

PROVISIONAL REPORT ON AUSTRALIAN
DIVING RELATED DEATHS. 1983

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SUMMARY

There were thirteen (13) diving-related deaths identified as having occurred in the period under review. Complete details are still unavailable (November 1984) on four of these. There were three breath-hold, seven scuba, two hookah and one rebreather diver deaths. Critical factors for the breath-hold divers were respectively trauma (hit by a motor boat), blackout following hyperventilation, and the combination of fatigue and cold. In the cases of the scuba divers, two were both untrained and inexperienced, one trained but inexperienced, the others were reported as both trained and experienced. In one case there may have been a cardiac problem and aspiration of water. Of the hookah users, the critical factors in one were depth (185 ft), cold, narcosis, nil visibility, entanglement, and insufficient air supply. The other was diving alone to free his fishing nets, the details are still unavailable. The victim using the rebreather was trained but relatively unfamiliar with the set and had done no recent deep dives, probably suffered nitrogen narcosis as the depth was 180 fsw, was alone, and had too low an airflow to support exertion. Nearly all the deaths were potentially preventable.

CASE NOTES

The dive histories reveal deviations from those councils of perfection, the generally accepted principles of safe diving. The victims probably prejudiced their chances of survival little more than did many others, but to them was presented the dive end-point of death. There being no appeal against such terminations it is prudent to gain merit, and preserve life, by following the rules.

Case BH 83/1

Motor boats and swimmers cannot safely co-exist in the same area of water, the risks to the latter being too serious. This diver and his friend were in an area frequently used by swimmers and divers, shallow water over a rocky ledge which ended at deeper water used as a motor boat channel. The buddy was closer to land than his friend when he heard a thud and a cry and then the sound of a motor boat stopping. He swam over to the spot and found the severely injured victim at the surface. He died shortly after he was placed in the boat. It would have been very difficult for anyone in the boat to see a black wet-suited person in the water even had a special watch been kept.

MOTOR BOAT. TRAUMA. BOAT CHANNEL. NO FLAG. BLACK WETSUIT HARD TO SEE.

Case BH 83/2

The victim was an expert spearfisherman training to improve his endurance. He descended breath-hold down a weighted line to hookah-using pearl divers who saw him start his ascent. His body was not recovered. His death was almost certainly due to drowning following a post-hyperventilation blackout.

POST HYPERVENTILATION BLACKOUT. ALONE. EXPERT BREATH-HOLD DIVER.

Case BH 83/3

After spearfishing separately both divers surfaced and found that their boat was adrift. The buddy left the victim at the surface and dived to reposition the anchor. When he surfaced he was unable to find his friend despite a search. The victim was not wearing fins and the sea was cold and choppy. The body was not recovered for eight days with the weight belt still on. No buoyancy vest was worn.

COLD. FATIGUE (INCREASED WORK DUE TO NO FINS). CHOPPY SEA. NO BUOYANCY VEST. FAILED TO DROP WEIGHTS. POOR BOATMANSHIP (ANCHOR INSECURE, UNATTENDED BOAT). SEPARATION SURFACE PROBLEM (UNEXPLAINED).

Case SC 83/1

Four friends, in two boats, anchored off a rocky shore in order to scuba dive. In one boat was a diver with five years experience who "didn't consider himself proficient" but was nevertheless taking a friend on her first ever scuba dive. Their dive was soon aborted as the girl felt cold. It is not stated whether they wore wet suits. The other pair consisted of the victim, said to have been trained and to have some experience and the buddy, who had loaned him the scuba he was using, whose experience was not recorded. Both wore wet suits. After about forty-five minutes the buddy was low on air and returned to the boat. It is apparent that they dived separately, not as buddies. The other pair brought their boat closer and then one of the group saw the victim's scuba unit bobbing about at the surface in shallow water and the victim's body was then found floating face up. As he appeared to be dead no attempts at resuscitation were made. Autopsy showed signs of pulmonary barotrauma and drowning.

SEPARATION/SOLO. LOW AIR SITUATION. PULMONARY BAROTRAUMA. NO GAUGE OR J VALVE. NO BUOYANCY VEST. DITCHED SCUBA. WEIGHT BELT ON (?). INEXPERIENCED.

