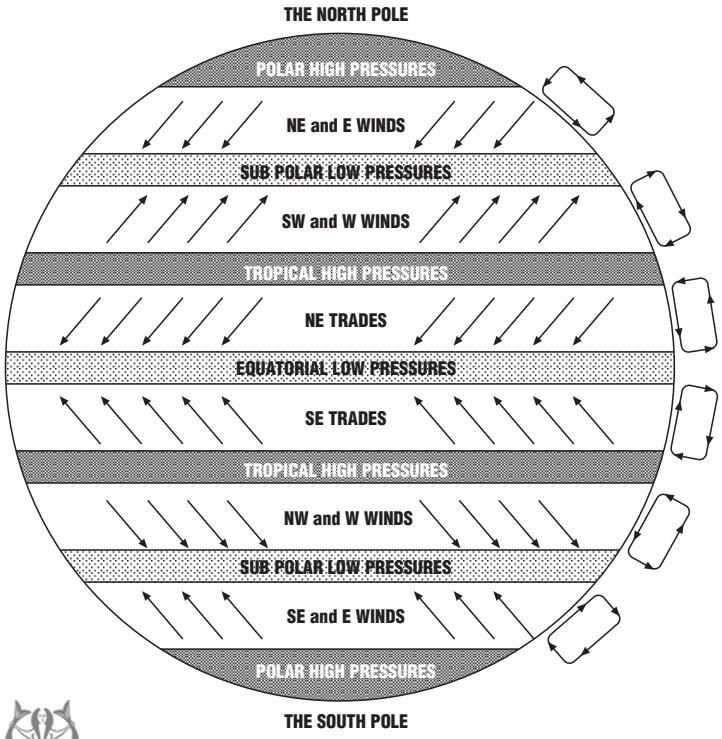
Buys-Ballot theory enables to locate the position of the centres of low and of pressure.

In northern hemisphere, turnig the face towards the wind, the low pressure will be on the right and the high pressure on the left in southern hemisphere the low pressure will be on the left and the high pressure on the right.

If you examine the isobars, shown on a weather map, it is important to consider that the nearer isobars are the stronger the wind will be. Consequently the farther isobars are the gentler the wind will be in the area. Really the circulation of winds in the troposphere is not so schematic.
The circulation of winds has the following characteristics:
A. In intertropical zones air moves from the tropics to the equator turnig off right in northern hemisphere and left in southern one, to take the place of the air that rises along the equator because of the continuous sun heating up of those zones. Strong winds called trades form (north-east in northen hemisphere, and south east in sourthen hemisphere).



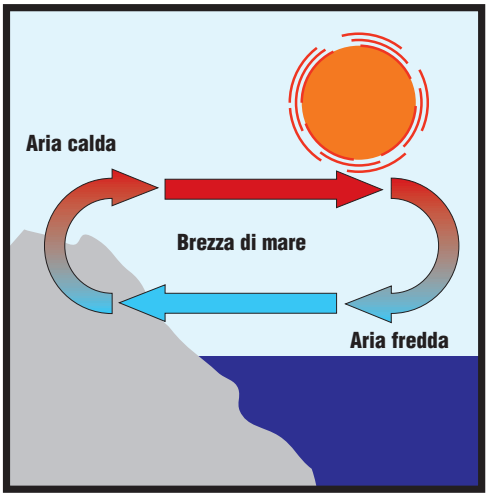
B. Air masses that rise from the equator go towards north in northen hemisphere and towards south in southern hemisphere, creating the antitrades, that they will be to level, respectively of south-west and of north-west. These antitrades when they arrive at tropics, they descend towards the surface, closing the so called two big circulation cells of winds.
C. In intermediate latitudes a low pressure zones is created, at surface, air coming from high pressure zones of tropics and of polar zones (that they are high pressure zones too) pours. Consequently, in temperate zones, winds from south-west in northen hemisphere and winds from north-west in southern hemisphere form.

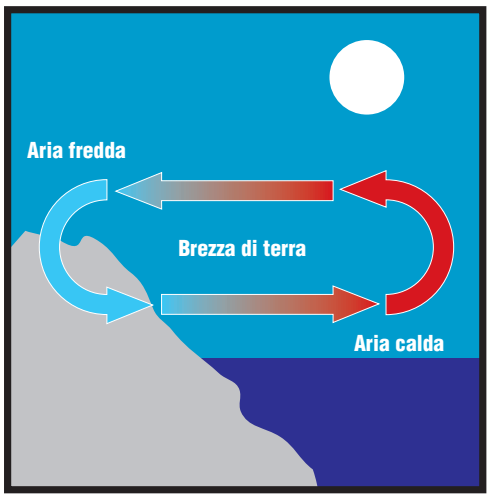


D. In polar zones winds are respectively from north-east and north, and from south-east and south. Besides at high latitudes winds move from east, while they move from west in temperate zones.

BREEZES

Breezes are air movings on horizontal plane, and on inclined planes of the mountains. They are situated between th earth and the sea, and between moutains and valleys, because of the diurnal and nocturnal change in temperature, for this reason they are called termic winds.
Sea breezes are, generally, peculiar the good weather because of the insolation, but they can get together or get away to stronger winds.During the day, winds blows from the sea to the land and, at night, from the land to the sea. The breezes of plane big lakes blow the same too: during the day they blow from the lake to the land and, at night, from the land to the lake.





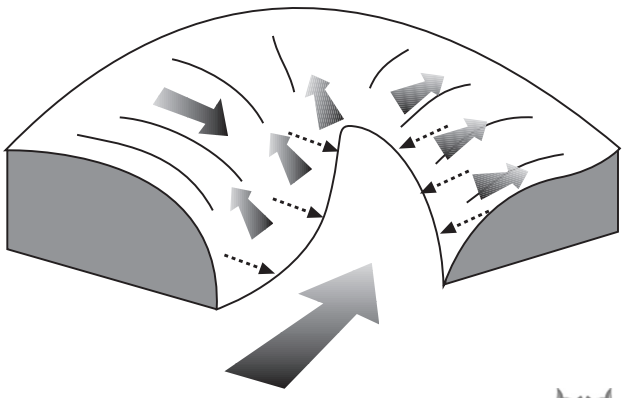
MONSOONS

Monsoons are seasonal winds, caused by a strong insolation, for a long time, in wide zones in central Asia. They blow with strong strong intensity, alternatively from north-east and from south-west, especially in the Indian Ocean. The SW monsoon is very strong along sides of the during July and August.

SW MONSOON

ATMOSPHERIC DISTURBANCES

There are some air masses, with an area of some thousands square kilometres , that preserve their characteristics some time, like temperature, density, humidity during their moving on the Earth's surface.
These enormous masses, in relation to their temperature compared to the temperature of the surface, can be hot or cold, but they are called equatorial, or intermediate, or polar, or artic/ antarctic according to whether they have been formed at the equator, in the tropical zones, in the temperate areas, or in polar zones. They have different phisycal characteristics for which they are separated from the troposphere, along a surface, called



frontal surface. The intersection of this surface with the Earth's surface is called front. The inclination of the frontal surface is due to the thickness of the cold air, it is very thick at the Poles, but when it moves towards south, it is getting less and less thick, consequently it appears like an inclined plane at average latitudes.

Geographically front are divided into:

STATIONARY FRONT
if it does not move

WARM FRONT
if warm air advances driving cold air

COLD FRONT
if cold air advances driving warm air

OCCLUDED FRONT
when a cold front is supeirmposed upon a warm front because the warm front is lesse fast

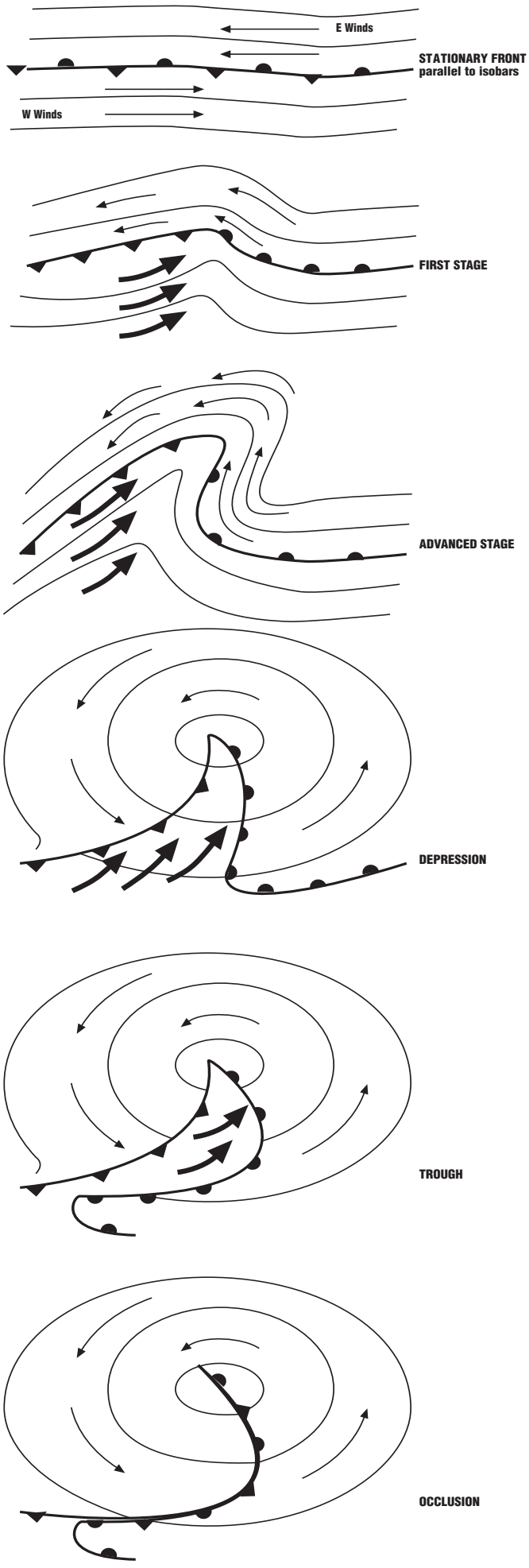
ARTIC FRONT
in the south hemisphere it will be antarctic front that separates artic air from polar or intermediate air at a latitude of 65°/75°.

TROPICAL FRONT
It forms at temperate latitudes,40°/50°, it separates tropical air from intermediate air carried towards lower latitudes.

EQUATORIAL FRONT OR INTERTROPICAL
It is caused by the meeting of the NE trades with SE trades that takes place in proximity of termic equator.

ATLANTIC TROPICAL FRONT THEORY

Fronts could be also classified according to their place of origin and in this case are called geographical fronts, among these fronts the Atlantic tropical front is very important for Europe and it is Atlantic portion of the front that separates air polar from tropical air at intermediate latitudes. This front affects directly weather conditions in European continent. If the front is stationary it appears without deep undulations, but if a deep undulation formed and the front moved toward south-east, it would become unstable joining a to a disturbance that will move toward Europe with a speed of 20/30 knots. The front of undulation corresponds to warm front, tha back corresponds to cold front. The air between the two parts are called warm sector.
As cold front is faster than warm one, cold front will reach it and warm front will disappear. When cold front is superimposed upon warm front the obstructed front forms. In the point where wave forms crest, the pressure decreases very much because warmer air moves upwards to be replaced by polar air that it is colder and consequently heavier. In the middle of disturbance a minimum pressure point forms where cold air masses will go, veering to the right. An enormous whirwind will be produced in the minimum point. In the whirwind air masses will revolve anticlockwise, while the whole system will move toward east. The pressure representation of the system will appear like a series of closed isobars with pressure readings that decrease little by little they move toward the centre. And consequently the nearer the isobars and the greater gradient will be the most operating depression will be. Unlike if on a great portion of the Earth's surface decreasing



pressure will be measured round to a zone of maximum (pressure), an anticyclonic area forms, that is high pressure or good weather too. On the edges there could be strong winds, but in the middle of it breezes will prevail. Cyclone is a peculiar depression of the tropical zones for whici this depression is called extratropical cyclone. The disturbances that concern Europe and the Mediterranean basin come from west.

The origin of these disturbances is generally due to the warm and humid air movement of going round. This moviment occurs when the warm and humid air is above Atlantic zones in its moving towards north and meets the anticyclone of Azores, that presents a stationary disposition, except during its seasonable moving. The most west portion of this air mass will move upwards in latitude touching American coasts, after having overcome the anticyclonic zone and having touched Greenland coasts it will move toward European coasts. In this phase the moving air will be reached by polar or artic air that will move toward east along north Atlantic depression directrix. The clash of these two great air masses creates strong disturbances that move toward European coasts.

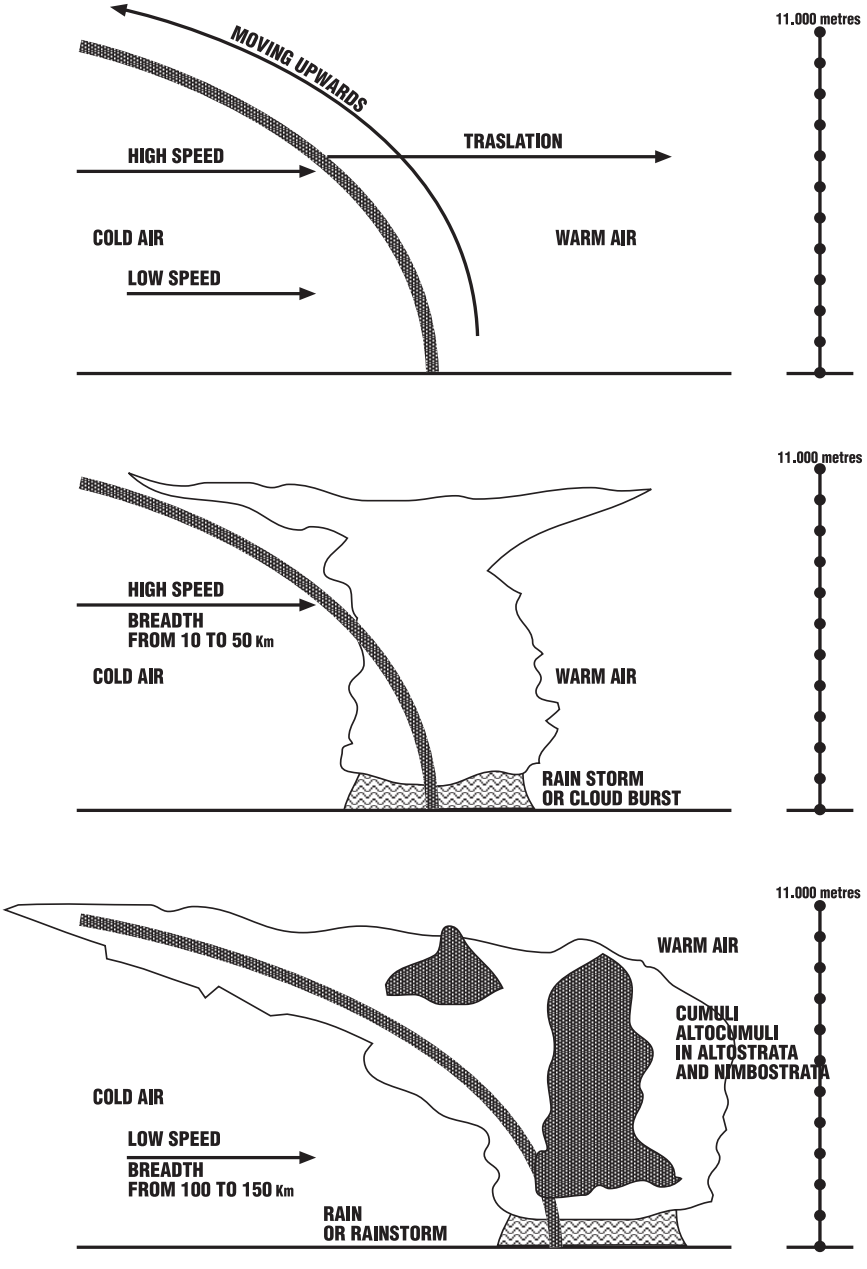
VARIABILITY LINE

Variability line is drawn on the weather chart with long lines, alternated with two very short lines, and it is a narrow and no frontal stripe (from 20 to 80 km.), it forms in the warm front at a distance of hundreds kilometres far from the cold front. The variability line is important because along it some convective phenomena form and, if their intensity is very strong they can create short but strong disturbances with squails of wind They are transitory phenomena because they last about 12 hours.

DEPRESSION AND CLOUDS

The air of warm front that begins to move upwards forms cirri that cover the sky gradually, the barometer begins to fall and cirrostrata and altostrata begins to appear.

Altostrata begin to be thicker turning into strata and nimbostrata, and it starts raining while temperature rises because the warm front is approaching. On crossing of the warm front the sky could clear up a little. The barometer arrives at the minimum and as soon as it begins to rise the cold front is going to arrive. The sky fills with cumuli and altocumuli, while the wind reaches its maximum intensity. Torrential rain reappears. Then, slowly, these phenomena lose their strengt, pressure rises and the good weather comes back. The same phenomena recur if an other depression arrives. This hypothesis is not improbable because extratropical cyclones are not isolated phenomena.



WEATHER FORECAST

Weather cannot be analysed on board ship because it is a long and extremely complex operation but each captain can be kept up to date about weather thanks to areonautic metereological service. From this service, by analytical messages,it is possible to get weather chart. This chart, that sailors of boats can get from big ship, or from metereological offices, or from harbour-master, includes depression centre, the fronts that separate air masses of different origin, with their movements and the main isobars.

PROVENANCE DIRECTION AND FORCE OF THE WIND

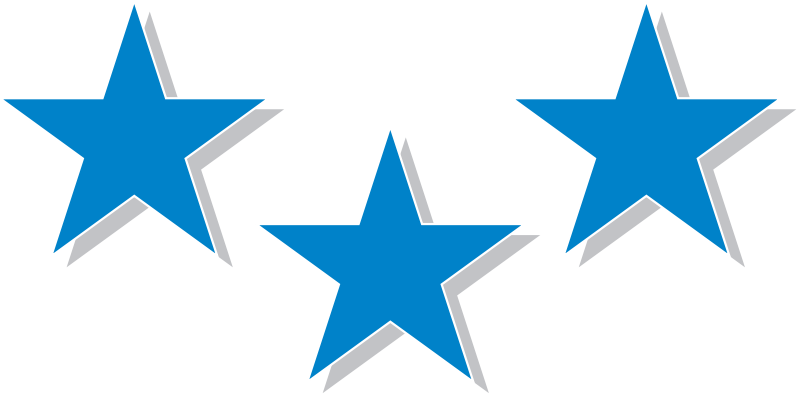
Wind is characterized by its provenance and speed, or force. It could be measured by means of instruments called wind gauge that could be fixed or portable.

The unities of measure used to measure the force of the wind are knots or mt/sec. Wind rose is used to know the provenance direction. At sea the observation of these two elements are often reckoned. To know the provenance direction of the wind is sufficient to observe where the shortest waves are coming . To know the force of the wind it is sufficient to read the indications given by Beaufort's scale in which the sea different appearences are described according to the intensity of the wind.

Wind velocity Km/h	BEAUTORT DEGREE AND EFFECTS OBSERVED OFFSHORE	Name
1	0 Smooth sea	Calm
1-5	1 Light ripples form but without foam	Ligth air (breath of wind)
6-11	2 Short and visible waves with glassy crests that do not break	Light breeze
12-28	3 Small waves with glassy foam in which the crest begins breaking	Gentle breeze
29-38	4 Moderate waves lenghthened in shape	Moderate wind
39-49	5 Waves with crests of white foam and sea sprays form	Fresh breeze (fresh wind)
50-51	6 Waves with white foam that break facing the direction of wind; tha sea swells	Strong breeze
52-74	7 Very lengthened waves, medium in height, sea sprays begin coming off from crests of waves; visible foam facing the direction of the wind	Near gale
75-88	8 Big waves whose crests begin tottering and breaking with foam and strong sprays that shoul reduce visibility	Gale
89-102	9 Very big waves with long crests and very large agglomerates of foam facing the direction of the wind; very strong breakers and reduced visibility	Strong gale
103-117	10 Very high waves, sea covered with foam facing the direction of wind; reduced visibility	Storm
118 >118	11-12 White sea, air full of sea sprays and foam, very reduced visibility	Hurricane

BEAUFORT	FRANÇAIS	ENGLISH	ESPAÑOL
0	Calme	Calm	Calma
1	Très légère brise	Light air	Ventolina
2	Légère brise	Light breeze	Brisa muy débil
3	Petit brise	Gentle breeze	Flojo, Brisa débil
4	Jolle brise	Moderate breeze	Brisa moderata
5	Bonne brise	Fresh breeze	Brisa fresca
6	Vent frais	Strong breeze	Brisa fuerte
7	Grand frais	Near gale	Viento fuerte
8	Coup de vent	Gale	Viento duro
9	Fort coup de vent	Strong gale	Viento muy duro
10	Tempête	Storm	Temporal
11	Violent tempête	Violent storm	Burrasca
12	Ouragan	Hurricane	Huracan

LESSON 2



CMAS

WORLD UNDERWATER FEDERATION

Water Life Support

The WLS term or *Water Life Support* contains all these elements and tecniques able to solve some problems that occur during underwater activity.
This section will explain you how to recognize when a diver needs assistence, how to assist him, how to deal with an unconscious diver.

WLS KEYWORD

Emergency

Extraordinary and unexpected situation or dangerous circumstance which arises suddenly and which requires a quick action.

Safety

Condition or state of being safe from harm or danger.

Help/Rescue

Actions to get someone out of an unpleasant or dangerous situation.

Danger

Combination of circumstances or situations from which a damage could come from.

During diving when an emergency arises your friends can help you and could save your life if they are able to. How many times before diving you have wondered if you are able to lend assistence to your friends.

The statistics tell us that:

- *over the 60% of divers has saved his friend's life,*
- *the 60% of them has brought another diver to the surface ,*
- *the 60% of them has shared air with a friend,*
- *the 20% of them has practiciced artificial respiration,*
- *the10% of them has practiced a cardiopulmonary resuscitation.*

WLS procedures are not infallible tecniques: the environment, the equipment, or the type of boat, or the weather, or the waves, or the currents or the water temperature makes the underwater rescue a specific activity.

In addition to a SPECIFIC PREPARATION a diver, to be a good rescuer, has to have:

- *CALM AND SELFCONTROL,*

- *QUICKNESS IN INTERVENING,*

- *ABILITY IN OBSERVING,*

- *AND ABOVE ALL INTUITION.*

The rescue

PREVENTION

"Prevention is better than cure"

because sometimes diving accidents could create serious physical problems.
It is important to learn the tecnique so as to solve the problem when it occurs. But knowing the tecnique is not sufficient if the rescuer is not well trained.
Every year some divers die because their friends have not recognized the problem and have not able to help them.
But it is also important to know WHAT YOU HAVE TO DO and HOW TO DO IT.

RECOGNITION OF THE PROBLEM

"The diver in danger" is a person, in our case is a diver that is in a real or hypothetical dangerous situation.
Facing a danger "the diver in danger" can react according to his experience, gravity of situation or his nature in the following ways:

- rational and aware of the dangerous situation,

- unconscious and without breathing activity,

- passive and immovable,

- panic striken.

In the first circumstance "the diver in danger" recognizes his problem, he is often able to react and signal the problem to his friend, he is able to collaborate with the rescuer.
The passive "diver in danger" is very afraid, his eyes are wide and he breathes with difficulty, he is not able to collaborate with his rescuer. Once reached the rescuer have to to get him to calm down and avoid that he is panic striken or loses consciousness.
The unconscious " diver in danger" is asphyxiated (difficult breathing) and hi is in a dangerous situation. Our assistence must be very quick because the circulatory failure could be imminent consequently the unconscious " diver in danger" has to breathe in short time.
The panicked " diver in danger" is very dangerous, he has lost control, he is anxious to reach the surface and breathe rapidly for which he could tear rescuer's regulator off making dalgerous situation worse for him and his friend. In this circumstance tenacity, determination and courage need.

