Underwater Speleology

Journal of the Cave Diving Section of the National Speleological Society

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Volume 48, No. 1
Jan/Feb/Mar 2021

CAVES OF FIRE AND ICE
NSS
2021 CONVENTION
Weed, California

CALL FOR PRESENTATIONS

Submit abstracts by June 30

THE NSS VIRTUAL CONVENTION will be held from July 26-July 30, 2021, and is looking for presentations NSS-CDS members.

Each session will consist of a pre-recorded video that is served up menu-style so participants can pick and choose what they want to watch. Please submit the title, author's name, and abstract to pat.kambesis@wku.edu. Deadline is June 30, 2021.

Guidelines:

- Pre-record your presentation, and upload it to https://www.dropbox.com/.../NSS%202021%20Video.... (You do not need to have a Dropbox account).
- Duration is ideally 20 minutes (more or less). Many presenters have recorded their programs using Zoom, but any similar platform that allows video recording is okay.
- Narrated PowerPoint presentations (and recorded via PowerPoint) are also a good option.

For questions or problems, contact Patricia Kambesis.

Underwater Speleology
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January/February/March, 2021

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Cover: *Eckehardt von Damm scooters in Nohoch Nah-Chich.* © Ricardo Castillo.

To our readers and members: Views represented in *Underwater Speleology* articles are solely the author's and do not reflect the views of the NSS-CDS Board of Directors or of the Editor.

We advocate freedom of speech and welcome discussion. Feel free to rebut previous articles and/or to submit your own.

The magazine encourages members to submit news, stories, letters, trip and exploration reports, maps, and photos for consideration. Please contact the Editor for publication guidelines to avoid duplication of work.

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UWS is a membership benefit. Information about membership fees and registration can be found at www.nsscds.org.

Please send address changes to cdsmanager@nsscds.org or to 295 NW Commons Loop, Suite 115-317, Lake City, FL 32005.

NSS-CDS is a 501(c)(3) nonprofit organization.

a note from the chair

by Reneé Power

2021 State of the NSS-CDS

It has been a crazy year, but our organization's state is healthy. We have faced down COVID-19 and other challenges that have prevented us from fully flourishing. This report offers a look at where our organization now stands with regard to our accomplishments, community, finances, and training. In addition, there are some openings for committee volunteers.

Accomplishments include:

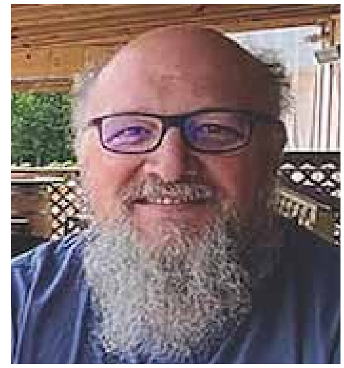
- Electing members to fill the Board of Directors' vacancies;
- Reviewing and and approving bylaws changes by the membership https://nsscds.org/organizationdocuments/;
- Posting the Spanish translation of *Basic Cave Diving - A Blueprint for Survival* on our website;
- Launching the official NSS-CDS Instagram account ;
- Storing some of Sheck Exley's personal items, previously held by Mark and Annette Long, at NSS headquarters for safekeeping. Michael Poucher delivered the items;
- Establishing a more positive working relationship with the NSS;
- Designing a new Training Department IT platform (in progress);
- Selling Grim Reaper signs in our online store;
- Creating a membership electronic database;
- Holding a holiday free giveaway drawing for members. Thank you to our sponsors: Dive Rite, Light Monkey, and Cave Adventurers.

(continued on page 22)

NSS-CDS board of directors 2021

Jason Black – Chair – one year remaining

Andrew Pitkin – Vice Chair – incoming with 192 votes (23.7%)



Richard Blackburn – Secretary – one year remaining

Renée Power – Treasurer –incoming with 225 votes (27.8%)

Max Kuznetsov – Training Director– one year remaining

Charlie Roberson – Program Director –incoming with 153 votes (18.9%)

Thank you to the Nominations Team: Kelly Jessop (Administrator of Elections) and to Roderick O'Connor, Jim Wyatt, Sean Barnes, and Jozef Koppelman for your dedicated service.

James Chandler– Program Director–incoming (named at June 7 Board of Directors' meeting)

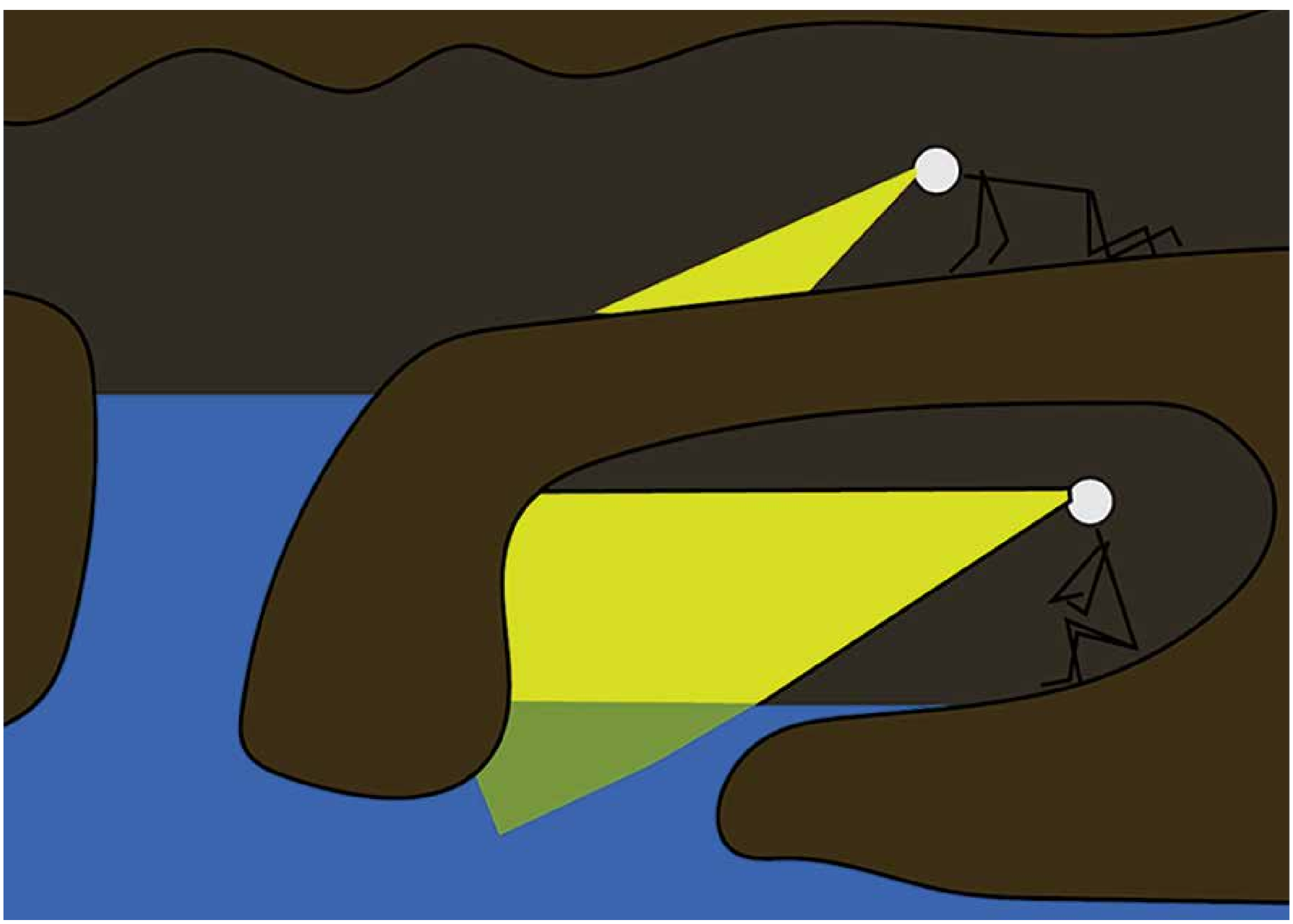
Conducting Rescues from Underwater Air Bells

by Michael A. Raymond

A friend of mine described a disaster situation he needed to plan for. A deep cave that he was exploring had the potential for massive flooding. He always kept an eye on the weather report, but wanted a contingency plan in case the cave started to flood while he was at its bottom. He presented his plan and wanted to know what I thought.