Case SC 83/2

This death occurred during a post-certification course on wreck diving. During the third dive of the weekend they were on a wreck in 25 m deep water in a calm sea. After the victim and his buddy completed their assignment on the wreck they were joined by the course instructor, who till then had been maintaining general overview of his class while undertaking some underwater photography. It was about 20 minutes from the commencement of the dive that the victim indicated that he was low on air and the three divers swam to the anchor line. Somewhat to the buddy's surprise the victim was to ascend alone while he continued with the instructor, though he later realised that they had not seen one of the other pairs and it was necessary to ascertain whether they were still down. It was later established that one of the pair had a severe migraine and they had aborted their dive. After a quick search the instructor and the buddy returned to the anchor and started their ascent. The instructor, as was his usual routine,

looked down at the dive site as he started his ascent and was surprised to see the victim's camera on the sea bed. He then saw the victim nearby, his mask half full of vomit, regulator out of his mouth. He placed the regulator of his "octopus rig" in the victim's mouth and inflated his own buoyancy vest to assist their ascent. After surfacing he inflated the victim's buoyancy vest and ditched the weight belts of himself and the victim. The resuscitation attempts were unsuccessful. The victim had made mention of some nausea before the dive but had stated firmly that he was fit to dive. It was stated later that he had experienced and successfully managed underwater vomiting on a previous occasion. The onset of the vomiting was probably too rapid for him to drop his weights, inflate his vest, or avoid fatal aspiration. The time between separation and being found was about 7 minutes.

TRAINED. EXPERIENCED. SEPARATION FOR SOLO ASCENT. LOW AIR. FAILURE TO DROP WEIGHTS OR INFLATE VEST. UNDERWATER VOMITING.

Case SC 83/3

As a kindly meant deed the buddy, who was trained and experienced, hired scuba equipment for the victim (but not a wetsuit because he was too large for those available). He had apparently made only a few previous scuba dives, all several years previously. He declined to wear the cylinder in his buoyancy vest "because it rubbed and hurt his chest." The weights provided were found to be excessive (21 lb) but he chose not to reduce them. After a successful dive, when the gauge was showing imminent low air, the sound of a passing motorboat caused them to slightly delay their ascent. As they ascended the victim seemed to be red faced and to have some unknown problem so the buddy attempted buddy breathing. He seemed unresponsive at the surface but started struggling when offered assistance. The buddy attempted unsuccessfully to drop his weight belt and keep him at the surface but lost hold and the victim sank. A search was made by nearby divers, initially without success. When found by the summoned rescue services his mask was off and his tank still contained some air. The water was warm and conditions safe for diving.

UNTRAINED. INEXPERIENCED, SCUBA HIRED BY CERTIFICATED DIVER. EXCESS WEIGHTS. NO WET SUIT. NO CYLINDER IN BUOYANCY VEST. FAILED TO DROP WEIGHTS. LOW AIR MOTOR BOATS IN AREA. UNKNOWN PROBLEM THEN PANIC. VALIANT BUDDY.

Case SC 83/4

The pipe from a dam supplying an irrigation scheme on a farm was leaking significantly between the dam and the pump house and this could not be repaired without stopping the flow of water. Unfortunately no valve had been placed on the pipe's inlet and the exact position of the open end of the pipe was unrecorded. It was suggested that a diver could be employed to find and cover the open end of the pipe, divers having been employed successfully when other owners of dams had problems. The farmer therefore went to the nearest dive shop to enquire about obtaining someone able to perform this job. One of the customers in the shop at the time offered his services, stating that he had performed similar jobs previously. He arrived at the dam with several helpers and entered the water alone, a stout

rope round his waist and a metal probe in his hand, intending to identify the pipe's open end before placing a piece of metal sheet over it. The water was turned off at the pump valve, though naturally it continued to escape from the leak. Suddenly the rope almost tore from the tender's hands, then went slack. It had parted as the victim was sucked into the pipe, dying instantly from a broken neck. Frantic efforts were made to open up the pipe and rescue the diver but his body was washed out in the gush of water and only later found in the nearby flooded area, his tank torn off. The possibility of water flow into the pipe occurred to the tender but was discounted by the victim: neither realised the head of force resulting from 26 feet deep water in the dam.

DAM. UNEXPECTED SUCTION INTO OPEN PIPE (26 FT HEAD OF WATER) TRAUMA.

