



*DAN's Smart Guide to Air Consumption*

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# 13 Ways to Run Out of Air & How Not to

- The most common ways to run out of air.
- How much air do you really need?
- Safety tips to prevent emergencies.

A blue-tinted underwater photograph showing several divers swimming near a coral reef. The scene is viewed from below, looking up through the water towards the surface where sunlight is filtering through. The divers are silhouetted against the bright blue water. The coral reef is visible in the foreground and background, creating a frame around the divers.

# DAN'S SMART GUIDE TO AIR CONSUMPTION

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Our self-contained underwater breathing apparatuses are only useful as long as the tank contains sufficient breathing gas. Scuba equipment allows us to breathe underwater, extending our ability to explore. Without breathing gas, our time is limited by the dangers of asphyxia and drowning.

During dive training you learned how to:

- Understand breathing gas needs
- Calculate the limits of available gas
- Monitor the remaining gas pressure
- Return to the surface in a timely manner with enough gas to inflate your BCD

Even so, running out of breathing gas is the most common dive incident and the number one cause of diving fatalities. Even the most skilled divers can make mistakes and run out of gas. In this guide, we'll cover the 13 most common errors that lead to out-of-air emergencies and how to avoid these situations.

## UNDERSTANDING BREATHING GAS NEEDS

Your breathing rate depends on your level of exercise and depth. The higher your level of exercise, the more oxygen you need and the more CO<sub>2</sub> you will produce. In order to flush the CO<sub>2</sub> from your lungs while diving, you must inhale breathing gas. The chart below shows the relationship between depth, pressure, exercise and breathing gas requirements. The deeper the depth and the higher the level of exercise, the greater the demand for breathing gas.

BREATHING GAS NEEDS: HOW MUCH AIR IS REQUIRED TO VENTILATE LUNGS?				
DEPTH (FEET)	ENVIRONMENTAL PRESSURE (ATMOSPHERES)	BREATHING GAS NEEDS (LITERS PER MINUTE)		
		AT REST	LIGHT TO MODERATE ACTIVITY	VIGOROUS EXERCISE
0 FEET (SURFACE)	1 ATM	8 lpm	20 lpm	70 lpm
30 FEET	2 ATM	16 lpm	40 lpm	140 lpm
100 FEET	4 ATM	24 lpm	80 lpm	280 lpm

## BY THE NUMBERS

The Aluminum 80 is the most commonly used tank.

Specifications:

- Internal tank volume: 11 liters (0.39 cubic feet).
- Maximum pressure allowed: 3,000 psi (207 bar)
- 80 cubic feet = 2,265 liters (1 cubic foot = 28.317 liters)

HOW LONG WILL MY BREATHING GAS LAST IN AN ALUMINUM 80?				
DEPTH (FEET)	ENVIRONMENTAL PRESSURE (ATMOSPHERES)	BREATHING GAS NEEDS (LITERS PER MINUTE)		
		AT REST	LIGHT TO MODERATE ACTIVITY	VIGOROUS EXERCISE
0 FEET (SURFACE)	1 ATM	215 minutes	70 minutes	20 minutes
30 FEET	2 ATM	107 minutes	35 minutes	10 minutes
100 FEET	4 ATM	53 minutes	17 minutes	5 minutes

# Diving Too Deep

Not Monitoring Pressure Gauge

Ignoring Anxiety

Working T

OUT OF

Less Than

## THE MOST COMMON CAUSES OF OUT-OF-AIR EMERGENCIES

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### LACK OF AWARENESS

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#### **Diving too Deep**

Gas consumption increases dramatically with depth. Your decompression obligation builds quickly, and you may need more gas for decompression stops. An Aluminum 80 is not meant for deco dives. Running out of gas at depth puts you at risk of a long, hazardous emergency ascent. You can maximize your time at shallower depths and easily reach the surface in the event of an emergency.

2

#### **Staying too Long**

Sooner or later you will consume your gas reserves. Determine in advance the tank pressure at which you will need to turn back and start your ascent. During the dive, actively monitor your tank pressure and turn back on time.

3

#### **Working too Hard**

Fighting a strong current, hunting or lacking buoyancy control can affect air consumption. Exertion at depth may speed up depletion of your tank up to twenty times. If you are not accustomed to diving in strong currents or surf, seek training prior to diving in these environments.

4

#### **Not Monitoring Your Pressure Gauge**

Be air aware: Monitor your air supply. Check your pressure gauge regularly and communicate your supplies with your buddy.

