# WRECK DIVER MANUAL

PADI

## Table of Contents

# Introduction

As you descend, you look below for your first glimpse, instinctively searching for pattern – something that looks like a ship. You near the bottom and suddenly, in a blink, the wreck materializes below you.

Whether your first or your hundredth dive on it, few moments in diving compare with descending on a wreck. The first few times, you sense the mystery and exhilaration of discovery. As you get to know it, each dive rings with familiarity, reminding you of your last visit. Over the years, you see changes from one dive to the next as the wreck gradually evolves from a work of humanity to part of the underwater world. On the other hand – especially in colder, freshwater environments, the wreck seems timeless – you grow older with the passing years, but it changes little.

While most people think "ship" when they think of a wreck, wreck diving includes other craft, such as sailboats, houseboats, railroad cars, automobiles, aircraft and military craft. Because of this, few dive environments lack wrecks, so virtually every diver ends up diving on wrecks from time to time. Nonetheless, boats and ships do make up the majority of wrecks, so the references you'll read in this manual apply primarily to them.

The PADI Wreck Diver Specialty course teaches the basic principles for fun, safe wreck diving. The course was designed for flexibility, so that what you learn applies when diving on both intact wrecks and wrecks that have become little more than a rubble pile. Whether wrecks interest you out of historical curiosity or because they're artificial reefs with abundant life, this program will help you enjoy wreck diving more and help you avoid potential problems.

## Course Overview

As in most PADI Specialty Diver courses, the PADI Wreck Diver course emphasizes diving, and you will make at least four wreck dives in open water with your PADI Instructor. You'll have fun on these dives while developing and refining the skills you need for wreck diving.

The course includes significant background information that you'll need, ranging from theory you apply during the dives to legal and historical knowledge. Normally you'll cover this information by reading this manual, by watching the PADI *Wreck Diving* video, and by discussing the material with your instructor prior to your dives. Your instructor may decide to have more formal class meetings. The recommended sequence is to begin by skimming through this manual, noting the headings, topics and pictures. This speeds learning by giving you an idea of where you're headed. Then, as your read, highlight or underline the answers to the study objectives. **It's important to actually do this** – not simply note them – because the physical act of writing/highlighting enhances transferring the knowledge to long term memory. Answer the exercises, reviewing anything you don't understand. Then, fill out the Knowledge Reviews to turn in to your instructor.

After completing the manual, watch the *Wreck Diving* video. This reinforces what you read, and shows demonstrations of many of the skills you'll learn. If you prefer to watch the video first, that's fine.

You may initially practice some of the skills you'll learn in controlled conditions, such as practicing the use of lines and reels at the surface. Your instructor may add a pool or confined water dive for added time to develop skills before your open water wreck dives.

When you've completed the course, you'll have earned the PADI Wreck Diver certification, which qualifies you to wreck dive in conditions comparable to or better than those in which you have experience and training. With your PADI Wreck Diver certification, you can apply for the Master Scuba Diver rating if you also have the PADI Rescue Diver certification, and four other PADI specialty certifications.


*The PADI Wreck Diver certification credits toward the PADI Master Scuba Diver rating – recreational diving's highest nonprofessional level.*

**Important**

While you can learn many aspects of wreck diving by reading this manual and watching the video, it doesn't replace hands-on learning with your PADI Instructor. This is particularly true with respect to the training and techniques that apply to exploring the inside of an intact wreck. Do not attempt wreck penetration without the supervision and training of your PADI Instructor.

## PADI Wreck Diver Course Prerequisites

To take the PADI Wreck Diver course, you must be certified as a PADI Adventure Diver or have a qualifying certification from another training organization similar to that of a PADI Advanced Open Water Diver.

If you'll be wreck diving deeper than 18 metres/60 feet, it's recommended that you successfully complete the PADI Deep Diver course. This course develops your knowledge and skills appropriate for diving to an absolute maximum depth of 40 metres/130 feet.

## Watch for These Symbols

Alerts you to important safety information. Pay close attention when you see this symbol and consult your instructor if you do not understand the material.

This Project A.W.A.R.E. symbol highlights information or a specific diving technique that allows you to interact harmoniously with the aquatic environment.

Alerts you to additional/related information on PADI videos, books, CD-ROM and other media. This material is for your interest and further learning. The information required for this course is in this manual.

## Other Skills You'll Want as a PADI Wreck Diver

Wreck diving skills integrate well with the skills you develop in new opportunities through training in other PADI Specialty Diver courses.

- **PADI Enriched Air Diver** – Enriched air nitrox extends your no stop times, which can be particularly handy when conducting wreck dives in the 18 metre/60 foot to 30 metre/100 foot depth range. Wreck diving tends to be deeper than many other forms of diving, so enriched air maximizes your dive time, especially on repetitive dives.
- **PADI Deep Diver** – Since wreck dives tend to be deeper dives, it's useful to have training as a deep diver. In many areas, you'll do your PADI Deep Diver course and PADI Wreck Diver course on the same wrecks.
- **PADI Diver Propulsion Vehicle (DPV) Diver** – It's hard to see very much of a large ship even in a couple of dives. DPVs allow you to see more of the wreck, and, if it's largely intact, it's easy to navigate. This makes wrecks some of the best places to enjoy a DPV.
- **PADI Digital Underwater Photographer** – Few dive sites offer as much drama as wrecks, especially in clear water. Some divers learn digital photography purely because they want photos of their favorite wrecks. In addition, some photographers take up wreck diving because they want to capture images of these impressive dive sites.
- **PADI Peak Performance Buoyancy Diver** – It's useful to fine tune your buoyancy skills, which helps prevent disturbing underwater environments and prevents silt-outs when penetrating wrecks.
- **PADI Dry Suit Diver** – Wreck diving is often in cool to cold water due to location and depth. In fact, some of the best wreck diving is in cold water because it's the cold that preserves them. Certification as a PADI Dry Suit Diver prepares you to visit these spectacular sites comfortably.
- **PADI DSAT TecRec** – If you're interested in deeper wrecks and longer dives that require decompression stops, you may be interested in becoming a tec diver. This isn't surprising because much of tec diving originated with wreck divers. If you're interested in this kind of diving, having the proper training and equipment is mandatory.

The first dive of most PADI specialties* corresponds to the same dive in the PADI Adventures in Diving program. Therefore, if you're a PADI Advanced Open Water Diver or Adventure Diver, you may have already made the first dive to these specialty courses. Similarly, the first dive of the specialties credits toward the Advanced Open Water Diver or Adventure Diver certification.

Successfully completing five PADI Specialties and the PADI Rescue Diver course qualifies you for the PADI Master Scuba Diver rating – the highest nonprofessional rating in the sport.

For more information about PADI courses, including specialties, the Adventures in Diving program and PADI Master Scuba Diver, visit padi.com.

***PADI Ice Diver and TecRec courses do not have corresponding dives in the Adventures in Diving program.***

# The Appeal of *Wreck Diving*

People differ in their interests when it comes to wreck diving. It's possible to find yourself diving with someone who finds wrecks just as exciting as you do, but for completely different reasons. Like deep diving, night diving and other dive specialties, you may find dozens of reasons why wreck diving interests various divers. You and your future dive partners get more out of wreck diving when you recognize what about it appeals to you and them. This allows you to choose wrecks based on satisfying these appeals.

**Study Objectives**

Underline/highlight the answers to this question as you read:

1. What are four common reasons why people wreck dive?

## Curiosity

Wrecks fascinate many divers. Even after many dives on a wreck, there's always something new to discover and new mysteries to uncover. You may wonder what's inside them, what sank them and what they were like before they went down. This curiosity manifests itself as adventure: igniting a passion for exploring wrecks and providing a glimpsing into the unknown. It may prompt you to research your favorite wrecks so that you understand more about what they were as you explore what they've become.

## History

You may see wrecks as time capsules holding clues to humankind's past. Some wrecks are tangible historical and archaeological resources that tell us something about who we once were, and what we once did. Others may not tell us anything new about our past, but remain historically significant as memorials to battles, conflict or tragedy.

The Project AWARE Responsible Wreck Diving Considerations focuses on preserving the history and habitat of wrecks. Learn more about the Project AWARE Respect Our Wrecks campaign, which advocates a hands-off, take-nothing-but-photos approach to wreck diving. This is important to preserve archaeological resources, to avoid desecrating war graves (which some ships are) and to keep wrecks interesting for the divers who will follow you.


*The Project AWARE Respect Our Wrecks campaign encourages you and your fellow divers to preserve our underwater cultural resources.*

## Aquatic Life

In most underwater environments, a sunken ship quickly attracts aquatic life, slowly transforming into an artificial reef. Even in freshwater sites where aquatic life isn't as conspicuous or varied as in the ocean, wrecks attract fish and other organisms.

Many divers love wrecks more for their role as a reef than as an artifact or challenge. One reason for this is that wrecks provide something unique for those interested in underwater natural history – a reef with a known (or approximate) date of origin. This makes it possible to estimate how fast some types of organisms spread and grow.

Another reason is that in some areas, wrecks are the only dive sites with appreciable concentrations of aquatic life. Often, they're underwater "oases" and the only places teeming with fish and other organisms for kilometres/miles in any direction. It's therefore important to use techniques that preserve fragile artificial reef environments. Fine-tune your buoyancy, streamline your equipment and avoid touching the wreck with your hands, knees or fins.

## Underwater Photography

As mentioned in the introduction, wrecks make dramatic photo and video settings. Not only do they have fish and other creatures photographers want, but they're usually photogenic – particularly fairly intact ones.

Another reason underwater photographers and videographers like wrecks is that nondivers often relate more easily to a picture of a recognizable wreck than to a natural reef because they're familiar with what ships look like. Beginning underwater photographers often love wrecks because their photogenic quality make their pictures better, while experienced ones love wrecks because revealing their full dramatic qualities can be an artistic challenge.

Finally, photography gives you a way to bring something back from a wreck without taking anything from it. Thanks to digital imaging, it has become easier than ever to get started in taking pictures underwater.

Learn more...

*In some areas, wrecks are the only dive sites with appreciable concentrations of aquatic life.*

Learn more *see the PADI* Digital Underwater Photographer Manual

PROJECT AWARE *10 Tips for Underwater Photographers*

## Wreck Diving World Hot Spots:

## Truk Lagoon

Of all the top wreck diving spots around the world, one of the most famous is Truk (Chuk) Lagoon, with its dozens of coral encrusted World War II shipwrecks. Truk Lagoon lies just above the equator in the Pacific in Micronesia, northeast of Papau New Guinea.

On February 17, 1944, Allied aircraft caught the Japanese Combined Fleet at anchor in the lagoon, beginning an attack that eventually involved 450 aircraft. In two days, more than 50 ships were sunk or sinking.

Today more than a dozen wrecks lie within reach of recreational divers. Some are so shallow you can snorkel on them, while others begin at moderate depths and reach beyond the limits of recreational diving. Resting in warm water, these wrecks are spectacular, both as wrecks and as living coral reefs. Divers may visit the wrecks, but it's illegal to remove or disturb anything.

*Underwater photography is a primary motivation for diving wrecks.*

### Exercise 1 – The Appeal of Wreck Diving

1. Divers may be interested in wreck diving because of (check all that apply):

   ☐ a. curiosity.
   ☐ b. aquatic life.
   ☐ c. underwater photography.
   ☐ d. history.

How'd you do?

*1. a, b, c, d.*

# Wreck Diving and the *Law*

### The Origin of Shipwreck Laws

Laws regarding shipwrecks date back hundreds of years and were written for two primary reasons: to determine who had salvage rights, and (more recently) for antiquity protection – protecting our submerged underwater cultural resources or to preserve a war grave.

Salvage laws determine who owns something that has been lost at sea. Most of these laws predate scuba diving, and state when a sunken ship (or other property) still belongs to the original owner or an insurer, and when it's available to anyone willing to salvage it.

Although the specifics vary, most countries declare objects in the sea open to whoever wants to go after them when the owners clearly abandoned their lost property. However, this doesn't necessarily mean you can take things off any wreck. The definition of "abandoned" varies internationally, generally leaning to favor the one who lost the property. Owners and insurance companies can still claim title on a wreck and its contents for decades after a sinking.

Even after salvage laws make a wreck open for partial or complete salvage, the wreck may still have protection under the antiquity protection laws written to guard historical resources found underwater. Most of these were written after the growth of scuba diving in the 1950s and 1960s, after divers ignorantly or uncaringly destroyed or damaged significant wreck sites before study by archaeologists. In the Mediterranean, for example, divers carried off amphorae (ancient earthen jars) from wrecks more than 2000 years old, often without even realizing they were diving on a wreck.

Today, divers have become much more aware of this problem, and legal artifact recovery for recreation takes place only on nonhistorical wrecks. Still, most areas of the world now regulate what a diver may or may not do when visiting a particular wreck – or, even whether someone may dive on a particular wreck at all.