Case SC 83/5

During a weekend cruise the vessel was anchored off a beach to give passengers an opportunity to go ashore or go shore diving. Three, all trained, decided to scuba dive and were rowed ashore. The water was shallow near the beach (15 ft) and when one became short of air and swam back to the vessel on the surface the other pair continued to scuba until the victim also became low-air, when they surfaced together. The victim seemed to be in some mild distress with a cramp like pain at the surface, though calmer after inflating her "compensator". The victim was seen to change to a snorkel then let it loose and go unconscious, mouth submerged. The buddy attempted in-water CPR, which was continued when back on the vessel, without reviving the victim. There was no stated previous ill health but autopsy showed evidence of previous myocardial damage. The "cramp" may in reality have been the pain of a heart attack.

SURFACE DEATH. INFLATED VEST FAILED KEEP MOUTH OUT ABOVE WATER. COLD WATER. PREVIOUS MYOCARDIAL DAMAGE. PROBABLE HEART ATTACK.

Case SC 83/6

Few details are available beyond the fact that the victim dived alone, having waited till his friends finished their dive before being able to borrow a mask, having forgotten his own. Alarm was felt when he failed to return to the boat but a search was unsuccessful. The equipment was later recovered but there was no trace of the victim. Available information is insufficient for proposing any scenario for this incident.

ALONE. EQUIPMENT RECOVERED WITHOUT BODY.

Case SC 83/7

The victim and his son, overseas visitors, were making a day trip to dive on the Barrier Reef. Both were certificated and experienced scuba divers. The vessel also carried competitors for a spearfishing competition who left the dive boat before the two scuba divers entered the water. They checked each other's scuba then entered the water and descended together. Separation occurred near the bottom despite good visibility. After a short search underwater the buddy surfaced, asked those on the boat

whether his father had surfaced. He then decided that non-appearance indicated that his father had continued to dive, so decided he also would dive alone. Shortly afterwards the victim was heard yelling a short distance from the boat. Several boys swam to assist him, but he sank before they could reach him. A breath-hold diver soon located him on the sea bed, mask off and regulator lying free. Water depth was 20 feet and the boy was not able to pull him to the surface. A more experienced diver arrived shortly and surfaced the victim by inflating his buoyancy vest. He failed to respond to resuscitation efforts. The buddy surfaced 30 minutes later. No fault was found in any of the equipment, autopsy showed no evidence of ill health. It is not known why he drowned.

TRAINED. EXPERIENCED. SEPARATION ON DESCENT, CONTINUED SOLO. UNKNOWN TROUBLE CAUSED HIM TO SURFACE AND CRY FOR HELP. SANK BUT HAD WORKING BUOYANCY AID. POSSIBLE AIR EMBOLISM.

Case H 83/1

Bravery and "Can Do" are unfortunately inadequate as protection against the several problems inseparably associated with deep diving. In this instance a deep bounce dive was thought necessary to retrieve a TV camera apparently caught on the object of the search, a lost stop-gate deep in a dam. The surface of the dam was at an altitude of 236 m, depth was 185 ft, visibility nil, the water cold, and objects capable of causing entanglement were very probably present. The victim was owner of a small dive company. His employee/friend had made a bounce dive here the previous day to check whether the stop-gate had been located by a scanner. The only problem he reported was an entanglement of his air line which necessitated him ditching his equipment and surfacing using his "bail out" scuba. Before travelling to the dam the victim had phoned a large dive company to discuss the possible need for special equipment, but left a decision till he had checked the need for divers to attach cables when the gate was found. Possibly the presence of engineers from the water authority influenced his impulsive decision to dive to check the underwater object and free the TV camera as he ascended. The dive base was a barge held in position by shore lines and the wind moved it while he was underwater. He fixed his bailout bottle on his chest, an unusual position, before descending. Line calls to his tender indicated ascent started then abruptly ceased. Failure of the diver to respond alarmed the surface party and the standby diver was ordered to descend to give assistance. When he surfaced he reported having found the victim under some ropes and drums, on his back, mask on but no air bubbles escaping, indicating absence of breathing. He attempted unsuccessfully to free the victim then ascended. Some doubt was later cast on the exact situation found, nitrogen narcosis and the nil visibility which limited contact to the use of cold hands being thought to make recollections unreliable. Next efforts were made to pull the diver free, but the line parted. The next search, also using air, failed too. Later a dive using full deep-dive protocol (oxy-helium, hot water suits, wet bell, available RCC) was successful, the body being found floating near the bottom. The TV camera pulled free after the incident. A helmet with voice communication to the surface was available but not used because a little time was needed to rig it for use. During the investigation it was established that the

compressor could barely supply enough air at 180 ft depth for light work and certainly insufficient for heavy exertion or a panic or emergency situation. The second diver was lucky not to suffer a lethal mix of anoxia, hypothermia, narcosis and entanglement. No adequate allowance for the altitude was made in initial dives.

