Cave Diving Section		Schweizer Unterwasser-Sport-Verband Fédération Suisse de Sports Subaquatiques Federazione Svizzera di Sport Subacquei

Unfall-Reports aus dem Cavern-/Cave - Bereich

Fall 1: Verfehlen einer Abzweigung; Jump Reel nicht eingesetzt

Mayan Cenote, Mexico

95APR- Two ***experienced cave divers ran out of air and died*** after missing a turn while trying to exit a cave dive in Mexico. The two were among a group of seven cave divers who had broken into three teams for a 45-minute dive on air at depths no greater than 60 f/ 18 m. The pair was on the third team to enter the cave. Besides making an incorrect turn while trying to exit, the divers ***failed to use safety reels to mark a jump*** and apparently ***missed or disregarded a series of line markers*** pointing the direction to the exit.

On their way into the cave, all three teams used a main tunnel known as B. They passed in sequence through a T-turn, where the divers expected a jump. However, instead the cave came to a T, with three line markers marking the correct direction to turn while returning to go to the exit. A member of the second team repositioned one of the markers to make it more visible.

The third team into the cave called their dive earliest as planned, since the first two teams were stronger swimmers and wanted to penetrate further. The two divers then headed back, but turned in the wrong direction at the T, apparently missing all three line markers at the spot. Their mistake led them 300 f/91 m to the end of B tunnel, where another route leads to the A tunnel. The divers headed into the A tunnel, which also led to an exit, crossing a visual gap without setting up a safety reel to mark their path.

The divers then made a series of errors, apparently missing several indicators that should have told them that they were following a different path than the one they'd taken in. The divers made it to the end of the line marking the start of the A tunnel, **about 30 feet from an exit**. Rather than exiting, the team headed back into the A tunnel, passing as many as 14 line markers pointing back toward the entrance they'd just left. The divers then swam past the unmarked jump which might have led them back to the other dive teams.

When the third team did not return from the dive, the other five divers notified local authorities and asked for help. Later that day, the divers returned to the cave and recovered the bodies of the two divers. Their moves were reconstructed by the other members of the team, one of whom had entered the A tunnel after completing his dive in an attempt to find the missing divers. He noticed silt at the entrance, indicating that the missing team had recently been there, but because of low air had to turn back before going far enough into the tunnel to find them. One of the divers who died was 38 and had made between 75 and 100 cave dives; the other was 45 and had some 150 cave dives.

A cave diving instructor with the group commented that the series of errors apparently made were inexplicable given the level of experience between the two divers.

Fall 2: Technisches Versagen DPV Steuerung; kein Longhouse

Bakerston Mine, Harpers Ferry, West Virginia

94JUL- A ***certified cave diver apparently embolized and died*** when his ***DPV trigger stuck in the "on" position dragging him to the ceiling of the cave*** following a gas switch from trimix to air at a depth of 200 f/61 m on the return leg of an exploration run. Prior to the switch, the diver had drained his doubles-violating the "thirds rule"- and was forced to share gas with his partner and swim for safety when his reserve cylinder regulator failed to function- ***the regulator hose being too short to permit scootering.***

The team's objective was to explore beyond the end of the existing permanent line at approximately 1650 f/503 m at a depth of 285 f/88 m. the team began the dive by motoring in 900 f/274 m to a depth of 200 f/61 m where they switched from air to trimix. The dive continued to a landmark known as "The Rock" at a depth of 250 f/78 m at 1200 ft/366 m. At this point the cave sloped to 270 f/83 m over a distance of several hundred feet (61 meters). The diver dropped his DPV due to the limited depth rating of the vehicle and swam as his partner slowly motored along. The end of the line was reached without incident at a depth of 285 f/86 m and the team added another 150 f/46 m of line to a depth of 305 f/94 m. The dive was called and the exit began.

The team returned to the staged DPV at 270 f/83 m at which point the diver attempted to switch to his reserve cylinder, his doubles being empty. Apparently, his regulator would not deliver any gas. Realizing there was a problem, his partner handed the diver a regulator from one of his two trimix stage bottles, however, **the short hose made it impossible to motor so the team swam their DPV's back to The Rock**. At this point, the diver switched back to his air stage and the team motored approximately 300 f/91 m up the ledge to the big room at a depth of 200 f/61 m.

Once they entered the room, his partner felt a DPV blast and saw a flash of light. He turned to find the diver unconscious on the ceiling- the DPV running circles around him. The trigger was stuck "on." There was blood in the diver's mask. He cut away the DPV and tried to hold a regulator in the diver's mouth with no response. The partner then attempted to tow him out but had to leave the diver to complete his own decompression.