Near the bottom of the cave is a moderate-sized chamber. Its only opening is in the floor. He knew from historical records that the cave could flood to 60 m/200 ft above this chamber and that the water usually dropped all the way back down within four days. His contingency plan was to climb up into the chamber and wait out the flood. His hope was that since the air in the chamber had nowhere to go, it would be compressed but he would stay dry.

You can do the math of the situation at home. His decompression schedule is relaxed and safe. The problem is oxygen toxicity. He would spend a day with a pO_2 of 1.5 ATA. The author isn't positive of the effect, but doubts it is good.



Water in a typical underwater air bell is below the local water table. The elevated gas pressure in the chamber prevents the water level from rising. © Michael Raymond

There's another problem. Caves are where they are because that's where the weakest rock was. Limestone is a porous rock, and air leaks through it.

Each of us has noticed the air bubbling up from the sand as we've swum down the run toward the cave entrance at Ginnie Springs. It's the same air that was recently exhaled by divers in the cave tunnel below us. The same air that only momentarily formed a pocket on the roof of the cave. My friend's plan for surviving a flood was imaginative, but it would never work because the air in the chamber would leak right out of the ceiling.

There are several environments that would trap the air. Air bells are cavities with water at their bottom in which the only exit from the cavity is below the water level. In normal air bells, the water level sits at the same height as the local water table, and so the air in the cavity is not compressed. In underwater air bells, the water level in the chamber is below the local water table and is kept from rising by an elevated gas pressure in the chamber. Examples include diving bells and decompression habitats.

In this article we are going to look at rescuing people from underwater air bells. We will examine two mine rescues and two rescues from overturned ships. While neither of these environments are caves, techniques for sump rescue still apply here. By studying these incidents, cave divers can broaden their awareness of the factors involved in sump rescues and increase their ability to help others in a wider variety of situations.

Australia 1907

Modesto Varischetti was working 200 m/656 ft below the surface of western Australia in a gold mine. A major rainstorm caused a flash flood that swept into the mine and flooded the lower levels. Water filled from the twelfth level almost up to the ninth. Varischetti was working alone in a rise above the tenth level. He didn't notice the flooding until the water had risen almost 20 m/66 ft above his location, trapping him in an underwater air bell.

Once his fellow miners realized he was missing, they immediately initiated a rescue. They knew what part of the mine he was working in. They traveled to a spot directly above his location and were able to communicate with him by hitting the mine floor with hammers. They were mostly recent immigrants from northern Italy and used a tap code common to the region. The miners turned on the pump attached to the compressed air line going into his room. The line was normally used to power his tools, but in this case, it replenished his air supply.

The first attempt to use underwater breathing equipment for a sump rescue was in 1894, but Varischetti's rescue is its first known successful use. Hard-hat divers were brought in to ferry Varischetti supplies. The first diver reached him through low visibility and many entanglement hazards after Varischetti had been trapped for four days. Another diver helped manage the first diver's surface-supplied air hose.

The divers were able to regularly bring him meals, candles, and cigarettes. Some of the food had been peptonized (artificially partially digested) in order to help him in his weakened state. After nine days of captivity and hundreds of trips by the mine train hauling out water, Varischetti was able to leave his 7m/23 ft-long room. The lead diver carried him through now waist-high water in the tenth level to a ladder, where he was escorted from the mine.

Pennsylvania 2002

In July 2002, 18 miners were working in Quecreek Mine in Pennsylvania, evenly split into two groups. One group was working in an area they knew was near another long-abandoned mine, but they believed that the mines were still far apart. What they didn't know was that undocumented expansion had occurred at the other mine. They discovered this when one of their blasts broke into the other mine, which was at a higher elevation, and 75 million gallons of water starting gushing in.

This group immediately attempted to escape the area. First though, the men heroically took the time to contact the second group using the in-mine telephone system. This gave the second group enough time to escape the mine, though it was close. The first group, though, found its exit blocked by water and retreated to the highest elevation area it could reach. They were wet, cold, covered in coal dust, and without any supplies.

The rescue attempt started right away. Fortunately for the miners, the Quecreek mine was very well surveyed. Rescue personnel located the surface area above the most likely place the miners would have gone to, and started drilling a six-inch shaft 73 m/240 ft down to them. They also used seismic sensors to listen for hammer noise that the miners were trained to produce.

The 22-inch capsule used to rescue the Quecreek miners in July 2002. © Michael Raymond

Down below, the water was rapidly nearing the miners, and the oxygen in their area was running out. When the drill broke through the mine ceiling, the men used the pressurized air line that was powering the drill to refresh their air. Fortunately, the compressor was producing clean air, or their situation would have gotten even worse.

Something had to be done about the rising water. Huge pumps were brought to the mine, but they wouldn't be able to lower the water in time. The rescue team decided to seal the shaft they had bored, and pump in 90 psi of air. The sound was deafening to the miners, but the hot air helped keep them warm. Their part of the mine was at an elevation of 558 m/1830 ft and had a five-foot ceiling. Records show the water reached a maximum height of 560 m/1836 ft, which would have drowned them if it were not for the pressurized air preserving their air bell.

The rescue team then had to decide how to extract the miners. They considered using Navy divers, but this plan was rejected due to distance, route, and water condition. Their eventual plan was to drill a 26-inch shaft down to the miners and raise them in an old 22-inch rescue capsule. First, they bored down more six-inch shafts into deeper areas in order to add more pumps to the effort. The rescue team realized that decompression illness was a major threat.

To combat this, the Navy delivered 10 portable hyperbaric chambers to the incident site, and local engineers built a special compartment to go over the rescue shaft. The compartment would preserve the air pressure in the mine while the capsule was being raised and lowered.

The team decided that once the capsule reached the surface, they had 15 minutes to get the miner into a hyperbaric chamber. Part of the movement effort would involve cutting off the miner's clothing and washing him. Putting someone into a hyperbaric chamber while covered in coal dust was apt to lead to spontaneous combustion.

Fortunately, the chambers were never needed. By the time the rescue shaft was completed, the pumps had dropped the water level enough that the air pressure in the mine was back to normal.

All nine miners were successfully raised to the surface and flown at low altitude to the hospital. They were on the verge of hypothermia and very hungry after being in the mine for four days, but all fully recovered.

Pearl Harbor, Hawai'i 1941

When the Japanese attacked Pearl Harbor in December of 1941 and General Quarters was sounded, the Sailors of the U.S. battleship *Oklahoma* raced to their battle stations. Despite warnings about possible hostilities, the ship was awaiting an inspection, and all of its hatches were open. This meant that when it was struck by multiple torpedoes, it quickly began to flood.