## Study Objectives

Underline/highlight the answers to these questions as you read:

1. What two primary considerations have led to the development of shipwreck laws?
2. Why should only a trained archaeologist disturb artifacts on an historical wreck?
3. What are the two main arguments given against recreational divers removing objects and artifacts from nonhistorical wrecks?
4. What are the two main arguments given in favor of recreational divers removing, restoring and collecting objects and artifacts from nonhistorical wrecks?
5. Why does recovering an object require special training beyond the scope of the Wreck Diver course?
6. What is your responsibility with regard to laws that apply to the wrecks on which you dive?

*Today, legal artifact removal only takes place on nonhistorical wrecks, but the trend is to leave things as you find them, even where legal to do otherwise.*

## War Graves and Human Remains

Another reason why divers usually leave wrecks alone is that many of them are war graves. In many areas, the law requires you to leave wrecks untouched for this very reason.

While it's not common to come across human bones while wreck diving, it does happen, particularly when making penetration dives on war wrecks such as those found in the Pacific. If you ever discover human bones on a wreck:

1. Don't disturb them. In effect, you're visiting someone's final resting place, whether you intended to or not. Show the same respect you would when visiting a cemetery or any other final resting place. Some wrecks designated as war graves are closed to diving, but many are not, and probably will remain open to divers as long as divers treat the site and remains with respect.

2. If you think you're the first to discover remains on a particular wreck, report your find to the proper authorities. If it is an older historical wreck, the remains may have archaeological significance. If it is a more recent wreck, authorities may want to recover the bones for reburial elsewhere.

As a rule of thumb, you can consider a wreck historical if it has known historical significance (the *Titanic*, for example), if it has been declared historical by law, or if it is more than approximately 100 years old (such as the remains of a Roman cargo ship). When in doubt, the law generally leans toward considering a wreck historical, and you should, too.

What constitutes an historical wreck varies from region to region as regulated by law. For example, many World War II Japanese wrecks now rest in Truk Lagoon, and while none of these are older than 100 years, and no individual ship has particular historical significance, the battle of Truk itself is very significant historically, and the law protects all the wrecks in the lagoon. In other areas, wrecks older than 100 years have been determined to have no historical value, and divers are free to visit them virtually unregulated.

A primary reason governments prohibit removing or even disturbing artifacts on historical wrecks is to preserve the site for archaeology. Archaeologists draw information not just from what they find in a wreck, but from where they find various objects in relation to one another. Simply picking up an old jar and moving it from one part of a wreck to another can destroy what the trained eye might have learned from it, even though the jar remains on the wreck.

To be clear, divers aren't the only source of wreck deterioration, nor even the most significant. Storms, fishing nets and lines, current and the ravages of nature destroy wrecks over time. Notwithstanding, the archaeologist has enough trouble deciphering the puzzle eons and nature leave behind without having divers accidentally add to the problem.

Antiquity laws, then, spring from the philosophy that historical objects and wrecks are cultural resources that should benefit the public. Accordingly, what you find on a wreck should be left alone. If something is taken, it belongs in a museum rather than in private collections.

Although the trend in the dive community is away from doing so, the door on recreational divers collecting things isn't entirely closed because many wrecks – especially recent ones – don't have historical significance. However, be sure you know the laws and regulations before you disturb anything; if in doubt, leave everything on a wreck as you find it. Even well meaning actions can carry a penalty: a diver was fined for removing a modern soda can (litter) from a protected wreck site. Dive communities often prefer to ensure the wreck remains interesting for future divers.

# The Controversy Over Removing Artifacts from *Nonhistorical Wrecks*

As mentioned, where legal, some divers like to find and recover artifacts from nonhistorical wrecks. Although this is common in some areas, this activity isn't part of the PADI Wreck Diver course, and increasingly, local divers highly discourage it.

Two schools of thought surround collecting, recovering and restoring wreck artifacts as a hobby, and in many areas, legal decisions about what constitutes an historical wreck or a public resource affect this practice, too. Those who argue against artifact collecting argue that once removed from the water, artifacts deteriorate rapidly if not properly preserved. This leads to total loss of the artifact. They also point out that wrecks stripped of their artifacts are much less interesting for divers, so the practice eventually reduces the number of interesting wrecks to dive.

Those who believe that artifact removal is acceptable if done responsibly, counter that many underwater environments rapidly destroy wrecks and artifacts anyway. Therefore, if a diver recovers something and properly preserves it, the diver has rescued something that will inevitably be lost. Furthermore, goes the argument, the result is often more people – especially nondivers – seeing the artifact than if it stayed on the wreck. Another argument for legal, responsible artifact collection is that it motivates individuals to research and look for wrecks, thus increasing the number of wreck diving sites available. No one might otherwise find these wrecks because neither governments nor museums have sufficient funds to locate them.

Like many issues, the controversy over removing artifacts doesn't have any black or white answers. The appropriateness of removing something from a wreck depends on many issues, including the wrecks in question, how many divers visit them, local laws, whether divers will properly preserve and restore what they recover, and other issues.

Regardless, artifact recovery often requires special training in raising an object, and in restoring, preserving, and documenting an object. Both of these lie outside the scope of this course. Those interested in this activity should approach it responsibly and within applicable laws. The PADI Search and

*Like many issues, the controversy over removing artifacts from wrecks doesn't have any black or white answers, apart from those imposed by law or local community practice.*

Recovery Diver course teaches proper lift bag rigging and use (it's also covered in the Adventures in Diving program Search and Recovery Adventure Dive), which applies to recovering moderate weight objects that are too heavy to swim safely to the surface. Programs in underwater archaeology teach individuals how to restore and preserve what they bring up.

## Your Responsibility and Wreck Laws

Clearly, laws affect many of the wrecks you're likely to visit. On some, virtually no regulations apply, and on others, regulations may be strict. Some wrecks may be entirely closed to divers, while others may be open but require a permit. In any case, your responsibility as a wreck diver includes finding out what laws apply before you go diving, and obeying those laws while you dive.

## Wreck Diving World Hot Spots: Scapa Flow

One of the world's premier wreck sites lies in the remote Orkney Islands off the northern tip of Scotland. It was here in Scapa Flow that the German High Fleet – 74 warships – was interned at the end of World War I.

Admiral Ludwig Von Reuter, who commanded the fleet, believed that Germany would reject the Treaty of Versailles and the war would resume. Rather than let the ships fall into British hands, he ordered all the ships to scuttle. On 21 June, 1919, all 74 ships – battleships, battle cruisers, cruisers, destroyers and their support ships – went to the bottom of Scapa Flow without so much as a bullet being fired.

Later, during World War II, the German U-47 U-boat under the command of Gunther Prien snuck into Scapa Flow, torpedoed two vessels and escaped. Subsequently, the Royal Navy sank derelict vessels strategically in the flow to block another U-boat from sneaking in.

Although many of the World War I and World War II vessels have been salvaged, many remain. One, the *Royal Oak* (torpedoed by the U-47) went down with hundreds of sailors aboard and, as a war grave, is closed to diving. However, remaining World War I German ships and block ships remain open to divers. Some of the block ships rise above the surface, so you can make a "shore" dive from the ship deck to the submerged portions of the wreck.

Scapa Flow is colder water, making a visit there seasonal, with dry suits recommended. However, cooler water deteriorates wrecks more slowly than tropical water. For this reason, many Scapa Flow World War I wrecks are in better condition than World War II wrecks in tropical water.

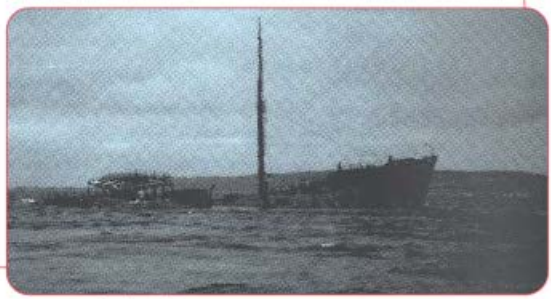


*photo courtesy by Alan Webb*

## Exercise 2 – Wreck Diving and the Law

1. The two primary considerations that have led to the development of shipwreck laws are:
   - ☐ a. antiquity protection.
   - ☐ b. artificial reef preservation.
   - ☐ c. diver safety.
   - ☐ d. salvage rights.

2. You shouldn't disturb an historically significant wreck because archaeologists learn a great deal from how objects lie in relation to each other.
   - ☐ True
   - ☐ False

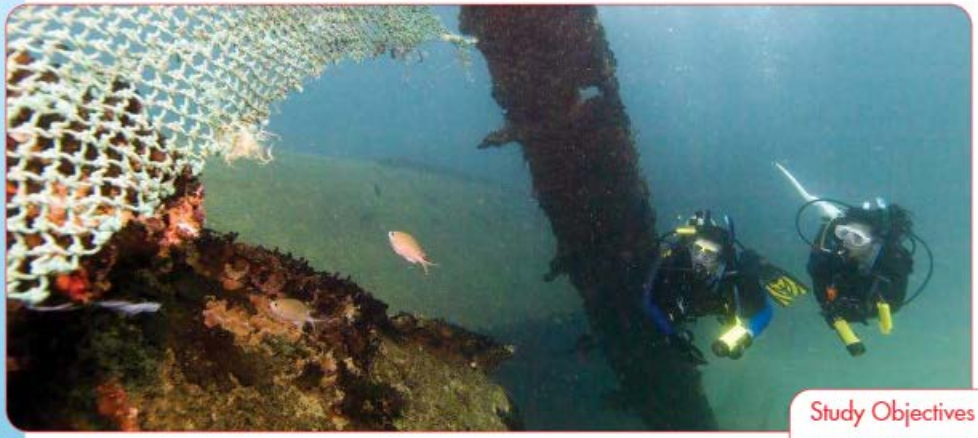
3. The two main arguments against removing objects and artifacts from nonhistorical wrecks are (check two):
   - ☐ a. it causes a substantial reduction of underwater habitat.
   - ☐ b. it may lead to the complete loss of the artifact.
   - ☐ c. it may be dangerous to the diver.
   - ☐ d. it leaves the wreck less interesting for subsequent divers to see.

4. The two main arguments given in favor of removing, restoring and collecting objects and artifacts from nonhistorical wrecks are (check two):
   - ☐ a. the environment destroys artifacts over time anyway, so collection and proper treatment preserves them.
   - ☐ b. collecting artifacts creates the incentive to find wrecks, thus creating new dive sites.
   - ☐ c. collecting artifacts saves local government money because it doesn't have to hire archaeologists to do it.
   - ☐ d. collecting artifacts makes wrecks safer by removing obstructions.

5. Artifact recovery requires special training beyond the scope of this course, including (check all that apply):
   - ☐ a. artifact preservation.
   - ☐ b. lift bag use.
   - ☐ c. artifact restoration.
   - ☐ d. artifact documentation.

6. It's not necessary to check wreck diving laws if you don't intend to disturb or remove anything from a wreck.
   - ☐ True
   - ☐ False

How'd you do?
*1. a, d. 2. True. 3. b, d. 4. a, b. 5. a, b, c, d. 6. False. Divers may be entirely prohibited from diving on some wrecks.*



# Wreck Diving *Hazards*

## Hazards Common to Most Wrecks

Like all dive environments, shipwrecks have potential hazards that you watch for and avoid. As long as you remain alert, keeping clear of these hazards shouldn't be a significant problem. While some wrecks have hazards unique to the wreck, there are five hazards common to many wrecks.

### Sharp objects

Rusted metal, jagged steel plates, broken glass, splintering wood and rough or sharp coral all pose potential injury sources to an unwary diver. Even when diving a wreck intentionally sunk as an artificial reef, these hazards develop over time as the environment deteriorates the wreck's structure.

Your exposure suit helps you avoid most sources of potential cuts or abrasions. In addition, it's wise to wear protective gloves, even if you prefer not to wear them on natural reefs. The potential for cuts tends to be greater on wrecks, and there's more tendency to use your hands because you can often pull yourself along more readily than on a natural reef without damaging aquatic life. It's recommended that you keep your tetanus immunizations current in the event of an accidental cut.

## Study Objectives

Underline/highlight the answers to these questions as you read:

1. What are five potential hazards common to wrecks, and how do you avoid them?
2. What are five hazards of entering (penetrating) a wreck, and what causes these hazards?

*The potential for cuts tends to be greater on wrecks than other environments, so it's recommended that you wear heavy duty gloves while wreck diving.*

### Entanglement

Wrecks attract fish, which makes them popular sites for both commercial and sport fishing. When you go diving, expect wrecks to have monofilament fishing line or fishing nets on them, plus possibly ropes, cables and other lines used aboard them.