The recovery team had no problems locating and extracting the body. All equipment was functioning properly, including all regulators. The doubles were empty and the single 80 with trimix was full with the regulator working properly.

The diver had a reputation for violating the thirds rule, had previously run out of gas on at least three cave dives, and had experienced "deep water blackout" (where a deep air diver is rendered unconscious) at 210 f/65 m while switching from bottom mix to air during a previous dive to the site and survived. An astute dive partner held his regulator in his mouth until he regained consciousness.

Fall 3: Hypoglykämie ? Herzrhythmusstörungen ?

Huautla Expedition: Fatality Report

On 27MAR1994, British ***cave diver Ian Roland died*** whilst exploring the terminal sump in Sotano San Agustin, part of the Systema Huautla, in Oaxaca, Mexico. A member of the expedition team, Roland was diving the prototype rebreather system under development by Bill Stone.

At 08.00 on the 27th, Ian had dived from Camp Five for a 380 m/1246 f penetration. Dive time was 53 minutes at a maximum depth of 26 m/85 f.

At 11.00 Kenny Broad continued the exploration, surfacing in a large air bell at 430 m/1410 f. The chamber was approx. 20m wide and 20m high (65 feet x 65 feet) with large sandbars. There was not sound of running water or air movement. Kenny returned to base without exiting the water. At 16.00 Roland set out to explore the chamber. He estimated a return time of three hours but said not to worry for six.

At 19.00 Broad, concerned by Roland's non-appearance, began to assemble the second rebreather rig. At 22.00 he set out to Camp Three to alert the support party. They returned to Camp Five in due course and completed the assembly and checking of the second rig. At 12.15 on 28MAR, Broad began the dive through to the chamber. He carried emergency medical supplies (Roland was diabetic), food and bivouac equipment. At 12.41 he surfaced in the chamber and noted foot-prints on the sand bar. He swam alongside the bar, in clear water, and continued beyond its end for 10 m/33 f at which point he located Roland's body resting on its right side. Resuscitation was futile.

Broad noted that the line reel appeared to have fallen out of Roland's hand. Four out of five tanks were full and the control system was functional. The mouthpiece was in closed circuit position and out of the mouth; the O2 "setpoint" was 0.5 atmospheres; the O2 control valve was in manual shut off position and the PO2 was 0.17 atmospheres (heliox 14/86). There was no sign of struggle or distress. The body was recovered by team members, assisted by Mexican cavers and members of a British expedition, in an operation which took six days.

Observations during the recovery showed that the control system was still active and the heads up and buddy displays were both flashing red, indicating a PO2 below 0.21 atm. The left diluent tank was empty. Black box data records that were retrieved from the rig, show that the tank was emptied over a seven minute interval following Roland's loss of the mouthpiece as the rig attempted to maintain counterlung volume. Functional tests were made on the rig back at the base. All systems were operational and within specification.

Roland had eaten a normal breakfast in the morning buy was suffering from mild diarrhea. He had taken two food bars which were not eaten. There was not sign that Roland had doffed & donned the rig when leaving the water. ***These items had combined the weight of approximately 140 pounds,*** therefore traversing the airbell would have involved a significant exertion. The oxygen injector unit on the rig was manually switched off. This is a common procedure upon surfacing which conserves oxygen. Normal procedure would have been to re-enable the unit upon re-entering the water.

Given that his rebreather appeared to be fully functional, it was initially presumed that Roland's death was due to operator error based on the closed position of the O2 valve. However, black box data clearly indicates that at the time of what was apparently an uncontrolled descent from the surface to 9 f/2.8 m, the PO2 of the breathing mix was 0.24 atm, i.e. not hypoxic, indicating Roland's blackout was due to some other cause. The observed PO2 of 0.17 atm resulted from purging of the gas processor with 14/86 heliox during the descent. It's subsequent stability at 0.17 atm indicates that Roland was not breathing form the rig following initiation of the descent.

Based on his dive line, it was clear that Roland was returning to the sand bar from the head of Sump 2 after apparently realizing something was wrong. Given that Roland ***was a diabetic and had not recently eaten; that heavy exercise, and mental impairment was present*** (evidenced by the failure to re-enable to O2 valve) it has been concluded that the black out was caused by ***hypoglycemia and/or related events such as arrhythmia or seizure***. Roland was extremely meticulous cave diver and had logged more than 60 hours on rebreathers. He was, however, a recently diagnosed diabetic and did not have a blood glucose test kit in the cave.