Situation of emergency

Now we are examining the more frequent situations of emergency and their resolution..
Each section will analyse some situations and will explain why, how and when to intervene.
So each section will examine :

- Cause of accident,

- State of the diver in danger,

- Rescue manoeuvre.

Problems concerning the control of your friend or of the group

LOST DIVER

CAUSE OF ACCIDENT

Very often divers do not remain with their group because they are not able to follow the group or because they are distracted:

- during diving and especially diving in limited visibility it is important that all group is united,
- if a diver makes a stop during diving to observe the environment, or to arrange his equipment he must informe the divemaster or his friend as so to be helped in case of need or to be waited by the group.
- when there is current it is difficult to stay with the group especially during ascending consequently the diver must stay very close to his friend.

STATE OF THE DIVER IN DANGER

If the diver is experienced and skilled when he realizes that he has lost his group he can :

- search for the group: if he realized that the group or his friend cannot be far because he has not been losing the group for long and his friends are looking for him,
- ascend to the surface: if after some searches he does not find the group he must arrive at the boat or the dive site.

If the diver is not experienced and skilled once realized that he is alone, he must be calm, breathe and waiting for the group at the exact point where he is because the group is looking for him going along again the dive the opposit way.

If after few minutes the group does not arrive he must ascend to surface correctly.

RESCUE MANOEUVRE

"Do you search for the group or do you ascend to surface?"

The experienced diver once got lost begins the search for the group looking at 360 degrees, right and left, up and down to catch sight of the group's air bubbles or some elements of their equipment. If he sights nothing he can go on the search for the group according to the instructions given during the briefing and he goes on the dive because he is sure that the group is searching for him. During the searh it is better ascending slowly because it is easier to cath the sight of the group from up to down, he must be calm because if he was nervous he could aggravate the situation.

If after some minutes he does not find his group he will begin to ascend to the surface.

If the diver decides to ascend to the surface immediately either experienced diver and the unexperienced will take the following precautions:

- If he is near the anchor of the boat or near the floating device of the dive site he will reach this point and will begin the ascent using a line to arrive at the surface.
- If he is too far from the boat or he is not able to find it it is better that he arrives at a sheltered zone preferably near a rocky wall or a rising rock, avoiding a zone of boat passing, so he begins to ascend. Once at the surface it is advisable to swim to boat or dive site, signaling his presence to his friends that are in water or aboard.

Technical problems

REGULATOR FREE FLOW

CAUSE OF ACCIDENT

A bad handling and maintenance of regulator is one of the most cause of this type of problem, there could be sand or dirt inside regulator or in purge button or the pressure could be excessive.

STATE OF THE DIVER IN DANGER

The diver will be surprised when this problem occurs but he will have to be calm when he sees air bubbles around him or else he can lose his bearings and depth.

RESCUE MANOEUVRE

This problem causes the emptying of tank in short time cosequently the diver must:

- attract his friend's attention,
- try to breathe and during exaling he must exert a pressure with the mouth so as to compensate the out-air pressure,
- use the A.A.S. (alternate air source), take the faulty regulator and try to close the exhaust valve with a hand,
- If the A.A.S. and regulator are on two separated valves ask to friend to close the faulty regulator valve,
- if the problem does not solve, require air to your friend and begin a buddy ascending. If air bubbles obstacle the ascent to the surface the rescuer will close the diver's tank.

REGULATOR DOES NOT DELIVER AIR

CAUSE OF ACCIDENT

Suddenly during diving we feel that the regulator stop delivering air, the more frequent causes are:

- the tank is empty because we have not tested the amount of air inside it, or the submersible pressure gauge does not work well and gives us a wrong amount of air,
- if wa are very deep the pressure can affect a correct working of the regulator,
- the regulator is faulty bacause of a bad handling or factory fault.

STATE OF THE DIVER IN DANGER

If the air stops being delivered gradually the diver is able to verify what is happening and solve the problem, he is calm and is able to ask for help to friends.

If the air stops being delivered suddenly the situation could be dangerous if the diver gets into panic.

RESCUE MANOEUVRE

- The panicked diver will try to ascend quickly, the rescuer will have to reach the diver in danger and without safeguarding his safety he will try to administer air to the diver in danger by A.A.S. so as to restablish breathing control and to prevent a breathing failure.
- If the panicked diver without air is too far from the rescuer and the diver in danger begins to ascend too rapidly the situation becomes very dangerous so the rescuer will have to ascend to surface correctly and then he will check the diver's state at the surface.
- If the diver in danger is calm and able to signal his air needs, he will get closer to the rescuer or his friend and a buddy breathing tecnique will be utilized to ascend to surface.

AIR IS DISCHARGED FROM B.C.D.

CAUSE OF ACCIDENT

This problem is due to a factory fault or a bad handling or maintenance of B.C.D.

STATE OF THE DIVER IN DANGER

the diver realizes of this problem because:

- he does not maintain his neutral buoyancy and gets too closer to the bottom,
- he sees that the air inside the B.C.D. is discharged from a hole or a faulty valve.

Usually this problem is not dangerous, once the diver values the problem he makes a stop, he informs the

group or his friend and begins to ascend .
RESCUE MANOEUVRE
The friend that helps the diver in danger will share his B.C.D. During ascending buddy breathing tecnique will not be used because it is sufficient that the two divers get hold each other from the shoulder straps.

B.C.D. IS OVERFILLED

CAUSE OF ACCIDENT
This problem is due to a factory fault or a bad handling or maintenance of B.C.D.
The faulty element is usually the inflator valve of the B.C.D. that could block when you open it.
STATE OF THE DIVER IN DANGER
If the B.C.D. is overfilling accidentally the problem could be dangerous because diver's buoyancy turns positive and diver could ascend too fastly.
Unexpectedly diver feels that his buoyancy begins to increase and he begins to ascend to the surface, he tries to deflate the B.C.D. so as to descend but after few minutes the problem recurs.
RESCUE MANOEUVRE
Once the experienced diver is aware of the problem he goes near a rock , he makes a stop, he tries to regulate his buoyancy disconnecting the B.C.D. inflation hose. Then he can ask for assistence and ascend with his friend or decide to go on with the dive connecting the inflation hose when he have to inflate the B.C.D. or inflating it orally. The inxperienced diver have to ascend with the rescuer's help.

WEIGHT BELT RELEASES

CAUSE OF ACCIDENT
During diving it could happen that the weight belt releases for different causes:
- the belt has not been tigthened well, underwater the body grows thiner because of the increases of the pressure and consequently the belt releases,
- during diving the buckle hits a rock, the belt opens and releases,
- if the belt have pockets it is possible that lead shot or solid weights can release if they are not held in the pockets correctly.

STATE OF THE DIVER IN DANGER
When diver feels that the belt is releasing he tries to take it with the hands before it goes to the bottom: diver does not maintain his buoyancy, he gets nervous and tries to replace it.
If the belt releases suddenly, diver will turn positive quickly, he will ascend too rapidly and the consequence will be very dangerous.
RESCUE MANOEUVRE
If the belt is in diver's hands he must deflate the B.C.D. a little to maintain his buoyancy, he must find a support and replace the belt with calm.
Help: It is difficult that the diver ask for assistence as he is busy to take his weight belt consequently the rescuer will get closer him fastly, he will deflate the diver's B.C.D. , if necessary the rescuer will deflate his B.C.D. too and will try to hold diver's buoyancy. If a third diver has been able to recover the weigt belt it will be replaced. If they are alone (rescuer and diver in danger) they will search for stones or small rocks and will put them in the pockets of the B.C.D. so that the buoyancy is negative and will start ascending to the surface because the dive must be interrupted.

DRY SUIT PROBLEM

CAUSE OF ACCIDENT
We know that the dry suit contains inside it between material and skin an amount of air that isolates and has the same effects of B.C.D.
Dry suit has equipped with an inlet valve and an outlet one. These valves can get stuck because of design faults or bad handling and maintenance so it could happen the following problems:
- Air inlet valve gets stuck in opening phase and the dry suit is overfilled and we could ascend to surface too rapidly,

- Air inlet valve gets stuck in closing phase and air does not enter, in this circumstance the diver will feel cold but the B.C.D will help him to maintain his correct buoyancy,
-Outlet valve gets stuck in closing phase and tha air cannot be expelled causing the loss of buoyancy and the risk of a too fast ascent,
- Outlet valve gets stuck in opening phase and the air is discharged .

STATE OF THE DIVER IN DANGER

These problems can be dangerous if the diver (who usually uses a dry suit is an experienced diver that is able to understand when this problem could generate an accident)) is not able to control the effects of his dry suit on the buoyancy. The diver is in a difficult situation when:
- he tinkers with the valves of the dry suit and does not pay attention to his group,
- he changes depth continually,
- he asks us to check his equipement because he understands that anything is out of order.

RESCUE MANOEUVRE

If a dry suit is not inflated we are cold, but if it inflates accidentally the risk is to ascend too rapidly.
In this circumstance it is necessary to go out excess air:
- manually from the outlet valve,
- opening a wristband or the neck area by fingers. The dry suit will flood but we shall conclude the dive and arrive at the surface even we shall get cold.

LOSS OF MASK

CAUSE OF ACCIDENT

During diving it could happen:
- to lose the mask on the bottom during an adjustment or cannoning into the friend,
- to break the adjustable strap of the mask.

STATE OF THE DIVER IN DANGER

All divers know that during a mask clearing they must stop and be calm to do this operation.
It could happen that the cold water could create some problems and in some situations could create panic.

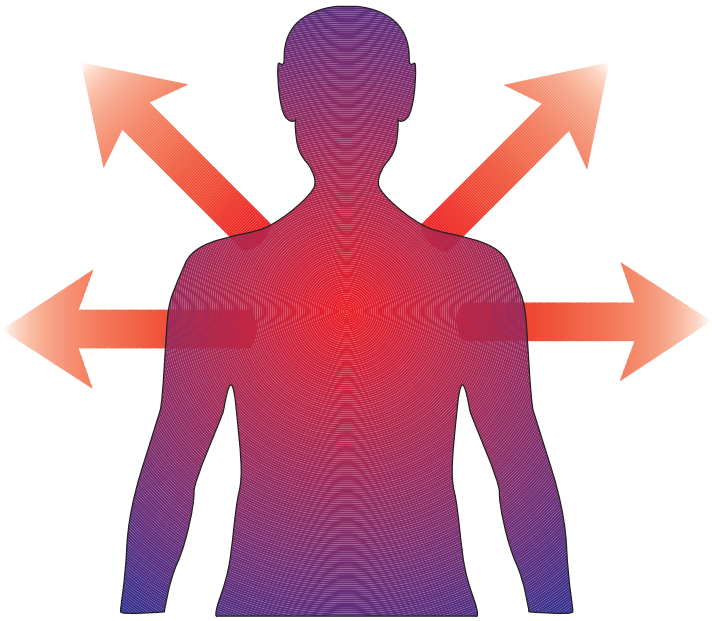
RESCUE MANOEUVRE

If a diver lose the mask and it is enough coloured so that he can see it and he is able to recover it without excessive effort, he can continue the dive, if he is not able to recover it he must be calm and signal the problem to his friend. If the friend does not recover it they will have to ascend to surface together. If an adjiustable strap breaks the diver can hold the mask on his face with hands. If the rescuer notices that the diver is afraid, before searching for the mask he must go near the diver and calm him down. Then the rescuer tries to recover the mask but if he does not find it he will bring the diver to the surface.

Physical problems

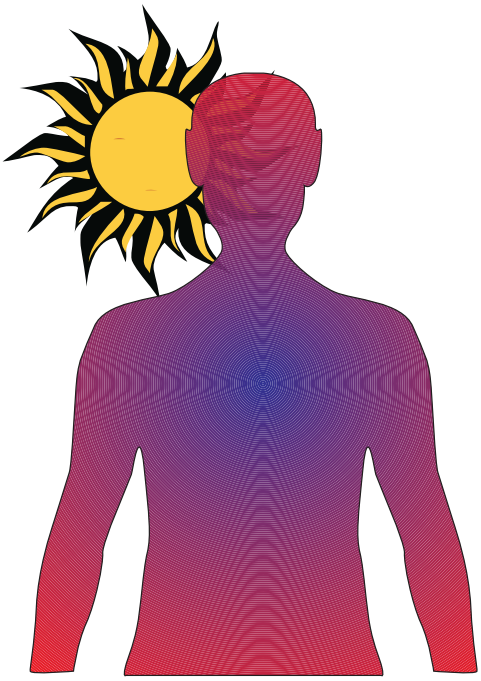
HYPOTHERMIA

When there is a loss of body heat (thermolysis) our body reacts so as to maintain an even temperature especially in the central zone. For example in a dive the central zone that includes vital organs (heart, bowel ecc.) will be protected, and if you dive in cold waters for a long time an hypothermia could be ocurred. The hypothermia is caused by a drop in temperature to about 30 degrees and it could cause serious problems. At the beginning heart beat increases to face up to this negative situation, but when the temperature drops to about below 34 degrees, the heart beat drops gradually. Below 30 degrees a heart disorder could arise. The hypothermia depresses respiratory functions too consequently the reduction of the rhythm of respiration will affect brain with nervousness and disorientation consequently it is better to be well equipped and to be cautious during a dive. The hypothermia treatment consists in preventing a subsequent drop in body temperature, the diver must take off wet clothes, he must get dry and wrap himself with blankets. Remember that it is very dangerous to drink alcoholic in these circumstance because blood vessels widening out would allow to colder blood that it is in the perpheral zone of the body, to reach quickly the vital organs.



HYPERTERMIA

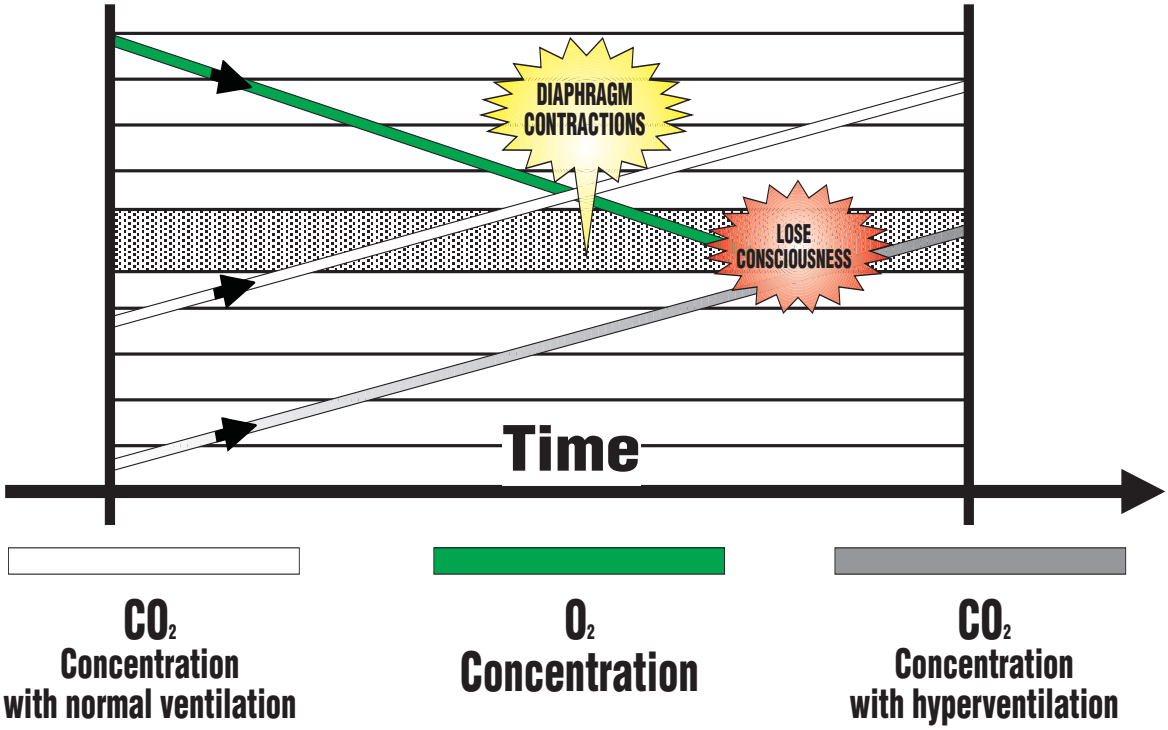
Hypetermia is due to an excesive exposure to hot environment, for example when a diver ,worn the exposure suit, stays on the sun for a long time, the human body does not compensate the increases of the internal temperature. Symptoms could be dizziness, headache, excessive sweating, difficult breathing, loss of consciousness. The treatment consists in undressing the diver, bringing him to a cold place, giving him drinking water and applying him ice compresses.



BREATHLESSNESS

If a diver is breathless the rescuer will have to calm him down and help to restablish his breathing control.
The dive will be resumed when the diver in danger will have solved the problem.

HYPERVENTILATION



CRAMPS

If a diver gets a cramps while diving the rescuer will get closer to diver either he is at surface and he is underwater.
The dive must be stopped if the cramps continue.

Emergencies during diving

ACCIDENTS THAT COULD OCCUR DURING DESCENDING

TYPE	CAUSES	SUBJECTIVE SYMPTOMS	OBJECTIVE SYMPTOMS	FIRST AID	FOLLOWING PRECAUTIONS	PREVENTION
MIDDLE EAR SHOCK OR TRAUMA CAUSED BY EXTRA WATER PRESSURE SUCKER STROKE	CATARRH OBSTRUCTION OF EUSTACHIAN TUBES	LOSS OF HEARING EARACHE LOSS OF BLOOD FROM AUDITORY DUCT	INFLAMMATION OF TYMPANIC MEMBRANE POSSIBILITY OF PERFORATION	ASCENDING TO THE SURFACE INSTALLATIONS OF OTALGAN IN AUDITORY DUCT DECONGESTANT TABLETS OF ACTIFED AEROSOL OF OTRIVIN		DON'T DIVE IF YOU HAVE A COLD OR CATARRH
INTERNAL EAR	SUDDEN CHANGES IN PRESSURE	DIZZINESS NAUSEA	BLOOD CLOTS IN THE AUDITORY DUCT CHANGES IN THE TYMPANIC MEMBRANE		OTOLARYN-GOLOGICAL EXAMINATIONS AND TREATMENTS	EQUALIZE CORRECTLY
EXTERNAL AUDITORY DUCT	OBSTRUCTION OF EXTERNAL AUDITORY DUCT	EARACHES LOSS OF BLOOD POSSIBILITY	LOSS OF BLOOD FROM THE NOSE	ADMINISTRATION OF ANALGESICS INSTALLATIONS OF OTALGAN IN AUDITORY DUCT DECONGESTANT TABLETS OF ACTIFED AEROSOL OF OTRIVIN ASCENDING TO THE SURFACE		DON'T WEAR EAR PLUGS
PARANASAL SINUSES	CATARRH CONGESTION OF PARANASAL SINUYSES	WHEN THE PRESSURE CHANGES, PAINS IN ONE'S PARANASAL SINUSES		INSTALLATIONS OF OTALGAN IN AUDITORY DUCT DECONGESTANT TABLETS OF ACTIFED AEROSOL OF OTRIVIN ASCENDIG TO THE SURFACE		DON'T DIVE IF YOU HAVE SINUSITIS OR CATARRH
LUNGS	DURING THE DESCENT AIR DELIVERY IS INSUFFICIENTE	DIFFICULT BREATHING PAINS IN ONE'S CHEST	BLOOD EXPECTORATION CYANOSIS	ADMINISTERING OXYGEN ANTISHOCK TREATMENT	EMERGENCY ADMISSION TO HOSPITAL	
CUTIS	STALE AIR INSIDE DRY SUIT	PAINS IN ONE'S SKIN	HEMATOMA		OPHTHALMOLOGIC EXAMS AND TREATMENTS	WEAR A WOOL VEST UNDER THE WET SUIT
FACE	MASK EQUALIZATION IS NOT CORRECT	PAIN TUMEFACTION	TUMEFACTION AND BRUISES IN FACE BLOODSHOT EYES LOSS OF BLOOD FROM THE NOSE			PUT MASK THAT EQUALIZES CORRECTLY

ACCIDENTS THAT COULD OCCUR DURING DIVING

TYPE	CAUSES	SUBJECTIVE SYMPTOMS	OBJECTIVE SYMPTOMS	FIRST AID	FOLLOWING PRECAUTIONS	PREVENTION
LOSS OF CONSCIOUSNESS DURING DIVING	HYPOGLYCEMIA POST INFECTIVE STATES HEART TROUBLE TRAUMATISMS AQUATIC ANIMALS AND PLANTS LONG BREATH-HOLD DIVING		DEPEND ON THE CAUSES	RESCUE THE DIVER QUICKLY EXECUTE BLS PROCEDURES RECOMPRESSION IN A HYBERBARIC CHAMBER IF NECESSARY	SPECIALIST'S INTERVENTATION	DON'T DIVE IF YOU DON'T STAY HEALTHY DURING DIVING AVOID OVEREXERTION
NITROGEN INTOXICATION	COMPRESSED AIR BREATHING	LOSS OF CONCENTRATION UNCONTROLLED ACTIONS DIZZINESS EUPHORIA		REDUCE THE DEPTH QUICKLY		AVOID DEEP DIVES
CO2 (CARBON DIOXIDE) INTOXICATION	BREATHING OF AIR WITH CO2 BREATHING WITH TOO PAUSES BREATH-LESSNESS	TACHYCARDIA GIDDINESS NAUSEA BUZZINGS BREATHLESSNESS	BREATHLESSNESS HEADACHE LOSS OF CONSCIOUSNESS AND MUSCOLAR RELAXATION A REDUCTION OF HEART RATE CYANOSIS LABOURED BREATHING	INTERRUPT ALL ACTIVITIES ASCEND TO THE SURFACE		AVOID BREATHLESSNESS CHECK AIR INSIDE THE TANK
OXYGEN INTOXICATION	OXYGEN BREATHING WITH HIGH PARTIAL PRESSURE FOR A LONG TIME	NAUSEA CONTRACTION OF FACIAL MUSCLES GIDDINESSES EYE TROUBLES TREMORS UNCONTROLLED MOVEMENTS OF LIMBS	MUSCOLAR SPAMS EPILEPTIC FIT	INTERRUPT DIVING ASCEND TO THE SURFACE ONCE ARRIVED THE SURFACE BREATH ANTISHOCK TREATMENT	SPECIALIST'S EXAMINATION	AVOID OXYGEN BREATHING WITH HIGH PARTIAL PRESSURE FOR A LONG TIME
OXYGEN DEFICIENCY OR ANOXIA	SCARCE OXYGEN IN COMPRESSED AIR	NON VISIBLE SYMPTOMS	LOSS OF CONSCIOUSNESS WITH MODERATE OR SERIOUS CYANOSIS	RESCUE THE DIVER EXECUTE BLS PROCEDURES RESUSCITATION	ADMISSION TO HOSPITAL	CHECK BREATHING EQUIPMENT RESPECT OPERATING RULES

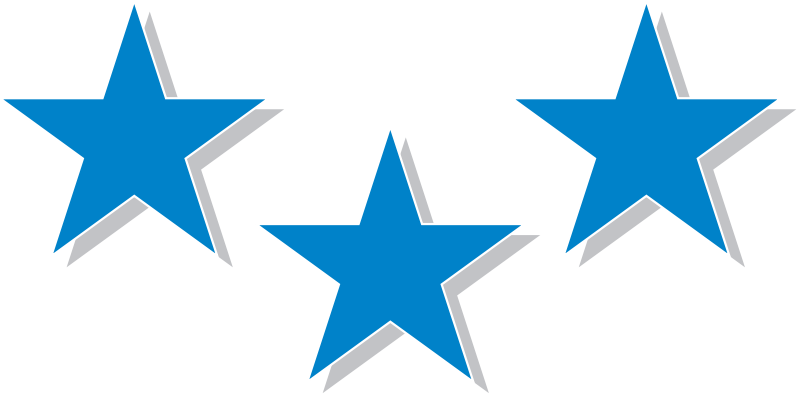
ACCIDENTS THAT COULD OCCUR DURING ASCENDING