You avoid entanglement by remaining alert. Look up as well as around so you don't accidentally swim under a net or thick concentrations of line. Stay well away from any significant accumulations of fishing net, and pay close attention to the taller parts of the wreck, which tend to catch the most line.

*Wrecks attract fish, which makes them popular fishing sites. Beware of entanglement hazard caused by fishing line or nets.*

Carry a sharp cutting tool such as a knife with a smooth and serrated edge so you can cut your way free of entanglement too difficult to untangle by hand. Many experienced wreck divers wear two or more cutting devices – a large, general-purpose knife or tool, and a smaller, very sharp backup, emergencies-only tool such as a z-knife or dive shears. For additional security, wear cutting tools widely separated, such as one inside your calf and the other on your BCD, to help ensure you can reach at least one if entangled.

### Aquatic life

Since wrecks quickly become artificial reefs, you need to keep an eye out for the same creatures that defensively sting or bite on local natural reefs. Follow the same procedures you learned during your Open Water Diver course: watch where you put your hands, feet and knees; wear exposure protection; and don't touch the aquatic life.

### Unstable structure

As a wreck ages, its walls, keel and hull weaken. Slowly, but surely, the wreck collapses into pieces. Although a wreck's collapse progresses slowly and steadily, the final fall of each piece happens quickly, usually when strong current, surge or high seas break away the weakened part. You can dive on a wreck, then return shortly after a storm and find superstructure completely torn from it. Hurricanes have been known to move entire wrecks, knock upright wrecks on to their sides and turn wrecks on their sides upright.

Although the final stress that breaks weak structure usually comes from a storm or current, it can also come from a careless diver. The hazard, of course, is that collapsing wreckage could fall on (especially if penetrating a wreck) or trap a diver. It could also pull fishing lines or nets over a diver.

Avoid this hazard by staying completely away from unstable structure. Look for walls or superstructure that move in the current or surge, give easily when touched, or simply look unstable. Give these areas a wide berth. You normally find such unstable structure only in isolated parts of a wreck, but you can come across wrecks that appear unstable throughout. It's usually best to avoid diving on such wrecks.

War wrecks may have munitions in them or lying around them, and these may be located in an unstable area, or may be unstable themselves depending on how they lie. Even after decades underwater, these munitions can still be explosive.

**Do not touch, move or disturb munitions found underwater.** Divers have lost their lives by accidentally triggering explosives.

### Surge pockets and suction

In surge conditions, water movement through a wreck can cause periodic suction through restricted openings such as hatches and holes. The wreck may draw and expel water in cycles as waves roll over, particularly if the wreck sticks partially above the surface.

Be cautious around wreck openings when you have surge or strong current present. Before swimming in front of one, watch suspended particles to see if they are pulled into the wreck, or stick your hand ahead carefully to feel for suction. If you encounter suction, it's usually best to stay clear of the area and explore other parts of the wreck.

## Hazards of Wreck Penetration

In diving, overhead environments that block or significantly restrict a vertical ascent to the surface pose significant hazard. Cavern diving, cave diving, and ice diving necessarily involve entering an overhead environment, whereas in wreck diving, penetrating the wreck is optional.

No diver should take entering a wreck (or any overhead environment) lightly; overhead environments can look deceptively safe and simple, yet without the proper equipment and training in the specialized techniques, divers can have accidents – all too often fatal ones.

It's worth noting what hazards await the diver inside a wreck, if only to emphasize the grave importance of never attempting a penetration dive without the proper training and equipment. You'll learn about the special equipment and techniques for limited wreck penetration later in this manual. However, understand that even with the proper equipment, training and procedures; entering a wreck raises potential risk and stress. It may be a challenge you enjoy, but for some it may be something you don't particularly enjoy. In that case, don't do it. You can enjoy a lifetime of wreck diving without ever venturing inside – there's plenty to see outside.

### Loss of direction

Perhaps the most immediate hazard in a wreck or other overhead environment is getting lost, and it's easier than you may imagine. A diver easily loses sense of direction merely by entering a wreck, which is aggravated further if the wreck lies on its side or even leans off an even keel.

Inside the wreck, collapsed passages and debris may block logical paths, and open strange ones, so a diver can't rely on intuition. The wreck may look simple and logical on the outside, but inside it may be a three dimensional maze with limited visibility. A diver who gets lost must find the way out before running out of air. Unfortunately, divers have lost their way in wrecks (and other overhead environments) and not made it out.

### No direct access to the surface

Even if a diver doesn't get lost, an overhead environment takes away the safety of ascending immediately if there's a problem. In a low air or out of air situation, a controlled emergency swimming ascent or a buoyant ascent aren't likely to be available options. If divers must share air, they must negotiate their way out of the wreck before ascending. The only way up is out.

### Restricted passages

Inside a wreck, the careless diver can swim down a dead end passage that lacks enough room to turn around. Restrictions have more potential for hitting sharp or abrasive objects, impeding turns and obstructing buddy assistance.

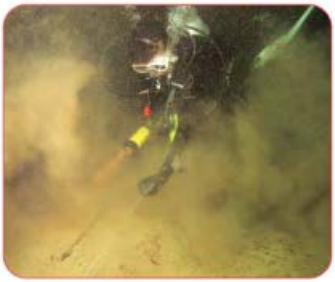
Note: Even when making penetrations using appropriate equipment and techniques, avoid these types of passages completely.

### Falling objects

In some wrecks, a diver can dislodge objects that fall on the diver or block the way. If a large object falls behind a diver, it can interfere with exiting. Divers making penetration dives must avoid any area that has the potential for falling objects.

**Silt**

Silt (particulate matter) tends to accumulate on most wrecks, especially inside. Stirring silt with fins, hands or equipment can cause a dangerous "silt out" – a complete or nearly complete loss of visibility caused by clouding the water. Even exhaust bubbles can obscure visibility by dislodging silt on the wreck walls and ceilings. Silt outs can reduce unrestricted visibility to zero in moments, and frequently lead to disorientation and loss of direction. This can leave the unprepared diver in the precarious situation of having to find the way out before running out of air.



*Stirring up silt with fins, hands or equipment can cause a near or complete loss of visibility. This can be a major hazard inside a wreck.*

As you'll learn, proper equipment and procedures, and staying within appropriate limits, make it possible to enter wrecks without significant risk. **However, never enter a wreck or other overhead environment without the proper training and equipment, and without following the proper procedures.**

Lying on the trade route from Europe to North America and surrounded by many shallow, hard to spot reefs, over the years Bermuda has accumulated more than its share of wrecks. It's probably the only place in the world where you can find 350 wrecks spanning 400 years of sea faring in proximity. You can dive on modern, nearly intact ships that have been underwater less than 30 years, and on ancient broken up wrecks that have been underwater for centuries – sometimes on a single boat trip.

Bermuda lies in the "cool tropics" – 32 degrees North Latitude, but within the warming influence of the Gulf Stream. Compared with many wreck locations, Bermuda allows relaxing dives with less insulation required, generally shallower depths, and seldom problems with strong current. You'll also find the Bermuda Maritime Museum with the Teddy Tucker Treasure Collection, which features treasure, shipwreck artifacts and dive equipment from the 1950s and 1960s. Note: Only archaeologists authorized by the government may remove artifacts from Bermuda shipwrecks. Other divers may visit most wrecks, but may not disturb anything.

## Exercise 3 – Wreck Diving Hazards

1. Potential hazards common to many wrecks include (check all that apply):
   - ☐ a. sharp objects.
   - ☐ b. entanglement.
   - ☐ c. surge pockets.
   - ☐ d. aquatic life.
   - ☐ e. unstable structure.

2. Hazards of wreck penetration include (check all that apply):
   - ☐ a. loss of direction.
   - ☐ b. no direct access to the surface.
   - ☐ c. silt.
   - ☐ d. restricted passages.
   - ☐ e. falling objects.

How'd you do?

*1. a, b, c, d, e. 2. a, b, c, d, e.*

# Wreck Diving *Techniques*

## Evaluating a Wreck

When you dive on a wreck for the first time, it's a good idea to look the wreck over and get to know it. On a large ship, it often takes several dives just to see the whole wreck, so becoming familiar with a wreck progresses each time you dive on it.

Evaluating a wreck isn't a major task, but simply making a point to note aspects of it and its condition as you explore. You speed up familiarity with a wreck by consciously evaluating four aspects of its condition. Even after you become acquainted with it, you'll want to evaluate these each time you visit.

### Possible hazards

Look for the hazards you just read about, and any hazards unique to the wreck. This allows you to plan subsequent dives to avoid them.

### Points of interest

All wrecks have their highlights and areas that stand apart as points of interest. Look for unique features that give the wreck its personality. A ship's wheel, telegraph, anchor or bell may be a prominent feature, but don't forget the natural aspects as well. A large moray eel that lives in the wreck, for instance, can be as interesting as the ship itself. These are the places you'll want to see again on future dives. They're also good to note for picture-taking if you're into underwater photography.

*Pay attention to points of interest as you evaluate a wreck. These are places you may want to revisit for closer exploration or to take pictures.*

## Study Objectives

Underline/highlight the answers to these questions as you read:

1. What are four aspects of a wreck to evaluate when diving on it?
2. What are three ways to navigate on a wreck?
3. Why may a compass be inaccurate on a wreck?
4. What five dive planning and equipment considerations should be made for wreck dives deeper than 18 metres/60 feet?
5. What are the general techniques for wreck diving in a current?
6. What are two reasons why you should obtain a local orientation for an unfamiliar wreck?

### General condition

The wreck's condition affects the way you explore it, areas you may wish to avoid and your safety, especially if you're considering a penetration dive. Check whether the walls and structure appear strong and intact, or flimsy and unstable. Look for any structure or objects that might be ready to fall. Consider the wreck's condition against its age, the environment and its material. An old wooden wreck may be quite sound even after a hundred years in cold fresh water, yet a metal wreck in turbulent tropical water may be ready to collapse in a decade.

*The wreck's condition affects the way you explore it, areas to avoid and your safety. This is particularly true if you're planning to penetrate the wreck.*

### Entryways

If you're considering a subsequent penetration dive, look for suitable ways to enter the wreck. Appropriate entries are large, unobstructed openings that admit much light. Rule out any entry that requires a tight squeeze, removing equipment or tying back a door or hatch. You'll want an opening large enough to swim through comfortably, and free of sharp objects, blockage or other hazards.

## Navigating on wrecks

In many circumstances, navigating on a wreck is easier than navigating on a natural reef. This is partly because you usually don't go as far when diving on a wreck, and partly because intact wreck structure provides navigation clues, lines and other physical cues that make navigation easier.

When diving on a large, broken up wreck, however, navigation may not be so straightforward. You'll find wreck navigation influenced by how familiar you are with the wreck, your dive objective and how much of the wreck you plan to explore. Depending on its condition and what you find when you evaluate it, there are three basic ways to navigate on a wreck. In some cases, you may find it advantageous to use different techniques on the same wreck as you move from one area to another. Sometimes it helps to use these techniques simultaneously.

### Follow the wreck's layout

On a relatively intact wreck, it's usually easiest to follow the ship's natural lines, such as by swimming along the hull or a rail. This works well in limited visibility as well as in clear water, and is one of the easiest ways to find your way on a wreck.

*On a relatively intact wreck, it's usually easiest to navigate by following the ship's natural lines.*

On smaller wrecks, such as a tugboat, you can navigate and see the entire wreck by following the hull around the perimeter. On larger upright ships, you can swim along one side until you reach your turn point (no decompression time or air supply), then swim across the wreck and follow the other side back to your start point.

**Feature reference**

When diving a broken up and scattered wreck, you probably won't find the same natural lines to follow as on an intact wreck. Instead, you navigate by noting prominent features and their relative positions to track where you are and find your way back.

When diving in relatively clear, currentless water on a wreck with relatively few conspicuous features, navigating by memory usually suffices. In reduced visibility, when the wreckage lies scattered over a wide area or on a wreck with many features that you could confuse, it's worth taking the time to sketch/note your path to simplify returning to your start point. As you swim through the various features, look back periodically so you can see how they'll look when navigating back.

Although you normally use feature reference for navigating broken up wrecks, you may find it useful on large intact wrecks of major ships. Major ships may have multiple features that look similar, particularly along adjacent decks. Feature reference helps keep you from confusing, for example, a row of pipes you were following with a similar row a deck up.

*Feature reference helps you navigate broken up wrecks, but it's also useful on large, intact ones, too.*

**Base line**

Base line navigation uses a straight line you draw through a wreck; you'll find it especially useful on a very scattered and broken up wreck with few prominent features. The base line forms a known heading back to the anchor/mooring line or exit that you track constantly during the dive. You swim along the line, leaving it for short distances to explore, and then returning to it as you continue through the wreck.