Many Sailors stayed at their battle stations deep in the ship because they either had not been relieved, or because their leaders told them to stay there away from the falling bombs. This meant that when the ship rolled over and sank into the mud, they were trapped inside. The bottom of the ship was still above the water, but the compartments where the surviving Sailors were became underwater air bells.

The book *Trapped at Pearl Harbor* by Steven B. Young details his experience of being trapped in one of the turrets. He and the Sailors trapped with him were relatively warm. They had a few flashlights that they kept off most of the time to preserve the batteries. Their principal concern was that the water was rising, and they knew they were running out of oxygen.

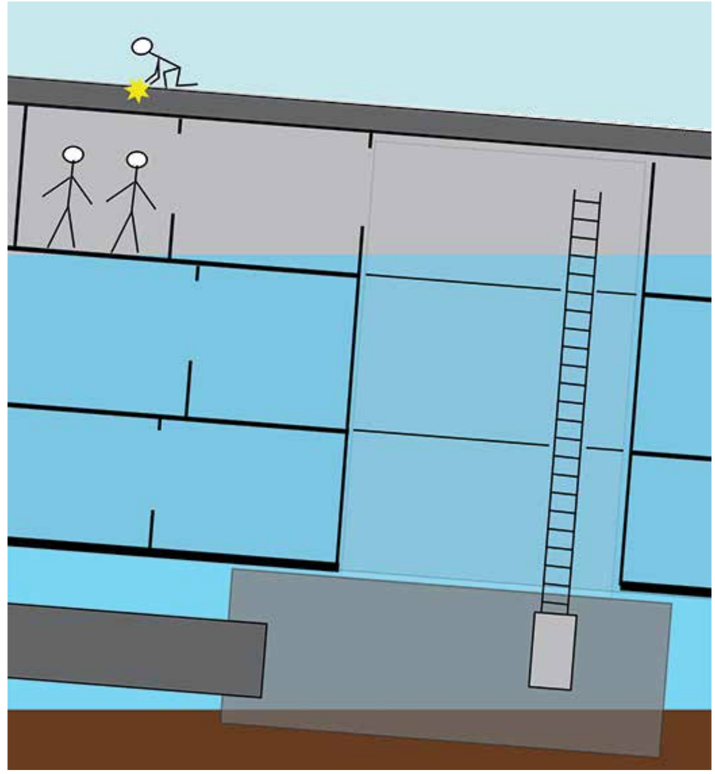
The Sailors were very familiar with their ship and knew there was an escape hatch at the top, now the bottom, of their area. Theoretically they could breath-hold dive down without any light, go through the hatch, swim along the deck of the ship, and then swim up to the surface. They didn't know if they could make it all the way, though.

At the start of their ordeal, several Sailors made the attempt. Some made it almost all the way to the hatch, thought better of it, and swam back up into the air bell. There was little talking, and no one shared that the way was clear. Other Sailors did make it all the way out of the ship and to the surface. Once on the surface, they were so exhausted from the effort that each one would have then drowned were it not for passing watercraft that saw them pop up and raced to retrieve them.

When people didn't come back, the Sailors inside didn't know if it was because they had made it, or if they had gotten stuck, which meant that the hatch would be even harder to get through. Eventually those who remained were in such bad condition from the bad air in the compartment that they collectively decided they did not have the energy for any more attempts.

Outside the ship, the rescue party working to save them had several complications. They could hear banging from inside the ship, but it was hard to precisely locate the source. They could not start cutting into the hull of the ship just anywhere. There were many fuel tanks in the hull, and cutting into one with a torch would ignite the fuel. Using a torch to cut into a small chamber also risked using up all the oxygen in the chamber and suffocating anyone inside.

The men inside the turret eventually broke open a door into a room beside theirs. With the tilt of the ship, it was higher and they could get out of the rising water. The expanded area also gave them more air to breathe. They were overjoyed to hear the rescuers cutting into the ship and getting closer.



Rescuers race against rising water in the U.S. battleship Oklahoma *at Pearl Harbor.* © Michael A. Raymond

When the rescuers began cutting into their room, a race began. When the first hole was made, their air bell was now broken. Air was escaping, which allowed the water to rise even faster. The Sailors didn't think to close the door in their new room and thus slow the rise. Eventually a man-sized hole was cut open. They padded it with mattresses, and everyone made it out of the ship before their area completely flooded.

Nigeria 2013

In June, 2013 the tugboat *Jascon-4* flipped over and sank nearly 30 m/100 ft to the bottom of the ocean. The ship had been helping to move an oil tanker off the coast of Nigeria while in high seas. The ship's cook, Harrison Okene, was unable to escape the ship and wound up trapped in an underwater air bell. None of the other eleven crew survived. The oil company immediately deployed divers to check the ship. They banged on the hull, and Okene banged back, but they didn't hear him.

Inside the ship, Okene worked to improve his situation. He tore apart the wall of the room he was in so that he could move to a larger area. He built a platform out of mattresses and the wall material so he could get out of the cold water. Okene was chubby, which helped keep him warm. He found one bottle of Coca-Cola to subsist on. He had two working flashlights, but they died after the first day. He could hear fish eating the remains of his fellow crew. When salvage divers encountered him on the third day, he was in very bad shape.

The oil company had hired salvage divers to remove the dead bodies from the tugboat. Their job was difficult for a number of reasons. The crew had locked all the doors as a precaution against pirate attack, and it took the divers an hour to break through them. The ship was upside down, full of debris, and slowly sinking into the ocean bottom.

After being trapped for 60 hours, Okene heard the salvage divers working on the ship, saw one diver swim past his position, and was fortunate to get a diver's attention the next time he saw a light. The video of their encounter is well known.

the temperatures of the air and water, the movement of the water, and the amount of time the persons have been there.

Can this equation be made simple enough to be useful to the incident response personnel? If not, we're left with our current rule of thumb that chambers with moving water replenish air "faster".

Moving water is likely a factor in Okene's survival in 2013. When experts ran the numbers for his situation after the fact, they found that he should have died at two and one-half days. This is the same amount of time that it took the salvage divers to get to him. His agitating water while struggling to stay on his small platform may have had a tiny benefit—water with more saturated O_2 and less saturated CO_2 may have then been exposed to the room.

Sump rescue skills translate to mining and shipwreck accidents. Special considerations include protecting the integrity of the air bell and having a decompression plan for the entrapped persons.

The salvage divers did a great job with rescuing Okene. When they found him, he was delirious, suffering from CO_2 poisoning, and short of breath. They fitted him with a diving helmet and harness and then gave him a 20-minute diving lesson. Okene remained calm throughout his extraction from the ship, which helped tremendously. The divers took him to a dive bell, which brought him to the surface where he was put into a decompression chamber for 60 hours. Okene fully recovered, though now he refuses to return to the sea and suffers nightmares of his ordeal.

Discussion

The sump rescue community needs a simplified way to calculate air replenishment for "small" chambers. Certainly the full solution can be calculated numerically. Take the volume of the chamber and factor in the respiratory rates of the trapped persons, the surface area of the water touching the chamber,

Movement by the trapped Quecreek miners probably had more of a negative effect. As the water rose, the miners struggled to build a series of barriers to keep it at bay. The water was rising so quickly that it quickly bypassed each of their attempts. They were following their training, but their physical exertion likely only exhausted their air.