TYPES	CAUSES	SUBJECTIVE SYMPTOMS	OBJECTIVE SYMPTOMS	FIRST AID	FOLLOWING PRECAUTIONS	PREVENTION
BAUROTRAUMATIC SINUSITIS	OBSTRUCTION OF PARANASAL SINUSES DURING DIVING	PAINS DURING ASCENDING		NASAL DECONGESTANTS	SPECIALIST'S INTERVENTATION	DON'T DIVE IF YOU HAVE A COLD OR CATARRH
OVERPRESSURE OF DIGESTIVE TRACT	FOOD INGESTION THAT PRODUCES DIGESTIVE GASES BEFORE AND DURING DIVING	ABDOMINAL PAINS DURING ASCENDING	HARD AND BLOATED STOMACH DURING ITS PALPATION	ASCENDING SLOWLY	ENEMA RECOMPRESSION	DON'T TAKE FOOD THAT WORKS PRODUCING GASES BEFORE DIVING
DECOMPRESSION SICKNESS						
PAINFUL AND SKIN TROUBLES	NON OBSERVANCE OF DECOMPRESSION RULES	ITCHINGS PAINS IN ONE'S JOINTS AND BONES THAT INCREASE GRADUALLY	HEMATOMA BLOTCHES ON THE SKIN BLOCK IN THE JOINTS	ANTISHOCK TREATMENT ADMINISTERING OXYGEN RECOMPRESSION IN A HYPERBARIC CHAMBER	MEDICAL EXAMINATION DURING HYPERBARIC TREATMENT TOO	AVOID DEEP DIVES AND RESPECT DECOMPRESSION RULES
NEUROSENSORIAL TROUBLES		DIZZINESS SIGHT, HEARING AND SPEECH TROBLES	PARTIAL PARALYSIS LOSS OF NEUROSENSORIAL FACULTIES SHOCK			
PULMONARY DISORDERS		PARALYSIS LOSS OF CONSCIOUSNESS DIFFICULTY BREATHIN COUGH PAINS IN ONE'S CHEST	DYSPNEA CYANOSIS SHOCK			
PULMONARY OVERPRESSURE						
EMPHYSEMA	NON EXHALATION DURING FAST ASCENTS PULMONARY AFFECTIONS	DIFFICULT SWALLOWING AND BREATHING	DYSPNEA	ANTISHOCK TREATMENT AMMINISTERING OXYGEN RECOMPRESSION IN A HYPERBARIC CHAMBER	MEDICAL EXAMINATION DURING HYPERBARIC TREATMENT TOO	CHECK ASCENDING SPEED DON'T HOLD YOUR BREATH REGULAR BREATHING
PNEUMOTORAX		DIFFICULT BREATHING PAINS IN ONE'S CHEST				
TRAUMATIC EMBOLISM		LOSS OF CONSCIOUSNESS WHEN YOU ARRIVE AT THE SURFACE	ONE SIDED PARALYSIS LOSS OF NEUROSENSORIAL FACULTIES			
CEREBRAL EMBOLISM		LOSS OF CONSCIOUSNESS WHEN YOU ARRIVE AT THE SURFACE SUDDEN PAINS IN YOUR HEART ZONE				
CORONARY EMBOLISM		DIFFICULT BREATHIG	INFARCTION AND SHOCK SYMPTOMATOLOGY			

VARIOUS ACCIDENTS

TYPES	CAUSES	SYMPTOMS	FIRST AID	PREVENTION
EXPOSURE TO LOW TEMPERATURE	AN INADEQUATE WET SUIT FAULTY DRY SUIT NOT UNDERSUIT OR NOT VERY THERMAL UNDERSUIT BEING UNDERWATER FOR A LONG TIME	COLD CONTINUOS SHIVERS SKIN TURNS WHITE PHYSICAL AND MENTAL NUMBNESS	WRAP A BLANKET ROUND A DIVER A HOT BATH LEAVING DRY HIS FEET DON'T GIVE ALCOHOLIC DRINKS	CHECK THE EQUIPMENT INFORMATION ABOUT DIVE SITE MAKE DECOMPRESSION IN A HYPERBARIC CHAMBER AT THE SURFACE
HEATSTROKE	SCARCE HEAT EXCHANGE BETWEEN BODY AND WATER EXCESIVE ENVIRONMENT TEMPERATURE EXCESIVE FATIGUE WEARING DRY SUITS IN WARM WATER	DIZZNESS, FATIGUE, HEADACHE, DIFFICULT BREATHING, FAST PULSATIONS, AXCESSIVE SWEATING, HIGH TEMPERATURE (FEVER), CRAMPS, PAINS IN ONE'S MUSCLES, LOSS OF CONSCIOUSNESS,	LAY DIVER ON A COOL PLACE PUT ICE PACKS ON THE DIVER'S HEAT AND HIS BODY WRAP WET TWELS ROUND A DIVER	WEAR PROPER EXPOSURE SUITS DON'T MAKE EXCESSIVE EFFORTS PROTECT YOURSELF FROM THE SUN WHEN YOU ARE AT THE SURFACE
STINGS FROM JELLYFISHES	STINGS DUE TO CONTACT WITH JELLYFISH'S TENTACLES	PAIN WHERE THE PRICKES IS, REDDENED SKIN, SWELLING, BLISTERS, LOSS OF FEELING, CRAMPS, PAINS IN ONE'S ABDOMEN, NAUSEA AND EMESIS, PARALYSIS OF LIMBS	GET THE DIVER OUT OF THE WATER WASH WITH FRESH WATER PUT ALKALINE SOLUTIONS (AMMONIA) ANTISHOCK TREATMENT	AVOID CONTACTS WITH JELLYFISH WEARING PROTECTIVE CLOTHES DURING DIVING
ACULEUS PRICKS	PRICKS ARE CAUSED BY THE PENETRATION IN THE SKIN OF VARIOUS MARINE ANIMALS'PRICKLES SOME PRICKLES SHOULD BE VENOMOUSNESS	PAIN WHERE THE PRICKES IS, BURNING SENSATION, PAINS ALL OVER, VERMILION SKIN, SWELLING, PARALYSIS OF LIMBS, BREATHING DIFFICULT	ACULEUS ANTISHOCK TREATMENT	EXPOSURE SUIT OFFERS A GOOD PROTECTION CONSEQUENTLY AVOID THE CONTACT WITH SEA URCHINS AND THEIR RELATIVES
WATER SNAKEBITES	WATER SNAKES INJECTS VENOM BY THEIR TEETH	SYMPTOMS OF WATER SNAKEBITE CAN OCCUR IMMEDIATLY OR MANY HOURS LATER, SLIGTH ILLNESS, STIFFENING OF LIMBS, PROGRESSIVE PARALYSES, SHOCK, CONVULSIONS, LOSS OF CONSCIOUSNESS	CALM THE DIVER DOWN PUT TOURNIQUET AT THE SOURCE OF WOUND GIVE AN ANTIVENIM INJECTURE ANTISHOCK TREATMENT	AVOID CONTACTS WITH WATERSNAKE PROTECT THE BODY AND THE LIMBS WITH PROPER CLOTHES

LESSON 3



CMAS

WORLD UNDERWATER FEDERATION

Aggressiveness in a panicked diver

During a diving any event could create panic and fear.
Particularly when the diver realizes that he cannot breathe he becomes aggressive.
A panicked diver reacts with uncontrolled and inappropiate actions, he could attack his buddy to get an irrational help.
This situation could cause accidents if his friend is not calm.

The panicked divers that attacks his friend could cause two situations.
The diver in danger can cling to us to get help getting us closer from the front or behind.
If he gets closer from the front, we are able to see him and we must ferestall his moves at once :
- to give him the A.A.S. if he is out of air and to begin a buddy ascending,
- to help him to adjust his B.C.D. if he does not control his buoyancy,
- to get him to calm down if he is in panic.

If he gets closer behind the situation is more serious because we are not able to understand the problem: is he in panic ? is he out of air ? does he not control his buoyancy ?
We must only understand his problem and solve it.
We will try to grab the diver in danger by the head or by the tank valve, and then we will try to place him behind our back.
While we catch hold of his tank we recover our regulator if it has fallen during this operation then we check the diver in danger and we give our A.A.S., we take his B.C.D. and we try to persuade him to relaxe even it will be very difficult because we are not in front of him.
If there is another diver it is advisable that he gets closer to the diver in danger from the front and helps the rescuer.

Restored the calm it is better to begin the ascent.

Carrying the diver in danger to a safe place

For any diving accident the aid procedure is:

CHECK ON THE CONSCIOUSNESS OF THE DIVER IN DANGER

Reached the surface it is better to check on the consciousness of the diver in danger asking him some simple questions, shaking him and looking at him in the eyes, if he reacts well and he is self sufficient ask his help to reach the boat or the land , if he is unconscious release his weight belt.

ASKING FOR ASSISTENCE

After checking on the consciousness of the diver in danger it needs to ask for assistence: with proper aid signals attract attention of the boat so that someone can help you .

CHECK ON RESPIRATORY ACTIVITY

While you are waiting for help, if the diver is unconscious check on his respiratory activity through the following assessments:

Observe if there is expansion of his chest or his abdomen

Listen to if there are sounds and noises coming from breathing

Listen to the expired air from nose and mouth

These operations are not easy, because of the uncomfortable situation and the state of anxiety. There are also other elements that can help to determine the absence of breathing:

The skin of the face is very flushed, cyanotic, because blood lacking in oxygen is circulating through the body

Lips and eyes will be swollen and congested

MOUTH TO MOUTH RESUSCITATION IN MOTION

If there is not respiratory activity, considering that it si very difficult that there is a heart failure instantly in these type of accidents, it needs to start quickly the artificial respiration "A.R." on the surface before and during the carrying of the diver in danger to the boat:

Inflate the diver' s B.C.D. so as to hold him without hampering the movements of the chest

If there is another diver, undress the diver in danger, the wet suit can maintain a buoyancy without B.C.D. , besides it is easier to make rescue operations without equipment

Put the palm of a hand on the forehead and block the nose with forefinger and inch, pout the other hand under the head to sustain the buoyancy of the head and consequently to keep airways out from the water,in the dry "A.R." the hand is on the chin because it is not indispensable to susstain the head

Now levering with hands in above mentioned position, the mouth emerges from the water and tends to open naturally, now some mouth-mouth insufflations start, one every 5 seconds, loosening the nose when the rescuer makes the inhalation

It is difficult to mark the rhytm of insufflations because we are in the water and we are carrying the diving in danger towards the boat , the effort will impede us either the artificial respiration and the carrying. We continue the "A.R." till the diver in danger begins breathing for example he coughs or breathes naturally, but if the diver in danger does not breathe we will carrying him to the boat or to the beach where we will make the BLS complete.

CARRYING THE DIVER IN DANGER TO THE SURFACE

If the diver in danger is unconscious, with or without heart failure, or he is conscious but he is not able to swim because he gets panicked or overexerted, we must carry him to the boat or to land according to some methods:

CARRYING THE CONSCIOUS BUT NOT SELF SUFFICIENT DIVER IN DANGER

Without undressing him, we will grab him by tank valve and we will carry him on supine position while we will take fish-bone position looking at aid point, boat or land. We will sometimes stop and speak to the diver to know his state.

CARRYING THE UNCONSCIOUS DIVER IN DANGER BUT WITH BREATHING ACTIVITY

In this case it is better to undress him so that his carrying is faster without equipment. As it needs to have the maximum contact with the diver in danger, the rescuer will put the diver on his side:

The rescuer puts himself fish-bone position under the diver in danger and grabs the diver with the hand passing above his shoulder and getting a grip under the armpit of the opposite arm. During this carrying the rescuer removes the mask to the diver in danger only if the sea is calm or if the diver has some breathing problems for which it needs that his nose is free .

CARRYING THE UNCONSCIOUS DIVER IN DANGER BUT WITHOUT BREATHING ACTIVITY

this type of carrying will be difficult and tiring because in addition to carrying we must practice the moth-mouth resuscitation. the position is similar to the previous carrying:

From the fish-bone position we will pass our arm from up to down under the armpit of the diver in danger and we will put the hand on his nape, while we will block his nose with the other hand and will practice the mouth-mouth resuscitation;

The arm which passes under the armpit provides us a firm grip so as to carry and practice the artificial resuscitation for a a long time.

HOISTING THE DIVER IN DANGER

Once carried the diver in danger near the aid point depending on we are or on the land or on the boat it needs to hoist him .

HOISTING THE DIVER IN DANGER ON THE BOAT

THE DIVER IS IN CONFUSIONAL STATE BUT HE IS CONSCIOUS

We will help him to undress of his equipment and then with the assistence of other divers that are aboard we will help himto go on by the boarding ladder

The rescuer that is in water behind the diver in danger must stay some distance from him so as to help the diver in danger if he falls to the water , but at the same time he must be careful that the diver in danger does not fall on him

Divers that are aboard help the diver in danger to go on the boat when he is falling the boarding ladder and if necessary they lie him down on an sheltered place from the cold or from the sun so that they are ready to check his state

THE DIVER IN DANGER IS UNCONSCIOUS BUT WITH BREATHING ACTIVITY

If during the carrying we have not undressed him it needs to do it aboard

Being careful to maintain dry respiratory tracts we will take off the equipment to the diver in danger as weight belt was released previously

The rescuer with a hand grabs the boarding ladder or the lowest side of the boat, with the other arm supports the diver by the waist, at this point he turns the diver with the back toward the boarding ladder or the side of the boat

The rescuer passes the diver's arms to other divers that are aboard and while the rescuer pushes the diver in danger upwards the assistants pull him up so that the diver in danger des not hit or hurt during hoisting.

HOISTING THE DIVER IN DANGER ON THE LAND

the diver in danger is carried to the land only if it is impossible to reach the boat and the shore is near or if the diving is not from the boat.

The rescuer will look for the beach or an enough easy point to hoist the diver in danger without causing other problems, but if the dive site is in a rocky zone he will look for a rock that degrades towards the sea so as to make a slide to lie on the diver in danger.

In shallow water the rescuer will undress the diver in danger ,(only if it has not been made it during carrying) then he will block the head putting a hand near the nape and with the other hand put under the armpit he will take him out from the water and will lie him on the beach.

SPECIFIC HOISTING

THE RESCUER IS ALONE

Holding the boarding ladder the rescuer turns the diver in danger so that his back leans against the boarding ladder, he puts the diver's arms around to own neck and the rescuer supports him holding with his legs during the climb.

This procedure is very difficult if the diver in danger is more heavily built than the rescuer.

THE BOAT IS AN INFLATABLE DINGHY

In this case as there is not a boarding ladder the diver in danger will be hoisted along the side of the inflatable dinghy.

We will try to put the diver in danger from the back to the inflatable dinghy, holding him with a leg between his legs, , the assistents that are aboard will take his wrists and will pull him up on the side of the inflatable dinghy
This procedure is impossible if the rescuer is not helped by assistens.

THE BOAT HAS EQUIPPED WITH A STERN GANGPLANK AT SEA LEVEL

We will hold the diver in danger with a leg between his legs and with our arms leaned against the the gang plank and under his armpit, we will bring his hand slowly and alternatively on the gangplank superimposing them, with a hand of ours we will block his hands and we will go up the gangplank levering on the other hand.

Then we will turn the diver in danger holding it by the wrists so that he puts from the back to the gangplank and levering on the legs we will hoist him aboard.
This operation will be easier if we will be helped by assistens especially during hoisting when the diver in danger will be very heavy.

FIRST AID

Once reached the boat,hoisted the diver in danger aboard, it is necessary to practice a procedure that gets in connection to BLS (basic life support) operations.

Location : put the diver in danger in a dry and protected place and if necessary lie him down on a sheltered zone

Call for help from land: consider the need to call the FIRST AID from land to send the divin in danger to hospital considering where we are, holding a telephonic contact to comuniate the diver's state

Monitoring: during the way back it is necessary to practice the BLS procedures starting from the check of consciousness and if necessary tha artificial respiration

DMP - Diving Medical Pack

The diving medical kit is useful to help divers and every diving centres should have it and take it aboard.
This kit includes:

technical- medical first aid kit
Disinfectans
- hydrogen peroxide
- chlorine antibacterial
- no cortisone based eyewash
- liquid soap
- ammonia stick for insect bites

Medications kit
- sticking plasters
- sterilized gauzes
- bandage roller
- medeicated plasters
- liquid holders
- set of scissors
- set forceps
- coton wool tampons
- trhowaway towels
- scalpel
- vaseline gel
- oral splints
- disponsable gloves

Medical measure instruments
- thermometer
- stethoscope
- pressure measure

Traumatology kit
- n.3 splints to immobilize limbs
- collar for vertebral trauma
- spinal plak for traumatized person rescue also in water
- blankets and pillows
- termal blanket

Intensive care kit
- Ambu ball
- pocket mask
- cannula
- oxygen tank kit
- liquid aspirators

Boat kit
- buoys from throwing
- ropes and lines
- strong elastic bans.

DPE - Diving Prevention Equipment

Some accidents could be avoided if someone managed a diving problem correctly so that it does not become a heavy damage.
Any small an easy techinical advice before, during and after diving allows us to dive without problematic situations.
This kit called DMP (diving prevention equipment) is useful to the diver's safeguard and is composed of the following equipment:

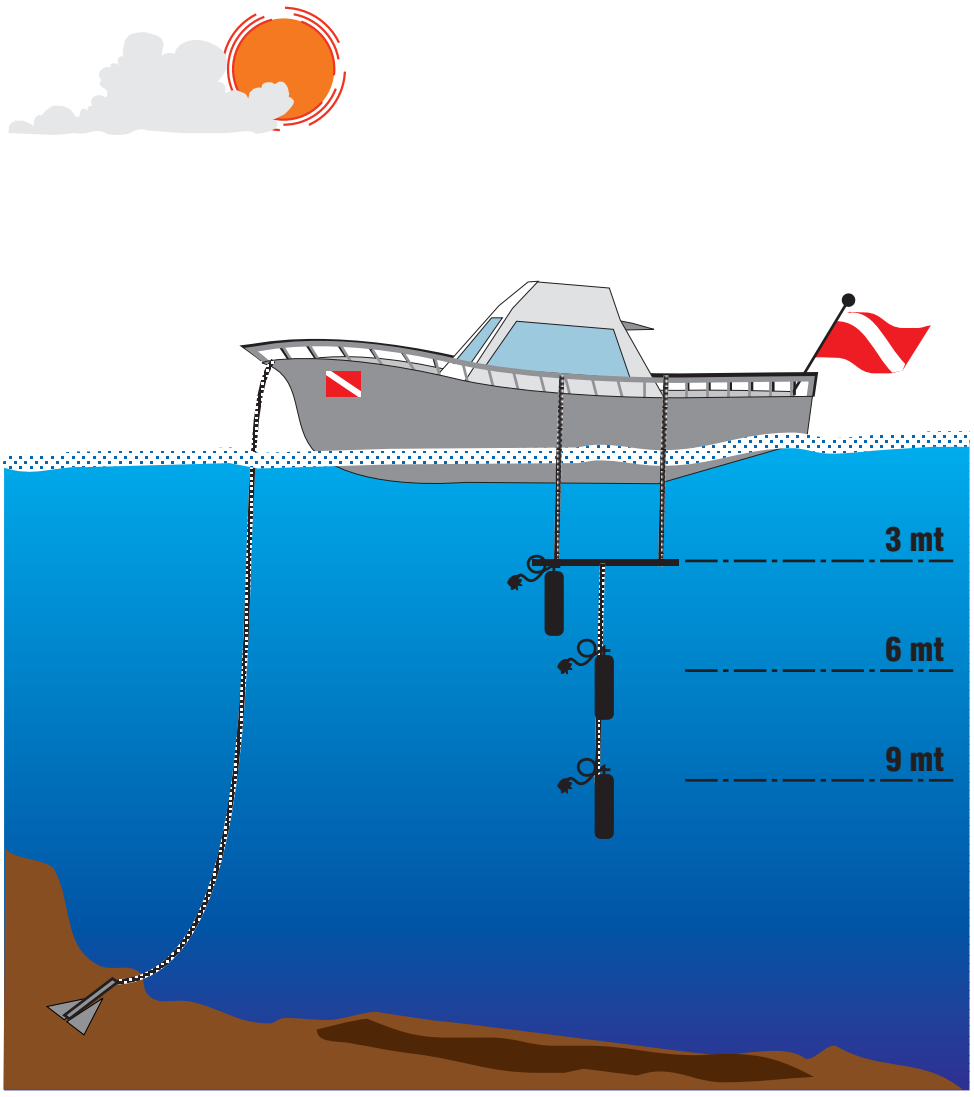
- Trapetium

- Spare tank

- Spair air

- 2 lead-covered lines of 4/5 situated at boat sides

They are useful devices to safeguard underwater activity and every diving centre could add or change according to its needs this diving prevention equipment.



Search and rescue

During an emergency aids must be fast. It needs to recognize immediately the problem and this is possible only if you have planned aids. This planning enables that your action is either fast and effective to solve the problem. In case of search or rescue even the action have been planned quickly it is sometimes delayed because of the numerous variations that could occur. The diver or divers that get ready to a serch or a rescue for example they must know the time passed from the alarm, how long diver or divers are missing, the causes that have create the problem, the conformation of the search place, the currents etc..

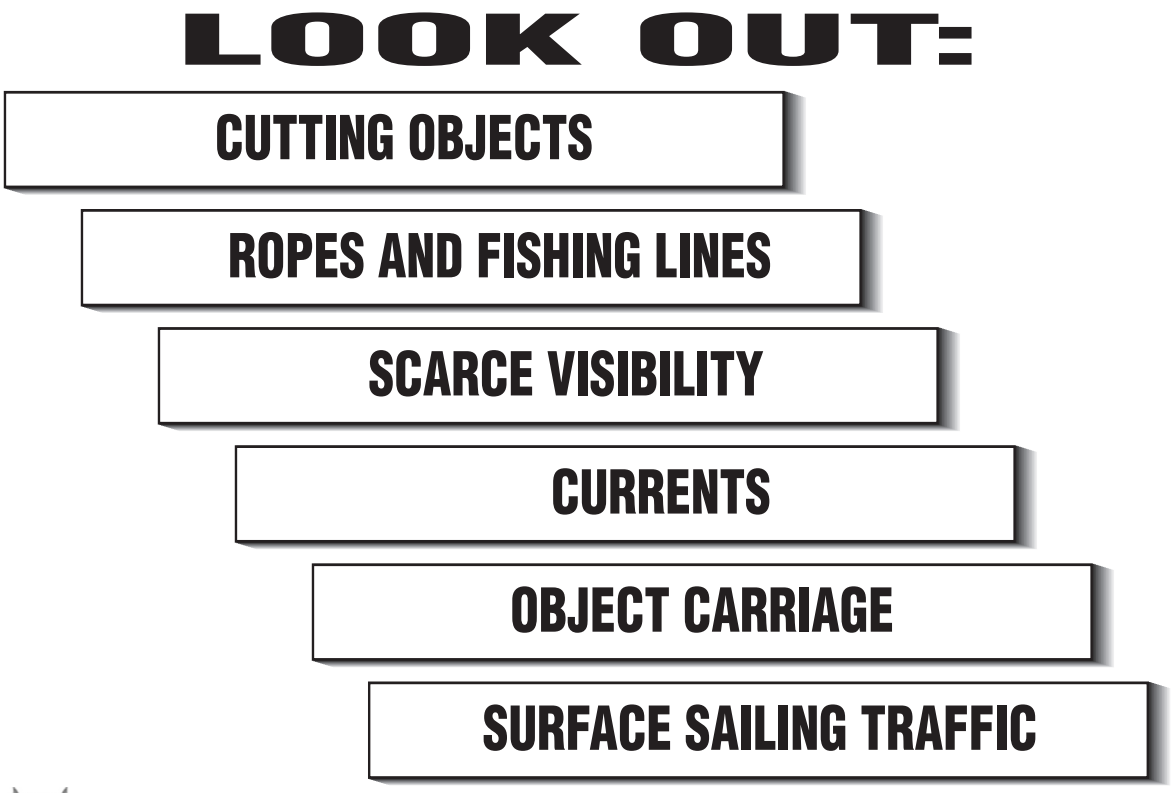
SEARCH AREA IDENTIFICATION

The search area identification is the most important step after the ascertainmen of the loss of contact with a diver or with a group of divers as it is a waste of time if we don't know where to search. It is also important to know environmental conditions like visibility, current, state of sea, etc. Once found this point we will mark it or by a diver that swim in the surface or putting sefety sausage. Then we will weight the pros and cons of this search as if there are conditions like limited visibility, depth, state of the sea that could endager divers'safety, the risks could be more numerous than advantages consequently it is important to distinguish between an aid action and a rescue action. In the first case you presume that the diver is still alive with air, maybe wouded and not able to move; in the second you presume that the diver is not alive.
In the first case we will have to decide quickly and to consider the greater risks that some choices could involve, in the second case we will decide to entrust the rescue to more qualified rescue team.