DAM. ALONE. ALTITUDE. DEPTH. COLD. NIL VISIBILITY. INADEQUATE AIR SUPPLY. ENTANGLEMENT. NO VOICE COMMUNICATION WITH SURFACE. DIVE BARGE MOVED. INEXPERIENCED AT THAT DEPTH. DIVE UNPLANNED. NARCOSIS. POSSIBLY EXCESS CO₂.

Case H 83/2

Few facts are available of the circumstances of this fatal incident. It is said the victim was using hookah with a scuba set as bail-out bottle. He is said to have dived from his fishing boat to free some nets.

NO DETAILS YET AVAILABLE

Case RB 83/1

The task was to obtain a series of bottom samples in a shipping channel, depth 180 ft. Because of a safety consciousness desire to avoid repeat dives there was a problem of having enough divers so each only dived once daily. The victim was trained but relatively inexperienced and had done no recent deep dives. Choice of flow rate was the responsibility of each diver. His was correct only for light work, with no margin for the unexpected (in the view of the other divers). He gave line calls to his tender which told of an ascent stopped after a few feet. It was imagined he had then realised narcosis had effected the performance of his task so had descended again to complete it before surfacing. However he failed to answer line calls so the standby diver was sent down. He found the victim on his back, full-face mask off, mouthpiece loosely in his mouth, unresponsive. He gave line calls to be pulled up with the victim and endeavoured to supply air to him using the demand valve of his octopus rig. This action was criticised at the court of inquiry because CT scan suggested presence of air embolism: but the "correct procedure" was not promulgated. Resuscitation failed. It was noted that his noseclip was missing: under the influence of nitrogen narcosis he may have removed his mask to replace it.

DEEP DIVE (180 fsw). TRAINED. RELATIVE INEXPERIENCE. LOW AIRFLOW RATE. NO RECENT DEEP DIVES. ALONE. NITROGEN NARCOSIS(?). REMOVED FACEMASK.

DISCUSSION

The three breath-hold fatalities followed dives where breaches of correct diving procedures were no worse than those a multitude of other divers probably commit. The supreme penalty they suffered should be a reminder that luck does not invariably protect those who tempt an unforgiving environment. Those with an interest in water safety should consider the value of identifying areas where swimmers and motorboats may seek to co-exist BEFORE an accident occurs.

The post-hyperventilation blackout syndrome is a problem

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Case	Age	Dive Victim	Skill Buddy	Diving group	Dive base	Dive purpose	Water sea	Depth incident	Weight On?	Belt lb	Contents gauge	Buoyancy vest
BH 1	33	experienced	experienced	2 separation	land	recreation	20'	surface	off	12	N/A	no
BH 2	N/S	experienced	N/A	solo	boat	training	60'	ascent	N/S	N/S	N/A	no
BH 3	30	some experience	N/S	2 separation	boat	spear fishing	8m	surface	on	17	N/A	no
SC 1	23	trained inexperienced	N/S	2 separation	boat	recreation	<30'	N/S	on	18	J reserve	no
SC 2	31	trained experienced	trained experienced	3 separation	boat	recreation	80'	N/S	on	18	yes	no
SC 3	35	not trained inexperienced	trained experienced	2	shore	recreation	60'	60'	on	21	yes	yes no cylinder
SC 4	21	trained	N/A	solo	land	work (dam)	26'	26'	on	N/S	N/S	yes
SC 5	55	trained experienced	trained experienced	2	shore	recreation	15'	surface	N/S	N/S	yes	yes inflated
SC 6	20	not trained inexperienced	N/A	solo	boat	recreation	8m	N/S	off	N/S	N/S	yes
SC 7	53	trained experienced	trained experienced	2	boat	recreation	20'	surface	on	N/S	N/S	yes
H 1	35	experienced	N/A	solo	boat	work	185'	185'	on	N/S	N/A	N/S
H 2	27	N/S	N/A	solo	boat	work	70'	70'	N/S	N/S	N/A	N/S
RB 1	30	trained. some experience	N/A	solo	boat	work	180'	180'	on	15	N/A	yes

KEY: N/S not stated N/A not applicable

GOOD breath-hold spearfishermen MUST take into account. It is unfortunate it is not painful, for then survivors might learn. The third case illustrates that the conjunction of several factors can be fatal (cold, no fins so greater fatigue, no vest, separation at a critical moment) and that the surface also has danger for divers.