An interesting additional issue is whether it is safe to use a Palmer Furnace or similar method to warm up your patient. The literature seems to suggest that in oxygen-enriched environments, fires are more affected by the percentage of oxygen than its partial pressure. Therefore, if you are in an area with compressed air then you should be able to safely operate a flame, whereas in an area full of nitrox or similar, it is recommended against. Most underwater air bells tend to be small areas though, and so fire should be avoided to prevent the depletion of oxygen and creation of harmful gasses.

Lessons Learned

Several lessons can be drawn from these rescues. In mine—and likely cave—rescues, the sooner you can start using pumps and the more pumps you can use, the better. Make sure that someone is watching and ready to react if one of the trapped people attempts to free dive out. Be prepared to deal with bad air when you encounter someone.

These rescues reinforce the first two parts of the ACME rescue acronym:

- **A**ir quality,
- **C**oherence as an indicator of the patient's mental status,
- **M**edical condition, and
- **E**xit plan.

Rescuers should step through this sequence upon coming up in an air bell and finding one or more of the missing persons. Remember, in cave rescue, it is almost always the cave environment that kills you, and not a debilitating injury.

Conclusions

Underwater air bells of sufficient size to shelter in are completely unknown in the caving world. They do happen in the worlds of mine and shipwreck rescue though. Sump rescue skills are applicable in these environments, but rescuers should be aware of the special requirements. These include:

- protecting the integrity of the air bell, and
- having a decompression plan for the patients.

Using this knowledge, cave divers can be able to assist their communities if these special circumstances arise.

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Michael A. Raymond is at work on a series that explores controversies and best practices in sump rescue. He is Associate Editor for Underwater Speleology.

Accident Analysis

Single-Diver Fatality in Cenote Vaca Ha (Sistema Zapote) July 12, 2020. Final Report

by Kim Davidsson and Alexanda Coffield-Feith

Location:

Cenote Vaca Ha is part of Sistema Zapote in Mexico, located on the Coba Road, 7 km/4.2 mi from Tulum. The cave is for the area considered deeper with an average depth of approximately 21m/70ft. There is low flow by Mexican standards with a direction from Cenote Vaca Ha toward Cenote Tucha Ha; the flow is in a southeast direction. On the day of the accident, there was a low flow.

Incident:

A solo diver entered the water at Cenote Vaca Ha at approximately 09:30 am on Sunday, July 12, 2020. The diver was very familiar with the cave and area as he had resurveyed all the existing lines in order to make a line map of the system. He had also made further explorations and added new lines to the system. He had been at the dive site very frequently over the last months. The caretaker of the property knew the diver and raised the alarm when he did not exit. He notified the dive center that the diver used for fills and logistical support. The dive center informed the search and recovery team.

Search and recovery:

Once the call went out, search team divers Skanda Coffield, Rob Bartlett, and Patrick Widmann met at ProTec Dive Center at 19:30. The search team prepared rebreathers and DPVs (underwater scooters) as someone had heard the victim had planned to dive to the "far reaches." Due to the depth and uncertainty of the diver's route, this was the best option. The exact dive plan of the missing diver was unknown.

As the search team was gearing up at 21:30, Robbie Schmittner and Kent Stone arrived at Cenote Vaca Ha. They had made a search by land looking at another entrance connected to the system, called Cenote Tucha Ha. With no sign of the missing diver and no other known exits, the team realized that they most likely were looking for a drowned diver.

The search team planned to dive for a maximum of four hours using side-mounted closed circuit rebreathers, taking two side mount tanks, an additional third tank as bailout, and a DPV each with O_2 to drop at 6m/20ft. The plan was to first traverse to Cenote Tucha Ha and then, if they did not find the missing diver, to continue through the Enormo land section to look for clues. They descended at 22:00, dropped the O_2, and confirmed that the diver's O_2 tank was still attached to the line and functional.

The team regrouped and continued into the cave. [They made] the first jump left (approximately 90m/300ft into the cave), at what was believed to be the route that the diver had taken and leading to the area where they thought he might be found. There was no jump spool installed. The team installed a jump and proceeded along. Patrick and Rob were ahead with Skanda following behind. Because this section of the cave is a low silty bedding plane (low floor-to ceiling-height with very fine sediment on the floor), visibility was quite reduced as silt was disturbed.

The team reached a restriction 215m/700ft from the entrance where they encountered the diver without signs of life. The diver was found on the cave side of the restriction. Passing the restriction would force a diver carrying three tanks to remove at least one of the three tanks to pass. The diver was found carrying all three of his tanks, all tanks being completely empty and the DPV still attached to the diver. There was no sign of distress or panic. Swimming the distance from the entrance would take a diver approximately 12 to 15 minutes.

Having confirmed the death and location of the missing diver, the search team exited toward Cenote Vaca Ha to inform the local authorities and to start planning for the body recovery. The total dive time for the search team was 40 minutes.

The body recovery was scheduled for the next morning. A team of three divers (Rob Bartlett, Patrick

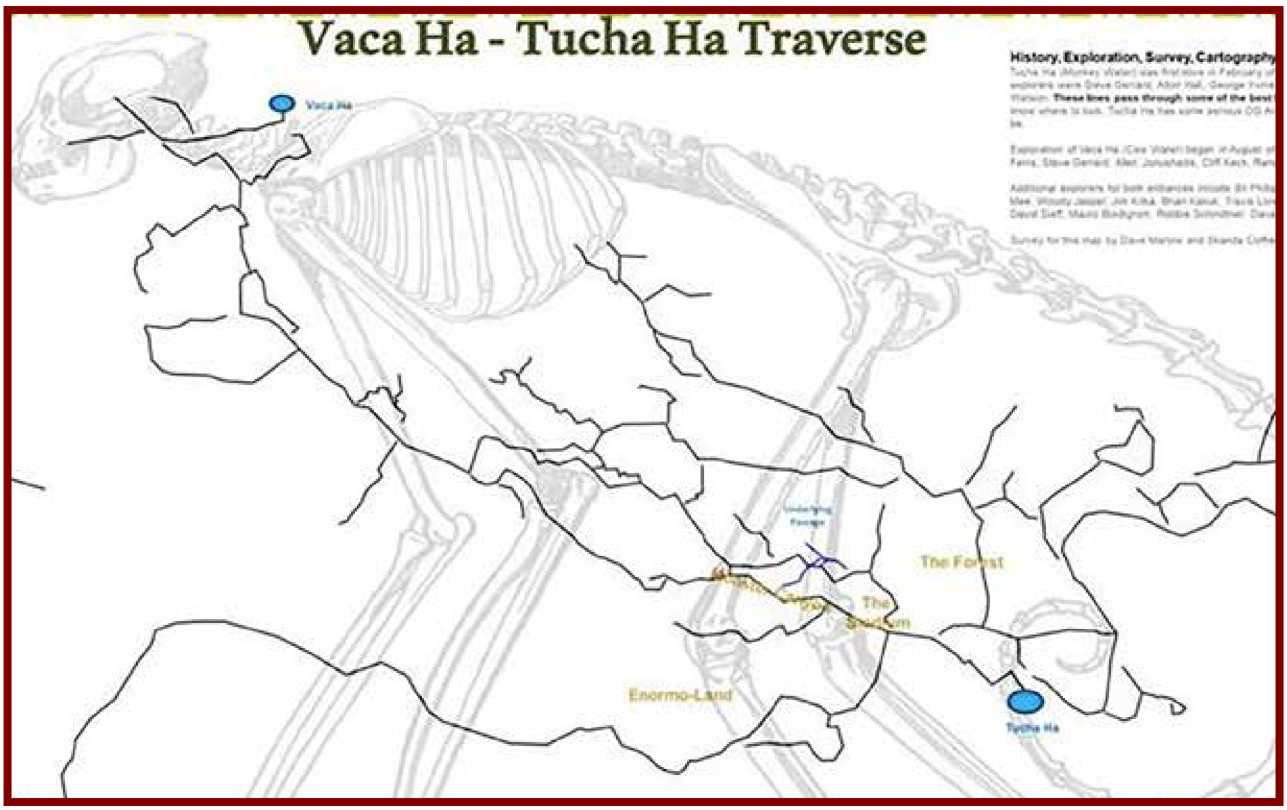
Widmann, and Kim Davidsson) entered the water for documentation and recovery. Recovery was successful with a total dive time of less than an hour. In addition to the recovery team, there were officials from Protection Civil, the police, and the coroner's office. Alex Álvarez was also there as support representing the divers through BUCEMA.

