

13. Dive Planning

An open-circuit scuba system allows a diver to breathe compressed air from a pressurized cylinder and exhaust the used gases into the water. It is a simple, reliable, easily maintained air delivery system, which makes it the safest and most popular scuba system. A closed-circuit scuba system allows a diver to rebreathe exhaled air by removing carbon dioxide and adding the correct amount of oxygen without allowing gases to escape from the system. It is a complex air delivery system that requires specialty training and extremely careful maintenance. Closed-circuit scuba systems are very expensive compared to open-circuit systems.

A scuba certification card (C-card) indicates that you have completed initial training, but it does not reflect how recently you have been diving. Certification agencies recommend that you complete simple refresher training if you have not dived for a year or longer. This training is a review of your basic skills under the supervision of an instructor during an open-water dive. The confidence you gain from knowing that your skills are refreshed will make your diving safer. A good reason to log your dives is to document your diving activity. Some dive resorts and charter boats will want to review your log book to determine your diving experience, especially your most recent dives. Logged dives also can help you recall many facts that you would otherwise forget.

A medical exam for scuba diving should be performed by a scuba diving physician who understands medical issues that could be problematic for those considering scuba training. Knowledge of how pressure affects medical conditions can help prevent pain, suffering, and even death.

Actions you can take to minimize your risk of injury while scuba diving are to dive only when you are in good health, use well-maintained equipment, dive in good environmental conditions, and adhere to the safety rules of scuba diving.

When you are in the process of selecting an instructional course for scuba diving, you need to know the sanctioning national agency, the instructor's experience, the total cost of the course, the course curriculum and duration, and how much open-water (real environment) training is included.

absolute pressure—The total pressure exerted on a diver, which is measured by adding atmospheric pressure to gauge pressure.

actual bottom time—The elapsed time in minutes from when a diver leaves the surface in descent until the diver begins a rest stop or surfaces.

alternate air source—A source of compressed air other than the diver's primary scuba regulator. The two primary types of alternate air sources are extra second stages and backup scuba units.

ambient pressure—The surrounding pressure.

Archimedes' principle—This principle states that the force of buoyancy acting on a submerged object equals the weight of the water displaced.

arterial gas embolism (AGE)—An embolism resulting from an air bubble blocking the arterial circulation.

atmospheric pressure—The pressure exerted by the atmosphere.

backpack—The equipment that holds the diver's scuba cylinder.

barotrauma—Trauma or injury caused by pressure.

bends—See decompression illness.

bezel—A movable ring on a waterproof watch (being used as an underwater timer) or compass that you can set to indicate elapsed time or direction.

blooms—Overpopulations of plankton that can color the water, destroy underwater visibility, and form toxins in animals that feed by filtering water.

blowout plug—A plug included in a submersible pressure gauge to relieve pressure in the housing in the event of a high-pressure leak.

Bourdon tube—A type of depth gauge that uses a thin metal tube formed into a spiral. The movement of the coil, linked mechanically to a needle, indicates the amount of pressure exerted on the gauge.

Boyle's law—This law states that for any gas at a constant temperature, the volume varies inversely with the absolute pressure, while the density varies directly with the absolute pressure.

buddy breathing—The sharing of a single regulator second stage by two divers.

buddy line—A short line used by two divers to keep in contact with each other when visibility is poor.

buddy system—The practice of teaming up with a qualified partner for activities that involve risk, such as skin and scuba diving. A buddy provides reminders and assistance and sees things that you might not see.

buoyancy—The upward force of water.

buoyancy compensator—An item of equipment that helps a diver control buoyancy. You can inflate your buoyancy compensator at the surface to increase

burst disk—A thin metal disk that is a standard feature of the valves for scuba tanks. If a tank is overfilled or the heat from a fire causes the tank pressure to increase to a hazardous level, the disk will burst and vent the tank to prevent an explosion.

capillary gauge—A type of depth gauge that is made up of a hollow, air-filled, transparent plastic tube sealed at one end and placed around a circular dial. Water pressure compresses the air inside the tube during descent (based on Boyle's law), and the position of the air-water interface inside the tube relative to markings on the dial indicates the depth.

cavern—A large, roomlike opening in a natural formation where light from the surface can be seen.

caves—Openings in a natural formation that extend farther than a cavern where no surface light can be seen.