-submitted by Rob Parker & Bill Stone

Fall 4: Gasverwechslung (Hyperoxie)

Sydney, Australia

MAR94-A very experienced technical diver, PADI and NAUI instructor and ANDI nitrox instructor trainer, ***mistakenly breathed his EAN 50 (50% O2, balance nitrogen) decompression mix during a wreck dive to 50 m/164 f (PO2 = 3.0)*** on the Coolooli, and convulsed and drowned 18 minutes into the dive. Efforts to resuscitate the 47-year-old diver were unsuccessful. The diver was diving air supplemented with EAN 50 mix for decompression-a common practice among Sydney wreck divers. Reportedly, the diver carried both his bottom and decompression mix on his back and ran both through a ***switchable manifold block***. Several colleagues apparently talked about the shortcomings of this configuration with the diver without success. An analysis of the contents of the tanks showed that the diver breathed EAN50 during the duration of the dive. He convulsed just as he and his tow dive partners began their ascent.

Fall 5: Nichtausgebildete Taucher, inadequate Ausrüstung

Abaco, Bahamas

94APR-***Three "untrained" open water divers ran out of gas and drowned*** in the Big Boil Blue Hole cave system. *None of the divers were cavern or cave certified*.

It was reported that the three divers entered the low and silty Big Boil cave with only two guide lines. ***Two of the divers carried single 72 cf tanks. The third carried a single 80 cf tank***.

The team leader who reportedly had "dived Big Boil many times before," ***made the dive without a depth gauge, BC, knife or redundant second stage.*** The team apparently made about 150 foot/46 meters penetration to a depth of 75 f/23 m.

Two of the bodies were recovered on the main line at what is believed to have been their point of maximum penetration. One of the divers was tangled in the line. The body of the team leader was located after an extensive search, in a *restricted side passage* approximately 150 feet/46 meters off the main line.

-submitted by Al Pertner

Fall 6: Nichtausgebildete Taucher, inadequate Ausrüstung

Grand Bahamas

94MAY-***Two very experienced divers who were not cave certified, got lost*** in a popular Blue Hole during a live-aboard dive trip, ran out of gas and drowned. *Neither diver was running a line or carrying multiple lights.*

One of the divers was found within 100 feet/30 m of the cavern zone in about 90 f/28 m. The second body was recovered by a cave recovery team the next day at about 400 feet/122 meters from the cave entrance in about 120 f/37 m of water. Both were wearing ***single 80 cf tanks***. It is not known if the bodies were separated by the tidal flow in the system or if the team had been separated during the dive.

The cavern zone at the site is often dived by recreational divers from a liveaboard. A partner of one of the deceased who was on the dive boat believed that the two "had no intention of making a cave dive," and in fact, had left line reels on the boat. One of the divers was going shell collecting. The other was apparently planning to shoot video. The partner believes that the two got intrigued an ventured out of the cavern zone into the cave system. Ironically, the two were considered the most experienced divers on the liveaboard trip. One of the divers was a former commercial and military diver, was open circuit mix trained and had worked as a divemaster with a technical diving operation. The other was a dive store owner, a 20 year instructor and was in the process of completing a cave course.

Fall 7: Nichtausgebildete Taucher, inadequate Ausrüstung

Little River, Florida USA

93SEP-***A novice cave diver ran out of gas and drowned on a solo dive in the Little River cave system***. The diver was found with no air in either of his independent 104 tanks about ***1300 feet back in the cave*** on the mainline. Though the individual frequently made solo dives he was not diving with a "buddy bottle."

The diver was known to use "creative" gas management rules outside of the basic tenets of cave diving and on at least one occasion had explained the gas management strategy he utilized to a group of cave students. Basically the diver reserved sufficient gas to exit form known points in the cave using the outflow in the system. The problem is that liberalized gas management rules such as this leave not margin for error or the unexpected compared to the golden "rule of thirds" or better (i.e. use at least 1/3 of your gas for penetration and exit on the remaining two thirds).

Members of the recovery team speculate that the diver ventured into an unfamiliar part of the cave and got lost in the low silty tunnels and "tees." Having silted out the area, the diver spent precious time searching for the main line connection and likely missed the tee on the way back. Eventually he found his way to the line but it was too late. A long time aquaCorps subscriber, he had renewed his subscription only a week before.

Fall 8: Steckenbleiben in Engnis auf 61m, ca. 1900m bergwärts

Wakulla County, Florida USA

93SEP***- A very experienced 24 year old, cave diver*** lost consciousness and drowned while negotiating ***a restriction on the way back to the team's decompression stages*** following a deep mix exploration push to about 220 fsw/66 msw with a planned bottom time of 120 minutes.