For a wreck in clear, currentless water, you may use an informal general direction through the wreckage as a base line. In restricted visibility, you may want to use a more precise compass heading, and in poor visibility, or with a current, you may want to lay out a rope for you and your fellow divers to follow. The more challenging the conditions, the more precise you'll want your base line. (Note: Keep in mind that iron and steel objects may affect compass readings by attracting the magnetic needle away from north. Don't expect your compass to read as accurately as usual.)

*Base line navigation follows a line through a very scattered or broken up wreck. Your base line can range from a general direction through the wreck to a compass heading or laying an actual line through the wreckage.*

## Considerations for Deeper Wrecks

As you probably recall from the PADI Advanced Open Water program, dives deeper than 18 metres/60 feet call for deep diving procedures and equipment. You'll find many wrecks shallower than 18 metres/60 feet, but the majority of larger wrecks lie deeper, primarily because large ships cruise oceans and major lakes well away from shore to avoid striking reefs. When an accident happens, therefore, large ships often sink in deep water.

*Many larger wrecks lie deeper than 18 metres/60 feet. This calls for planning the wreck dive as a deep dive.*

It's recommended that you consider the following points when planning wreck dives deeper than 18 metres/60 feet:

**1. Be trained as a PADI Deep Diver.**

The PADI Deep Diver course extends the training and experience you've had in the Advanced Open Water core deep dive, providing you with more hands-on experience with deep diving techniques and equipment. In fact, divers interested in wreck diving often make up the majority of students in a PADI Deep Diver program. See your PADI Dive Center, Resort or Instructor about this course. As you learned in the Introduction, it's also very useful to be certified as a PADI Enriched Air Diver to maximize your no stop dive time.

**2. Use a high capacity cylinder or hang a cylinder at 5 metres/15 feet.**

Having more air than you need assures ample supply for a safety stop or an emergency decompression stop if you encounter a delay returning to your ascent line, or if you use air more rapidly than you planned. Taking a cue from the tec diving community, some recreational wreck divers choose high capacity cylinders (2.8 litre/100 cubic foot at 240 bar/3400 psi or larger) and reserve one-third of their air for emergency use only.

In lieu of a high capacity cylinder (which may not be available), the traditional approach is to leave an extra cylinder at 5 metres/15 feet. Be sure you can relocate your ascent line (which may be an anchor/mooring line), and that you have any other deep diving equipment appropriate for the local environment.

*Having more air than you need assures an ample supply for a safety stop or an emergency decompression stop. If you don't have high capacity cylinders available, you can do this by hanging an extra cylinder at 5 metres/15 feet.*

**3. Take the effect of narcosis into account.**

As you approach 30 metres/100 feet, you can expect nitrogen narcosis to affect you, even if you don't particularly notice it. Plan the dive accordingly by keeping your objectives simple, avoiding task loading and give yourself ample time.

Don't change your dive plan during a deep dive in a way that makes the dive less conservative. For example, if you planned a maximum 20-minute dive time, it's acceptable to surface at 15 minutes, but don't change your mind and stay 25 minutes. Following this guideline reduces the possibility of narcosis affecting your judgment in an unsafe way.

**4. Plan for reduced bottom time.**

Available time diminishes rapidly below 18 metres/60 feet thanks to short no stop limits and rapid air consumption. Stay closer to your ascent point than you would on a comparable shallow wreck.

On a tall, intact wreck, it's sometimes possible to moor or anchor into the wreck's top area. You have more bottom time and see more of the wreck if you plan a computer-assisted multilevel dive that begins by descending to the deepest point followed by gradually working your way upward in levels as you explore. Generally, avoid "sawtooth" dive profiles that involve ascending to a significantly shallower portion on the wreck, then dropping back down to locate and ascend the anchor/mooring line.

**5. Be trained as a PADI Enriched Air Diver.**

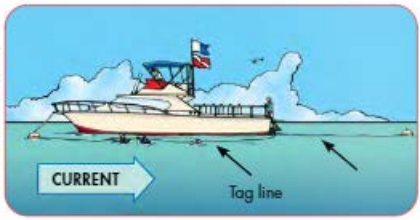
Enriched air extends your no stop limits for a given depth, giving you more time to explore. It especially pays off if you plan to make two or more dives because you reduce your residual nitrogen considerably, allowing longer or deeper repetitive dives. Using EANx with an EANx computer can further increase how much time you get to explore by crediting you both for a multilevel profile and enriched air use.

*Enriched air nitrox extends your no stop limits, giving you more time to explore a deeper wreck.*

## Wreck Diving in Currents

Just as you commonly come across wrecks in deeper depths, you also commonly find them in areas with current. Current diving calls for special procedures that vary from region to region and boat to boat. With only a few exceptions (such as drift diving), however, these procedures are more similar than different from one place to the next.

The dive begins by anchoring the boat by the wreck, or attaching to a permanent mooring over the wreck. The crew then secures various lines to make it easier to reach the wreck and avoid being swept down current. From the stern, they run a long *trail line* (also called "drift line" or "current line") with a float at the end. In all but the weakest currents, the dive boat also runs a *swim line* from the stern, trail line or entry area to the anchor/mooring line.




*When wreck diving where there's current, you use lines as you ascend and descend so that you can progress against the flow.*

You enter the water and immediately seize the swim line or the trail line. You use the swim line to pull yourself against the current to the anchor/mooring line. If you need to wait for your buddy, you either wait on the trail line, or you move up the swim line and let your buddy follow you. In very strong currents, the crew may use a boat hook to pull the current line up to you so you can hold it *while* you enter (obviously, these conditions are for those with considerable experience diving in currents).

*When diving in currents, hold on to the trail line or swim line while waiting for your buddy to enter.*

When you and your buddy reach the anchor/mooring line, you descend hand-over-hand to the wreck. (Note: Permanent mooring lines tend to be encrusted with aquatic growth, so watch where you put your hands and have your gloves on from the start of the dive.) The current will usually be slower near the bottom, and most wrecks shelter you from the current on the lee side. You usually explore along the lee side, and if necessary, pull yourself along the wreck, being cautious where you put your hands.

*When you and your buddy reach the anchor/mooring line, continue your descent, hand-over-hand to the wreck.*

At the end of the dive, return to the anchor/mooring line for your ascent. Maintain contact with it, hand-over-hand, followed by your safety stop at 5 metres/15 feet. Continue up to the swim line, and follow the swim line back to the stern, exit point or trail line — to whichever it's secured. You want to maintain contact with the lines at all times during your descent and ascent. However, the trail line extends from the boat in case a diver surfaces alongside or is swept off a line and has to swim for the boat in the current. It also provides you a place to wait for your turn to exit. An inflatable signal tube, whistle and other signaling devices should be standard equipment, but they're especially important in circumstances in which you could end up down current and need to signal the boat to pick you up.

## Why Hand Pulling Works

You only have to pull yourself along a rope in current once to realize that it's much more effective than swimming, but it may not be obvious *why*. After all, your legs have more strength than your arms – shouldn't kicking be more effective?

Try this with a buddy while floating at the surface in calm water: With neither of you using your feet, gently push away from your buddy with your arms, and note how far you drift from where you started. Now push with the same force against a fixed object, like a pool side or dock. You'll drift (give or take, depending on your buddy's size relative to yours) about twice as far.

Your buddy moved away from the start point about as far as you did. In other words, about half your directed energy goes into moving you, and the other half into moving your buddy. This is like using fins — about half the energy of each kick goes into moving you, and the other half goes into moving the water you kick against.

When pushing against the pool side, all your directed energy goes into moving you because the pool side can't move. This is like pulling yourself along a rope or over a wreck – virtually all of your energy goes into moving you because you're directing your energy against a fixed object.

In addition, you can't rest in a current while swimming. If you stop swimming, you are swept down current and have to expend energy to get back to where you stopped. When pulling yourself, you just stop and hang on. Your pulling muscles rest and you don't lose ground.

### Local Orientations to Unfamiliar Wrecks

Wreck diving varies from region to region and from wreck to wreck. As a PADI Wreck Diver, you'll be familiar with the basic techniques for exploring wrecks in recreational diving environments, but you'll want a local orientation to unfamiliar wrecks whenever possible.

One reason a local orientation helps is that the optimum techniques may differ locally from the ones you're used to – sometimes significantly so. A local orientation acquaints you with the particular procedures that work well in the area, or on a specific wreck.

The second reason for getting a local orientation is to enhance your dive. A local orientation lets you know about a wreck's unique points of interest, its hazards and any regulations or community practices that apply, in advance. This makes it easier to plan your dive. If you'll only have a chance to make one or two dives on the wreck, it steers you to the best spots on it.

## Wreck Diving World Hot Spots: North American Great Lakes

The Great Lakes on the border between the U.S. and Canada hold some of the best preserved major shipwrecks in the world. Although they're freshwater bodies, the Great Lakes are really inland seas, subject to violent storms that have sunk major ships more than 220 metres/700 feet long. The combined shoreline of Lakes Huron, Ontario, Erie, Michigan and Superior is greater than the entire U.S. Atlantic coastline.

Ships have been sailing the Great Lakes since the 1500s, with commercial traffic common by the end of the 18th century. During the 1800s, wooden frigates gave way to iron steamships, which evolved into today's steel freighters.

Estimates suggest that somewhere between 3000 and 10,000 wrecks lie in the Great Lakes. Those that divers have found tend to be well preserved by the cold, fresh water. Even wooden ships remain remarkably intact after more than 100 years underwater. Divers frequently find artifacts in remarkable condition (though most areas prohibit removing these). As wreck diving has grown popular in the Great Lakes, underwater parks and preserves have been established in both the U.S. and Canada to protect these wrecks. Some of the most popular include Alger Underwater Preserve, the Apostle Islands National Lakeshore, Devil's Door, Fathom Five National Park (a.k.a. "Tobermory"), Isle Royal National Park, and Manitou Passage Underwater Preserve.

The Great Lakes remain cool year round, calling for full wet suits or dry suits. Visibility changes depending on weather and you can encounter moderate currents as well. Most divers visit wrecks by boat, but you can reach quite a few wrecks from shore. Dive depths range from snorkel depths to beyond the limits of recreational diving.

*Photo courtesy by Al Hornsby*

## Exercise 4 – Wreck Diving Techniques

1. Four aspects of a wreck to evaluate include (check all that apply):
   - ☐ a. points of interest.
   - ☐ b. number of divers on the wreck.
   - ☐ c. possible hazards.
   - ☐ d. general condition.
   - ☐ e. entry ways.
   - ☐ f. recoverable artifacts.

2. Which is not a common method for navigating on a wreck?
   - ☐ a. feature reference
   - ☐ b. base line
   - ☐ c. following the wreck's layout
   - ☐ d. dead reckoning

3. A compass may be inaccurate on a wreck because
   - ☐ a. steel and iron may cause the needle to deviate.
   - ☐ b. currents common around wrecks make it hard to keep a heading.

4. Wreck dives deeper than 18 metres/60 feet call for which of the following considerations (check all that apply):
   - ☐ a. accounting for nitrogen narcosis
   - ☐ b. certification as a PADI Deep Diver
   - ☐ c. planning for reduced bottom time
   - ☐ d. high capacity cylinder or a cylinder hanging at 5 m/15 ft
   - ☐ e. be certified as a PADI Enriched Air Diver

5. When wreck diving in a current, you'll generally drop straight to the bottom and avoid all contact with the boat's anchor/mooring line.
   - ☐ True
   - ☐ False

6. When diving on an unfamiliar wreck, there's not much benefit of a local orientation if you're a certified PADI Wreck Diver.
   - ☐ True
   - ☐ False

How'd you do?

*1. a, c, d, e. 2. d. 3. a. 4. a, b, c, d, e. 5. False. You generally descend and ascend along the anchor/mooring line to keep from being carried down current. 6. False. A local orientation to an unfamiliar wreck acquaints you with local techniques, points of interest, hazards, and any laws or community practices that apply.*

# Researching Underwater *Wrecks*

For many divers, wreck diving encompasses much more than visiting the remains of a ship. It includes visiting the ship's past through research. To these individuals, exploring the local library, archive or museum, or the Internet is as exciting as exploring the wreck itself.

## Study Objectives

Underline/highlight the answers to these questions as you read:

1. What are three reasons for researching the history and condition of a wreck?
2. What two sources provide quick, basic information about diving a popular wreck?
3. What possible sources can you check when researching more in-depth, detailed wreck information?

Whether wreck research appeals to you depends, at least partly, on what draws you to wrecks in the first place. If wrecks interest you for their roles as artificial reefs, why a ship sank probably means less to you than if wrecks interest you from an historical perspective. Uncovering the wreck's history may be something you consider a normal part of diving a wreck if your passion is history or archaeology, but not if you're mainly interested in photography or nature.