The scuba fatalities are best studied case by case, each one illustrating different potentially critical factors. Included are the unwisdom of taking an untrained, inexperienced diver scuba diving and the lack of value of a buoyancy vest without its inflation cylinder or of one which fails to maintain the wearer's mouth out of the water. The dramatic power of water flowing through a pipe to create an irresistible suction was tragically illustrated, even a rope failing to preserve the victim from harm. Solo diving and separation again appear to be adverse factors in fatal

incidents, though many consider themselves their own best buddy. A buddy may not always be successful, but examination of the case reports will show buddy assistance at least offered the victim another chance of surviving. That even the trained and experienced may suffer if safe-diving protocols are breached is illustrated by case SC 83/2.

Both the hookah divers died alone. The dam dive had so many adverse factors that it is fortunate the other diver did not also die. Broken rules prejudice a diver's chances of survival.

That only the thoroughly trained should even consider using a rebreather unit is a truism generally accepted, but even a trained diver needs to keep in practice, particularly when diving at depths where narcosis or decompression

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Remaining air	Equipment test	Equipment	Wet suit	Significant Factors
N/A	N/A	own	yes	Hit by a motor boat in a near-shore channel. No flag. No warning signs.
N/A	N/A	own	N/S	Breath-hold down weighted line to pearl divers. Seen to start ascent.
N/A	N/A	N/S	N/S	Surface separation when buddy went to recover drifting boat. Cold. No fins.
low	yes	loaned	yes	Separation. Buddy was low on air and surfaced alone. One of other pair first scuba dive. Tanks first seen floating then the body. Pulmonary barotrauma.
low	yes	own	yes	Separation. Started solo ascent up anchor line while buddies continued dive. Vomit in mask.
low	yes	hired	no	Too large to hire wetsuit. Excess weights. Buddy breathing ascent. Surfaced unconscious. Unsuccessful buddy aid. Air embolism?
full	yes	own	yes	Leaking outlet pipe of dam. Dive to find and cover inlet. Unexpected suction.
low	yes	own	yes	Surfaced. Distressed (cramp?). Changed to snorkel. Unconscious. Mouth under water. Angina?
N/S	N/S	hired	N/S	Borrowed mask after others dived. Failed to resurface. Only the equipment was found.
N/S	yes	hired	N/S	Separation on descent, continued alone. Suddenly surfaced, cried out and sank.
N/A	yes	own	yes	Cold, deep, nil visibility, altitude. Impulse dive. Entanglement. Inadequate airflow.
N/A	N/S	own	N/S	Wore scuba and hookah. Retrieving net. Pre-dive Valium? Ill health? Other?
N/S	yes	employer's	yes	Little experience at depth. Using rebreather with low gas flowrate. Nose clip off. Removed his full face-mask. Nitrogen narcosis?

problems need consideration in dive planning. Regulations governing North Sea divers do not allow any "free diving" at the depth of this dive for reasons deserving consideration when planning any deep dive.

This report is presented in the hope that knowledge of these events will increase the level of awareness of factors able to critically effect the safety of the reader's diving.

ACKNOWLEDGMENTS.

This report would not be possible without the generous and continued support of many organisations and individuals, in particular the assistance of the Attorney General's, Justice, or Law Department in every State. Such assistance is a vital element in this ongoing investigation into factors capable of critically influencing the safety of diving.

PROJECT STICKYBEAK

The aim of this investigation is to receive, store, and if appropriate publish and make available for discussion, an accurate record of all types and severities of problems encountered by divers. CONFIDENTIALITY is maintained and no details are published to identify persons involved or sources of information.

Please send reports to:

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PO Box 120
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A double fatality in a pond, again due to suction through the outlet, was reported in DIVER December 1984.