The inbound leg of the dive which was the latest in a series of progressive pushes intended to connect several major sinks had gone as scheduled. The team of three reached the end of the line in a good time and added about 800 feet of line (7800 feet back at about 220 fsw/66 msw) when the diver "unexpectedly" called the dive. The team turned for home. Upon reaching their staging area, the lead diver turned to see the diver tangled in the line struggling with his stage. The third diver freed him and they continued although the diver appeared shaken. ***As the diver negotiated the "short cut" restriction at about 200 fsw/ 61 msw and 2000 feet back***, ***then his scooter prop caught and ate the line, halting his forward motion and pinned him between the floor and the ceiling*** just as his stage bottle ran out of gas. He flashed an "Out-of-Gas" signal to the lead diver who responded with his long hose. Thinking the diver was out of gas (he actually had 1000 psi in his 104s and 1000 psi in his other stage), the lead diver passed him a stage bottle. The

diver gave back the long hose and jettisoned his old stage. ***At this point the cave silted up and the lead diver lost visual contact.***

From the rear, the third diver saw his team mate wedged in the restriction and initiated touch contact as the cave silted out. The third diver squeezed his leg to indicate "Go" and the diver kicked. He backed off then squeezed again with no response. ***He tried to pry him free and at some point realized the diver was dead***. The third diver unclipped his scooter and stage bottles and was able to squeeze around the unconscious diver in the cloud of silt and made physical contact with the lead diver.

Silted out and under the time constraints of their gas supply the remaining two divers linked up and motored back to the safety of the decompression bottles. ***The two had about six hours of decompression remaining.***

The incident generated serious discussion in the cave community regarding the role of a dive team and how much push is too much. Reportedly the diver couldn't sleep the night before, had ill feelings about the dive, and exhibited anxiety. He told at least one person that this was the last of these dives he would do. It was reported that the diver was "off" that day and that he may have chosen to go ahead so as not to miss the "big" dive and lose status.

Fall 9: Bewusstseinsverlust mit Ertrinken

High Springs, Florida USA

93OCT-***An experienced cave diver lost consciousness at the start of a "pleasure" cave dive at Devil's Ear and drowned.*** The dive was intended to be a fun dive to practice scooter techniques. The team of two mounted their double stage bottles and scooters and descended into the "Ear" against the normal outflow. The lead diver went through the first restriction after exchanging OKs with his partner. The diver appeared preoccupied. The lead diver got to the "Lips' about 200 feet into the cave, turned and waited. The diver wasn't there. Not seeing his lights, he turned and back tracked. ***He found the diver unconscious with his regulator out of his mouth in about 30 to 40 feet of water.*** The diver was immediately brought to the surface, CPR was initiated and the diver was flown to Shands Hospital. The diver was placed on life support but never regained consciousness and was pronounced dead the following morning. The Coroners report didn't shed light on the cause of his trauma. He had not history of heart problems, no predisposing medical conditions and no signs of embolism. Individuals can only guess that the diver had a serious problem, turned to exit following the floor of the cave, missed the exit, lost consciousness and drowned.

Fall 10: Hyperoxie mit Ertrinken

Merida, Mexico

1993 March***-A full cave and nitrox instructor suffered an oxygen convulsion during a deep air dive in a sink a hole in Mexico and drowned***. His partner who experienced CNS toxicity warning signs during the dive and a safety diver survived. The two later recovered the body.

The team had planned a 20 minute air dive in excess of 230 fsw (71 msw)-the depth of the saltwater halocline-in a cavernous open-water sinkhole near Merida on the Yucatan Peninsula. Because of the difficulty in obtaining helium mixes in Mexico, the team decided to conduct the dive on air followed by oxygen for decompression. Both were experienced deep divers. A weighted

descent line was rigged for navigation and for staging oxygen and extra air cylinders. The safety diver was to descent with the team to 220 fsw, ascend to a shallower depth and wait for the dive team.

After a long slow descent past the halocline, the team tied into the descent line to explore the well at a leisurely pace. Informed sources estimated their maximum depth to be close to 300 fsw (92 msw) (A PO2 in excess of 2.0 atm-e.d.). The surviving partner experienced a tingling in his lower lip and turned back to call the dive only to see the diver headed back as well. When he reached the line, he sensed that the diver was in trouble. The diver grabbed the line and began a hurried hand-over-hand ascent. The partner reached the diver, gained control and they began to ascend together. ***The diver continued to pull on the line creating slack and getting himself tangled. His partner cut him free. The diver then darted got tangled again apparently convulsed.*** By the time his partner reached him the diver's regulator was out of his mouth. At that point they were still deeper tan 230 fsw (71 msw). After repeated attempts to force the regulator back into the diver's mouth with no success, the surviving partner realized the diver "was gone" and leaving the body entangled in the line, ascended to complete his decompression. Following decompression, the partner and safety diver were able to pull up the line and recover the body.