C-card—The certification card you receive when you complete your training requirements as a scuba diver.

ceiling—The minimum depth that a diver cannot rise above without the risk of DCS.

ciguatera—Fish poisoning that results from eating fish that consume a certain species of algae.

closed-circuit—Refers to a scuba system that eliminates carbon dioxide from exhaled breath and resupplies oxygen without allowing gases to escape from the system.

compartments—Mathematical models used to estimate gas absorption and elimination by various areas of the body.

compass course—A series of headings on a compass that leads to a destination.

compass heading—A direction that is set on a compass.

console—A display unit into which several instruments can be combined. An instrument console attaches to the high-pressure hose coming from the regulator first stage.

continental shelf—An underwater area that extends from land and slopes gradually to a depth of about 600 feet (183 meters).

contingency plans—Plans that address possible circumstances that could force changes in the original plans for a dive.

controlling compartment—The area of the body that determines how long a diver can remain at a given depth. The determination is made by how quickly a gas diffuses from that compartment.

crest—The top of a wave.

Dalton's law—A law stating that the total pressure exerted by a mixture of gases is the sum of the pressures that would be exerted by each gas if it alone were present and occupied the total volume.

decompression illness (DCI)—A serious medical condition in which a diver has neurological symptoms on surfacing. Also known as the bends.

decompression stops—Precautionary stops made during ascent in order to reduce the risk of decompression illness.

defogging—The process of removing the film of oil from the surface of the glass lenses on a scuba mask in order to prevent the mask from fogging underwater. Commercial defogging solutions can help keep your mask clear while you dive.

dehydration—A physical condition resulting from the excess loss of body fluids.

density—Weight per unit volume.

DIN valve—A newer type of threaded outlet for a scuba tank valve that has a recessed O-ring seal and withstands higher pressures than a traditional O-ring valve. Tank pressures in excess of 3,000 psi (204 atmospheres) require a DIN fitting.

dive profiles—Diagrams used to plan a dive by plotting the time and depth of the dive.

diver's push-ups—A buoyancy evaluation used to learn buoyancy control. When the diver is weighted properly, a full inhalation will raise the shoulders while the fin tips remain on the bottom, and an exhalation will cause the shoulders to sink.

dolphin kick—A type of fin kick in which a diver holds both feet together continuously and exerts force against the water using a wavelike up-and-down motion of the body.

downwelling—A compensating downward current that occurs when wind blows along a coast where there is a steep drop-off near shore.

drag—A force that slows movement.

drift—The speed of a current.

drift dive—A dive in which the divers move with the flow of the current.

eardrum—A thin membrane that separates the ear canal from the middle ear and transmits vibrations to the inner ear via a series of small bones that are attached to the membrane.

ebb—The flow of water away from an area because of low tide.

eddies—Swirling currents that result from non-linear water flow

embolism—A blockage of circulation.

emergency decompression—A required delay in ascent that a diver must take if the actual or total bottom time (ABT or TBT) exceeds the no-decompression-stop limit for a dive.

equalization—The process of keeping the pressure inside an air space in or attached to the body equal to the ambient pressure.

eustachian tube—The part of the ear that allows the equalization of pressure in the middle ear.

Farmer Johns—A type of wet suit design where the leg material extends upward to cover the chest and is held in place with shoulder straps

fetch—The area in which waves were created.

fetch length—The distance wind travels unobstructed. The length of water over which a given wind has blown.

flaring—A method of slowing an uncontrolled ascent by arching the back, extending the arms and legs, and positioning the fins so they are parallel to the surface.

flood—The flow of water into an area because of high tide.

flutter kick—The most common type of fin kick. The flutter kick is an up-and-down kick that you can do facing down, up, or to the side.

fronds—The portions of kelp that appear to be the leaves.

gauge pressure—The pressure indicated by a pressure gauge that reads zero at sea level (this type of gauge displays only the pressure in excess of one atmosphere).

Gay-Lussac's law—This law states that for any gas at a constant volume, the pressure of the gas varies directly with the absolute temperature.

gyres—Large circulating currents that move clockwise in the northern hemisphere and counterclockwise in the southern hemisphere.

half-time—The amount of time it takes a tissue to accumulate half of the gas it can hold at a given pressure.

heat exhaustion—A medical condition that occurs when the core temperature of the body is above normal and the victim has become dehydrated.

heatstroke—An emergency medical condition that occurs when the body temperature becomes so high that the body's temperature-regulating ability shuts down.