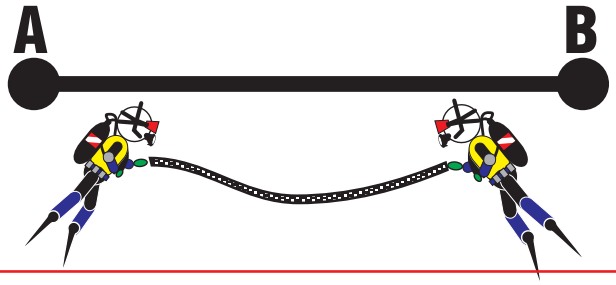
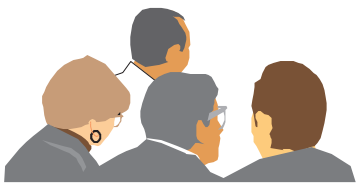
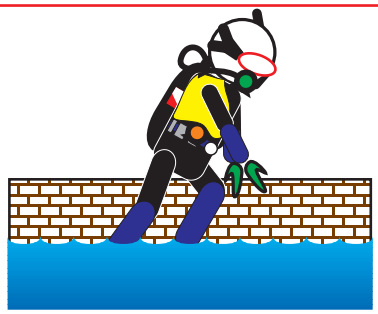
SEARCH PROCEDURE SELECTION

The main element to obtain positive results is the proper search procedure selection. There are several search types and methods: in pair, alone, by using specific tools like compass and among thes tools the most effective will result the simplest. In addition we will consider risks that we will run during a search and we will have to be able to weight the pros and cons.

SEARCH DIAGRAM

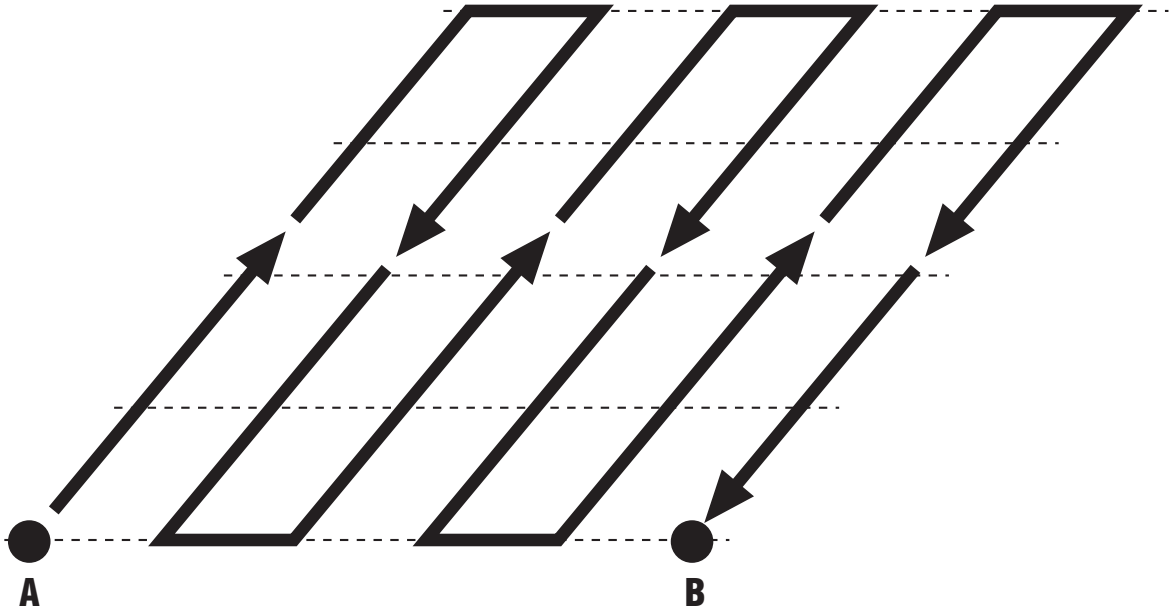


Search course

A GOOD RESCUE PLAN MUST:	
START FROM A KNOWN POINT AND END IN A SETTLED POINT. IT ENABLES TO DETERMINE THE PRESENCE OR NOT OF THE RESCUE OBJECT IN THE CONSIDERED AREA	
USE A GOOD COMUNICATION SYSTEM AMONG DIVERS THAT ARE UNDERWATER AND DIVERS THAT ARE ON THE SURFACE	
USE THE BASIC EQUIPMENT IN CASE OF SCARCE VISIBILITY TOO EITHER FROM THE SHORE AND FROM THE BOAT	
ENABLE TO SIGNAL THE RECOVERY POINT EASILY	
ENABLE PEOPLE THAT ARE NOT DIVERS TO PARTECIPATE TO RESCUE OPERATIONS	
HAVE A DIVER AT SURFACE THAT MUST BE READY FOR HELPING	

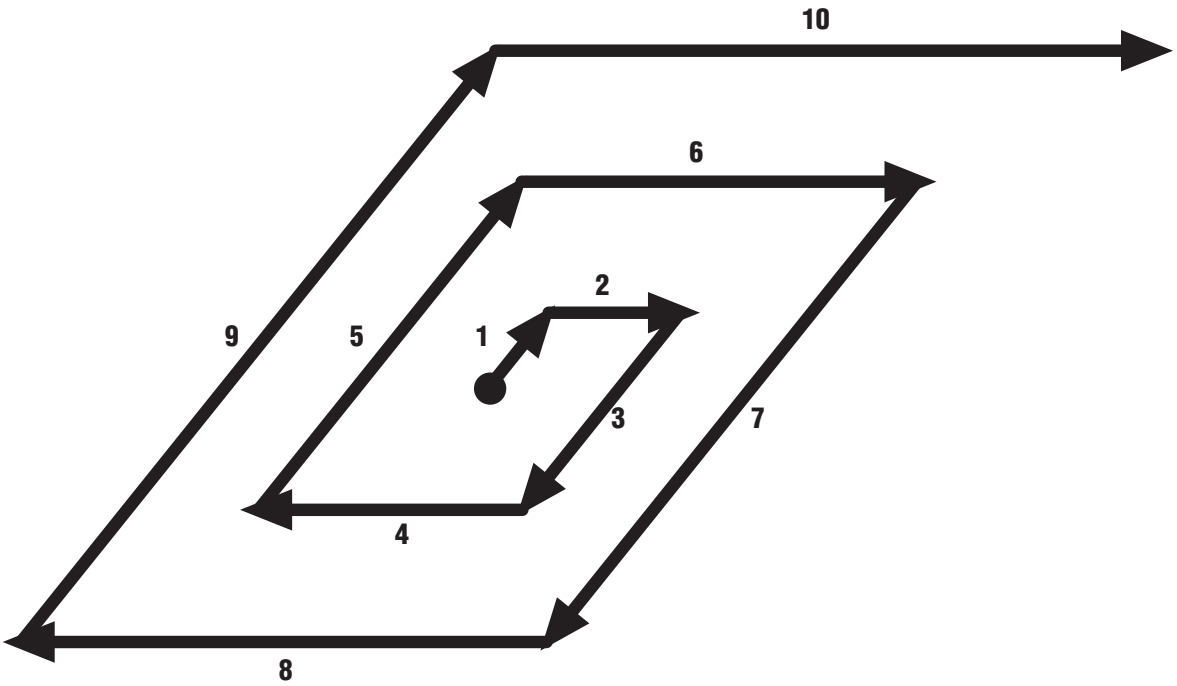
"U" COURSE

This course is very simple because it does not require lines



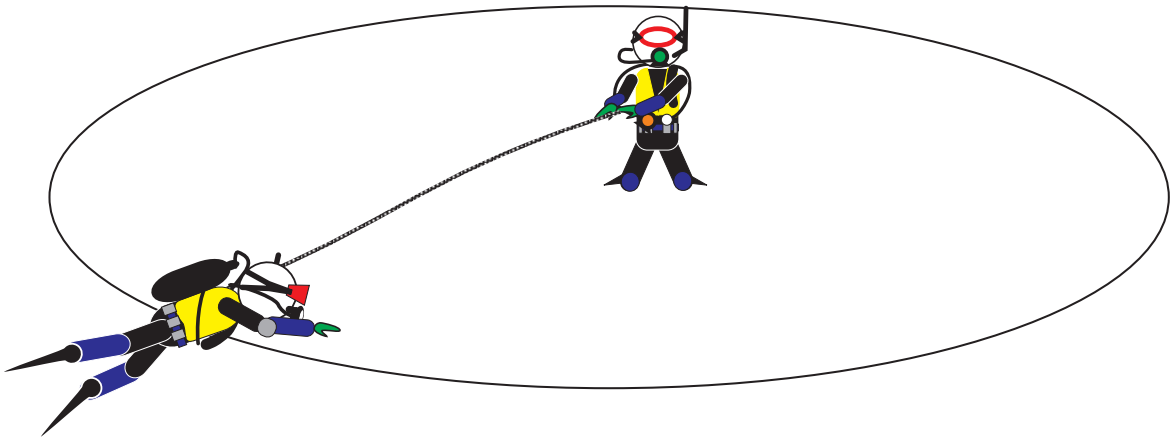
SQUARE COURSE

The square course is right for searches in environment with reduced wave motion on disconnected sea-beds.



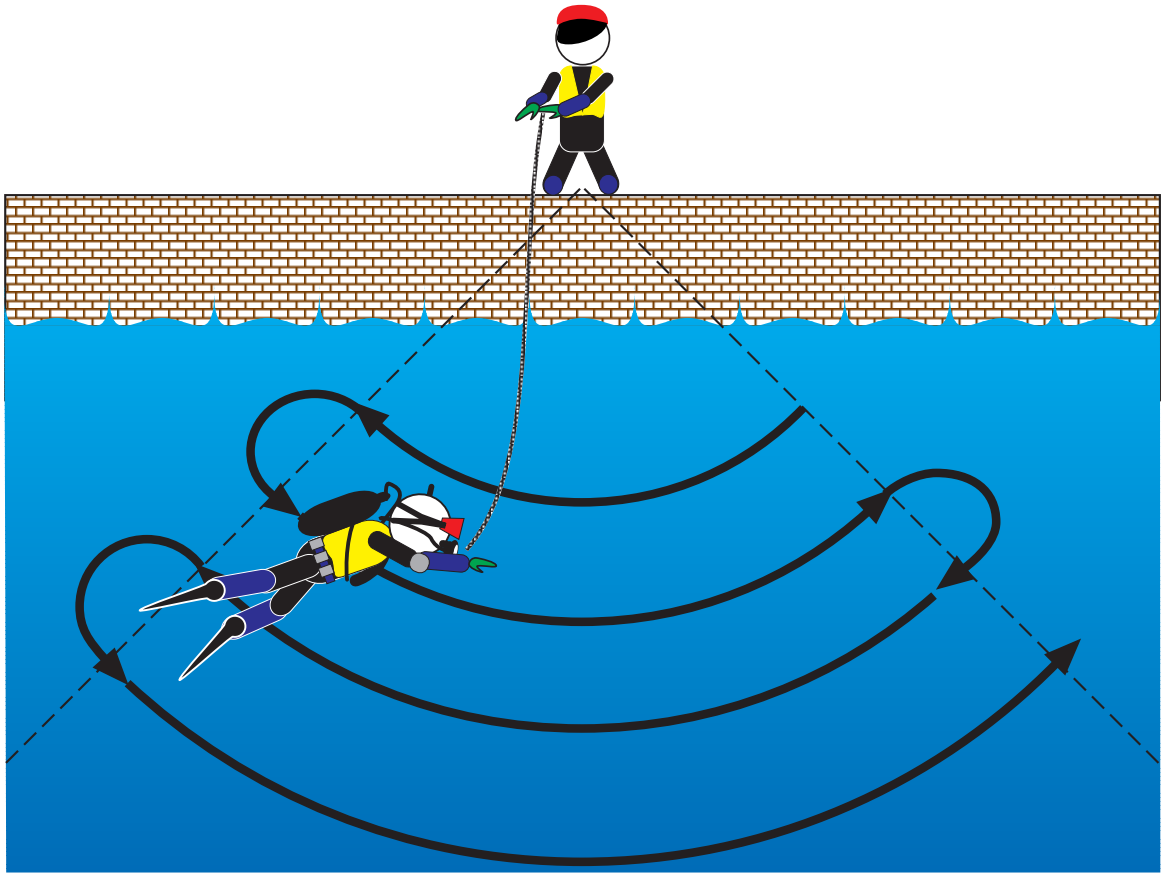
ROUND COURSE

This course can be effectuated on flat seabeds, with currents or undertow



CONTROLLED COURSE FROM THE SURFACE

This course is usually used for searches from shore, bridge or boat. The assistent that is on land examines the diver's course signalling him, by means of line indications, when he has to change the course.

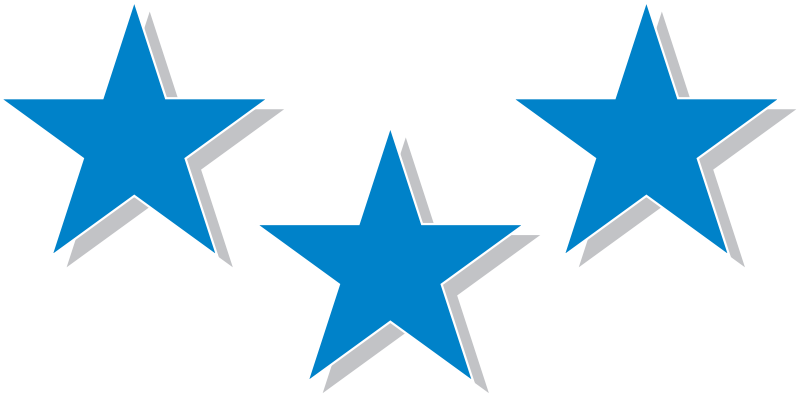


RESCUE OF THE OBJECT

If after locating an obiect it needs to rescue it you will consider its weight and volume, so that you can establish the rescue procedure.

Objects below of 8/10 Kg will go up by B.C.D., being careful not to lose it to avoid a fast ascent. Heavier objects will go up by lifting ball, choosing the most proper according to the weigth of the object.

LESSON 4



CMAS

WORLD UNDERWATER FEDERATION

Equipment

HOW A COMPRESSOR WORKS

"HIGH PRESSURE COMPRESSOR" is a device that refills tanks with a pressure that goes from 200 bar to 330 bar.

This type of devices are used to compress air for breathing in tanks for recreational divings or for professional divings for example cylinders used by firemen.

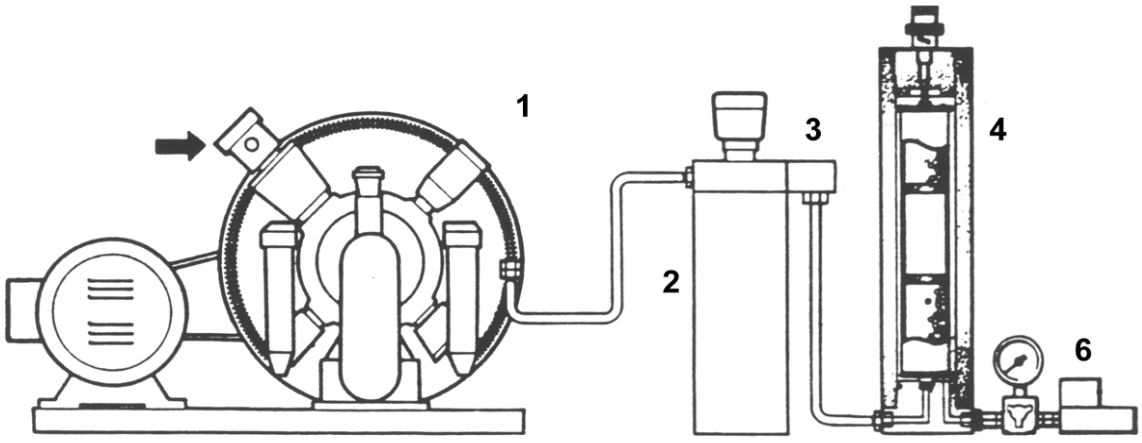
The heart of this device consists of high pressure compressor unit, composed usually of three or four cylinders, in which air is compressed in successive stages till the proper pressure.

The moving components of the compressor unit are lubricated with different system according to the model and tha manufacturer, mixed system is usually present, shaking system or injection pump. In the first case the lubricant, gathered in a tank or "cup" arrives at points of friction after that it has been atomized by the movement of the inside components, in the second case by means of an injection pump that gets from the same cup, this system is generally used to lubricate the last stage of compression, the stage that is subjected to wear and heating.

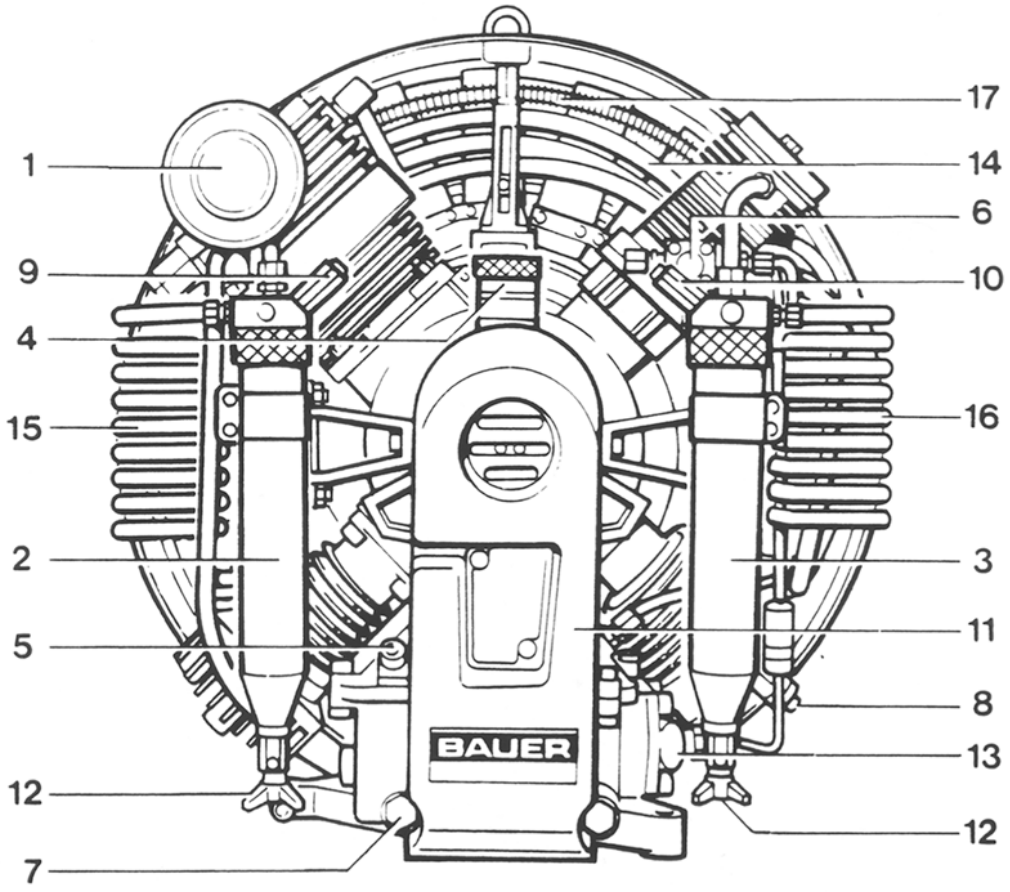
It is very important for the life and a good maintenance of the device, given the temperature of pumping unity, the choice of a proper oil lubricant, which should have the following requisites:

- *Few sediments*
- *No carbonization,especially on the valves*
- *Good anticorrosive properties*
- *Emulsifying effect*
- *Physiological and toxicological properties that respect the set of rules*

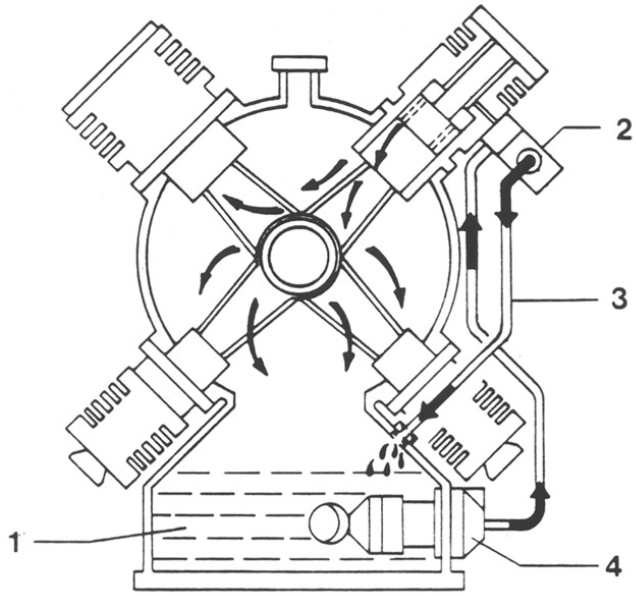
There are different types of lubricant according to conditions and the use of the compressor and for a proper choice it is better to follow the manufacturer's advices.



1. Compressor
2. Closing separator filter
3. One way valve
4. Purifyng filter
5. Ventilation valve and pressure gauge
6. Pressure keeping and one way valve



1. Suction filter
2. 2 stage separator filter
3. 3 stage separator filter
4. Lubricate filling nozzle
5. Level check bar
6. Lubricate pressure adjustment valve
7. Lubricate drainage cap
8. 1/2 stage safety valve
9. 2/3 stage safety valve
10. 3/4 stage safety valve
11. protection belt
12. Condensation drainage valve
13. Oil pump
14. 1/2 inter-cooler
15. 2/3 inter-cooler
16. 3/4 inter-cooler 17 final cooling circuit

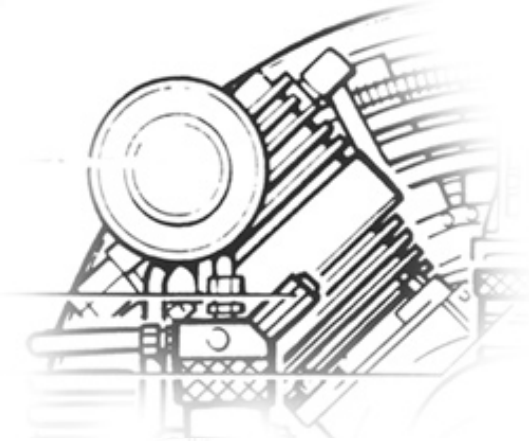


1. Cup
2. Pressure regulator
3. Return circuit
4. Injection pump

FILTERS OF A COMPRESSOR

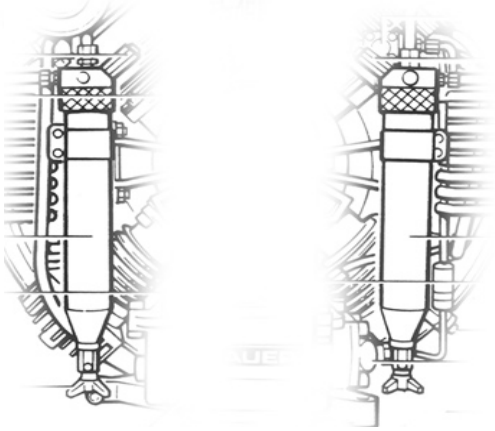
INLET AIR FILTER

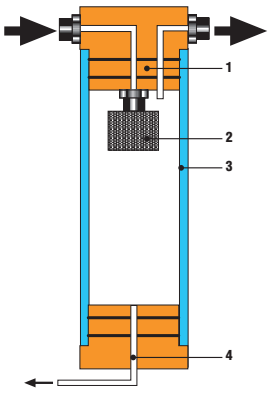
When the air enters it is separated from the impurities by a dry filter similar to filters that are used in the cars.