Nonetheless, researching a wreck's history – at least minimally – benefits you in three basic ways when you dive the wreck. First, the wreck's history may explain the wreck's location and condition. If you're interested in nature, it's useful to know, for example, when the ship sank so you know how long aquatic life has been developing on it.

Second, research reveals or confirms a wreck's identity, especially when dealing with a newly discovered wreck. Knowing what the wreck is plays an important role in determining whether the wreck has historical/archaeological significance, and whether it may have some unusual hazard to avoid, such as munitions.

Third, research helps you uncover unique points of interest, the suitability of the wreck as a dive site, and potential hazards. As you just learned, a local orientation usually covers these points, but research may uncover new facts, or help provide this information when you can't get a local orientation.

You can get wreck information from basic, readily available sources, and from more involved references that take more time and effort to locate. The basic sources apply to most popular wrecks, and generally provide what you need to know for diving purposes, such as the wreck's general history, condition and points of interest. Quick, basic wreck information sources include:

- **Dive stores and dive boats.** You can usually get a few facts about popular wrecks in their area, plus general wreck conditions, pointers and things to watch for.


*You can usually get facts about popular wrecks at a local PADI Resort or Dive Center. The more popular wreck diving is in the area, the more information they may have.*

- **Dive magazines, guidebooks and the internet.** Look for articles and web pages about popular wrecks, which usually include more detail and background information than you're likely to get from a dive store or boat. The internet in particular is a good source because you can often find a great deal of information using search engines. The caution is that you'll sometimes find conflicting information about historical details. Be aware that articles, books and websites on the particular wreck become dated with respect to the wreck's condition as it deteriorates. Check publication and revision dates for the most current information.

*Dive magazines, guidebooks and the internet can be excellent sources of information about popular wrecks.*

For more detail than you're likely to get from a local dive store or boat, and when you can't find a wreck's published history (such as with a newly discovered wreck), you may want to conduct some more involved research. You may also find it interesting to research a well-known wreck, because sometimes the "facts" that divers pass on to each other are inaccurate. Although the internet can get you started, for in-depth wreck information you're likely to end up at sources of records that may not be online. These include:

## The U-Who

Perhaps the most noted example of persistence in wreck research is the story of John Chatterton and Richie Kohler and the identification of a German U-boat found in the waters off New Jersey, USA, in 1991. Dubbed the "U-Who" by local tec divers (it lies at 70 metres/230 feet) because it had no immediately identifiable marks and there were no records of a U-boat lost in the area, for six years Chatterton and Kohler dived the wreck repeatedly looking for clues. During the winter, they poured through records in the U.S. and Germany.

Finally, in 1997, Chatterton and Kohler recovered a toolbox that identified the wreck as the U-869, lost thousands of kilometres/miles from where officially recorded as sunk. It solved one of the last mysteries of World War II. The story of their quest is documented in Robert Kurson's *Shadow Divers* (2004), but it doesn't end with the U-869. Afflicted with the wreck-research bug and demonstrating a gift for it, Chatterton and Kohler launched the History Channel's *Deep Sea Detectives* as cohosts, leading viewers to exotic wrecks and other sites around the world.

- **Libraries.** Look up newspaper articles (they may be on microfilm) from the date of the wreck's sinking. As you scan through the papers, keep an eye out for references to other wrecks — you might uncover facts about an undiscovered wreck that no one has looked for.

- **Museums.** Write or visit maritime museums for specific information. These specialized museums maintain incredible volumes of files, photos and other information. Often, you can access more than you want to know just by identifying the ship. When possible, identify the ship by name, approximate age, sinking date (or approximate date, if known) and registry. The more information you provide, the more easily the museum can locate records if it has any.

- **Archives.** Write or visit the archives maintained by insurance companies, lighthouses, harbors and national history libraries/museums. Ask for specific information; you'll usually get a list of what they have available, from which you request items that interest you.

- **Historical/archaeological groups.** Local groups often know the history of regional events and wrecks in surprising detail.

- **Maritime societies.** These groups usually maintain records of members and their ships.

- **Maritime insurance companies.** Lloyds of London and other companies that insure ships keep records on every ship, past or present, floating or sunk, that they insure. When a ship sinks, filing the claim usually involves detailed reports of who, what, where, why and when.

- **Universities.** The archeology or history departments may have information and can offer advice on research.

Don't hesitate to request information from sources like these – that's what they're there for. If people like you didn't have an interest in old records and ship history, there wouldn't be any reason to have these museums, libraries and archives. However, don't expect everything for free or for them to do heavy research for you. Most institutions like these operate on tight budgets, and while they don't try to make a profit, they often require you to cover the cost of photocopying, duplicating microfilm, etc. Often, they will grant you reasonable access to the records, but you must do most of the digging yourself.

## Wreck Diving World Hot Spots: The Graveyard of the Atlantic

Off the United States' east coast lies the Graveyard of the Atlantic. Centered off North Carolina and reaching north of the Canadian border and south into Florida, this expanse harbors the remains of thousands of ships. Sunk by storms, torpedoes in both World Wars, collisions and other accidents, these ships have become very popular with wreck divers.

One reason is that the continental shelf extends far off the coast, so that wrecks more than 20 kilometres/10 miles offshore lie shallow enough for recreational diving. In addition, the Gulf Stream sweeps up the coast, so that many of the wrecks (especially more southern ones) are in warm tropical water much of the year. Currents are common and temperatures vary, however. You can dive a wreck one day with minimal exposure protection and no current, and the next find yourself on the same wreck in a dry suit, hanging onto the anchor line against a moderate flow.

Most of the popular wrecks are from World War II (including a few U-boats), but not exclusively. Some, such as the *San Diego* and *Proteus* date back to the World War I era, while others, such as the *Tarpon*, sank much more recently.

## Exercise 5 – Researching Underwater Wrecks

1. Three reasons for researching the history and condition of a wreck are (check all that apply):
   - ☐ a. to determine the wreck's historical significance.
   - ☐ b. to confirm the wreck's identity.
   - ☐ c. to confirm the dive boat brought you to the right wreck.
   - ☐ d. to determine points of interest and potential hazards before the dive.
2. Two sources for quick, basic information about a popular wreck are:
   - ☐ a. archives.
   - ☐ b. dive stores/boats.
   - ☐ c. dive magazines/internet
   - ☐ d. maritime museums.
   - ☐ e. insurance companies.
3. Sources for more in-depth, detailed wreck information include (check all that apply):
   - ☐ a. archives.
   - ☐ b. dive stores/boats.
   - ☐ c. dive magazines/internet.
   - ☐ d. maritime museums.
   - ☐ e. insurance companies.

How'd you do?
*1. a, b, d. 2. b, c. 3. a, d, e.*

# Mapping *Shipwrecks*

Although you probably won't map every wreck you dive on, from time to time you'll find it useful. You may map wrecks purely because you find it enjoyable, but there are two practical reasons for mapping wrecks.

The first is to simplify future dives. As you've already learned, two of the primary wreck characteristics you watch for are points of interest and potential hazards. By creating a wreck map, you can note these, updating and expanding the map (for a large wreck) from one dive to the next. Some divers keep copies of their maps at each stage, so they can show how the wreck has changed over time. Besides helping you plan future dives, you can share maps with friends planning to visit a wreck.

The second reason to map a wreck is for planning penetration

### Study Objectives

Underline/highlight the answers to these questions as you read:

1. What are two benefits of mapping a wreck?
2. What four tools can you use when mapping a wreck, and what is each used for?

dives. A wreck map helps you plan possible entries into the wreck, and, if you carry it with you (laminated in plastic or sketched onto a slate), it can help guide you through the wreck during the penetration.

## Wreck Diving World Hot Spots: Aruba

Not long ago, few divers thought of Aruba in the Netherland Antilles as a major wreck diving destination. Known for reef diving, water sports and other resort amenities that make it a major Caribbean attraction, Aruba's wrecks were a "secret." That, however, has changed.

Aruba is home to several major shipwrecks easily within the recreational depth range in warm, clear, tropical water. Most lie a short boat ride from the popular dive operators (15 minutes), with attractions suited to wreck beginners and hardcore advocates alike. Some of Aruba's major wrecks are true marine casualties, like the *Antilla* and the *Pedernales*, both World War II casualties. Others, like the *Jane Sea*, *Debbie II* and the *Star Garren* are intentionally placed, largely intact artificial reefs. They're a delight for underwater photographers and naturalists as well as wreck enthusiasts.

*The Antilla is one of Aruba's favorite wrecks. It's known for its large open cargo hold that allows divers to explore inside without entering an overhead environment.*

### Basic Wreck Mapping Techniques

Over the years, divers have come up with perhaps dozens of methods for mapping wrecks. These range from archaeological methods, which require placing a grid over the wreck and mapping it with precision and detail square by square, to a rough sketch from memory. For most purposes, something in between suffices.

You'll find four tools useful for mapping.

- **A large slate.** Draw your map on as a large a slate as possible. Your map will be more accurate if you give yourself room to draw. Later you can transfer your sketch to paper or a computer photocopying it, scanning it or photographing it digitally for finishing.
- **Compass.** Use this to determine the relative angle between different wreck features. Again, beware of compass deviation caused by steel or iron. Regular compass checks while mapping should improve the quality of your map.
- **Marked rope or measuring tape.** Use a tape or marked line to give you precise distances between objects and features. You can also measure with kick cycles and arm spans. Tape/line gives you greater accuracy, although kick cycles/arm spans may save you time.
- **Navigational aids.** The Nav-Finder™ and similar navigation aids that help you assess bearing and distances help you sketch map features with greater accuracy, and save you time. They're often useful for general navigation on a wreck, especially one that's broken up.

Draw your map using your compass to measure relative angles and measuring distance from one part to the next. As you sketch, try to draw everything to scale, but unless you take a ruler, that may be difficult. For that reason, note the measured distances you draw, and note the relative angles from your compass. Later you

*As you sketch, try to draw everything to scale. Note measured distances and relative angles so you can refine your map after the dive.*

can make a second draft with a ruler and protractor on graph paper for better scale and angle precision, or with a computer drawing program.

For additional utility (especially if you share your map with other divers), include information such as the depth at various points – especially at the bottom, on different deck levels and for prominent features. It may help to show compass heading and approximate distance between key features (especially if they're beyond sight underwater).It's common to include the wreck's GPS (global positioning system) coordinates, or a miniature map inset with shore bearings for locating the wreck. With today's high accuracy GPS, on large wrecks you may note the GPS coordinates for different points.

## How to Mark a Wreck

When you wreck dive from a charter boat, finding the wreck is easy – you just enjoy the ride until the captain or divemaster announces your arrival. The crew *marks* (pinpoints) the wreck for you.

When diving from a private boat, on a wreck that lacks a permanent mooring, you'll have to mark the wreck yourself. Marking a wreck is as much an art as a science – it sounds easy, but it takes practice, especially when dealing with wind or current. Minimally, you'll need a bottom finder that shows relief, and ideally, you will also have a GPS. A couple of marker buoys with sufficient line for the depth greatly simplify the job, too. If you have current, use an extra heavy anchor on the buoys so they deploy fast and don't drift far.

Begin by motoring to the wreck's coordinates (GPS or lined up shore bearings). As you approach the coordinates, slow down and watch the bottom finder, looking for a sharp spike or rise that indicates the wreck. (The taller the wreck and the flatter the bottom, the easier this will be.) If you're lucky or if you've gotten really tight bearings (like GPS), you'll motor right up to the wreck; toss in a marker buoy when you do. Stay close to the buoy and tie it off as soon as it hits bottom so you don't get much slack.

If you miss the wreck, toss in and tie off a marker at the coordinates where it was supposed to be. Use this as a reference and begin searching away from it. In conditions with little current or wind, an expanding square pattern with the buoy at the center works well. With current or wind, initially try a U-pattern into the current or wind. Keep searching (and this can take a while) until you spot the wreck on your bottom finder. Hint: leave the fish-finding option activated on your bottom finder because fish tend to congregate around a wreck. When you start finding many fish, you're probably getting close. When the wreck shows on the bottom finder, toss in and tie off a second buoy.

Motor down current/downwind of the buoy marking the wreck, and have someone stand by the anchor. Motor directly toward and past the buoy (don't foul it in the props) until you spot the wreck on the bottom finder. Don't be surprised if you pass the buoy before you find it. Motor all the way across the wreck until you think you've cleared it, then hold the boat in place while someone lowers (not drops) the anchor quickly to the bottom. Put the engine in neutral and the current/wind should drift you back over the wreck and set the anchor. Try a touch of reverse engine to make sure it's holding.

Normally this procedure puts the anchor on the up current/upwind side of the wreck, but not in it. To be sure you don't put the anchor in the wreck – important for old, historical or protected wrecks – motor until you first see the wreck on the bottom finder then, while someone begins lowering the anchor, ease off the power just enough so you drift back off of it, then increase power to stay in place. This puts the anchor downwind/down current from the wreck. If you don't see the wreck when you reach the bottom, it should be directly ahead into the current.