Due to environmental conditions (zero visibility) during the recovery, a third dive was conducted by Skanda and Tamara Adame to recover the diver's final pieces of equipment on the following day.

caves. He was a very active cave diver, having made many other line maps and projects.

Dive route:

The diver was using side-mounted cylinders configuration (2 x 80 cu ft) with an additional stage tank (1x 80cu ft) filled with 32% Nitrox and using a deco tank (40 cu ft) of O_2 left at the entrance. The diver was also using a DPV for propulsion and entered at Cenote Vaca Ha. The diver took the first jump left but did not in-



Line map of the system produced by the diver. Lines that are under resurvey and exploration are not shown. This map has been cropped with the authors' permission (Editor's note).

Victim:

The victim was a 49 year-old male, an American citizen. The diver was certified as a full cave diver in 2007 and did his original training in Mexico. On multiple subsequent trips, he continued his training and experience building. He was certified as an Advanced Side Mount diver and in the use of multiple extra tank stages and also the use of DPVs. He had visited Mexico many times after his initial certification and had professionally retired to Tulum in 2019. He had approximately 470 cave dives at the time of the accident. Since moving to Tulum he had been resurveying, exploring, and then creating line maps of the

stall a spool to make the jump. No further navigation spools or markers were left. Later dives were made to the area to verify this. However, survey data from the diver's Mnemo survey device corresponded with lines of a section that had recently been explored.

On the day of the accident, the diver had surveyed three different lines with a total of 300m/900ft. These lines were either explored by the diver, were a resurvey of existing lines, or a combination. It is not clear how far the victim progressed into the cave, but he did not go past the jump to Enormo land as this shallows up to 6m/20 ft. This we could confirm by checking the victim's profile logged by the dive computer.

Further analysis of the diver's computer gave the diver a maximum depth of 24m/78ft with an average depth of 18m/60ft and a total dive time of 160 minutes until running out of gas.

Equipment analysis:

Forensic analysis of the equipment revealed no malfunctions or other likely cause for the accident. All regulators, valves, and tanks were in working order when tested after the accident. The tanks were completely empty. The DPV, a SeaCraft, had 73% battery remaining and was fully functional. The victim used equipment suitable for cave diving, including all necessary safety equipment.

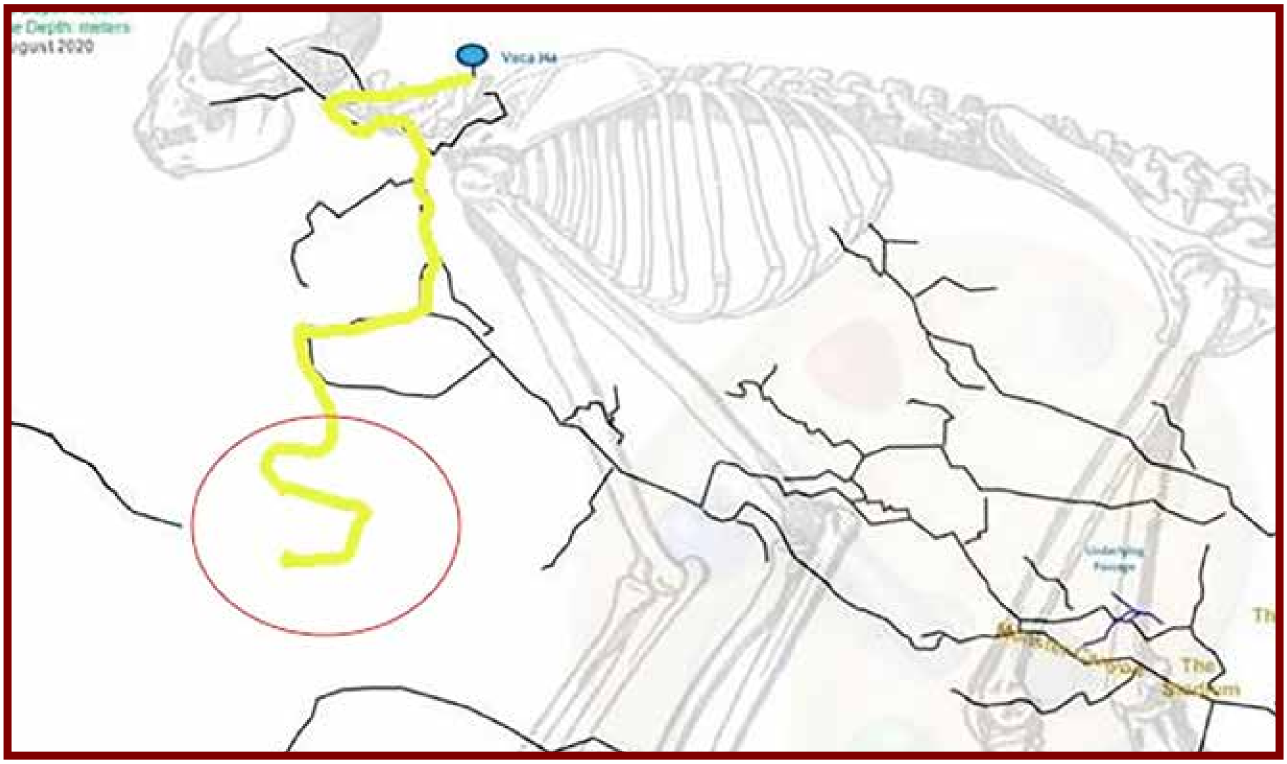
Conclusion:

Solo cave diving is a very controversial topic.There is no “backup brain” or partner to help you in case of a problem or emergency. You don’t have a second or third opinion in the planning or execution phases of the dive. It is, however, a common practice in the area, especially for exploring smaller cave passages. One could always argue, given the specific type of cave, whether solo diving increases or decreases the risks involved while cave diving.

We do not know exactly what happened on the dive. We know where the victim started, we know where the victim ended, we know the maximum depth, we know the average depth, and we know at what time the victim ran out of gas. We know roughly in what area the diver was working and what route he took.

What exactly happened on the victim’s last dive? One can only speculate and make educated assumptions. Becoming very comfortable in a normally very uncomfortable and unforgiving environment most likely played a factor. Solo diving, complex navigation, exploration, use of a DPV, recalculating gas range, and penetration most likely were also contributing factors. But this is, as said, speculation and guess at best.

What we do know is that scuba diving in water-filled caves with a limited gas supply can be an extremely unforgiving and dangerous activity. One major mistake or multiple minor mistakes on the diver’s behalf can have a fatal outcome.