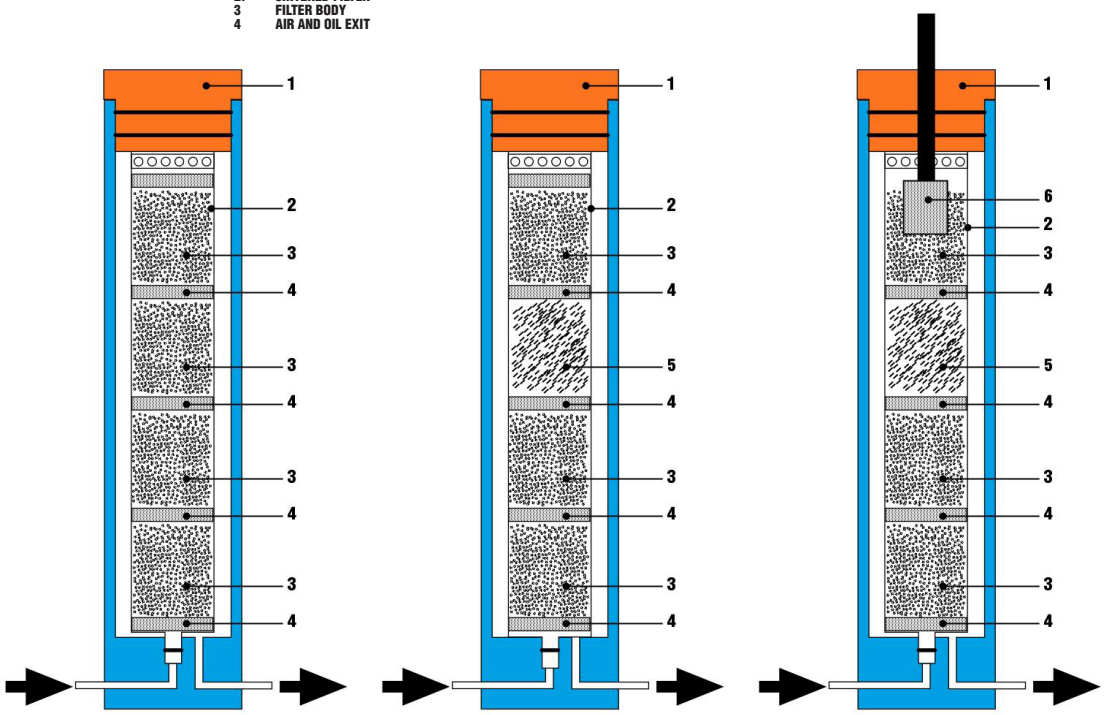
SEPARATOR FILTERS

The air that passes through various stages of compression suffers a sudden heating, therefore cooling down, the humidity that is inside turns into condensation. This condensation must be removed with the oil that pours out from cylinders befor the stowage in tanks to maintain a good qualitative standard of the air. There are proper filters, usually installed among various stages and at the end of the circuit a purifying filter, sometimes recheargeble, which carries out this work.





1. CLOSING CUP
2. SINTERED FILTER
3 FILTER BODY
4 AIR AND OIL EXIT



1 CLOSING CUP
2 FILTER BODY
3 MOLECULAR SEPARATOR
4 SPONGY DISCS
5 ACTIVE COAL
6 TERMINAL SENSOR

COMPRESSOR CHECKS

INLET AIR FILTER CHECK

A dry filter is usually used to filter air when it is entering, and this component of the compressor must suffer a strict maintenance and check too.

- *Before removing filter make a reference point by pen between filter and lodgement*
- *Remove the filter and clean it blowing air from inside to outside*
- *Clean with a cloth the lodgement of the filter, being careful that dust does not enter inside the aspiration pipe*
- *Riplace the filter rotating it of 90° as regards the marked point, at the third rotation the filter will have to change*

The date of this maintenance changes according to the environmental conditions where the device works .

SEPARATOR FILTERS CHECK

The intermediate filters are usually mechanical consequently their replacement must follow the manufacturer's advices. These filters are equipped with small tanks for condensation gathered that will be drained automatically or manually ar regular intervals.

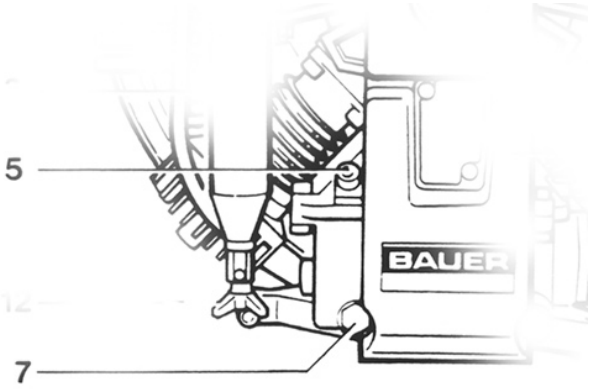
The duration of final purifying filter is given by:

- *Environment temperature*
- *Environmental humidity*
- *Compressor temperature*

The filter has a variable duration and must be checked regularly, following the indication given by the manufacturer.

LUBRICANT LEVEL CHECK

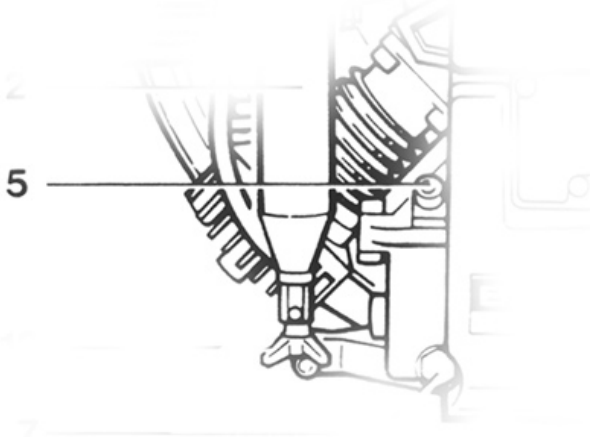
- By a proper small stafe it is possible to check the lubricant level
- This test must be done every day before compressor turns on
- The oil level must respect the indicated measures as if the level is too high oil could pass trough the cylinders valves.



CHANGE OF THE OIL

Follow always manufacturer's instructions for the change of the oil either the procedures and the quantity . The manufacturer will indicate when to change the lubricate too , besides if the compressor is standing for a long time it is better to remove the lubricant inside the cup to avoid corrosion.

- *Turn on the compressor for some minutes*
- *when the compressor is warm, make oil flow through draining nozzle*
- *Open filling cap to favour oil discharge*
- *After putting the new lubricant wait for 5 minutes before turnig up the device*
- *Check that are not air bubbles in the circuit*



SAFETY VALVE CHECK
All stages of the pumping unit are protected by safety valves that are tested and attested by the manufacturer. The most important valve is the final valve which regulates the refilled real pressure of tanks. This valve must be checked regularly to avoid leaks of circuit and especially to maintain the proper refilled pressure.

REFILLED HOSE CHECK
The hose are the most exposed component to wear in the refilled unit consequently they must be checked every six months and if they are standing for a long time they must be replaced before starting operations. Manufacturer will indicate the proper hoses which will have to respect the national rules.

REFILLED PROCEDURES

LOCATION OF COMPRESSOR
Compressor must be situated in a cool and dry place to avoid the formation of condensation but it is important to avoid dusty places too. The aspiration duct must be located far from exhaust emission exhalations. If the compressor is situated in a place with a cubature below 30 m2 a ventilation system will have to be installed. This rule must be respected too if there are other devices that develop heating in the same place.

REFILLED PROCEDURES

- *Check the oil level*
- *Test that the air intake are not obstructed*
- *Check the tank to refilled testing the OR seal of the tank valves*
- *Connect the on valve to tank valves*
- *Put the tank in water to get a better cooling during refilling*
- *Turn on the compressor.*
- *Wait for the filling of the intermediate stages*

The ticking that you listen to for few seconds when the compressor is on it is due to the piston of the last stage that is not in pressure yet.

- *Open the on valve*
- *Open the valve of the tank valves*
- *Exhaust the condensation regularly*

In aparatus equipped with automatic condensation exhaust check that this operation happens at regular intervals.

- If the compressor is equipped with it, reached the rated pressure, a proper valve will turn off the compressor. Otherwise a set valve will exhaust the exceeding pressure.
- Close the tank valves
- Exhaust the air through the on valve
- Disconnect the hose and replace the tank.
- During refilling tanks warm up, even they are in water, consequently the inside pressure decreases because of the cooling. it is possible to restore the proper pressure reconnecting the tank to the compressor later.

USE OF STOWAGE AIR UNIT

If you need to refill tank in short time you could use the stowage unit. These units include a set tank with a volume of about 90 lt, connected among them and, by by-pass unit, to the central refilled unit. Through this by-pass unit the connected tanks will be refilled by pouring off, you can restore the pressure of stowage or refill them directly. The main drawback of this refilled system is that the air could be stale because of a greater accumulation of condensation, mixed to oil, in the stowage tanks. If it is not removed it creates a bad smell.

REGISTRATION AND LEGAL OBBLIGATION

The staff that work in a refilling station should :
- Be at least18 years old

The staff that work in a refilling station should:
- Know how a compressor works and refilling system
- Know risks concerning the use of compressed gases
- Know the safety rules
- Know the safety procedures in case of accident
- Able to use extinguishers in case of fire or other safety equipment
- Know the refilling and maintenance operations indicated on the aparatus manual

Every refilling station should have own manual and some notes about pratical and safety procedures, at staff's disposal.
Empty tanks must be refilled and used in short time. Once refilled tanks are replaced and situated in a place where they do not form an obstacle for example near tha safety exit or ladders.
Tanks must be refilled with compressed air for breating and to the rated pressure.
If during an ispection, after the refill, a tank is damaged, it will be empieted and then undergone at a test because it could create a danger situation for the staff.
In every countries there are rules to install the high pression refilling system and rules about refillig, consequently it is better to know the local rules before starting an acitivity.

Equipment revision

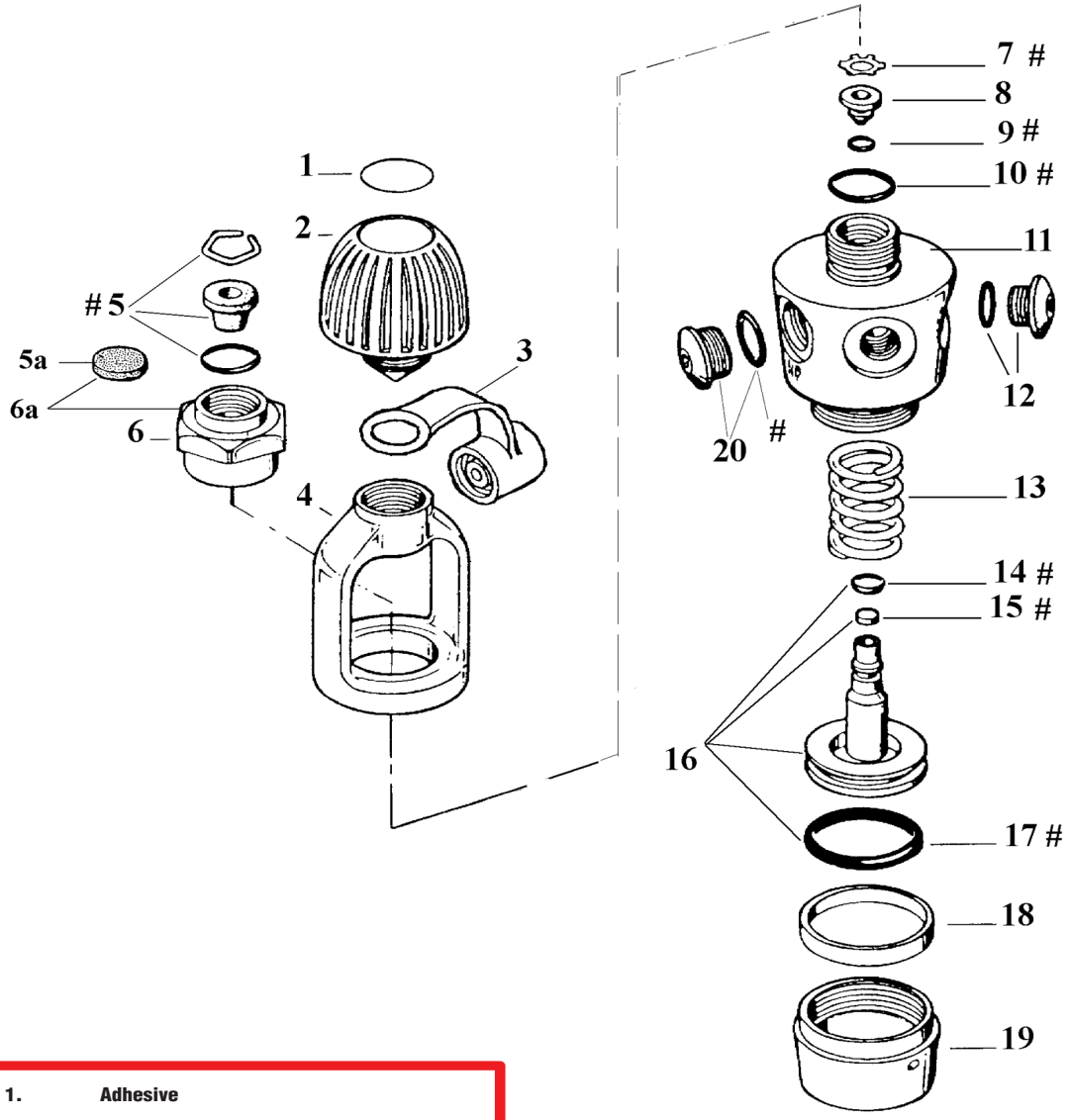
CHECK EQUIPMENT

EQUIPMENT	PROBLEMS	CAUSE	EFFECTS	
MASK	WATER INSIDE IT	DAMAGED NEOPRENE RUBBER OR SYLICONE HAIR OR MOUSTACHE UNDER THE SKIRT HOLED MASK	LIMITED FIELD OF VISION	PREVENTIVE CHECK OF ALL ITS COMPONENTS/ RIGHT EXECUTION OF PRACTICES
	FOGGING	YOU HAVE NOT CLEANED GLASS WITH A PROPER ANTIFOG		
	LOSS OF MASK	BROKEN ADJUSTABLE STRAP, MASK HAS NOT BEEN POSITIONED CORRECTLY, WRONG ENTERING WATER		
SNORKEL	WATER INSIDE IT	DAMAGED NEOPRENE RUBBER OR SYLICONE	DIFFICULTY IN BREATHING AND EXCESSIVE EFFORT WATER INHALATION	PREVENTIVE CHECK OF ALL ITS COMPONENTS/ RIGHT EXECUTION OF PRACTICES
	CLEARING DIFFICULTY	WRONG POSITION		
	LOSS OF SNORKEL	BROKEN ADJUSTABLE STRAP		PREVENTIVE CHECK OF ALL ITS COMPONENTS
FINS	CRAMPS	UNFIT FINS	FATIGUE DIFFICULTY IN MOVING	RIGHT SIZES RIGHT EXECUTION OF PRACTICES PROPER SIZE AND THICKNESS
	LOSS OF FINS	BROKEN ADJUSTABLE STRAP TOO BIG FINS		FIT SIZE
SUIT	COLD	WRONG SIZE	TREMORS BREATHLESSNESS CRAMPS	PROPER MAINTENANCE
	DIFFICULTY IN BREATHING	TIGHT SUIT	BREATHLESSNESS ANXIETY	LOOK OUT MOVEMENTS WHEN YOU ARE UNDERWATER
	FLOODING OF DRY SUIT	HOLED SUIT BROKEN ZIP	HYPOTHERMIA NEGATIVE BUOYANCY	BUOYANCY CHECK
	POSITIVE BUOYANCY	WRONG WEIGHING OF NEW SUIT	DESCENDING DIFFICULTY EXCESIVE ASCEND SPEED	
B.C.D.	BUOYANCY CAN'T BE REGULATED	BAD WORKING OF INFLATOR AND DEFLATOR MECHANISM HOLED BLADDERS	DESCENDING DIFFICULTY EXCESSIVE ASCENDING SPEED	PREVENTIVE CHECK OF ALL ITS COMPONENTS MAINTENANCE
	LOSS OF AIR	DAMAGED HOSE UNFIT HARNESS AND BACPACK	VARIABLE BUOYANCY	
	UNSTEADY TANK	BROKEN FASTENING SYSTEM	LOSS OF TANK	PREVENTIVE CHECK OF ALL ITS COMPONENTS MAINTENANCE
WEIGHT BELT	DIFFICULTY IN RELEASING	TOO LONG BELT	DIFFICULTY IN THE RESTABLISHING POSITIVE BUOYANCY DURING AN EMERGENCY TOO FAST ASCENT	
	ACCIDENTAL RELEASE	UNFIT BUCKLE OR BROKEN MECHANISM	DIFFICULTY IN BREATHING	
REGULATOR	LOW OF AIR	SCARCE MAINTENANCE	BREATHLESSNESS DIFFICULTY IN BREATHING	PREVENTIVE CHECK OF ALL ITS COMPONENTS CHECK OF TANK PRESSURE RIGHT EXECUTION OF PRACTICES
	NON STOP AIR	SCARCE MAINTENANCE	BREATHLESSNESS FAST EXHAUSTION OF AIR	
	LOSS OF AIR	SCARCE MAINTENANCE A BROKEN HOSE LOSS OF ORING FAULTY SUBMERSIBLE PRESSURE GAUGE	BREATHLESSNESS INTERRUPTION OF DIVE DIFFICULTY IN BREATHING	
	WATER INSIDE REGULATOR DURING INHALATION	SCARCE MAINTENANCE BREAKING OF SECOND STAGE MEMBRANE BROKEN MOUTHPIECE	COUGH PREVENTION	