Fair warning: This sounds easier than it is, especially when you're trying to mark a broken up wreck on an irregular bottom. Be patient, and if possible, practice with someone experienced at marking wrecks. Don't forget to pick up your buoys when you leave. Good luck.

## Exercise 6 – Mapping Shipwrecks

1. Two benefits of mapping shipwrecks include (check all that apply):
   - ☐ a. to note the current direction over the wreck.
   - ☐ b. to note points of interest and potential hazards.
   - ☐ c. to assist in planning penetration dives.

2. Four tools that you can use in mapping a wreck are (check all that apply):
   - ☐ a. large slate.
   - ☐ b. marked rope or tape measure.
   - ☐ c. navigational aids.
   - ☐ d. nontoxic dye.
   - ☐ e. compass.
   - ☐ f . anchor chain.

How'd you do?
*1. b, c. 2. a, b, c, e.*

# Wreck *Penetration*

## Study Objectives

Underline/highlight the answers to these questions as you read:

1. What four pieces of equipment should be used for a penetration dive, and what is each piece used for?
2. What are the four penetration limits to observe when inside a wreck?
3. What are the proper techniques for:
   - Entering a wreck?
   - Moving through a wreck?
   - Using a penetration line in a wreck?
4. What are the proper responses and actions for:
   - Loss of visibility due to silting?
   - A lost or cut penetration line?
   - Light failure?
   - Air supply loss?

As you've already learned, entering a shipwreck (or any other overhead environment) presents many hazards you don't meet in open water. Because of this, many divers prefer to stay outside the wreck, avoiding the hazards and special equipment, training and procedures overhead environments require.

However, wreck penetration may interest you for the added challenge. If so, keep in mind that wreck penetration is a "do it right or don't do it all" activity.

**Entering an overhead environment without the proper equipment and without following proper procedures may expose you to significant risk. Entering an overhead environment without the proper training has taken hundreds of lives.** Never forget that many overhead environments look safe and unthreatening, yet pose grave danger to an unwary diver.

As a PADI Wreck Diver, you'll practice the techniques for safe, *limited* wreck penetration within recreational diving limits. Your training will be appropriate for penetrating a stable, secure wreck, within the light zone, in excellent environmental conditions, and applying all the needed equipment and procedures.

**Penetrating wrecks beyond the limits you learn in this program requires specialized technical or commercial diver training, and is beyond the scope of this course. Don't exceed your training/experience limits.**

## Wreck Penetration Equipment

Offsetting the hazards unique to penetration requires additional equipment beyond what you need to dive safely in open water. None of the following equipment is particularly complex, and you may already have most of it. However, without the necessary equipment, don't attempt a penetration dive.

### Dive lights

Although you will remain within the light zone (area from which you can still see the natural light at the entrance), ambient light dims as you move away from the entry. Therefore, you'll need *at least* two dive lights – a larger primary light and a more compact backup. Many wreck divers carry no fewer than *three* dive lights during penetration dives.

*Recreational wreck penetration requires a minimum of two lights, a primary and a backup. Additionally, you remain within the light zone.*

## Wreck Diving World Hot Spots: Where You Are

Besides the well-known wreck diving hot spots previously described, you'll find numerous other areas with concentrations of wrecks: Australia's Victorian coast boasts more than 800 wrecks, and the Mediterranean holds thousands that span the centuries. Off the Atlantic coast of south Florida in the U.S., the dive community has created a wreck diving haven with its artificial reef program.

So, while you may dream of places like Truk (Chuuk) Lagoon or Scapa Flow, don't overlook the opportunities right under your nose. The very fact that they're visited by fewer divers sometimes makes these dives more exciting than more famous, popular areas.

You carry a backup light in case your primary light fails, of course. Compared with your other dive equipment, lights are some of the least reliable. This isn't the fault of the manufacturers (who have considerably improved the reliability and quality of dive lights in the past twenty years), but the nature of lights: bulbs burn out, batteries wear out, and the lights themselves flood occasionally, even with proper care.

By properly maintaining your lights and their o-rings, and making sure you have fresh (or freshly recharged) batteries before you dive, you minimize the possibility a light will fail, but a statistical look shows how important it is to carry a backup: Suppose your light is 95 percent reliable. That sounds reliable, but you have a *72 percent chance of light failure within 25 dives.* Even if your light were 99 percent reliable, you would still have about a 22 percent chance – about one in five – that it would fail within 25 dives. However, if you have two lights that are 95 percent reliable, the chances are about 6 percent, or one in 16, that both will fail on the same dive in 25 dives. If you have three such lights, the chances drop to one in 320, and with four, chances are only 1 in about 6,450 that you'll have all four fail on the same dive within 25 dives. It's not hard to see why experienced wreck divers carry three or four lights, rather than the minimum two.


Carry your backup dive lights so that they're out of the way and don't dangle, yet remain accessible with one hand. This makes it possible to switch lights while using the other hand for maintaining buddy contact or penetration line contact. Most wreck divers find it simplest to attach a clip to the dive light, and then clip the light to a ring on the BCD. Another option is to carry it in a thigh pocket or BCD pocket.

Learn more *see the PADI* Night Diver Manual

*Your primary light is typically a full-size light; with a more compact light suitable for a backup.*

### Penetration line and reel

The penetration line provides a visual/tactile reference for finding your way out of the wreck, even if you're confused or unable to see due to silt. Statistics show that the most common cause of fatalities in overhead environments is a failure to run a continuous line to open water. Never make a penetration dive without this line and a proper reel for handling it.

***Line*** – Wrecks frequently have sharp or abrasive surfaces than can sever your line, so use a strong, durable line made from a nonbiodegradable material. By far, nylon is the most popular choice because it doesn't float, it's durable and it handles well.

The standard line you use is relatively thin braided nylon line (generally #36 line), though it is heavier than the line used in cavern and cave diving. It is more like a heavy string than rope, so it tangles easily and jams reels if you handle it carelessly. It stands up to a surprising amount of abuse, but you must place it properly so it doesn't cause entanglement or get cut by abrasion, and it's not strong enough for a diver to pull on for propulsion. Nonetheless, it is a reliable and vital visual/tactile trail back out of the wreck.

A few instructors and novice wreck divers use "beginner's line," though this has become less common

with the rising popularity of standard reels and line. Beginner's line is normally twisted or braided .6 centimetre/.25 inch or larger nylon rope. Rope this size stands up to abuse, such as a divers using it to pull themselves through the wreck (not a proper procedure), and it doesn't tangle easily. However, it's use has fallen into disfavor because large line requires a large, bulky and awkward reel or line caddy, and it's more clumsy to handle and place compared to using a standard line and reel.

For this reason, beginner's line is primarily for inexperienced wreck divers making very limited penetrations. Ideally, use standard line after taking the time to learn how to handle it outside the wreck.

*Standard wreck penetration line tolerates a lot of abuse, but you must place it properly.*

***Reels*** – a standard reel with standard line is preferred because it only requires one hand (except when reeling the line back up). They clip easily to your BCD, and lock so they don't unreel when you're not using them.

Beginner's line requires a large plastic reel or line caddy. Because of their size, you generally have to hand carry them throughout the dive, and they take two hands to use, even when paying out line. This is another reason why beginner's line isn't used much anymore.

*You can handle a standard reel (right) with one hand most of the time. Beginner's line requires a line caddy (left), which requires two-handed use most of the time. Today, most divers learn to use a standard reel from the start.*

Inspect your penetration line and reel before each use. Discard any line that looks frayed, abraded or damaged in any way. Be sure the reel operates smoothly and properly, and repair or replace it before diving with it if it doesn't.

**Slate**

Earlier you learned that it's a good idea to carry a wreck map when making a penetration dive. You can sketch the map on your slate for reference during the penetration. As you go through the dive, you can make an interior map with notes to aid planning future penetration dives, and as a secondary reference to help find your way out if necessary.

Slates also come in handy for communication, especially if you find yourself in an awkward spot that makes it difficult to face your buddy for signaling. Although you should avoid restricted areas like these, if you find yourself in one by accident, you can write a message to pass to your buddy.

## Tips on Clips

The extra equipment you carry on a penetration dive makes accessory clips for attaching it to your BCD especially useful. While clips are straighiforward items, here are some hints to get maximum utility from them.

- **Brass, plastic and stainless steel**. You can get accessories clips in brass, chrome plated brass, plastic and stainless steel. Field experience shows that some types of chrome plated don't hold up as well as brass or plastic. Many divers prefer brass, but plastic clips work well for lightweight items, and they don't add much to your load. Stainless steel clips are probably the best clips, but they're considerably more expensive than brass.

- **Sliding gate clips**. Most divers use either sliding gate clips or swinging gate quick clips. You have to open sliding gate clips (a.k.a. "dog clips") to attach them, whereas swinging gate clips snap right onto lines or BCD D rings. That's exactly why most wreck divers prefer sliding gate clips – swinging gate clips have a reputation for snapping onto penetration lines, cable and other things snagging a diver. In some areas, divers call quick clips "suicide" clips, in reference to the possible hazard they create.

- **Clip on the accessory**. You will find it handiest to put clips on your accessories, rather than on your BCD. With a clip on each light, reel, etc., you know there is a clip for each, and you can easily move them to various D rings, loops and other places on your BCD.

### H-valve, Y-valve or pony bottle

Although they're not considered mandatory within recreational wreck penetration limits, in some areas and wrecks, you may find that local divers consider redundant valves or air supplies standard equipment.

Originally developed for tec diving, H- and Y-valves are special cylinder valves that allow you to attach two separate regulators. If one were to fail (and freeflow), you or your buddy would close the portion of the valve supplying that regulator, and you would end the dive using the other. When using this configuration, you normally have your primary second stage and your alternate second stage each on a different first stage. It's common to use H- and Y- valves with high capacity cylinders.

Pony bottles are miniature scuba systems with their own regulators typically attached to your main cylinder. These equip you with a completely independent air source, as well as with added air supply. The primary drawback (compared to the H- or Y-valve) is that it's bulkier and not as streamlined.

Both H- and Y-valves and pony bottles add a safety margin for the overhead environment because, in the event of an air supply problem, it's easier to exit a wreck using your own regulator than sharing air with your buddy's alternate. The deeper the wreck, the more important this extra margin may be. However, they do not eliminate the need for both of you to have appropriate alternate air sources for sharing air, nor do they replace the need for proper air use planning and management.

*H- and Y-valves allow you to equip yourself with two separate first and second stages.*

*Pony bottles are miniature scuba systems attached to your main cylinder.*

## Optional Penetration Equipment Configurations

Depending on the environment and the particular wreck, you may find the following ideas useful when setting up your equipment for penetration dives.

- **Two weight belt buckles.** In cool water environments, you may need a full wet suit or dry suit. This calls for a lot of weight to attain neutral buoyancy. Although you should consider a quick release primary safety equipment for open water diving, in an overhead environment, you wouldn't want to accidentally lose a heavy weight belt because extreme buoyancy could make it difficult to exit the wreck. As a precaution, some divers put two buckles on their belt, and clamp the extra one shut when they enter the wreck. Upon leaving the wreck, they release the extra, restoring the ability to ditch their weights quickly with one hand.

- **Head lights.** Some divers like to mount lights on their heads. This frees their hands and the light always points where they're looking. Some lights have mounting straps especially for this purpose, and many lights mount easily on helmets, which provide some protection. When using a head mounted light, remember that it's easier to accidentally shine the light in your buddy's eyes.

- **Canister HID lights.** At one time exclusively used by tec divers, today's high power canister lights are becoming popular with recreational divers for night diving, cavern diving and wreck diving. Canister lights, which have a separate light head and battery canister, were at one time so heavy and bulky that recreational divers rarely used them. Modern HID (High Intensity Discharge) versions are much more compact and lighter, so more and more divers take advantage of their substantial power and duration.

- **Snorkel quick release clip.** It's important to have your snorkel in case you need to make a long surface swim, even one that's not part of your dive plan. Although you can carry a snorkel many places, the most accessible spot is on your mask strap. Another popular option is to carry a folding model in your pocket. Before entering the wreck, unclip your snorkel and leave it secured to your penetration line tie point, or if it is a folding model, put it in your pocket. When you return, clip it back on and you're ready to handle a surface swim.

*Many wreck divers use foldable snorkels they can carry in their BCD pockets when planning penetration dives. After exiting the wreck, they can attach the snorkel to their masks to have available at the surface.*

Snorkels at your tie point also alert other divers that your line is a penetration line, not a hazard they should cut out of the way.

