SAVING YOUR OWN LIFE

Is dropping your weight belt the right response?

Lou Fead, NAUI 1413

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Divers' weights, whether on a belt or in a pack, are designed to counteract the excessive positive buoyancy of a diver, his tank and wetsuit. Weights permit him to attain neutral buoyancy for easy diving. Some divers, particularly photographers or researchers, use extra weight to offset surge or currents for more stability on the bottom. Some divers use less weight to compensate for wetsuit compression on a deep dive. Weights are designed to allow a diver to adjust his buoyancy. They are not worn to be available to a diver for jettisoning in an emergency.

Some divers who are trained with weights may later dive without them. This may be true of a diver trained with a wetsuit and weights who, on a tropical vacation, finds he does not need a wetsuit and can achieve neutral buoyancy without weights. If this diver has been trained to rely on dropping his weight belt to bail out of an emergency, he will find himself without the training for an emergency ascent when he reaches for his non-existent belt buckle.

How Divers Use Weights

Even those divers who wear weights on every dive cannot count on them as emergency devices. A recent survey has shown that weights belts often rotate during a dive so that the buckle is no longer readily accessible to the diver, or his buddy.[1]

Divers may trap their weights belts on their bodies with tanks, crotch straps, and leg knives, so that if released, the weights would still remain with them. Others may not recognize that releasing a weight belt buckle is insufficient action for attaining positive buoyancy. The belt must not only be released, but dropped and cleared of the body as well to rid the diver of its weight. Its a two handed job.

Furthermore, some divers trained in BCs who switch to integrated back buoyancy systems have not learned how much weight they need to jettison, and much less how to jettison it.

McAniff and Schene's analysis of diving fatalities revealed that most divers who die (80-90%) had not dropped their weights to save themselves.[2] Of those who had, most had been dropped by buddies or rescuers. Once a diver believes he's in serious trouble, logic is replaced by panic - unreasoning action based on fear. Dropping weights may float the victim to the surface for air and a diver without weights may be more comfortable by either floating higher or by having the restriction to breathing removed from around his waist. Nevertheless, the panicked diver tends only to recognize the need for relief, not the means for getting it.

Another survey shows that of 717 diver rescues conducted by the San Diego City Lifeguard Service from January 1, 1971, through June 30, 1975, only 12 weight belts had been dropped prior to the lifeguard arriving on the scene.[3]

The San Diego Council of Diving Clubs offers a free weight belt to any diver who had to drop his to save himself. The Council suspects that many divers don't drop their belts because it will cost them to replace it, so this program offers free replacement to encourage divers to save themselves. In two years of the

program, no San Diego diver has requested a belt, although the program is well advertised. Some divers may not wish to admit it, but the data does suggest that divers in emergencies *don't* drop belts.

Effect of Dropping Weights

Divers in serious situations don't drop their weights. In many situations panic probably prevents the action. Yet many divers who don't panic *decide not* to drop their weights. One reason is their ego: they're embarrassed by having to confess they got in trouble. Another reason is that many believe that dropping weights when submerged may send them shooting to the surface in a cloud of bubbles and ruptured lungs. It doesn't happen that way.

In open-ocean experiments, 16 instructor candidates, naturally buoyant at the surface, ditched their weights at 30 feet, relaxed and floated to the surface.[4] The average ascent time was 20 seconds, just half again as fast as the maximum proper ascent rate - 60 feet/minute.

TABLE 1

DEPTH WEIGHT FOR NEUTRAL		**ASCENTS TO SURFACE**			
		Drop Weights Only		**Kick Twice Only***	
(feet Seawater)	(pounds)	Time (sec)	Av Rate (ft/sec)	Time (sec)	Av Rate (ft/sec)
0	15	-	-	-	-
16.5	12	6	2.75	-	-
33	9	13	2.54	16	2.06
66	3	69	0.96	78	0.85
99	2	-	-	-	-

* With BC inflated to neutral buoyancy and weight retained.

A more recount examination open ocean of the weight belt effect on a wet suited scuba diver confirms that dropping does not result in a headlong rush to the surface (Table 1). The test was made to quantify buoyancy and ascent effects on weight and depth.

Comparison of figures in the column entitled "Weight for Neutral" shows how much floatation the diver's one quarter inch Farmer John, nylon 11, hood attached wetsuit lost on descent. It was measured while wearing a single-70 tank deflated vest, and a weight belt weighted for neutrality at the surface. Neutrality was achieved on the surface when breathing from a regulator: the diver floated with his eyes slightly above the water's surface.

Diving to stated depth, the diver removed excess to re-achieve neutrality in which full lungs caused him to ascend and empty lungs caused him to descend. (The little weight needed at 66 feet and deeper shows that dropping a 15 pound weight belt does not necessarily make a diver 15 pounds more buoyant. In fact, the change in buoyancy when losing a weight belt in 70 feet of water could go almost unnoticed).