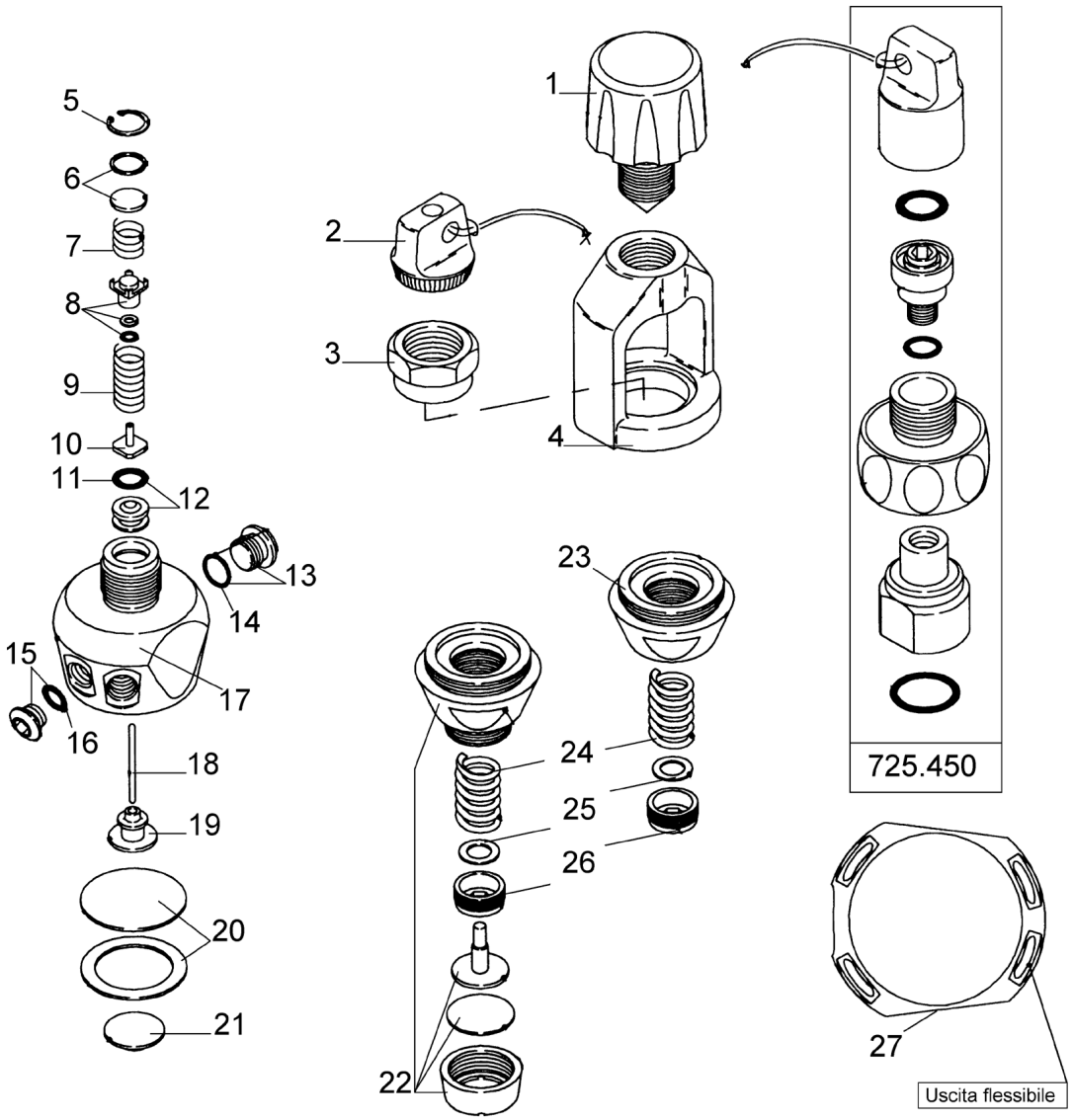
EQUIPMENT MAINTENANCE

EQUIPMENT	MAINTENANCE	PROBLEMS	REPAIRS
MASK	KEEP IT OUT OF SUNLIGHT AND STORE IT IN A PROPER BOX, RINSE IT THOUROUGHLY WITH FRESH WATER AND DRY BEFORE STORING IT, CHECK THAT ITS SKIRT AND ADJUSTABLE STRAPS ARE NOT DAMAGED	ADJUSTABLE STRAP SLIDES PURGE VALVE LEAKS	FASTEN ADJUSTABLE STRAPS BY INSULATING TAPE FOR ELECTRICIANIANS CHECK THAT THERE ARE NOT SAND IN THE VALVE
FINS	KEEP IT OUT OF SUNLIGHT, AFTER USE RINSE IT THOUROUGHLY WITH FRESH WATER AND DRY BEFORE STORING IT AND CHECK THAT THE ADJUSTABLE STRAPS ARE NOT DAMAGED, PUT A A LAYER OF SYLICONE ON ITS RUBBER COMPONENTS	ADJUSTABLE STRAPES SLIDE	FASTEN ADJUSTABLE STRAPS BY INSULATING TAPE FOR ELECTRICIAN
SNORKEL	RINSE IT THOUROUGHLY WITH FRESH WATER AND DRY BEFORE STORING IT CHECK THAT THE MOUNTHPIECE KEEPER IS NOT DAMAGED IF THE SNORKEL HAS SELF DRAINING VALVE, CHECK IT.	DURING ITS USE WATER ENTER VALVE LEAKS	CHECK THAT MOUNTHPIECE OR TUBE HAVE NOT CUTS AND ARE NOT DAMAGED CHECK THAT THERE IS NOT SAND UNDER VALVE OR IT IS NOT DAMAGED
REGULATORS (THEY HAVE TO BE TESTED BY UN EXPERT IN A QUALIFIED DIVING CENTER AT LEAST ONCE A YEAR)	AFTER EACH DIVE CHECK THAT THE FIRST STAGE FILTER ARE CLEAN AND FREE OF SAND, MUD, ETC PUT THE COVER ON THE FIRST STAGE BEFORE SOAKING IT IN FRESH WATER IT IS BETTER THAT FRESH WATER IS TEPID SO SALT CRYSTALS CAN DISSOLVE DURING RINSING WATER SHOULD BE FLUSHED INSIDE THE SECOND STAGE THROUGH THE MOUNTHPIECE AND GONE OUT THROUGH THE EXHAUST VALVE DRY AND STORE IT AVOINDING HOSES FORM TIGHT LOOPS NEAR THE FIRST STAGE	FREE FLOWING REGULATOR WATER ENTERS INSIDE THE FIRST STAGE DURING INHALING CHECK THE FIRST STAGE FILTER ARE CLEAN AND FREE OF SAND, MUD, ETC	DON'T USE THE REGULATOR UNTIL IT HAS BEEN TESTED BY A QUALIFIED TECHNICIAN DAMAGED REGULATOR MOUNTHPIECE SAND UNDER THE EXHAUST VALVE TEARED DIAPHRAGM CONSEQUENTLY DON'T USE THE REGULATOR UNTIL IT HAS BEEN TESTED BY A QUALIFIED TECHNICIAN
TANKS AND TANK VALVES	TANK SHOULD BE STORED WITH AIR PRESSURE IN IT BETWEEN 6/10 ATM IT MUST BE VISUALLY INSPECTED AL LEAST ONCE A YEAR/ CHECK THE DATE OF THE LAST VISUALYY INSPECTION AND HYDROSTATIC TEST DATE STAMPED INTO THE METAL A TANK LACKING THESE DATES CANNOT BE FILLED	AIR FLOWS FROM THE JOINT POINT BETWEEN TANK VALVE AND REGULATOR AIR FLOWS FROM OVERPRESSURE VALVE AIR FLOWS FROM TANK VALVE LEVEL AIR FLOWS FROM THE JOINT POINT BETWEEN TANK VALVE AND TANK	CHECK THE O-RING AND REPLACE IT IF NECESSARY EMPTY THE TANK AND REPLACE THE SAFETY DIAPHRAGM EMPTY THE TANK AND CHECK GASKETS INSIDE THE TANK EMPTY THE TANK AND DISASSEMBLE THE TANK VALVES CHECK THE SEAL O-RING AND CALL A QUALIFIED TECHNICIAN IF NECESSARY
BLADDERS INFLATION MECHANISM BACKPACKS (B.C.D.)	AFTER USE RINSE IT WITH FRESH WATER AND DRY THOUROUGHLY BEFORE STORING IT CHECK THE EXTREMITY OF STRAPS ARE NOT UNLAID CHECK THAT BUCKLES WORK CORRECTLY, LUBRICATE METAL PARTS OF STRAPS WITH SYLICONE BEFORE DIVING CHECK THAT TANK IS SECURELY ATTACHED TO THE BACKPACK RINSE THE BCD INSIDE WITH FRESH WATER AND DRY BEFORE STORING IT SPRAY A THIN LAYER OF SYLICONE ON THE RUBBER PARTS OF BCD CHECK THE OVERPRESSURE VALVE CHECK INFLATION MECHANISM IS FREE OF SAND, MUD, ETC CLEAN THE JOINT POINT BETWEEN HOSE AND INFLATION MECHANISM	TANK SLIDES OUT OF BACKPACK BLADDER LEAKS FROM BLADDER OVERPRESSURE VALVE DOES NOT WORK WELL INFLATION VALVE FILLS BCD WITH AIR AFTER A BUTTON VALVE IS RELEASED	READJUST THE BAND AROUND THE TANK FOR A TIGHTER FIT YOU CAN USE SPECIAL ADHESIVE TO REPAIR SMALL HOLES OR TEARS IN CASE OF BIGGER HOLES OR TEARS, TAKE B.C.D. TO QUALIFIED CENTRES OR TO MANUFACTURER DISSAMBLE THE VALVEE AND CHECK ITS MECHANISM DISACONNECT THE JOINT POINT AND CHECK THA BUTTON IS FREE OF SAND
DIVE SUITS	WATER AND DRY IT ON A WIDE HANGER CLEAN THE SUIT AND ITS ACCESSORIES WITH A SOFT DETERGENT AND WATER CHECK ZIPPERS AND FASTENERS PERIODICALLY AND LUBRICATE WITH PROPER LUBRICATES IF NECESSARY STORE THE SUIT IN A COOL AND DRY PLACE	TEARS ON THE SUIT ZIPPER JAMS	BE SURE THE PARTS THAT HAVE TO BE SIZED ARE CLEAR AND SMOOTH PUT THE GLUE ON BOTH PARTS AND LET IT DRY UNTIL GLUE IS NOT TOO WEET, THEN GLUE TWO PIECES TOGETHER AND LET THEM DRY RINSE THE ZIPPZER WITH FRESH WATER AND LUBRICATE IT
DIVING INSTRUMENTS	AFTER EACH DIVING RINSE WITH FRESH WATER AND DRY IT ON A WIDE HANGER KEEP THEM OUT OF THE SUNLIGHTS IN A BAG OR IN PROPER SAFE KEEPING TAKE DIVING INSTRUMENTS TO A QUALIFIED CENTRE TO BE TESTED PERIODICALLY		
RECHARGEABLE AND UNRECHARGEABLE DIVE TORCHES	KEEP RECHARGEABLE BATTERIES WITH A GOOD PERCENTAGE OF STORAGE DON'T STORE DIVE TORCHES WITH THEIR BATTERIES LUBRICATE OFTEN ORING WITH A THIN LAYER OF SYLICONE RINSE WITH FRESH WATER AND DRY THOUROUGHLY BEFORE STORING THEM	COMPACT DIVE TORCH FLOADS	DESASSEMBLE IT AND LET GO OUT THE WATER, RINSE ALL ITS COMPONENTS WITH FRESH WATER AND DRY THEM QUICKLY TRY THE COMPACT LIGHT, IF IT DOES NOT WORK TAKE IT TO A QUALIFIED
WEIGHT SYSTEM	RINSE AFTER USE THE BELT SHOULD HAVE A PROPER LENGHT AFTER CUTTING IT USE THE LIGHTER TO FUSE THE CUT EDGE	WEIGHT BELT RELEASES FREELY WEIGHTS SLIDE EASILY	REPLACE THE BUCKLE OF QUICK-RELEASE DEVICE USE RETAINING CLIPS
DIVING KNIVES	AFTER USE RINSE IT WITH FRESH WATER AND DRY THOUROUGHLY BEFORE STORING IT SPRAY A THIN LAYER OF OWD 40 SYLICONE ON THE KNIFE TO AVOID RUST CHECK ITS SHEAT, STRAPS, ETC	THE BLADE HAS SOME RUST	CLEAR AWAY THE RUST BY ABRASIVE PAPER OR STEEL WOOL FOR POTS SPRAY A THIN LAYER OF OWD 40 SYLICONE ON THE BLADE TO AVOID RUST RETAINING CLIPS CENTRE.

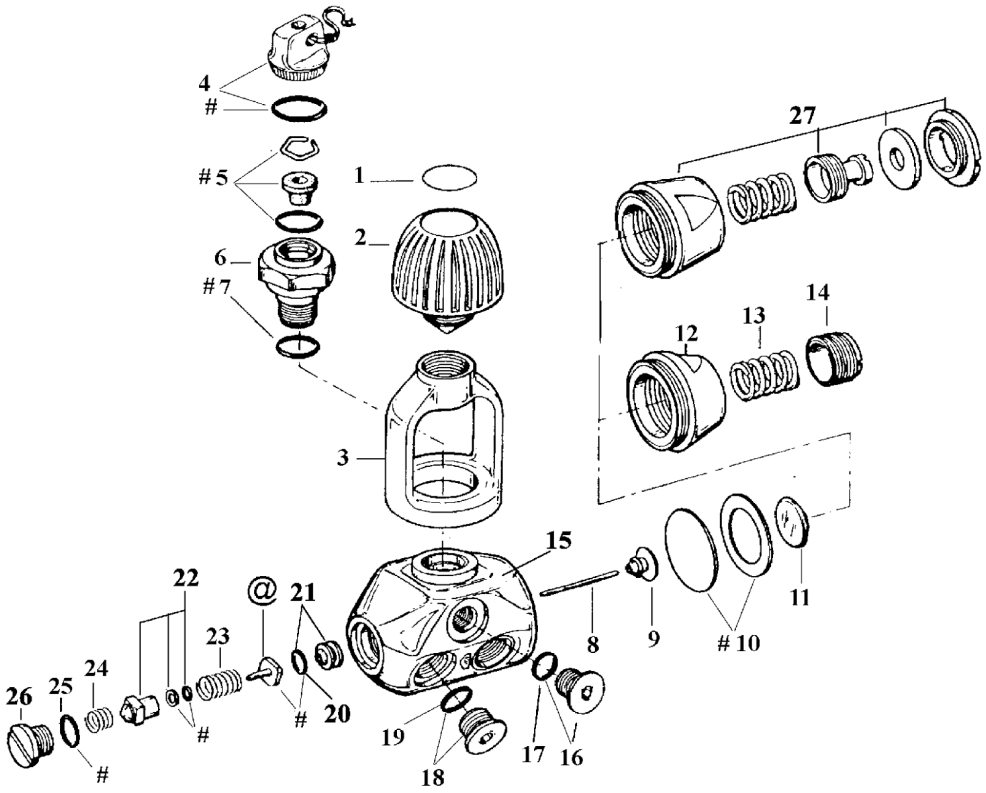
FIRST STAGE MAINTENANCE



1.	Adhesive
2.	Hanwheel
3.	Seat cup
4.	Flask
5.	Conic filter
5a.	Filter
6.	Ranger seat
6a.	Air system seat
7.	Cloking washer
8.	HP seat
9.	Oring
10.	Oring seat
11.	Body
12.	MP cap
13.	Spring
14.	Oring
15.	Pad
16.	Piston
17.	19 Oring
19.	Cap
20.	HP cap Kit

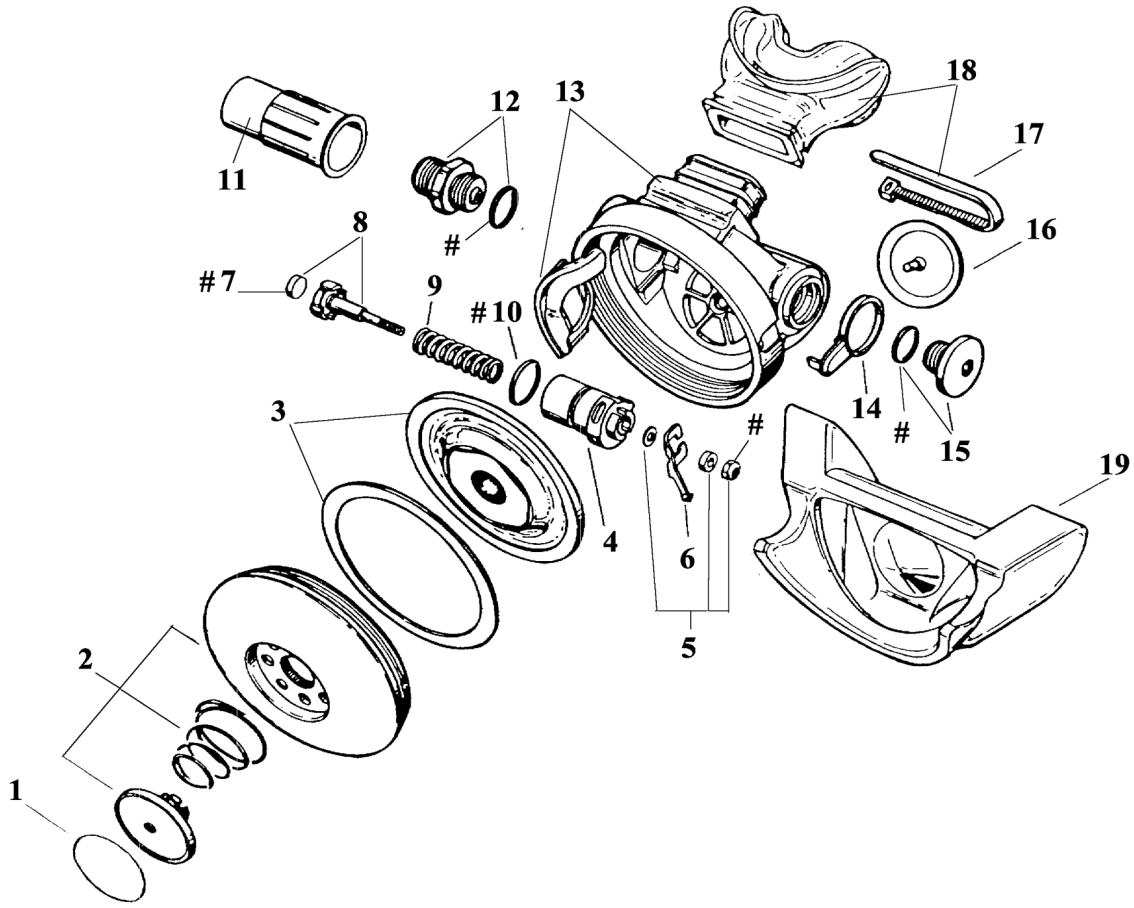


1.	Hanwheel	16.	3/8 Oring
2.	Seat caps	17.	Titan body
3.	Seat flask	18.	Titan plunger
4.	Flask	19.	Plunger bearing
5.	Circlip	20.	Diaphragm
6.	Filter	21.	Spring base
7.	Cylinder spring	22.	Dry conversion kit
9.	Spring	23.	Titan seal nut
10.	Blue valve	24.	Spring
11.	O-ring	25.	Antifriction washer
12.	HP piston seat	26.	Adjusting screw
13.	HP cap	27.	Sticker
14.	7/16 Oring	* Titan maintenance kit	
15.	MP cap		

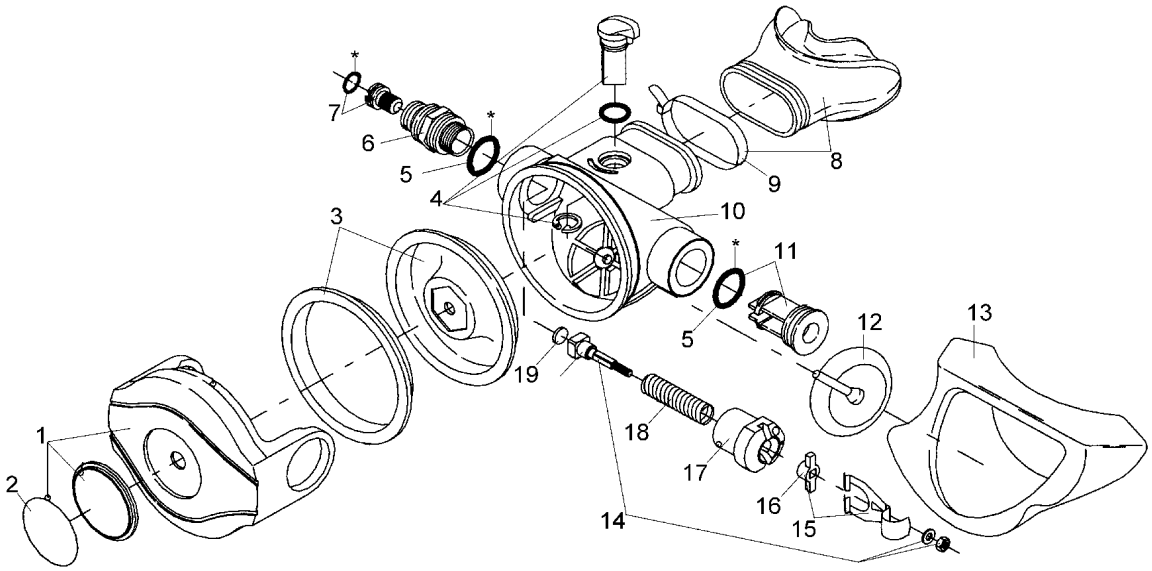


1.	Adhesive		16.	LP cap
2.	Hanwheel		17.	3/8 O-ring
3.	Flask		18.	HP cap
4.	Seat caps		19.	7/16 O-ring
5.	Conic filter		20.	O-ring
6.	17,8 Seat		21.	Piston seat
7.	O-ring		22	Cylinder
8.	Plunger		23.	Spring
9.	Plunger bearing		24	Cylinder spring
10.	Diaphragm		25	O-ring
11.	Spring base		26.	Cap
12.	Seal nut		27.	Arctic Kit
13.	Spring		#	Sevice kit
14.	Adjusting screw			
15.	Body			

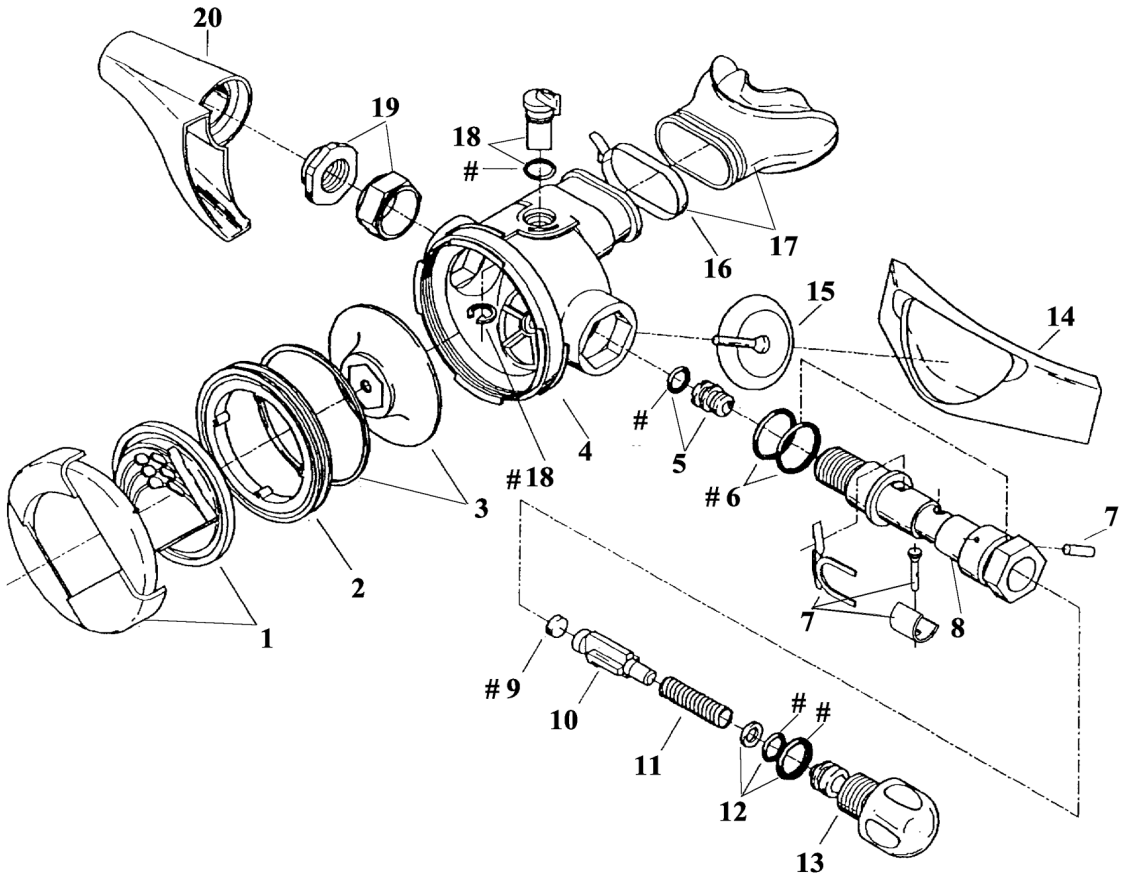
SECOND STAGE MAINTENANCE



1.	Adhesive
2.	Pioner cap/XP
2a.	Ranger cap
3.	Diaphragm
4.	Housing connection.
5.	Nut – washer – spacer
6.	Lever
7.	Pad
8.	Piston
9.	LP spring
10.	O-ring
11.	Flexible protection
12.	MP seat
13.	XP housing/ Ranger / Pioneer
14.	Spline
15.	Housing cap
16.	Exhaust valve
17.	Clip
18.	Black mouthpiece
18a.	Transparent mouthpiece
19.	Deflector
#	Service kit

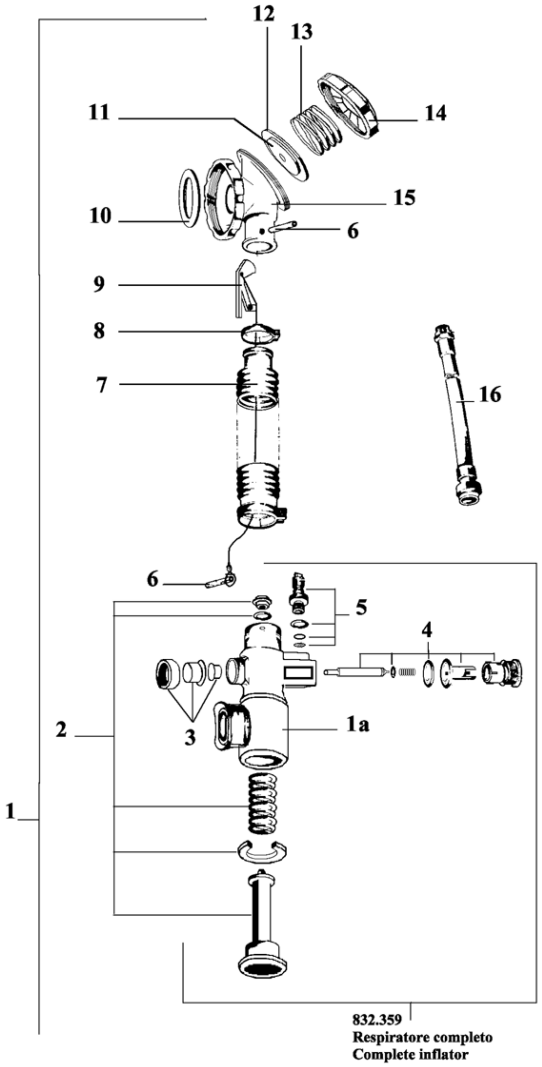


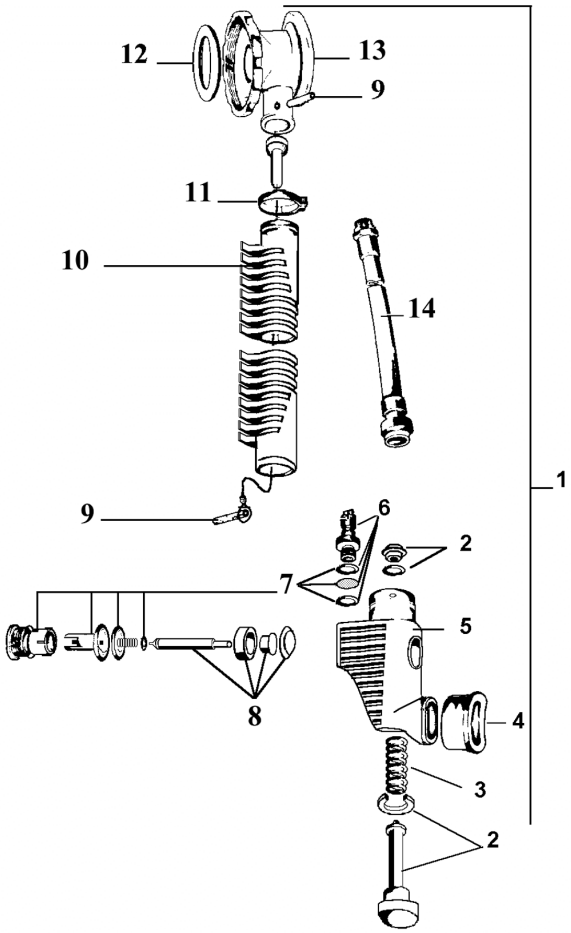
1.	**Cap**
2.	**Matched Adhesive**
3.	**Diaphragm**
4.	**Venturi deflector**
5.	**O-ring conector**
6.	**Hose connector**
7.	**MP seat**
8.	**Syl. Transp. Mouthpiece**
9.	**Clip**
10.	**Housing**
11.	**Cap**
12.	**Exhaust valve**
13.	**XLC deflector**
14.	**XLC piston**
15.	**XLC lever**
16.	**Spacer**
17.	**Core**
18.	**XLC piston spring**
19.	**Pad**
#	**XLC service kit**