The yellow highlighted line shows the diver’s route, and the red circle shows the area the diver was working in. This map has been cropped with the authors’ permission. Editor’s note). .

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Book Review

Close Calls

by Stratis Kas

Reviewed by Robert Laird

Close Calls is an attractive book that features invaluable accounts of diving near misses. The stories are written by a heady collection of well-known technical divers from around the world. Its collection of 69 stories with photos—many spectacular and contributed by the individual authors—is well conceived and assembled. The book makes for interesting reading.

As the cofounder of the International Underwater Cave Rescue/Recovery (IUCRR), I believe that Michael could not have spoken words that better describe our current sad situation on the lack of accident analysis.

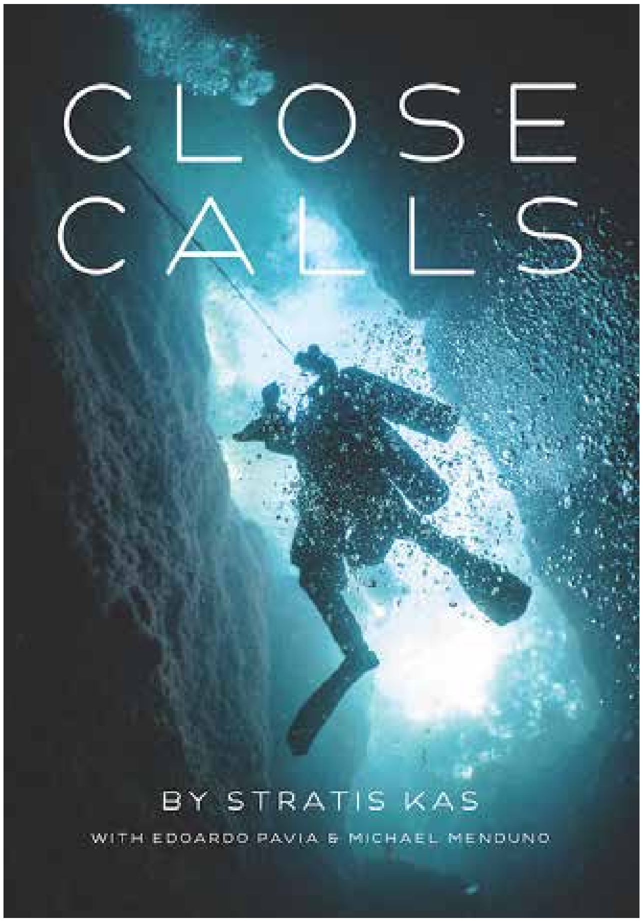
The IUCRR is often criticized for not sharing information about rescues and recoveries. But in most cases, we are prohibited from doing so by law enforcement, judges, attorneys, families, and others. So this book can and should be used to supplement our current knowledge base about underwater and overhead accidents and near-misses.

> **"Close Calls comes at a time when individual diving fatality reporting is largely nonexistent...and all of us are the losers."**
>
> — Michael Menduno

The preface is written by the inimitable Michael Menduno, who also narrates his own "close call" later in the book. He describes perfectly the innate value of these stories: "*Close Calls* comes at a time when individual diving fatality reporting is largely nonexistent. This is a result of our litigious legal system, and all of us are the losers. These days it is rare to learn what happened when an accident occurs. The parties involved are often unwilling or are advised against talking for fear of legal reprisal."

Close Calls is also a testament to the willingness of dive leaders to open up and report, usually in great detail, some unfortunate mistakes they've made that have led to these events. So hats off to these brave women and men!

Robert Laird is a lifetime member of NSS-CDS, the cofounder of IUCRR with Henry Nicholson, and author of The Tunnel, a cave diving adventure novel set at Florida's Madison Blue Springs. He's an early explorer of Goodenough Springs in Texas and has joined expeditions in the US midwest caves, Mexico, and the Bahamas. He lives in New Waverly, Texas.



Close Calls by Stratis Kas. Published by Because I Can, Ltd., London, 2020.

The stories demonstrate that the accidents share no common factor other than the diver. The near misses described occur in caves, mine shafts, shipwrecks, under ice, and in almost any situation in which overhead divers may find themselves.

If there is a common thread, it would have to be rebreathers. The majority of the stories involve aspects of this still-developing technology. Some of the stories that predate widespread rebreather use—one written by Tom Mount—demonstrate strongly that having good basic technique is a matter of life and death.

Not everyone in this book escapes the near misses unscathed with only a heroic story and a slap-the-forehead "I was stupid." Divers such as Dr. Sonia J. Rowley still suffer from the consequences of a close call, making the stories more heartfelt and poignant.

All of the divers who contributed are, each in their own way, telling the reader to stop and think about all the ways that things can go sideways. They illustrate that it happens even to the best-trained, smartest, and most conscientious divers.

But will readers listen? Too often a story, no matter how well told, cannot prompt the changes that may be needed to make technical divers recognize how to prevent close calls—or worse. Yet it's all we have.

So, accordingly, I encourage you to run, not walk, to get a copy of this book. I hope that these stories will underscore that a cavalier approach to dive adventure may cost you your life.

A collection of stories such as this is unique and—if you're a technical diver—not to be missed.

Author and underwater photographer Stratis Kas teaches cave diving, trimix, and sidemount diving in Greece. He contributes frequently to GUE's *Quest* magazine and has worked on the CMAS cave diving manual. *Close Calls* is available on Amazon.

Cave Diver Training Update

by Jim Wyatt

The NSS-CDS Training Committee and the Board of Directors revamped the core training procedures in 2020. These changes have been published in the NSS-CDS Standards & Procedures Version 20.11.15.

This article is to inform the membership about these changes as well as to discuss their justification.

The Cavern Diver Course

The cavern diver course was historically the first step a diver took toward becoming a Full Cave Diver. It was also billed as a “safety” course designed to introduce divers to daylight-zone overhead diving to help make them aware of overhead diving’s dangers. Those of us who taught the old cavern course had a lot of flexibility as to how we taught it, and the students had a lot of flexibility in their gear configuration. That flexibility stemmed in part from the students’ objectives and reasons for taking the course.

But this flexibility meant that the training procedures were not completely standardized, and standardization is a key component of a good class and consistency.

The newly designed NSS-CDS Cavern Diver course is a safety and awareness course aimed at open-water sport divers. It is not a prerequisite for, nor does it count toward, Cave Diver training and certification. This course requires a minimum of four dives and 90 minutes of bottom time. The Cavern Diver course as now structured provides that standardization and consistency that was lacking in the old course.

Prerequisites for taking this class include:

- Advanced Open Water certification;
- Nitrox diver certification;
- Having a minimum of 25 logged dives; and
- Being at least 18 years old.

Students in the Cavern Diver course use standard, single-tank sport diving equipment with minor modifications. They may not use sidemount, backmounted doubles, or CCRs.

Cavern students are limited to the daylight zone with no planned decompression. The maximum depth allowed is 30 m/100 ft, and penetration cannot exceed 61 m/200 ft from the surface. There are other limitations for starting gas volumes and maximum penetration gas volumes.

Cavern Diver students will be better equipped to assess whether they possess the skills needed for Cave Diver training. They can also better evaluate whether it is worth the time and expense to do so.

This new approach to the Cavern Diver Course more clearly defines how the course is to be conducted and better defines the performance objectives required of the students.

Divers who know they want to pursue a Full Cave Diver certification will enroll in the NSS-CDS Apprentice Cave Course and not the Cavern Diver Course.