- **One metre/39 inches or longer alternate air source hose.** Since the inside of a wreck can limit how close a donor and receiver can get, wreck divers prefer the conventional right-handed second stage alternate air source on a 1 metre/39 inch hose. A few use a two metre/seven foot hose, which is the tec community standard for technical diving wreck or cave penetration. Virtually all recreational alternate air source second stage and alternate inflator regulator configurations work adequately in recreational wreck penetration environments, but you may want to consider hose length for improved performance in an out of air situation.

- **TecRec configuration.** Especially when using a two metre/seven foot hose, some wreck divers use a hose configuration similar to the standard tec configuration you learn in the DSAT Tec Deep Diver course. In this configuration, you wear a standard hose length second stage suspended on a bungee necklace. The long hose goes straight down along the cylinder, then up at the hip, across the chest behind the neck and into your mouth. In the event of an air supply emergency, you give your buddy the long hose primary out of your mouth and switch to the short hose secondary. This is an especially suitable option if you plan to move into tec diving. It's recommended that you practice using this configuration in controlled conditions before making a wreck penetration dive with it.


*Learn more see the DSAT* Tec Deep Diver Manual

## Wreck Penetration Limits

Besides the equipment you need, the recreational overhead environment imposes four limits that you should observe when penetrating a wreck, in addition to the no decompression limits and depth limits you observe when diving in open water.

**These limits couple with your equipment and training to keep you within reasonably manageable risk limits. Tec divers and other divers with considerably more equipment and training have more liberal limits in penetrating a wreck, but these don't apply to you until you have their level of equipment and training.**

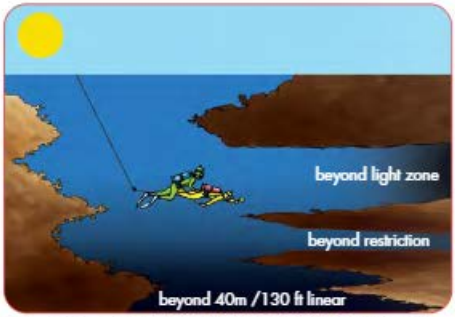
### 1. Edge of light zone.

Stay within sight of the natural light where you entered the wreck. This means that the available natural light may limit your penetration. If you're diving in relatively murky, low visibility conditions, less light enters the wreck and you may not be able to go in as far as when you have very clear water with good visibility. This means, of course, that you shouldn't make penetration dives at night.

*Remain within the light zone - the area in which you can still see natural light from the entrance.*

### 2. Linear distances of 40 metres/130 feet.

In open water, your maximum depth shouldn't exceed 40 metres/130 feet. Similarly, your maximum distance from the surface when penetrating a wreck shouldn't exceed the same distance, which means that your depth plus your distance from the wreck entry shouldn't exceed 40 metres/130 feet. For example, if you're diving on a wreck 30 metres/100 feet deep, you wouldn't go more than 10 metres/30 feet into the wreck.




*The recreational overhead environment imposes four limits that you need to stay within.*

To help gauge this, some divers knot their penetration line each 3 metres/10 feet. If you're diving on a wreck at 30 metres/100 feet of depth, you know that you've reached the limit when you reach the third knot.

### 3. One-third of your air supply.

Overhead environments call for reserving two-thirds of your air or enriched air for exiting the wreck. This includes the air you use from the time you leave the surface. For example, if you begin the dive with 200 bar/3000 psi, you would turn around and head for the exit when you reach 133 bar/2000 psi. This essentially means that you use one-third in, one-third out and one-third for reserve, and is another reason many wreck divers prefer high capacity cylinders.

Overhead environment accident analysis shows that failing to observe the Rule of Thirds contributes to accidents. Saving two-thirds of your air for exiting gives you more of the most important factor you need to

handle a problem inside a wreck: time. You can solve almost any problem given enough time, and the Rule of Thirds gives you about twice as much time to get out of a wreck as it took to get in. Never violate this important principle when penetrating a wreck. It's worth noting that tec divers also use the Rule of Thirds in technical wreck diving and cave diving.

While you must turn and exit once you've used a third of your air, you don't have to *surface* with all this reserve. Once you're outside, you can use the remaining air exploring the wreck's exterior until you reach a conventional open water limit, such as no stop time or appropriate open water reserve.

**4. Space too narrow for two divers to pass together.**

In recreational penetration diving, you don't go past any area that is so narrow that you and your buddy couldn't move through it together while sharing air with a conventional alternate air source. This means there should be enough room for you to swim side-by-side or over-under. If it's tighter than that, don't go through.

*Never pass through an area that is too tight for two divers to go through together while sharing air.*

## Wreck Penetration Techniques

Moving through a wreck differs in many ways from swimming through open water. You're traveling through

## Recreational Penetration & Technical Penetration

The technical diving community is a small but visible niche within the dive community. You may hear about technical divers making extensive penetrations into wrecks, as well as other overhead environments. As a PADI Wreck Diver, you should be familiar with how technical and recreational penetration differ, and why.

Recreational penetration follows the limits you have just learned: Maximum 40 metres/130 feet from the surface, within the light zone, within the Rule of Thirds and not past any area too narrow for two divers together. Recreational penetration limits were introduced by the cave diving community in the form of cavern diving. The cave community, which is the oldest and most experienced group in technical diving, recognized that many divers wanted something between open water diving and full fledged technical cave diving. They also recognized that for those few interested in technical cave diving, this created an intermediate step to build upon. Recreational wreck penetration limits follow this philosophy, and sprang from cavern diving.

Technical penetrations continue past the light zone and farther than 40 metres/130 feet from the surface. To do this while reasonably managing these risks, the diver needs even more extensive equipment than for recreational penetration: multiple redundant air sources, more lights, and other considerations. The training is especially rigorous, because procedures that are more complicated apply and the margin for error is narrower. **Even when properly equipped and trained, the technical diver faces more risk than a diver who remains within recreational limits.**

Keep in mind that just as the cavern diver interested in cave diving needs additional training beyond the scope of a cavern course, the recreational wreck diver interested in technical wreck penetration requires training and experience beyond the scope of the PADI Wreck Diver program. If tec diving interests you, ask your PADI Instructor about the DSAT TecRec program.


Learn more *see the DSAT* Tec Deep Diver Manual, *DSAT* Tec Trimix Diver Manual, *DSAT* TecRec Equipment Setup and Key Skills *video*

a relatively confined area, and you'll have to return through it, so you need to preserve the visibility by not stirring up silt. You're going along a penetration line or, if you're handling the reel, you're laying and retrieving it. In either case, you'll want to avoid getting tangled or accidentally breaking the line. To complicate matters, you have to do everything by dive light.

You shouldn't find wreck penetration techniques difficult, but they do take some practice. This is why you learn them initially *outside* the wreck.

### Entering the wreck

Ideally, you'll have surveyed the wreck on a previous dive before making your penetration dive, allowing you to descend and swim directly to your entry point. You begin by tying off the penetration line outside.

Look for a sturdy piece of wreckage that's not movable or likely to break, and that doesn't have sharp edges. Standard practice is to have a permanent loop in the line end (usually tied with a figure eight knot) large enough to pass the reel through. Pass the line around/through your tie object, and then put the reel through the loop to secure the line without a knot. Wrap the line another turn around the object, going in the direction that tightens the tie.

*Tie off the penetration line to something secure and without sharp edges outside the wreck.*

When ready to enter the wreck, the reel diver goes first. Assuming you're the reel diver, go just inside the entry (remember that it should be large, have no sharp edges and there shouldn't be any risk of closing doors, covers or blockage) and stop. Sweep your light in a circle and look up, around, down and in before proceeding. Look for possible hazards. Let your bubbles hit the ceiling to see if they cause much silt to rain down (if so, abort the penetration).

After you're confident that it's okay to continue, go into the wreck a couple of metres/few feet and wrap the penetration line around a second anchor point. This is in case the outside tie is accidentally cut or comes free. The line from the primary tie to the secondary tie shouldn't have any slack, but it doesn't need to be excessively tight.

*Once inside the wreck, immediately tie the line to create a secondary anchor point in case the outside tie is accidentally cut or comes free.*

You want to make this secondary tie and all subsequent ties in a way that's quick and secure, yet comes loose easily when you exit. To do this, wrap the line around a suitable object (secure without sharp edges). Make a second wrap, then pass the reel under the line and pull snug. Line tension tightens the tie, but it comes free easily as you exit and release tension. With practice, you'll be able to do this quickly with using one hand.

*Technique for secondary and subsequent ties.*

As you continue into the wreck, maintain light tension on the line as it comes off the reel. Slack makes tangling very likely, and can cause some reels to jam. Use one or two fingers on the reel to maintain tension. (Note: If you ever tangle or jam a reel, don't try to untangle it underwater. Abort the penetration and wrap the line around the *outside* of the reel as you exit. You can clear it later on the surface.)

Wrap the line around nonsharp objects from time to time as necessary to route the line where your buddies can follow it, to avoid slack, and to keep the line from blocking passage. However, don't make any more wraps than necessary because it makes it harder to follow the line during a silt-out and increases the time it takes to exit. Keep the line low, since it's harder to follow and easier to tangle behind your head if it's close to the ceiling. Only place the line if you have no other choice for a reasonable placement.

*Maintain light tension on the line at all times by keeping a finger on the reel. Slack makes tangling or jamming the reel very likely.*

## Knots for Wreck Divers

**Backed up bowline.** Few knots perform as well as a bowline: it's easy to tie, holds well and unties easily. It doesn't usually jam, even when wet. However, with wet synthetic line, occasionally a bowline may slip. An overhand knot prevents slippage, making this a very secure, yet easy to untie knot.

**Double bowline.** If you need a loop in the middle of some line, try a double bowline. You can also tie a backup knot on a double bowline.

**Figure eight knot.** Use this knot when you need a basic knot that's easy to untie, such as if you cut a line and want to keep it from unraveling.

**Figure eight knot loop.** A figure eight knot loop is considered more secure than a bowline, but it's not nearly as easy to untie, especially after bearing a load. It's a good choice for permanent or semi permanent loops.

**Two half hitches with round turn.** This is your basic "tie a rope to something" general-purpose knot.

**Square knot.** Use the square knot with caution. It is a knot that spills easily (is pulled out of shape), causing slippage. It is designed for use with an even load on both sides of the knot, such as tying a box shut. Its best use in wreck diving is with a more secure knot to provide extra confidence against slippage.

### Moving through the wreck

The proper techniques for moving through a wreck begin with maintaining neutral buoyancy. Once you enter, stay neutral and stay off the bottom; failure to do this will usually lead to stirred up silt and reduced visibility.

Inside the wreck, you need to modify the way you kick to techniques that minimize silt. In wide areas, use gentle frog kicks, and in narrow areas, use a modified flutter kick. To do this, keep your upper leg straight and kick only at the knee, with your foot stopping at the centerline with your body. The idea is to keep from directing any kicks toward the bottom where the wash will disturb silt.

When practical, gently pull yourself by hand through the wreck. However, to prevent cuts or contact with aquatic life, look closely before you grab anything. Also, be cautious not to grasp or pull on anything fragile that may break. If in doubt, don't touch.

*Frog kick.*

*Modified flutter kick.*

**Don't use the penetration line to pull yourself along.** Pulling on the line on the way in can spin the reel, cause slack and possible entanglement, jam the reel or pull it out of the reel diver's hand. Pulling on it as you exit can fray and break the line, or pull it off a wrap point causing slack. Remember, the penetration line is a visual or tactile guide, not a method for propelling yourself.

Inside the wreck, try to do everything slowly and deliberately. You'll find that stirring up some silt is inevitable, but if you pay attention and use buoyancy control, you can keep it to a minimum. For example, if you find yourself sinking toward the floor, rather than kicking to stay up, use buoyancy control.

*Don't use the penetration line to pull yourself through the wreck. Use modified kicks and buoyancy control to minimize kicking up silt.*

### Penetration line use

Proper line use minimizes the probability that you or your buddies become entangled in the line as you follow it into and out of the wreck.

As you've already read, the reel diver goes first, maintaining line tension and deploying the line. A recommended maximum of two buddies follows single file, near the line but not holding on to it (except for turns or during emergencies – more on these shortly). If you're not handling the reel, try to swim with the line just below chest level to one side, wreck configuration

permitting. You should know where to find the line at any time, and be able to reach out and grasp it.

*If you're not handling the reel, try to swim with the line just below chest level to one side, wreck configuration permitting.*

When you need to turn around, either to check on a buddy behind you, to confirm that you're still within the light zone, or to exit the wreck, if you're not handling the reel and you have ample space and good visibility, gently back away from the line and turn around toward the line. Keep the line in view, so you avoid entanglement. If you can't back away, then start the turn by grasping the line with your hand closest to it. Turn toward the line, holding it clear to avoid snagging and tangling your equipment. Grasp it with your other hand and release with the first to complete the turn.