1.	Cap
2.	Nut
3.	Diaphragm
4.	Housing
5.	MP seat
6.	O-ring
7.	Lever
8.	Core
9.	Pad
10.	Piston
11.	Spring
12.	O-ring
13.	Hanwheel
14.	Deflector
15.	Exhaust valve
16.	Clip
17.	Black mouthpiece
17a.	Transparent mouthpiece
18.	Venturi adjustment
19.	Housing nut
20.	Safe hose
#	Service kit

B.C.D. MAINTENANCE

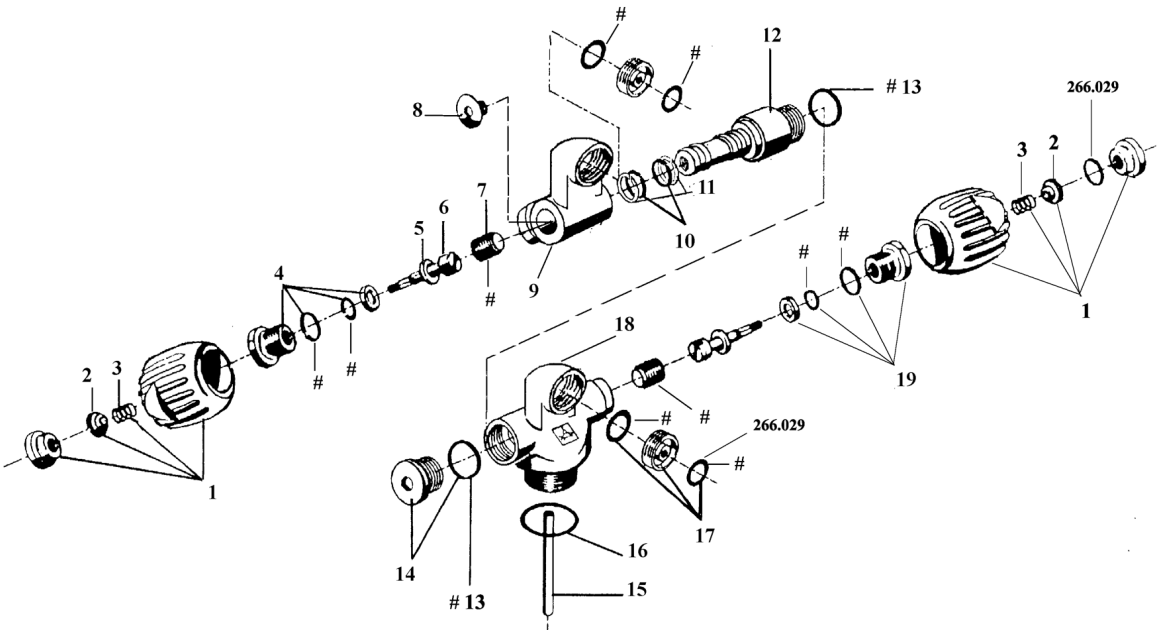




1.	Combo inflator
1a.	Inflator body
2.	Exhaust system
3.	Button kit
4.	Valve kit
5.	Joint
6.	Pin
7.	Wrinkled
8.	Clip
9.	Cam small cable
10.	Seat gasket
11.	Gasket
13.	Exhaust spring
14.	Valve cap
15.	Complete valve
16.	Hose

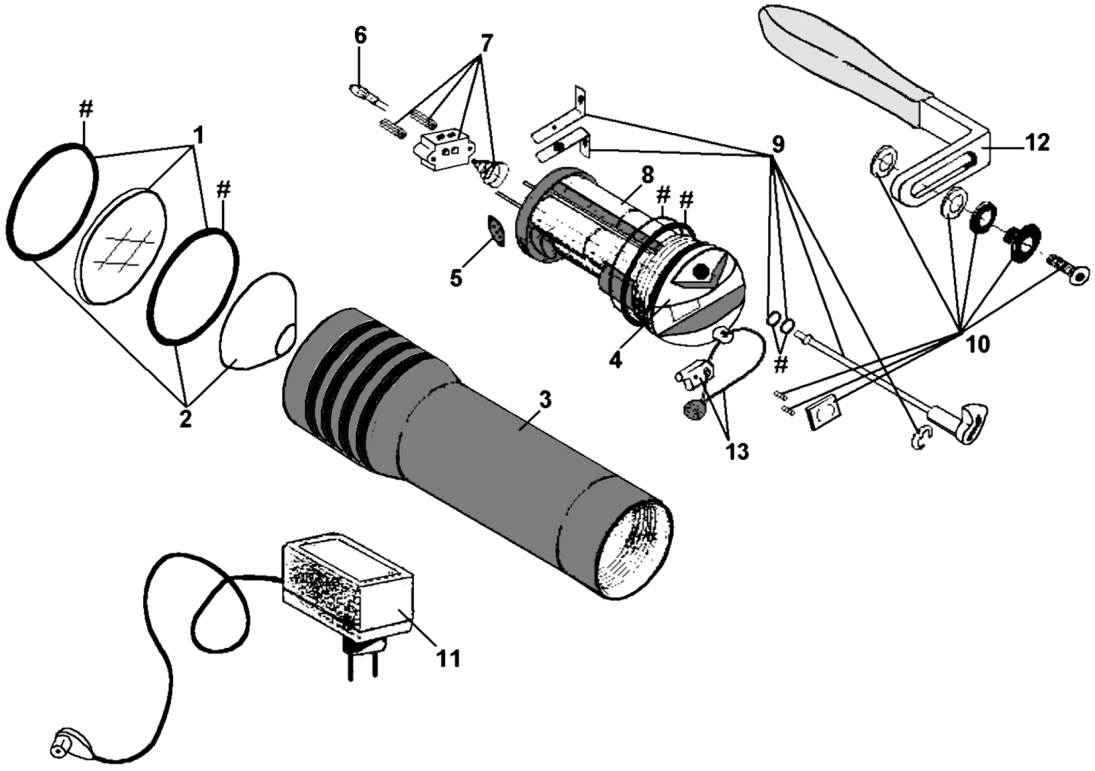
1.	Trimiline inflator
2.	Exhaust button
3.	Spring
4.	Mouthpiece
5.	Inflator body
6.	Joint
7.	Service kit
8.	Inflation buttone kit
9.	Pin
10.	Wrinkled
11.	Clip
12.	Valve seat gasket
13.	Upper valve
14.	Hose

TANK VALVE MAINTENANCE

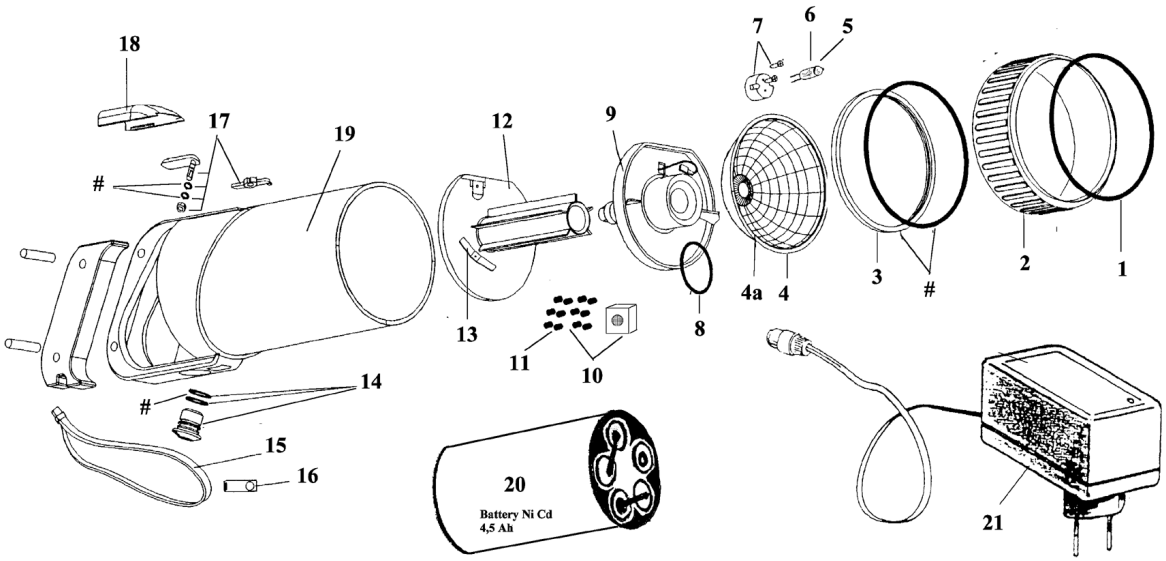


1.	Hanwheel
2.	Locking nut
3.	Spring
4.	Pressplait
5.	Teflon washer
6.	Valveshaft
7.	Pallet
8.	Locking screw
9.	Second.Outlet body
10.	O-ring
11.	Antiextrusion ring
12.	Second Outlet bearing
13.	O-ring
14.	Second outlet cap
15.	Passage tube
16.	O-ring
17.	DIN converter
18.	Valve
19.	Pressplait
#	Service kit

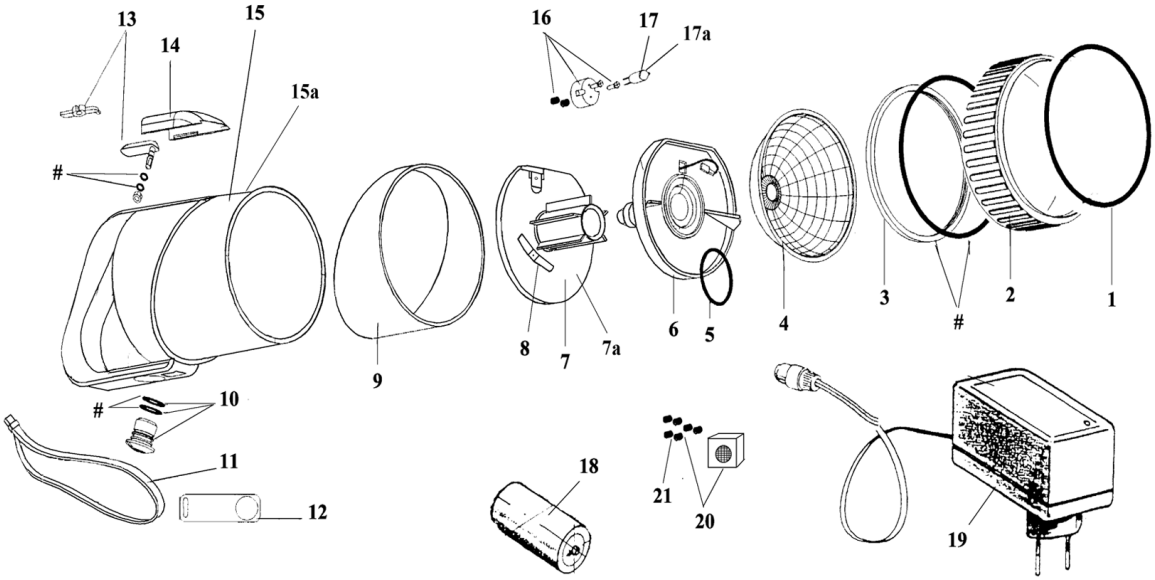
DIVE LAMPS MAINTENANCE



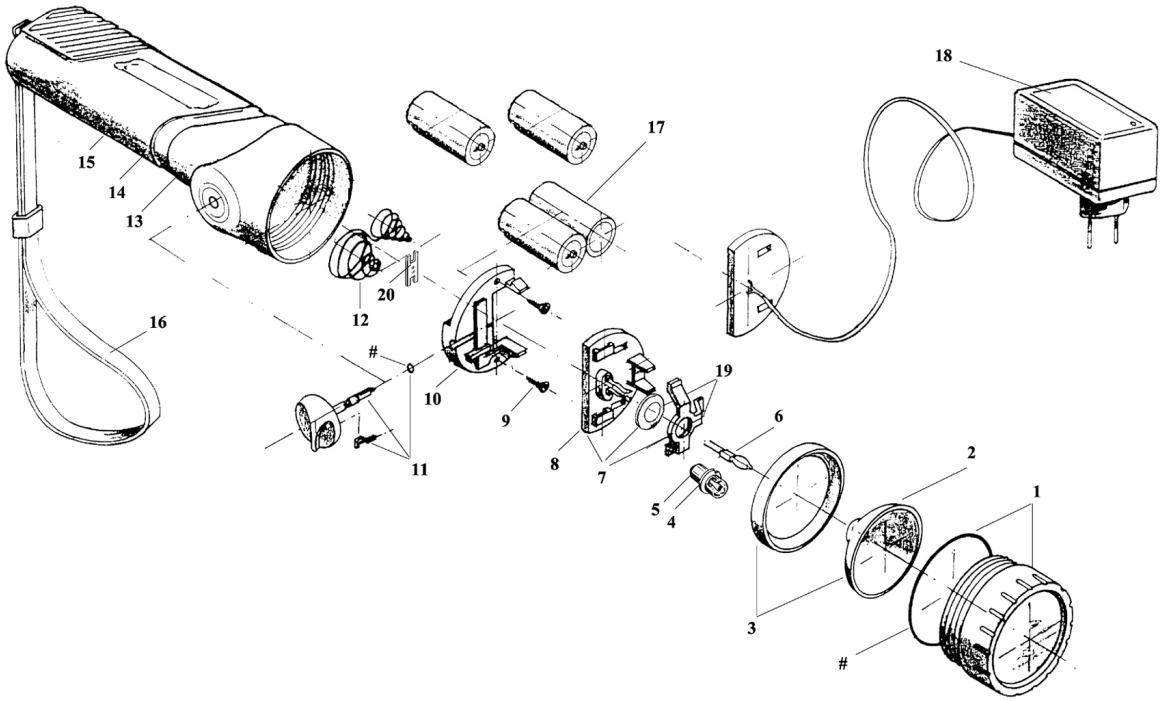
1.	Tempered glass
2.	Parable with Orings
3.	Body
4.	Back cap
5.	Holderpads cap
6.	35watt bulb
7.	Clog set
8.	Battery package set
9.	Digital set
10.	Knob movement
11.	Recharger
12.	Completed knob
13.	Safety catch
	# Orings



1.	File ring
2.	Nut
3.	Gasket
4.	Parable
4a.	Video parable
5.	50ww bulb
6.	100ww bulb
7.	Clog
8.	135 Oring
9.	Upper disk
10.	Absorbing gases container
11.	Absorbing gases pad
12.	Lower disk
13.	Thin plates set
14.	Recharge cap
15.	String
16.	Holdercap ring
17.	Completed switch
18.	Safety catch
19.	Black body
20.	Storage battery package
21.	Rechearger
#	Gasket set



1.	File ring
2.	Nut
3.	Gasket
4.	Parable
5.	O-ring
6.	Upper Contact disk. Vega 2
7	Lower Contact disk. Vega 2
7a.	Rechargeable Upper Contact disk
8.	Thin plates set
9.	File belt
10.	Recharge cap
11.	String
12.	Holder cap ring
13.	Completed switch
14.	Safety catch
15.	Completed body Vega 2
15a.	Recheargeble completed body
16.	Holder bulb clog
17.	Vega 2 bulb
17a.	20ww bulb
18.	Storage battery
19.	Rechearger
20.	Absorbed gases set
21.	Absorbes gases pads
#	Service ket



1.	Porthole
2.	Lumen parable
3.	Parable
4.	Lumen 4 bulb
5.	Lumen 6 bulb.
6.	10ww bulb
7.	Movable plate
8.	Movable plate
9.	Screw
10.	Fixed plate
11.	Digital set
12.	Spring
13.	Lumen black body
14.	File Lumen body
15.	Rechergeable Lumen body
16.	String
17.	Storage battery
18.	Rechearger
19.	Lamp stop
20.	Spring stop
	# Oring set

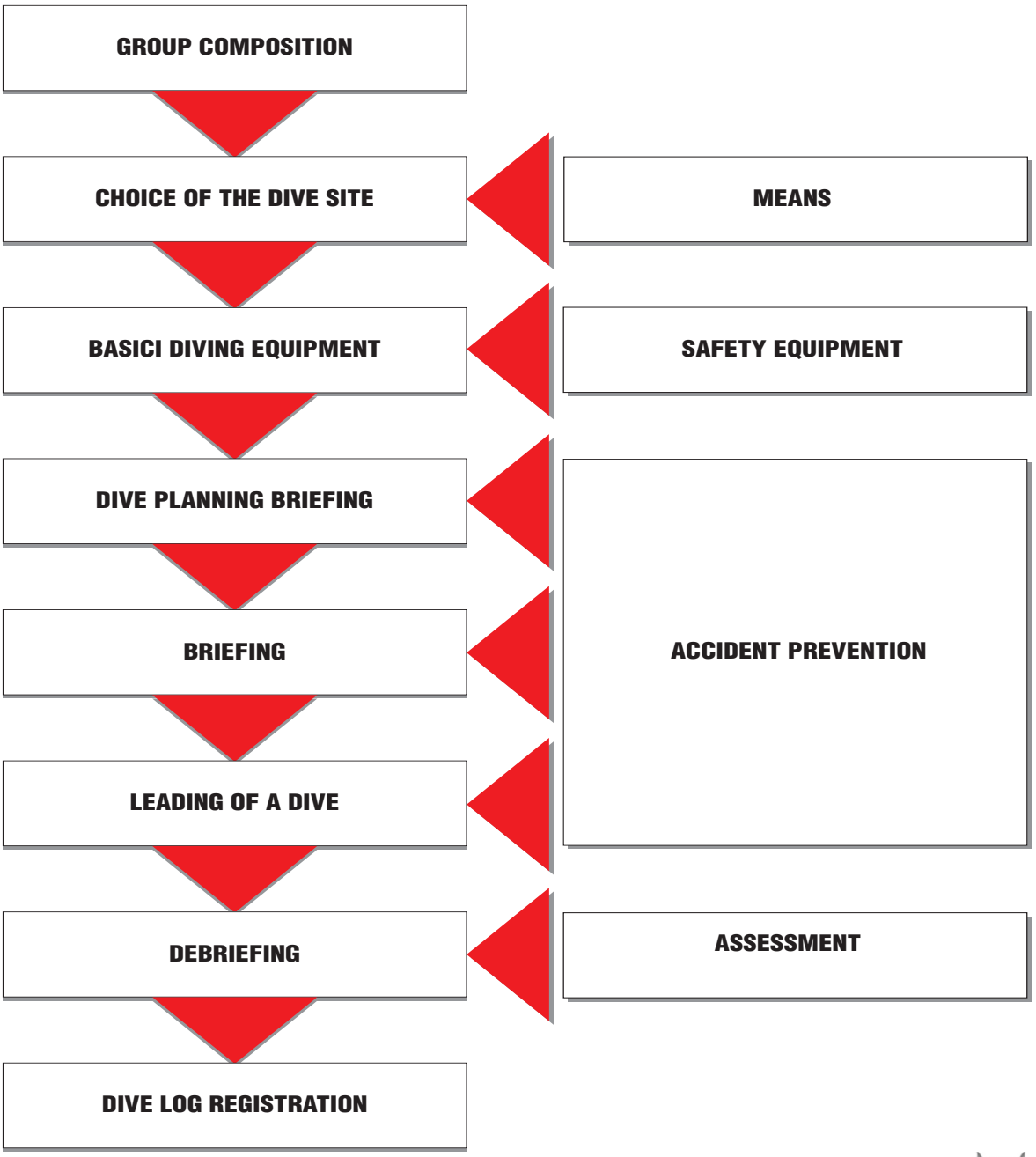
LESSON 5

CMAS

WORLD UNDERWATER FEDERATION

Diving guide C.M.A.S.

A diver with 3 Stars CMAS certification, is internationally recognized like Diving Guide. To be a diving guide involves in depth knoweledge of many matters like organization, managment and the leading of divers' group for safety dives.
Besides the diving guide CMAS must prepare divers to diving activities and must be ale to divulge federation guide lines about diving safety and diver's behaviour in marine environment. During his activity, Diving guide must be able to estimate the degree of qualification of divers.
In the world there are lots of underwater organizations which take up diving teaching, one of task of diving guide CMAS is to know the main differences among the various standards as so to estimate the level of knowledge of the various divers that form the group.
In this chapter, considering the matters dealt with and their practical application, many outlines will be used, this method enables a better learnig of procedures.
The use of this organization enables the diving guide a more effective and quick control on the various situations that he will have to analyze during his activity.