© Tom McCarthy

The Apprentice Cave Diver Course and Basics Orientation

The NSS-CDS Apprentice Cave Diver course is the first of a two-step process leading to full NSS-CDS Cave Diver certification. It replaces the old Cavern, Basic, and Intro-to-Cave Diver courses.

The performance objectives overall have not changed significantly but rather have been organized in a more sensible flow. No longer do we have a single tank "H" or "Y" valve option in the standards. The Apprentice Cave Diver course focuses primarily on limited penetration along the main line. It is also where students learn and master critical emergency skills.

The Apprentice course also provides students with the opportunity to gain limited experience and practice fundamental cave diving skills before completing the requirements for full Cave Diver certification.

The Apprentice Cave Diver course prepares students to dive within the following limits:

- Penetration is limited to a gas volume of 1400 L/50 ft^3 or one-third the available starting volume, whichever is less;
- Divers may navigate off the main line using a single reel or spool. However, no jumps or gaps to offshoot or continuation lines are permitted; and
- No planned decompression, no use of stage bottles or DPVs, and no original exploration.

The course requires a minimum of eight dives and a minimum bottom time of 240 minutes;

The prerequisites for the NSS-CDS Apprentice Cave Diver course have changed. To enroll in the course, students must:

- Provide proof of certification in Technical Sidemount or some form of Basics/Fundamentals/Essentials from a widely recognized technical diver training organization OR document proof of equivalent experience in sidemount or backmounted doubles, and
- Demonstrate adequate mastery of buoyancy control, trim, and propulsion for cave diving. This includes modified flutter kick, frog kick, pulling, and helicopter turns.

© Tom McCarthy

As always, instructors will screen and evaluate students to ensure they possess adequate buoyancy, trim, and propulsion skills. Students who do not may take part in the *CDS Basics Orientation* course to acquire the necessary skill levels prior to enrolling in the Apprentice course.

The CDS Basics Orientation allows students to gain this experience while working within NSS-CDS' training program framework. Instructors may include additional information and skills or teach this program concurrently with other non-overhead courses, such as Nitrox Diver and Sidemount Diver.

There is no certification issued for the CDS Basics Orientation course

As far back as I can recall, cave instructors have always screened divers for buoyancy, trim, propulsion, and more prior to and during initial cave diver training. This new set of standards simply better defines and standardizes the training paradigm.

The actual "training" itself has not essentially changed. The old Apprentice Cave course consisted of four dives after students completed the required four dives for the cavern course. Now the Apprentice class consists of eight dives. The skills, exercises, and drills include what formerly was taught in a cavern class in addition to what was included in the Apprentice Cave course.

Extending the Limits of Training

Students may extend the limits of training by spending additional time with their instructor. To do this, they must make at least one additional dive beyond the eight required for Apprentice Cave. This dive must include at least one jump to an offshoot line. Instructors who take advantage of this option must be authorized to teach to the full Cave Diver level.

If students perform satisfactorily, the instructor may issue an NSS-CDS Apprentice Cave Diver “Statement of Understanding.” This form outlines four areas in which students may or may not exceed the normal Apprentice Cave Diver limits. The instructor can use the form to specify which limits these are and by how much students may exceed them.

These limits include:

- Usable Gas: Removes the 1400 L/50 ft^3 restriction and allows students to use a full third of their starting volume;

- Distance: Removes the 300 meter/1,000 ft restriction. The instructor may speciy depth limits.

- Limited Decompression: Allows students to make planned decompression dives using pure oxygen or oxygen-rich decompression mixture. Students must hold certification in the use of such deco mixtures and in decompression procedures from a widely recognized technical diver training organization. Decompression is limited by the fact that students may not use stage bottles or dive below 30 m/100 ft.

- Navigation: Students may make limited jumps to offshoot lines. The number of jumps is not specified, but is limited by the total distance students may penetrate.

Cave Diver Course

The Cave Diver course was not changed significantly from the old version. This course generally takes four days. Students must accrue at least 360 minutes of bottom time over at least eight dives. Penetration is limited to one-third of the available starting gas volume. The minimum starting volume of 2100 L/75 ft^3 and a minimum penetration gas volume of 700 L/25 ft^3. Depth must not exceed 40 m/130 ft, and use of stage bottles or DPVs is not allowed.

Jim Wyatt is a past Training Director of NSS-CDS and a current member of the Training Committee, He teaches cave and technical diving in Florida.

The Wes Skiles Legacy Project

Tessa Skiles is creating a legacy web site to carry on with Wes’ work of protecting and restoring Florida’s springs. She’s looking for stories, videos, and photos of Wes (especially from the ‘70s-‘90s). If you have any, Tessa would like to include them. Send them to her at tskiles@karstproductions.com. Please include the subject “Legacy Website Content - YOUR NAME, STORY/IMAGES.” Please include dates, locations, and names.

How NSS-CDS Training Weathered the Pandemic

by Harry Averill

Activity is Picking Up

The events of 2020 adversely affected diver training worldwide. By mid-year, most reports were that diver certifications across all agencies and all levels were running roughly half of what they did in 2019. Despite this, the NSS-CDS has done surprisingly well.

Diver Certifications

The first quarter of 2020 was a time when COVID-19 had yet to affect diver training. By April of last year, the situation changed drastically.

In contrast, by the first quarter of 2021 we were just coming out of most of the lockdowns and travel restrictions that so adversely impacted diver training as a whole.

Comparing the first quarter of 2021 to the same period a year before, NSS-CDS diver registrations were down, but only by 14%. We can attribute this not only to pent-up demand, but also to the fact travel to north Florida was relatively easy compared with most of the rest of the USA.

It's interesting to note that entry-level diver certs account for less than half of the total. Advanced and Specialty Cave Diver certifications are responsible for the rest. Many of these were for divers who may not have originally certified through the CDS, but came to us for training in stage, DPV and CCR Cave diver ratings.

Instructor registrations

It's never been easy to become an NSS-CDS Instructor, nor do we want it to be. Nevertheless, there were administrative roadblocks to maintaining CDS Instructor status, such as there being no single-step process to renew. We've changed that.

NSS-CDS Instructor registrations and renewals for 2021 are up 15% over 2020. This reverses a downward trend from prior decades.

What lies ahead?

NSS-CDS Specialty Cave Diver standards have always been stringent. By year's end they will be even more so.

The biggest change, however, will be in diver registration. Next month we will introduce a new system that further streamlines this process. It will also allow us to put student pictures and a unique identification number on NSS-CDS certification cards.

This is something our instructors have been asking for. We are happy to oblige.

Harry Averill has served on the Boards of Directors of both NSS-CDS and NACD. He is a past NSS-CDS Training Chairman and a current member of the NSS-CDS Training Committee.

Announcing a Welcome Technological Upgrade

by Max Kuznetsov

It is well known that as one of the oldest cave training agencies, the NSS-CDS has always been ahead when it comes to standards and teaching quality. And we remain the most reputable cave training organization.

The only field in which we've been a little behind is internet technology. Other organizations have made huge steps forward implementing the latest achievements in this field, which makes registration, learning, and certification very user-friendly for both instructors and students. Until now we have been stuck with an old-fashioned and rather slow system.