Henry's law—This law states that the amount of a gas that dissolves in a liquid at a given temperature is directly proportional to the partial pressure of that gas.

hyperthermia—Higher-than-normal body core temperature.

hyperventilation—Rapid, deep breathing in excess of the body's needs.

hypothermia—Excessive loss of heat from the core of the body.

hypoventilation—Rapid and shallow breathing that does not allow you to expel carbon dioxide from your lungs.

ingassing—The process of gas diffusion into a liquid.

jumpsuit—A one-piece dive suit.

J-valve—A cylinder valve that was designed to maintain a reserve of air to permit a normal ascent. The introduction of submersible pressure gauges for scuba tanks has rendered the J-valve obsolete.

kelp—Giant algae that produce long strands that a diver can become entangled in.

Kelvin—The absolute temperature scale for Celsius temperatures. To convert a Celsius temperature to Kelvin, add 273 degrees.

K-valve—A cylinder valve that is a simple on-off valve that operates like a faucet. You turn the valve handle counterclockwise to open it and clockwise to close it.

lubber line—A reference line on a compass that indicates the direction of travel.

mediastinal emphysema—A lung injury in which air is present in the tissues in the middle of the chest.

middle ear—The air space behind the eardrum.

modified frog kick—A fin kick in which the diver rotates the ankles so that the tips of the fins point outward, slides the fins tip first in an outward direction, then pulls the bottoms of the fins together quickly in a wide, sweeping arc.

multilevel dive profile—A dive that progresses from deep to shallow during a given period of time.

neap tide—The twice-monthly period of lowest tides, which occurs when the moon and sun are at right angles to each other in relation to the earth.

neutral buoyancy—A state of buoyancy that a diver achieves when the diver neither sinks nor floats when holding an average breath.

nitrogen narcosis—A detrimental effect caused by the increased pressure of nitrogen that occurs at a depth of about 100 feet (30 meters).

nitrox—A nitrogen and oxygen mixture with a higher percentage of oxygen than is found in air. The mixture reduces the effects of nitrogen at depth.

no decompression stop limits—The maximum time that a diver may stay at a specified depth.

nonreference descent—A descent made vertically in water without any external reference.

octopus—A term used to describe an extra second stage.

open-circuit—Refers to a scuba system that permits a diver to breathe compressed air from a pressurized cylinder and exhausts the used gases into the water. Open-circuit systems are the safest and most popular form of scuba system.

open-valve ascent—A method for maintaining neutral buoyancy during an ascent by keeping the BC inflator-deflator valve open while holding the valve in a special way.

O-ring—A soft, circular ring that surrounds the outlet for scuba tank valves.

outgassing—The process of gas diffusing out of a liquid. For diving, it pertains to the diffusing of nitrogen absorbed under pressure.

overturn—The movement of water from the top of a lake to a depth of about 60 feet as a result of water circulation caused by winds. This water movement carries oxygenated water to the bottom and leads to what is called spring diving conditions.

partial pressure—The percentage of the total pressure exerted by each gas in a mixture of gases.

perfusion—The circulation in a tissue.

plankton—Aquatic life-forms that drift with the currents.

pneumothorax—A lung injury in which air is trapped in the chest cavity.

pony tank—A backup scuba unit consisting of a small scuba cylinder with a separate, standard regulator.

ports—The openings in the first stage of a regulator. One of the ports is for high-pressure air measurement with an SPG. The remaining ports are for low-pressure air.

pressure—Force (often weight) per unit area.

pulmonary barotrauma—Any lung injury caused by pressure.

Rankine—The absolute temperature scale for Fahrenheit temperatures. To convert a Fahrenheit temperature to Rankine, add 460 degrees.

reciprocal compass course—A course where the diver moves in a given heading for a given distance and returns to the origination point by reversing the direction of travel.

red tide—Blooms created by a type of red phytoplankton.

reference descent—A descent that the diver controls by following a line or the slope of the bottom.

repetitive dive—Any dive made within 6 to 24 hours (depending on the dive-planning device) of a previous dive.

repetitive group or repetitive group designation—The letter on a dive table that indicates the amount of nitrogen in a diver's body.

residual nitrogen—Nitrogen remaining in your system from a dive made within the past 12 hours.

residual nitrogen time—An amount of time that must be added to the actual bottom time (ABT) of a repetitive dive to determine the total bottom time (TBT). RNT compensates for residual nitrogen remaining in a diver's tissues from previous dives.

rest stop—A precautionary decompression stop during ascent.

reverse block—Discomfort that occurs when the pressure in the middle ear is above normal during an ascent due to blockage of the Eustachian tube.