Too Hard

F AIR

a Full Tank

# Staying Too Long

Tank Valve Not Open All The Way

Omitting Pre-dive and Buddy Checks

## 5

### **Ignoring Anxiety as a Factor**

Anxiety changes all calculations and may deplete tank reserves faster than vigorous exercise. Try to maintain normal breathing, but if you do feel anxious, keep a closer eye on your gas supplies; it may dwindle more rapidly than usual.

## **PROCEDURAL PROBLEMS**

## 6

### **Starting With Less Than a Full Tank**

Regardless of how short an immersion you may contemplate, do not start your dive on less than a full tank. Never descend to retrieve a lost piece of equipment or anchor if the tank is nearly empty.

## 7

### **Not Opening the Tank Valve All the Way**

Open the tank valve all the way and check that breathing through the regulator does not cause the pressure indicator to swing with each breath.

## 8

### **Frequent Depth Changes and BCD Adjustments**

Yo-yo diving, or using your BCD frequently to move up and down in the water column, can quickly deplete your gas supply. Yo-yo diving also increases risk of pulmonary barotrauma and decompression sickness.

## 9

### **Omitting Pre-dive Check and Buddy Checks**

Use a printed pre-dive checklist to prevent mental lapses—the mental checklist is an oxymoron.

## EQUIPMENT ISSUES

# 10

### Regulator

Your gas consumption can be affected if...

- Your regulator is hard to breathe from.
- Your secondary regulator has a slow leak.
- Your regulator starts to free-flow due to freezing or debris.
- Your mouthpiece decouples from your regulator.
- Your dive buddy accidentally knocks your regulator out of your mouth.

Take preventative steps...

- Rinse your regulator after diving.
- Conduct regular maintenance on your regulator and have all parts replaced that may have been worn off or are out of date.
- Secure your spare regulator—don't let it drag on the bottom.

If your regulator starts to free flow, attempt to flush it; this may help if debris is to blame. Remember, you can still breathe from a free-flowing regulator, but the gas will not last long, so you have to initiate the ascent.

# 11

### BCD

Inflator leaks or tears in your BCD can deplete your air. Rinse your BCD after diving and conduct regular maintenance to prevent leaks.

# 12

### Pressure Gauge

If your pressure gauge is integrated with your computer, a computer error may also affect the gauge. If your tank pressure does not decrease with time of dive, you have a problem and should safely terminate the dive. Make sure that your gauge is calibrated properly. Some gauges will not indicate zero, even when the tank is empty. To avoid this problem, make sure you return to the surface with the gauge indicating 500 psi or greater.

# 13

### Burst O-ring or Hose

O-rings should be replaced regularly. Carry your own with you, and if you have a minor leak, replace the O-ring in question. Do not open your regulator on your own; this should only be done by a certified maintenance professional.



# SAFETY TIPS

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- 1 Maintain your equipment regularly and inspect any rental equipment carefully.
- 2 Use a written pre-dive checklist and plan the maximum depth and duration of your dive that can be safely achieved with the available supply.
- 3 Open the tank valve all the way. (Consider buying a tank with an open/close valve indicator.)
- 4 Conduct a pre-dive test breath on your regulator and make sure your tank is full before the dive. Also, check the gas line and complete an in-water buddy check before descending.
- 5 Carry an independent emergency gas reserve. Two independent gas sources are better than one. It may help you in your own emergency or if another diver requests your breathing gas.
- 6 Monitor your tank pressure at regular intervals.
- 7 Stay within your dive training limits.
- 8 Turn back when you exhaust half of your available gas supply and make sure you conserve enough air for flotation on the surface.
- 9 Adjust your buoyancy in protected, shallow water. If you find you have buoyancy problems, abort the dive and fix the problem.

Before the Dive	Turn Back	Bring to the Surface
3000 psi	1500 psi	500 psi

## SIGNALING

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The universal signal for running low on air is a fist held close to the chest.



## SAFETY STARTS WITH YOU

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This is an easily avoidable mistake that can carry serious repercussions. The best strategy is not to run out of gas. If you run out of your gas toward the end of dive, your buddies are probably also low on gas and there may not be enough supply to manage two stressed divers. Monitoring your gas supply is a simple step to preventing a serious situation. Dive safely.

# BECOME A DAN MEMBER

Dive safety should be taken seriously. When you join DAN, your exclusive member benefits ensure you have access to invaluable resources including:



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Access to the latest medical information for the prevention, identification and treatment of diving injuries.



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DAN's members-only magazine features dive-related medical and research information, underwater photography, dive travel and marine environmental issues.

Plus, your DAN membership supports the ongoing research, medical programs and education that promote the awareness of dive safety and ensures the availability of medical resources if and when you need them.

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