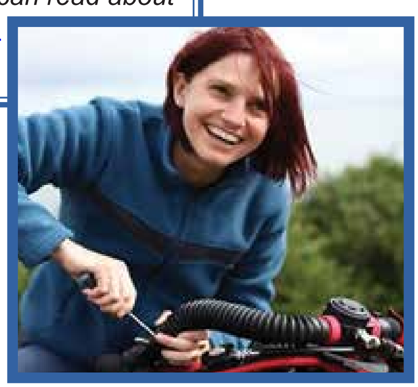
I want to announce that we are getting close to launching a modern user-friendly platform that will make student registration easier and faster. It will allow instructors to issue temporary cards in the field, right next to the dive site, and give regional trusted representatives permission to print certification cards. So someone certified in Mexico or Europe will no longer need to wait several weeks to get a card by mail.

The new system will also include an eLearning platform that will make it easier for students to prepare for the course and have a space for the student's photograph and numbers.

We will keep you posted about the development of this exciting process.

Max Kuznetsov is Training Director of the NSS-CDS. He teaches cave diving in the US, Russia, and Mexico.

Remembering Agnes "Ag" Milowka, who perished in Tank Cave near Mt. Gambier, Australia, 10 years ago February. Ag's brilliant smile and her passion for cave diving were infectious. She and James Toland made the long-elusive connection between Peacock and Baptizing Springs in August 2010. You can read about it in Underwater Speleology Vol 38 No 1, 2010 and more on Ag's website,.



State of the NSS-CDS 2021, continued from p. 4

- Holding raffle/donation-based member drawings of Dive Rite O2PTIMA CM CCR and Silent Submerge Magnus DPV. Thanks to our sponsors Dive Rite and Submerge Scooters;

- Providing funding for materials to repair the platform at Cow Springs (completed by Howard Smith) and to improve the stairs at Mill Creek Sink (completed by Howard Smith and Robs Culbert);

- Replacing the missing Grim Reaper warning sign at Orange Grove.

Community: Annual Board of Directors' Election Statistics:

Of our 782 eligible voters, 327 (42% of the membership) submitted ballots. Sixty-four ballot files were opened but not submitted

Bylaw Amendment Change Voting Statistics: Of the 285 members who voted, 226 (79%) voted to approve; 59 (21%) voted to reject, and 42 members abstained.

Finances/Treasury: (summary by Adam Hughes)

Our cash-on-hand balance was $54,115.66 on May 22, 2021 (the day of the annual membership meeting).This includes a two-year $15,000 reserve for annual overhead costs. It does not include the Sheck Exley fund of $14,201, which is held in a trust for conservation purposes or a $23,000 reserve account investment (it remains a 90-day current liquid asset).

During 2020 and the first half of 2021, the NSS-CDS had its first net loss in seven years. The main cause is that we have not been able to hold any conferences or any membership events for these two fiscal years due to COVID-19 restrictions.

Our five largest expenditures since the start of 2020 include: *Underwater Speleology:* ($14,887 publication costs); office administrator/contract labor ($13,600); professional IT services and insurance ($4,911); accounting fees for bookkeeping and tax filings ($3,397); and Cow Springs Porta-Potty and credit card merchant fees ($3,360)

The five largest revenue sources since the start of 2020 were raffle net proceeds ($9,125); student registrations ($4,880); membership renewals ($2,555); and merchandise sales ($2,185).

The CDS has experienced a decline in membership renewals since the beginning of 2020. Because new students who register through the training program receive a complimentary one year membership, however, our overall active membership remains remains steady at 600-800 members. This is consistent with the last three to four average membership rosters.

The NSS-CDS began fiscal year 2020 with a net cash reserve of five years' operating costs. Because we have not held a conference for two years, we currently hold two to three years of net cash reserves. We anticipate this increasing back to a five-year reserve once we begin holding conferences again —- these have been our primary source of income over the last seven years.

Training:

Diver registrations are down only slightly despite the COVID-19 pandemic. Entry level-cave certifications were less than half of the total.

See the Training Program Updates in this issue.

Available Service Opportunities:

Do you have specific skills and a desire to volunteer? Contact chairman@nsscds.org if you'd like to be considered for one of these positions/committees.

- Webmaster
- IT Committee (serves with webmaster)
- Media Committee
- Awards Committee
- Abe Davis Coordinator
- Land Owner Relations Committee
- Equipment and Technology Committee

You can find the committee descriptions in our ByLaws : https://nsscds.org/wp-content/uploads/2020/11/2020-Updated-NSSCDS-ByLaws.pdf

We have weathered a difficult year and look to a bright future. It's time to connect with one another again and explore how we can safely engage in education, service, and social events. The Board is grateful to you for staying the course and believing in the NSS-CDS. I am honored to have served on your Board of Directors for the past two years and look forward to the next term.

Together, we can.

Below you'll find a listing of the instructors who were in Active status as of 26 March 2020. Because this can change, you will want to go to the NSS-CDS website for the most up-to-date instructor listings. For each instructor, you will find:

- ☐ Current instructor rating
- ☐ Authorized specialty instructor ratings
- ☐ Clickable buttons that will take you to the instructor's website, Facebook page and email

Bahamas

Cristina Zenato 325

Mexico

Juan Carlos Carrillo 342
Ricardo Castillo 386
Jonathan Kieren 397
Olivier Prats 384
Luis Sanchez 387
Michael Silva Netto 398
Roger Williams 396

Russia

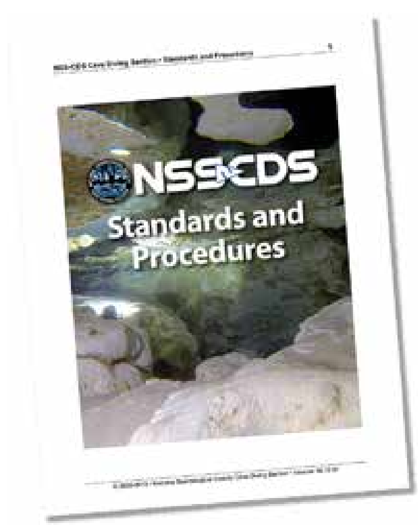
Elena Kryzhanovskaya 382
Maxim Kuznetsov 352
Timofey V Novikov 393
Evgeny V Runkov 371

USA

Harry Averill 218
Brenton C Booth 241
Chris Brock 392
Peter Butt 186
Mel Anne Clark 373
James Draker 395
Steven D Forman 106
Mark E Fowler 379
Georges Gawinowski 369
Jill Heinerth 340
Paul Heinerth 165
Lamar Hires 191
Thomas L Johnson 368
Jonathan Kieren 397
Maxim Kuznetsov 352
Jeff M Loflin 360
Mal Maloney 374
Bill Oestreich 253
Daniel C Patterson 353
Conrad Pfeifer 287
Renee S Power 383
Ken Sallot 390
Edd Sorenson 375
Pam Wooten 388
Jim Wyatt 355
Timothy Young 400

Western Europe

Johan Asplund 399
Martin J Robson 350
Phillip Short 365
Jose Mario Roberto Ventura 389
Sébastien Wilem 394



There's more in store…

Up-to-date instructor listings are not all you will find on the NSS-CDS website. Among other things, you can:

- ☐ Renew your CDS membership
- ☐ Order books and apparel
- ☐ Replace a lost cart
- ☐ Contact CDS Board members

In the *Training* section, you will find an in-depth description of all current NSS-CDS diver training courses. You will also be able to download the current standards for each CDS course. Here you will find:

- ☐ Student prerequisites
- ☐ Required dives, bottom time
- ☐ Course content
- ☐ Skill requirements
- ☐ Limits of training

Cave Diving Section of the
National Speleological Society, Inc.
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Gainesville, FL 32606

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