reverse thermocline—The point of transition from a layer of cold water toward the surface of a lake to a layer of warmer water toward the bottom. This state exists in winter.

rip current—The narrow, strong current that moves away from shore as a result of water flowing back to sea through a narrow opening in an underwater obstruction.

sawtooth dive profile—A dive that progresses from deep to shallow and back to deep.

scissors kick—A fin kick that can be used as a resting kick. While lying on the side, the diver slowly extends one leg backward while extending the other leg forward, and then pulls the legs together quickly.

scombroid—A type of fish poisoning that can result if you eat fish that have not been kept chilled. It produces nausea and vomiting within an hour.

scrolling—A method used by dive computers to provide advance-planning information through a sequential display of time limits for various depths.

scuba—Self-contained underwater breathing apparatus.

semi-closed-circuit—Refers to a scuba system that combines the benefits of closed-circuit and open-circuit systems. Small amounts of used gases are released periodically.

set—The direction assumed by a current.

shallow-water blackout—The sudden loss of consciousness near the surface of the water.

shorty—A one-piece dive suit with short arms and legs used for diving in warm water.

sink—The area formed when the ground collapses into an underground cave system.

siphon—An opening where water is channeled from a sink back into the system.

skip breathing—An attempt to extend one's air supply by holding each breath for several seconds.

slack water—The period of time between flow and ebb when the water has minimal movement.

Spare Air unit—A backup scuba unit consisting of a small scuba cylinder with a special regulator integrated directly into the valve. A Spare Air unit is smaller than a pony tank and provides only enough air to permit an ascent from shallow depths.

spike dives—A dive with a short actual bottom time (ABT), such as a dive to free a fouled anchor.

spring tides—The twice-monthly period of highest tides, which occurs when the moon and sun are aligned with the earth.

square compass course—A series of headings that allows the diver to travel in a square pattern so that the dive ends where it began.

squeeze—A condition that occurs when the pressure on the outside of an air space in or on the body is greater than the pressure inside the air space. This condition may cause pain and injury and may be avoided by keeping the pressures equal (see equalization).

stages—The two parts of a scuba regulator that perform the two steps in the pressure reduction process.

stand—A brief period of time during which the tide neither rises nor falls.

step dive—A dive that is made in a series of steps.

stipes—Long strands of kelp.

subcutaneous emphysema—A lung injury in which air is present in the tissues under the skin. The air swells the tissues around the neck.

submersible pressure gauges—An instrument that measures scuba cylinder pressure.

surf—Breaking waves that occur when the water within the wave moves forward and gives up its energy. This occurs when the depth of the water is about the same as the wave height.

surface interval time—The elapsed time from when a diver surfaces after a dive to the time the diver begins the descent of a repetitive dive.

surge—The back-and-forth subsurface motion of the water within waves when the waves enter shallow water.

swells—The rounded, undulating forms that waves take as they move away from the area in which they were created.

tetrodotoxin—A type of fish poisoning that results from eating exotic fish such as puffer fish or blowfish. Tetrodotoxin is the most serious form of fish poisoning and can cause death within minutes.

thermocline—An abrupt transition from a warmer layer of water to a colder layer of water.

total bottom time—The sum of actual bottom time and residual nitrogen time.

Toynbee maneuver—A method of opening the eustachian tubes by blocking the nostrils, closing the mouth, and swallowing.

trail line—A long line with a float attached that is deployed from the stern of a boat. Divers use the trail line to pull themselves to the boat against the current.

trapdoor effect—A condition that exists when pressure prevents the Eustachian tube from opening. This condition may be overcome by ascending to reduce pressure.

trough—The bottom of a wave.

tsunami—Gigantic seismic waves caused by an underwater earthquake.

turbid—Water that is unclear or murky because of stirred-up sediment.

upwelling—The replacement of warm water at the surface with colder water flowing up from the depths as a result of a strong wind blowing along the shore for a sustained time.

Valsalva maneuver—A method of opening the eustachian tubes by blocking the nostrils, closing the mouth, and gently trying to exhale.

valve seat—The portion of the cylinder valve that closes and stops the flow of air.

vasoconstriction—Narrowing of the blood vessels.

vertigo—A subjective feeling of movement perceived as a spinning sensation.

wave height—The distance from a wave crest to the trough.

wave period—The time it takes two waves to pass a given point.

wave train—A long series of waves.

wavelength—The distance between waves.