*If you must turn around while close to the line, grasp the line and turn toward it while holding it clear to avoid entanglement.*

Upon reaching 40 linear metres/130 linear feet, the edge of the light zone or an area too tight for two divers to pass together, you stop continuing into the wreck. Either you change direction to continue exploring within these limits, or you turn the dive and exit. In either case, when any diver reaches two-thirds air remaining – everyone turns to exit the wreck. The last diver now leads, with the reel diver in the rear taking up the line as you go. Because some silt stirring is unavoidable, don't be surprised if you find less visibility on the way out.

If you're using the reel, as you exit swim slow enough to maintain tension on the line. Take up slack quickly as you or a buddy releases each tie. Avoid excess slack because it can jam the reel and because slack along the line increases the chance someone will get entangled in it. Again, if you do jam the reel, don't waste time trying to unjam it. Wrap the line around the outside of the whole reel as you exit and deal with it later.

*Maintain tension on the line when using the reel. Slack can cause a reel to jam and increases the possibility that someone will get tangled in the line.*

*If you jam the reel, don't waste time trying to unjam it inside the wreck. Wrap the line around the entire reel and deal with it after the dive.*

## Wreck Penetration Emergencies

As long as you observe the penetration limits you've learned, you should have adequate time and resources to handle problems — even potentially severe ones —

during the penetration portion of a wreck dive. It's important to stop, breathe, think and then act, just as you would handling any dive problem.

**Silt-out**

A *silt-out* occurs when divers kick up the bottom, when bubbles dislodge particles from the wall and ceiling, or when divers don't control their buoyancy and bump into the bottom. A severe silt-out can reduce visibility to zero, making it impossible to see with or without a light.

*Kicking up the bottom and failing to control buoyancy can cause a silt-out, which can reduce visibility to zero.*

If silt begins to destroy visibility, immediately make contact with the penetration line by making a loose "O" around it with your hand. Everyone should hold still and give the silt a moment to settle. If it doesn't settle quickly (depends on how coarse the silt is) and visibility is very poor, signal "up" to abort the penetration if there's enough visibility to see your signal. If there's not, everyone should assume the penetration is being aborted.

Turn to the exit, handling the line as you learned, except don't release the line after completing the turn. In silt-out conditions, never release the line – but neither should you pull on it. Instead, maintain your loose grip as you follow it out. When you reach wrap points, find the line on the other side of the wrap with your other hand before letting go past the wrap.

*In the event of a silt-out, make contact with the penetration line by forming a loose "O" around it with your hand.*

Again, don't pull yourself out by the penetration line. If you're the reel diver and you can't see whether all divers make line contact and exit, lock the reel and leave it, and follow the line out. This leaves the line in place for the remote possibility that a diver lost line contact and may need to relocate it to exit. You can retrieve the line and reel on a later dive.

**Lost or cut penetration line**

If you accidentally lose contact with the penetration line, or if it accidentally is broken or cut, immediately stop and allow any silt to settle. Don't keep swimming because you may swim farther from the line. Instead, look for the natural light from the entrance. If you need to turn to do this, do so taking care not to stir up silt.

If you don't see light from the entrance, cover your light (but don't turn it off – bulbs most often fail when you turn them off and on) and let your eyes adjust to the dark. After spotting the exit or your buddy's light, swim carefully that way. You may also find a map slate helpful in locating the exit if you're tracking your progress on one.

If you're the reel diver and discover one of your buddies has lost the line, it's recommended that you leave the line and reel in place if you must exit before you're sure the diver has found the way out. Again, this leaves the line to help him if he needs it.

## Air, Fuel and Oil Pockets

In some wrecks, you may encounter what appear to be pockets of trapped air left by previous divers. Some of these may be large enough to bring your head out of the water.

Approach all "air pockets" with caution. Some pockets may be trapped fuel, oil or other chemicals from the wreck, which you'll want to avoid. If you find the pocket does contain air, don't breathe it – keep using your regulator. Over time, oxygen dissolves out of trapped air; you could lose consciousness trying to breathe it.

When in doubt about the source of an air pocket, keep completely clear of it.

### Light failure

If your light fails, stop and make loose contact with the line, while using your other hand to retrieve and turn on your backup. A good tip is to turn on your back up light before you unclip it. That way, if you accidentally drop it as you release it, you'll find it easily.

If you have only one backup, after switching (or while) signal your buddies and abort the penetration. **Don't continue the penetration with only one working light.** Use the backup to allow a safe exit (this is another reason why experienced wreck divers carry three or more lights – they can continue the penetration after a single failure).

If your backup light doesn't work or has been lost, signal to borrow your buddy's and then abort the penetration.

*Don't continue the penetration with only one working light. Use your backup to allow a safe exit from the wreck.*

### Air supply loss

If you follow the Rule of Thirds, it's highly unlikely you'll run out of air. However, if for some reason you do have an air supply problem and you're using an H- or Y-valve system shut down the free flowing regulator (or get your buddy to do it), and exit the wreck using the other. If you're using a pony bottle, switch to it and exit the wreck immediately. In either case, don't cause a silt-out while rushing to make the switch and shut down the free flowing regulator – that only compounds the problem. Deal with the problem slowly and deliberately – it not only avoids a silt-out, but is usually faster anyway.

After exiting, if you're using an H- or Y-valve and didn't lose much air, make a normal ascent. If you're using a pony bottle, you may not have enough air, so make contact and secure you're buddy's alternate air source. Ascend together.

If you're not using an H- or Y-valve or a pony bottle and you have an air supply problem while inside the wreck, secure your buddy's alternate second stage. Calmly, deliberately but immediately, exit the wreck. How you exit depends upon the wreck and the hose length of your alternate air source. You should be able to swim side-by-side or over-under all the way out. If necessary, with a standard 1 metre/39 inch, the donor can go through a tighter area first with the receiver behind, gently holding onto the donor's cylinder to prevent separation. When using the TecRec configuration with the two metre/seven foot hose, the protocol is for the receiver to go first with the donor immediately behind.

*You should be able to swim side-by-side or over-under all the way out of the wreck while sharing air.*

*If necessary to go through a tighter area while sharing air with a 1 metre/39 inch hose, the donor goes first with the receiver holding onto the cylinder.*

*Using the TecRec gear configuration with a two metre/seven foot hose, the protocol is for the receiver to exit followed by the donor.*

If you're the reel diver, whether you're the donor or the receiver, in an air supply emergency it's simplest to leave the line and reel in place and exit. You can retrieve them on a later dive.

## The Command Signal

Inside a wreck, the "thumbs up" signal to surface takes on more authority than in open water. In open water, you might reply with some question signals, such as "how much air do you have?" "let's go over there," then, "surface," etc.

In the overhead environment, the "surface" signal from any diver terminates the penetration immediately.

## Exercise 7 – Wreck Penetration

1. Pieces of equipment for wreck penetration diving include (check all that apply):
   - ☐ a. light and backup light.
   - ☐ b. H- or Y valve, or pony bottle.
   - ☐ c. lift bag.
   - ☐ d. penetration line and reel.
   - ☐ e. slate
2. The maximum distance to your point in the wreck is 40 linear metres/130 linear feet from the surface, or the edge of the light zone, whichever is longer.
   - ☐ True ☐ False
3. If you're handling the reel, procedures for entering a wreck include (check all that apply):
   - ☐ a. tying the primary and secondary anchor points.
   - ☐ b. looking up and around just inside before proceeding.
   - ☐ c. crawling gently along the bottom so your buddy can see past you.
   - ☐ d. maintaining neutral buoyancy.
4. In case of a silt-out, you should gently pull yourself along the penetration line until you exit the wreck.
   - ☐ True ☐ False

**How'd you do?**

*1. a, b, d, e. 2. False. The maximum is 40 linear metres/130 linear feet from the surface or the edge of the light zone, whichever is shorter. 3. a, b, d. 4. False. You should follow the penetration line maintaining a loose grip on it, and without pulling on it.*

# A World of *Wreck Diving*

It's a common cliché that ending a course is "only the beginning," but you often hear it because it's typically true. It certainly is with this course. As you wreck dive more and more, chances are your interest in it will grow. Wreck diving can become such a passion that your interest in diving focuses on wrecks. You may invest a lot of time researching wrecks, writing about them, chatting online and talking with fellow wreck divers. If so, chances are the wreck diving bug has bitten you hard. There's no cure, but you can relieve the symptoms a little by going wreck diving.

On the other hand, you may find wreck diving one of many diving activities that you enjoy, and one you combine with digital underwater photography, studying aquatic life and other activities. But, don't be surprised if, when given a choice between a wreck and a nonwreck dive site, you choose the wreck.

A few final thoughts about wreck penetration diving: Much of the PADI Wreck Diver course, this manual and the PADI *Wreck Diving* video deals with penetration, but that's primarily because there's a lot to cover from an instructional perspective. You'll decide whether to explore the inside or to swim on the outside of a wreck for your final course dive. You may find you have little interest in entering a wreck, either because you don't want to deal with the hassles, you don't think it's worth the added risk, or any number of other reasons. If you don't want to do it, don't. Furthermore, many popular wreck sites have little or no penetrable area. In any case, there's plenty of great diving on wrecks without making penetration dives. In the future, if you decide to give wreck penetration diving a go, it's a good idea to seek further experience and an orientation with a PADI Instructor before entering a wreck for the first time.

When it's appropriate to explore inside a wreck, follow the established limits and always employ the necessary equipment and procedures, no matter how familiar you've become with the wreck inside and out. Accident data show that accidents have happened when trained and experienced overhead environment divers thought they didn't have to follow these just because they knew the site so well. When you feel ready to move beyond the limits of recreational wreck penetration, complete training in a technical wreck penetration course so that you learn to extend your limits using the proper procedures and added equipment.

Either way, have fun. Wreck diving opens a completely new world underwater, and once you fall in love with it, you'll start to look at ships in a whole new light – you'll wonder what they would be like underwater.

# Wreck Diver Speciality Course
## *Open Water Dives*

The following outlines the four dives you'll make as part of your PADI Wreck Diver Specialty course. Your instructor may rearrange skill sequences in each dive, or may add more dives as necessary to meet your needs, desires, course requirements and the environmental conditions. Note also that there are two Wreck Training Dive Fours, which you and your instructor will choose from together. During your training dives, you may be using the Recreational Dive Planner, either the Table, The Wheel™, or the eRDP.

### Dive 1

- Knowledge Review/Briefing
- Predive Procedures – Above Water Skill Practice
- Dive 1 Tasks
  - Swim on the outside of a wreck, maintaining proper buoyancy control, and identifying and avoiding potential hazards, under the direct supervision of a Teaching Status PADI Instructor.
  - Navigate on a wreck so that the ascent point can be located without surfacing, with the assistance of the instructor.
  - Maintain neutral buoyancy and body position that avoids the bottom.
- Post-dive Procedures
- Debrief
- Log Dive

### Dive 2

- Knowledge Review/Briefing
- Predive Procedures – Above Water Skill Practice
- Dive 2 Tasks
  - Swim along the outside of a wreck, in a buddy team, identifying and avoiding potential hazards.
  - With a buddy, map a wreck (or portion of a wreck), determining approximate size and marking points of interest.
  - Survey a wreck for a penetration dive and evaluate possible entrances.
  - Navigate on a wreck, returning to the ascent point without surfacing.
- Post-dive Procedures
- Debrief
- Log Dive

### Dive 3

- Knowledge Review/Briefing
- Predive Procedures – Above Water Skill Practice
- Dive 3 Tasks
  - Demonstrate the deployment and retrieval of a penetration line, for practice, on the outside of a wreck, while working in buddy teams.
  - Swim along the deployed penetration line so as to maintain contact with the line without kicking up silt and holding on to a dive light.
  - Navigate on a wreck so as to locate the ascent point without surfacing.
- Post-dive Procedures
- Debrief
- Log Dive

### Dive 4A

- Knowledge Review/Briefing
- Predive Procedures – Above Water Skill Practice
- Dive 4A Tasks
  - Plan and perform an actual wreck penetration under your direct supervision:
    - Determining air supply and penetration limits.
    - Swimming without causing excessive silt disturbance.
    - Maintaining contact with the line.
    - Using a dive light while following a penetration line.
  - Navigate on a wreck so as to locate the ascent point without surfacing.
- Post-dive Procedures
- Debrief
- Log Dive

### Dive 4B

- Knowledge Review/Briefing
- Predive Procedures – Above Water Skill Practice
- Dive 4B Tasks
  - Organize and conduct a wreck dive with a buddy, but with only minimal instructor assistance.
  - Swim on the outside of a wreck, identifying and avoiding possible hazards.
  - Navigate on a wreck so as to locate the ascent point without surfacing.
- Post-dive Procedures
- Debrief
- Log Dive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