ORGANIZATION	
PARTECIPANTS	**Before making the group, the diving guide must check the number of participants, test their certifications, log book and medical certifications. Besides he will ask about their expectations so as to reconcile requests and possibilities**
Number	**The number of participants determines the number of the guides so as to respect the ratio guides/divers (1/4 if it is not prescribed differently by loca rules), the choice of means of transport and the choiche of dive site**
Certification	**It needs to examine certifications, to check the validity, the level correspondence of different certifications to CMAS level, the compatibility with the planned dive**
Log book	**It needs to check the number of dives, the maximum depth reached, the place where dives have been effectuated and the last dive. The dive should be planned considering the lowest level of participants**
Medical certification	**It must be valid**
Affinity	**The making of group should respect habits and knowledges of different divers. If the group is not homogeneous it is better to put an experienced diver with an inexperienced diver and so on**
Expectations	**It is often very difficult to satisfy the expectation of a group of divers. It can happen that there are some divers interested in biology or photography, etc. Consequently the guide will have to plan a dive that can meet their different requirements and form homogeneous groups**

PLACE

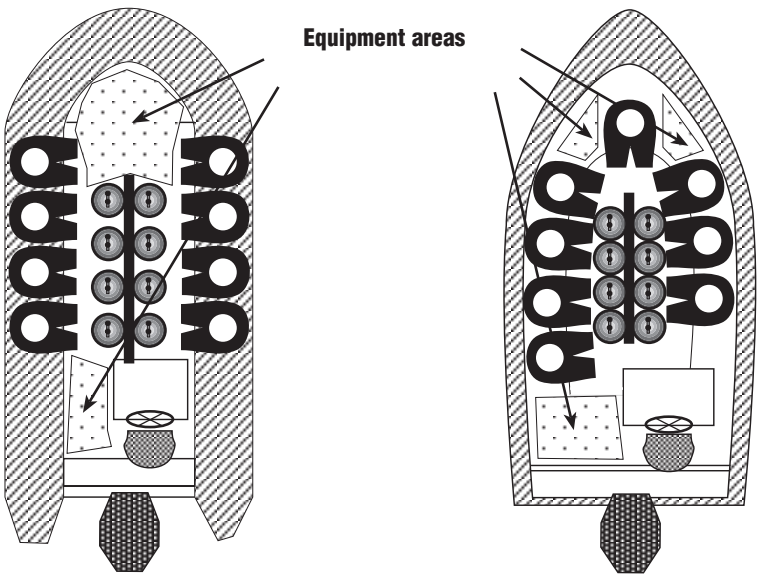
ORGANIZATION	
DIVE SITE	**The choice of the dive site is conditioned by its configuration, weather conditions, water conditions, number of divers, their training, and the request of the group**
Configuration	**If the bottom is sandy, dives will be easy and right to of the site inexperienced divers. A rocky coast will present some problems because its bottom is deep consequently it is necessary to enter the water one at time. This dive is better than other dives because waters are clearer**
Weather and	**Wind, current, waves, scarce visibility are elements that water conditions restrict the number of divers and their experience level. It is important to consider the proper equipment use too. It is better to reduce the ratio guide/instructors/divers so as to increase the control and the safety level**
Number of divers	**If the group is numerous we shall have to increase the safety level, we shall to choose a route that enables everyone to observe the environment, avoiding sites where visibility is reduced because of divers'passing**
Training level	**It is important to distinguish a didactic dive from a recreational dive; the first will be characterized by the presence of an instructor; the second will be planned by the guide that will consider the different training levels of the group.If the group is formed by experienced divers the guide and the divers can agree on the dive and their buddy**
Requests and	**Dive will have to be planned so that it meets divers' requirements requirements. Specific requirements like underwater photo and video, marine biology etc. must be agreed before**
Specific qualification	**The choice of dive site includes the following principles: the respect of marine environment, simple routes and landing places, improvement of entry and exit procedures**

ORGANIZATION	
EQUIPMENT	From the the start to the end of a divin we use numerous type of equipment, fixed, movable, specific and personal equipment. For all types of these equipment it is important the maintenance and periodical tests
Fixed	Compressor and stowage tanks need a careful maintenance to avoid that tanks are refilled with a stale air consequently problems during diving and divers' complaints there will be not
Movable	Tanks, regulators, BCD must be ready and tested, tanks must be conformed to the planned dive. Tank valve, regulator and BCD must be in working order. After assembling of the equipment, it is important to check that BCD is well connected to tank and the first stage to the tank valves
Personal	It is necessary to examine that suits, masks, fins, computers and other equipment are conformed to planned dive. Besides it is important to know the computer use so as to understand its data and if there are problems. It is important to check that all divers have dive tables, watches and depth gauges
Specific	Specific personal equipment like dive lañps, compasses, knives, slates can be requested according the type of dive. All other equipment must be checked and their use explained to divers
Safety – Rescue	Safety , rescue and First Aid equipment are very important and First Aid for a well planned dive. It is necessary to check radiotelephone, cellular telephone, lines in case of current, life buoys, First-Aid kit, oxygen kit, resuscitation kit and drinking water
Maintenance	It is indispensable to have tools and spare parts to solve problems. For example holes that are not well connected; Oring that are fault, etc.

ORGANIZATION	
MEANS	**In addition to various type of boat we must consider also the means used to carry equipment and to reach boarding points**
Inflatable dinghy	**The mean commonly used to reach dive site is the inflatable dinghy. This type of craft offers the advantage to utilize all the surface of tabulars to put divers. Consequently in the middle of it it is possible to arrange all equipment. The entry water most commonly used from an inflatable dinghy is the back roll. It is more difficult the climb, except for large inflatable dinghies which are equipped with a boarding ladder. It neds to remove previously weight belt and "heavy" equipment and then to help diver climbing. We shall have to take some precautions when we get closer to quays or orcks to avoid tearing of material of the inflatable dinghy**
Rigid hull boat	**This type of boat is larger than an inflatable dinghy so that scuba equipment can be well arranged, but divers are compelled to sit down inside of borders consequently they are nearer to equipment. The entry water used is the back roll while a boarding ladder is used to climb. Before climbing it needs to remove weight shiftt and heavy" equipment. Unlike the inflatable dinghy that possesses a good lateral stability this type of boat suffers from weight shiff consequently crowd of people on the same side must be avoided**
Medium	**This type of boat are larger, they have proper areas where or large boats divers can put on or off and assembly their equipment. If there is rough sea the approach to the boarding ladder will be more difficult and will need climbing with equipment and weight belt on but without fins. If the boat is very large the number of ivers will be numerous and some problems could occur. It is possiblie to organize txo dives in a day with this type of boat but in this case we shall have to organize double equipment**
Sailing boat	**This type of boat is not used for diving because the space is narrow consequently the number of divers will be restricted. In this case a tender will be useful**

ORGANIZATION	
MEANS	
Tender	**The boat with narrow space like sailing boats or very large boat like cruiser ship need tender. It can be a small, inflatable dinghy used for carrying divers to or from dive points, or a larger boat equipped with compressor aboard. It is very important to organize and to check divers'transfer and their equipment to avoid problems**
Carriage of divers	**If the meeting point and diving center are far from the and their boarding point we will have to organize the carriage of either equipment divers and their equipment avoiding damages of the to boarding point equipment and inconveniences to divers. We shall use different means depending on divers wear or don't wear their suit**
Carriage of	**If the meeting point is not very far form aboarding point we equipment will have to organize only the carriage of of the equipment to boarding point while divers will walk till the boarding point. This situation is simpler but we must remember that the equipment is ono our responsability**

ARRANGEMENT ON DIFFERENT BOATS FOR 8 DIVER WITH THEIR EQUIPMENT



Inflatable dinghy **Boat**

BRIEFING

ORGANIZATION	
BRIEFING	**Briefing is important for a safety diving and it takes place before each dive**
Plan	**During briefing it is better to arrange plan in davance so as to highlight all main points of a safety diving**
Supports	**It is better to use a graphic support like a blackboard or a plan where the route, depth and the main points of the dive are drawn to get a good attention level**
Selection buddy	**Entering data and diver's level enables to select a buddy. During the briefing we will have to test if our selections are good. We will have to be ready to change buddies granting any requests**
Signals	**Underwater signals must be reviewed, making sure that all divers are able to understand them so as to avoid incomprehension among divers or divers and guide**
Diving description	**During the diving description the guide will inform divers about visibility, currents, aquatic animals and plants**
Planning	**It is important to inform divers about the sequence and procedures of the dive, the route, depth and time limits, exit techniques and emergency procedures. Besides it is important to plan an alternative route in case conditions are unfavourable at primary route**
Safety	**During briefing we shall indicate the location of safety tank, First Aid kit, radiotelephone or cellular telephone with useful phone numbers**
Dressing	**Guide will give some instructions about dressing procedures and where the equipments must be located before and after diving**

ORGANIZATION	
DIVING	**We will illustrate all sequences of a dive, from the equipment checking to exit from water so as to avoid problems. This sequence includes all procedures that you practice and use during each dive**
Equipment	**Once concluded the dressing we must inspect the equipment check making sure of their correct adjustment and the presence. It is important that divers inspect their and their buddy's tank and vice-versa, testing pressure and that tank valvee are on**
Entering	**We will have to plan: order of entry; the position that diver the water must reach to be safe and the distribution of accessory equipment. In presence of current and waves we can change these procedures**
Descending	**When all group has entered water we are ready for the descent. If there is one guide he will have to be ahead of the group controlling that all divers are descending without problems. If there are two guides, the second will be in the rear. We will descend slowly and controlling that all divers are equalising**
Permanence	**Beginning from the planned maximum depth, we will follow a safe dive profile. We will have to check the position of divers, the depth, divers'behaviour, pressure tank so as to adapt diving time, speed and route of diving**
Ascending	**When we decide to conclude the dive and to reache the surface we will signal it to the group and we will make a safety stop. It is important to check divers' buoyancy so to intervene immediatly if there are some problems. There are many type of ascending: ascending using an anchor line ascending near a boat, ascending to reach the boat that is not anchored. If it is an ascending without line our control must be more careful especially during safety stops. Group shall not have to reach the surface together so that we must not control divers on surface and divers underwater**
Exit from water	**When the group is on the surface and BCD is inflated we will ready to exit from water. We will establish the order of exit we will rescue the equipment and we will put them in proper area so as to avoid confusion**

CLOSURE

ORGANIZATION	
CLOSURE	**At the end of the dive, when all equipment are put back we will summarize the salient points of the dive, then we will explain landin procedure and the equipment restitution. We will help divers to write the log-book**
Aboard	**Once aboard we will inspect the equipment. Before moving the boat we will check that all divers are present and their physical conditions are good**
Come back	**We will check that spare tank, safety lines or other accessories are well stored**
Landing	**It is necessary to check landing procedures and the carriage of all equipment**
Meeting point	**If divers have used hiring equipment, we will control that the divers rinse, give backe and store them**
Diving	**It is important to help divers to write their log-book, giving registration them some information about dive. It needs to confirm the data present in log-book and not to stamp or sign a blank log-book**
DEBRIEFING	**Debriefing must precede the moment of diving registration because it can give important information for a right writing up. During debriefing we will gather opinions, comments and we willi answer to any questions about diving. We will give suggestions or advices to improve divers'training level or their knowledges. Debriefing will allow us to gather useful information about our activity so as to improve our qualification**

PLANNING A DIVING IN CURRENT

" Diving in current" offers some advantages for examples: it is not indespensable to reach the exit point going backwards the route; you can explore greater underwater zones for the same dive time; you can reduce your physical effort and your waste of energy; you can go to rocky walls and to the most isolated and interesting reefs; etc. But if you do not plann it carefully this type of diving could become very difficult and dangerous too.

	BRIEFING
Aim of diving	**The aim of a diving in current is the observation and exploration of unusual "situation". If the group includes photographers or researchers the dive master will decide with them the stops if these stops does not compromise the safety of the group. All divers will have to respect these rules**
Weather	**Apart from weather conditions it is indispensable to make sure and marine conditions that bubbles sent out by divers are visible on the surface. If the boat cannot follow the group because of waves and rough sea the diving will have to be cancelled**
Strenght of current	**Once at dive side, a floating buoy tied to a line will be lowered into the sea to indicate the direction of the current. The line will be used by divers like a reference.If the current is very strong the dive will have to be interrupted**
Direction of the current	**Usually the directin where current comes from it is the same direction towards dive starts. The divemaster will tell it to the group remembering that it is better to swim across the current and not into it**
Visibility	**The main principle of a safety dive is the unity of the group consequently it needs to control that the first and the last diver are in sight**
Number of participants	**The groups must not be numerous. They will decend from the boat at regular intervals so as to not to mix. The divemaster of each group will have to be able to locate his group and the group will have to be able to recognize him**
Individual experience level	**It is better that individual experience level of divers are homogenous so to avoid experienced divers put into diffuculty inexperienced divers in their first dive in current**
Safety equipment	**As with a rough sea it is difficult to see a diver at a distance of and signals 200 metres, all divers must be equipped with a safety sausage equipped with a line of 9 metres, whistle and air whistle connected to the hose of BCD., dive torch (visibility decreases at dusk)**
Entry tecnique	**The system used in this type of diving is Buddy-system**
Behaviour during a dive	**The divemaster cannot leave the group during a dive in current, therefore every couple of divers will have to be able to face their problems without loosinf contact with other divers. If they are not able to solve them they must signal their difficulties to the dive master and then they can ascend. If the emergency is serious the divemaster and all group must ascend too establishing neutral buoyancy. If a diver has physical or techincal problem or most of divers has reached time or depth limits all group must ascend**
Exit techinique	**Exit techiniques are: all group ascend,; every couple of divers ascend. The first techique allows the maximum control of the divemaster to the group but it damages divers that have enough time and air to continue the dive. If the visibility, the current and the level of the divers are good, divemaster can decide that couples can ascend separately. Once at surface divers must wait for a boat to be picked up. The ascent will be effectuated in shor time with the boat engine off. While the first diver climbs the boarding ladder, the others wait for catching hold a line tied to the floating buoy. A tank for emergengy must be aboard**

NIGTH DIVING PLANNIG

The " nigth divings " are one of the most beautiful experiences that a diver can do but, it needs some conditions that divemaster will have to estimate each time.

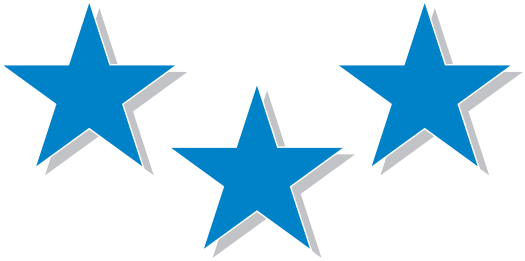
	BRIEFING
Aim of diving	**The aim of a night diving is to observe numerous marine animals that are not visible during day time. Most of invertebrates leave their hiding places or to open up to search of plankton only during the night. At night it is always easier to meet rocky predators. The numerous presence of these marine beings makes this type of dive slow so that if there are researchers or photographers they can do their activity without problems**
Weather	**Visibility during the dive. It is important to effect a night diving and marine conditions without problem and in safety that weather and marine conditions are good. Calm sea, no current and good visibility are ideal conditions for this type of diving. If one of these conditions fails the divemaster will decide if the dive must be cancelled or not**
Number of participants	**As the knowledge of the site is important to enjoy the marine environment, all divers will have to trust to divemaster's experience. Consequently the group will be composed by 6/8 divers, 3/4 couples. If the group is more numerous divemaster will pay more attention to the group than to environment**
Individual experience level	**As night dives are not very deep, groups can be composed of divers with different experience level even it is better to have a homogeneous group**
Entry points	**This type of diving enables to enter the water either from boat and from shore or beach. If it is possible the carriage of the equipment you can dive from shore but is is better diving from boat**
Personal equipment	**In addition to personal equipment proper for night dives it is important that divers are equipped with a good compact underwater light, a supply light and cyalume stick. The single diver will a dive torch useful for illuminating the environment while the divemaster will use the stick for illuminating the group**
Entry thecnique	**Once all couples of divers are equipped with proper equipment and accessory equipment, divemaster will give all information about entry the water. If it is an entry from shore or beach, two lights will be put to signal the diving entry point. As emergency tank cannot lay on the water surface, it is better to plan the dive within table limits. A light is usually placed at a depth from the bottom of 2/3 metres while the other light is placed at about 3 metres**
Descending thecnique	**If it is a descend from boat stroboscopic lights are placed along anchor line. If there are different groups aboard, every group will have dive lamps with the same colour so as to recognize own group while divemaster will have an dive lamp with a different colour so as to be recognized by his group. Any problem will be indicated by proper signals and the light will have to be pointed directly diver's face who is facing**
Behaviour during a dive	**All group must ascend if it occurs an emergency; if there are physical or thecnichal problems or if most of divers has reached time or air limits**
Exit thecnique	**During a night diving the sensation of time and space are altered and the time seems to pass slower, the divemaster will recommed to group to check often submersible pressure and depth gauge. It is better tha divemaster controles the group's equipment at regular intervals. For diving from a boat a tank will be placed at 3 metres and a line will be tied to the floating buoy**

PLANNING A DIVING ON WRECK

Diving on a wreck is one of the most excinting experience than a diver can do. The mystery that surrounds a wreck, the unreal lights and shades have a fascination without equal. A “diving on wreck “ requires a good training and a psychological equilibrium that enables the exploration of a so unusual environment. Remember that, this type of diving must be planned too.

	BRIEFING
Aim of diving	**Diving outside or inside of a wreck depend on information about the wreck and its conditions and the level of divers. It is important to remember that diving inside of a wreck can be dangerous because of corrosive action of salt water on sheets and of waves on all wreck**
IndividualWeather	**Wrecks are usually situated far from shore, consequentily they are and marine conditions accesible only by boats. For this reason weather and marine conditions must be always good to avoid problemas particularly during the exit from the water. Besides some wrecks are situated at depths for which it is necessary a proper decompression needs. Decompression will be difficult with a rough sea**
IndividualVisibility	**It is important a good visibility for two reasons: to enjoy the vision of the wreck; to find the line of boat without problems. If the group is composed of experienced divers it is possible diving on the wreck even the visibility is scarce but it is important that the conditions of the wreck enable it**
Individual experience level	**Individual experience level for this type of dive must be very high even it does not need special gifts. The peculiarity of this type of dive is that it is unusual. Wrecks often present adverse environments with cutting and entangled sheets**
Personal equipment	**You can use the same equipment for night divings consequently divers will be equipped with dive lamps, torches and a supply light. If it is a dive on inside of a wreck it is better to take a reel of thread**
Entry points	**Wrecks are usually situated far from the coastline consequently this type if dive needs proper boat. Some wrecks are accesible from the coastline. In this case it is better to ask about currents**
Entry thecnique Behauvior during the dive Exit thecnique	**During the briefing the divemaster, tested that all divers are equipped with all equipment and accessory equipment, will give instructions about depth limits, conditions of wreck and behaviour that the group will have to assume during diving. As diving on wreck is similar to an open water diving divers must besure to find the exit point. It is better to place a stroboscopic light and a pair of cyalume stick along the anchor line with clear waters too but with very great wreck. The divemaster will always be in contact to the group so that he is able to see any signals. In case of emergency signals because of a diver has reached air limit, all divers must be ascend. Wrecks are full of living organisms consequently they must be respected. Many times we can find living organisms very rare. If divers explore the inside and outside of the wreck they must be careful no to raise muds and dusts.If it is a diving from a shore or beach and there is a supply tank the dive will have to respect dive table limits. If it is a diving from a boat, the divemaster will put a tank at 3 metres and a line will be tied to the floating buoy. This operation must be always done**

REGISTRATION FORM



CMAS

WORLD UNDERWATER FEDERATION

Student

Name - Surname

Born date

Address

State Zip

Note

Instructor

Name - Surname Certification N°

3 STARS CMAS PROGRAM

LESSON 1
BOAT
TERMINOLOGY
TYPES OF BOAT
INFLATABLE DINGHY
RIGID HULL BOATS
STEERING OF BOATS
BEARING
BEARING PROCEDURES
COUNTERMANOEUVRE TO AVOID COLLISION
ANCHORS AND ANCHORAGE MANOEUVRES
KNOTS
LAMPS AND MARKS SIGNALS
RESCUE MANOEUVRES
SYSTEMS OF MARINE SIGNALLING
FLAGS
EQUIPMENT ON BOAT
SAFETY EQUIPMENT ON BOAT
STEERING A BOAT
ENTERING THE WATER
WATER EXIT
METEOROLOGY
ATMOSPHERE CHARACTERISTICS
CLOUDS
CLASSIFICATION OF CLOUDS
WIND
BREEZES
MONSOONS
ATMOSPHERIC DISTURBANCES
ATLANTIC TROPICAL FRONT THEORY
VARIABILITY LINE
DEPRESSION AND CLOUDS
WEATHER FORECAST
PROVENANCE DIRECTION AND FORCE OF THE WIND

LESSON 2
WATER LIFE SUPPORT
WLS KEYWORD
THE RESCUE
PREVENTION
RECOGNITION OF THE PROBLEM
SITUATION OF EMERGENCY
PROBLEMS CONCERNING THE CONTROL OF YOUR FRIEND OR OF THE GROUP
LOST DIVER
TECHNICAL PROBLEMS
REGULATOR FREE FLOW
REGULATOR DOES NOT DELIVER AIR
AIR IS DISCHARGED FROM B.C.D.
B.C.D. IS OVERFILLED
WEIGHT BELT RELEASES
DRY SUIT PROBLEM
LOSS OF MASK
PHYSICAL PROBLEMS
HYPOTHERMIA
HYPERTERMIA
BREATHLESSNESS
HYPERVENTILATION
CRAMPS
EMERGENCIES DURING DIVING
ACCIDENTS THAT COULD OCCUR DURING DESCENDING
ACCIDENTS THAT COULD OCCUR DURING DIVING
ACCIDENTS THAT COULD OCCUR DURING ASCENDING
VARIOUS ACCIDENTS

LESSON 3
AGGRESSIVENESS IN A PANICKED DIVER
CARRYING THE DIVER IN DANGER TO A SAFE PLACE
CHECK ON THE CONSCIOUSNESS OF THE DIVER IN DANGER
ASKING FOR ASSISTENCE
CHECK ON RESPIRATORY ACTIVITY
MOUTH TO MOUTH RESUSCITATION IN MOTION
CARRYING THE DIVER IN DANGER TO THE SURFACE
HOISTING THE DIVER IN DANGER ON THE BOAT
HOISTING THE DIVER IN DANGER ON THE LAND
SPECIFIC HOISTING
DMP - DIVING MEDICAL PACK
DPE - DIVING PREVENTION EQUIPMENT
SEARCH AND RESCUE
SEARCH AREA IDENTIFICATION
SEARCH PROCEDURE SELECTION
SEARCH DIAGRAM
SEARCH COURSE
"U" COURSE
SQUARE COURSE
ROUND COURSE
CONTROLLED COURSE FROM THE SURFACE
RESCUE OF THE OBJECT

LESSON 4
EQUIPMENT
HOW A COMPRESSOR WORKS
FILTERS OF A COMPRESSOR
COMPRESSOR CHECKS
REFILLED PROCEDURES
USE OF STOWAGE AIR UNIT
REGISTRATION AND LEGAL OBBLIGATION
EQUIPMENT REVISION
CHECK EQUIPMENT
EQUIPMENT MAINTENANCE
FIRST STAGE MAINTENANCE
SECOND STAGE MAINTENANCE
B.C.D. MAINTENANCE
TANK VALVE MAINTENANCE
DIVE LAMPS MAINTENANCE

LESSON 5
DIVING GUIDE C.M.A.S.
PARTECIPANTS
PLACE
EQUIPMENT
MEANS
MEANS
BRIEFING
DIVING
CLOSURE
PLANNING A DIVING IN CURRENT
NIGTH DIVING PLANNIG
PLANNING A DIVING ON WRECK
REGISTRATION FORM
CERTIFICATION FORM

SKILL UPDATE

CMAS

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Student

Name - Surname

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Note

Instructor

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SKILL UPDATE PROGRAM

	STUDENT			INSTRUCTOR		
	☹	😐	☺	☹	😐	☺
Preparation and assembly of scuba diving equipment						
TANK						
B.C.D.						
REGULATOR						
Putting on the scuba equipment						
DRESSING ORDER						
PUTTING ON EQUIPMENT WHILE STANDING						
PUTTING ON EQUIPMENT WHILE SITTING						
PUTTING ON THE EQUIPMENT IN WATER						
Entering and coming out of the water						
FROM A SHORE						
FROM AN INFLATABLE						
FROM A BOAT						
In water						
CONTROL OF THE BUOYANCY						
BREATHING WITH THE REGULATOR						
EMPTYING THE MASK						
STARTING THE DIVE						
FINNING UNDERWATER						
REGULATOR RECOVER						
BUOYANCY CONTROL						
SIGNALS						
ASCENDING						
Safety procedures						
ASCENDING						
BUDDY BREATHING						
ALTERNATIVE AIR SOURCE ASCENT						
EMERGENCY ASCENT USING THE FINS AND B.C.D.						
IN WATER WEIGHT BELT DRESSING						
Procedure di risalita						
RISALITA CON RESPIRAZIONE IN COPPIA ALTERNATA						
RISALITA IN COPPIA CON FONTE D'ARIA ALTERNATIVA						
RISALITA IN EMERGENZA PINNEGGIANDO						
RISALITA IN EMERGENZA IN ASSETTO POSITIVO						
MANOVRE CON LA CINTURA DI ZAVORRA IN ACQUA						
In water						
IN WATER DRESSING						
EQUIPMENT CHANGE						
GETTING OUT OF WATER						
MAINTENANCE OF THE EQUIPMENT						

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