Ascents were made from typical depths of 33 and 66 feet. The first ascents labelled "Drop Weights Only," had the diver drop his weights, without being neutralized first. He relaxed, breathed normally, and ascended with no other effort to reach the surface. An unconscious diver would be rescued in a similar manner. The ascents started slowly and gained speed as the wetsuit expanded to resume its uncompressed buoyancy. Note that the rate of ascent after jettisoning weights is much greater in shallow water than in deep.

The second ascent, "Kick twice only," had the diver adjust his vest buoyancy to achieve neutrality at depth, then push off the bottom and make two strong kicks. After that he relaxed and breathed normally for the remainder of the ascent.

Without some strong kick, just pushing off the bottom did not result in an ascent. The "Kick" ascent is equivalent to a neutralized diver's heading toward the surface to let the air in his wet suit expand for additional lift. This technique is recommended for normal ascents. It can, with some venting of excess vest air near the surface, control an ascent at 60 feet per minute quite handily.

In Review

It's apparent that weight dropping is not frequently used by divers as an emergency action in time of stress, regardless of the depth of the dive.

Second, at depths up to 60-70 feet, a dropped weight belt on a diver who is neutrally buoyant would provide sufficient lift to get the diver to surface with no expended energy, but the speed of ascent might not be sufficient to satisfy the emergency.

And, if a diver at a greater depth is not neutrally buoyant, his dropping a weight belt may not lead to his ascent. The greater the depth, the greater the validity of the statement.

At depths below 60-70 feet, a neutrally buoyant diver can ascend quickly if necessary by dropping weights and kicking up. Our experiment yielded an ascent time of 20 seconds for a 66 foot ascent.

Dropping weights is not the proper reflex action in diving emergencies. Dropping weights cannot be solve all problems. Dropping weights *cannot* be counted upon to save lives.

The solution in emergencies is the too often stated but all too true *thinking and acting*. In fact, the thinking begins with dive planning so equipment is well maintained and does not fail, so the diver does not run out of air, and so he does not need sudden positive buoyancy. Dropping weights, which is *not* the solution, only makes a diver lighter.

Essentially, safe divers avoid the need for sudden buoyancy. Practice of the following techniques of buoyancy control can help avoid the need for sudden buoyancy.

1. Weight yourself to be neutrally buoyant at the end of your dive, in the shallowest water you intend to explore. You will be a few pounds heavier when starting your dive, but you can offset that by adding a little air to your BC.

2. If positive buoyancy is needed during a dive, you can:

   a. Breathe with *fuller* lungs. A typical diver's lungs can provide up to eight pounds of buoyancy, but normal breathing provides about half. Fuller breathes can add buoyancy.
   b Kick up. The closer you are to the surface, the greater your buoyancy changes as you ascend. A normal kick provides about 15 pounds of thrust, the same as dropping 15 pounds of weight, but kicking is tiring.
   c. Inflate your BC to gain controllable floatation, and vent the excess air to slow your ascent.
   d. Drop your weights. It's a last ditch effort which does not normally allow reversal of the action (you don't regain the weight) and you will ascend sooner or later.

If you can't think of anything else to do and you are indeed in an emergency, drop your weights.

But if you are going to rely on dropping weights for solving emergencies, stay out of caves, kelp, wrecks — and don't ice dive. In those situations, dropping your belt can pin you against the ceiling forever.

FOOTNOTES

1. Hardy, Jon and Bear Sleeper, Jeanne. The Last Ditch Attempt - Weight Systems. *Proceedings of the Eight International Conference on Underwater Education*. Colton, California: NAUI, Nov 4-7, 1976.

2. Schenck, Hilbert V and McAnnif, John J. United States Underwater Fatality Statistics - 1973, NOAA Grant No 4-3-158-31, University of Rhode Island, May 1975.

3. Bruton, Al and Fead, Lou. The Lifeguard's Headache. *Proceedings of the Seventh International Conference on Underwater Education*. Colton, California: NAUI, Sept 26-28, 1975.

4. Graver, Dennis K. In Support of Emergency Ascent Training. Addendum to *Proceedings of the Eight International Conference on Underwater Education*. Colton, California: NAUI, Nov 4-7, 1976.

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Brief Profile

Kenneth Richard Tuson joined the RN Scientific Service as Scientific Assistant at the Admiralty materials Laboratory, Poole, in 1947, and by 1950 was working on instrumentation, high speed photography, the physics of bubble production and problems associated with diving research.

His work then developed into diving navigational system studies in stream lining, the development of breathing apparatus, and trials thereof.

He obtained special leave to work as Project Manager for DHB Construction on the production, testing and trials of JIM, the armoured diving suit.