Diving Deep:
Crisis Management Lessons from a Small Sub Emergency [1]

Guillermo Söhnlein [2]

Even though ten years have passed, I can still hear the sound vividly in my mind. *THUD!* I was sitting in the aft hemispherical acrylic dome of a small submersible bobbing at the ocean surface, and I knew in an instant what had happened. I felt the churn in the pit of my stomach as I visualized the rope from the support boat getting tangled in the ship's only propeller, and I knew before the engine shut off that we were all in big trouble. We had five people in the sub and four on the support boat, and now neither vessel had any propulsion to fight the current. I calculated in my head that we had maybe 20 minutes before the surge of the ocean smashed us all against the rocky shore. We had to act lightning fast if we were to avert a complete disaster, but ironically we also had to move methodically and avoid panicking.

[1] This article originally appeared at www.fortivo.com / www.sohnlein.com in August 2020.

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The Unlikely Life Journey to Monterey

Two roads diverged in a wood, and I—
I took the one less traveled by,
And that has made all the difference.

- Robert Frost

In the fall of 2009, I moved my family across the United States from Northern Virginia to Seattle in order to co-found a new venture called OceanGate. [3] As a child, I had two idols, Jacques-Yves Cousteau and Captain Kirk. I had wanted to become an astronaut and explore the solar system, but my failing vision kept me from becoming a military pilot and simultaneously quashed those dreams. Instead, years later, I took advantage of a life-changing opportunity to explore the depths of our own oceans.

My co-founder, Stockton Rush, was an aerospace engineer and accomplished pilot with similarly dashed aspirations of rocketing into space. We were introduced by Graham Hawkes, a world-renowned submersible designer, and almost immediately we agreed to start a company that would pioneer the use of manned submersibles for deep ocean exploration. OceanGate was born. [4]

Since neither of us had any substantial work experience with submersibles, we faced a steep learning curve before eventually designing and building our own deep vessels. [5] We decided to buy a used sub that would serve as our “training wheels”, and we were fortunate to acquire *Antipodes*, a 10-year-old sub capable of taking 5 people down to a depth of 305 meters / 1,000 feet. We brought her cross-country from Florida to our headquarters in Seattle and conducted an extensive months-long dive program in Puget Sound to give our team strong operational experience. By the fall of 2010, we were ready to embark on our first long-range expedition, and we spent a few weeks diving *Antipodes* around Catalina Island just offshore from Los Angeles.

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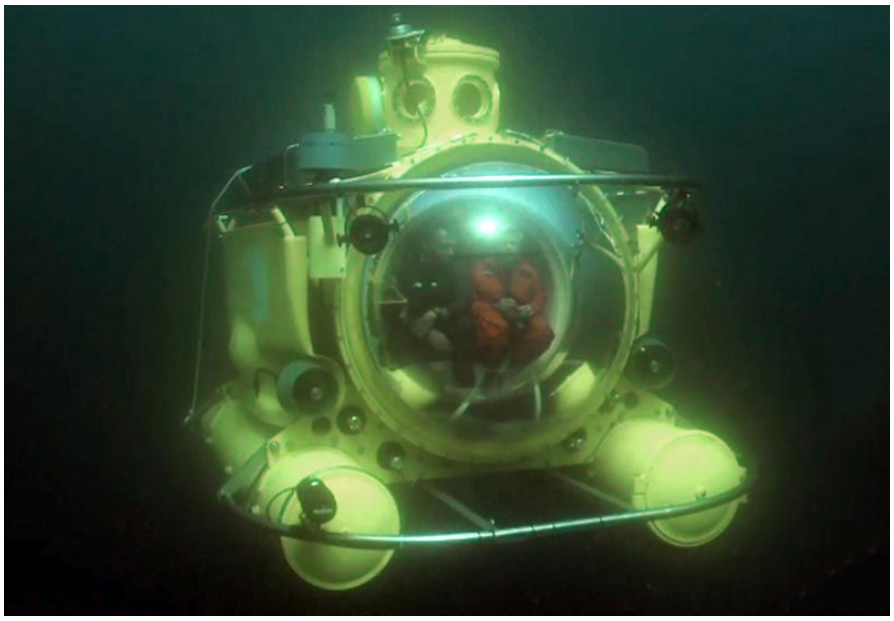
[3] www.oceangate.com

[4] There is substantial confusion between the similar terms “submarine” and “submersible”. Although outside the industry they are often used interchangeably because both refer to vessels designed to carry humans underwater, they are quite different. A “submarine” is fully autonomous, and it can regenerate its own power and breathable air. A “submersible” is usually supported by a surface vessel or platform. Most military vessels tend to be “submarines”, while most research vessels tend to be “submersibles”.

[5] As of August 2020, OceanGate has a fleet of 3 subs, including two self-designed vessels: *Cyclops* (capable of 500 meters / 1,640 feet); and *Titan* (capable of 4,000 meters / 13,123 feet).



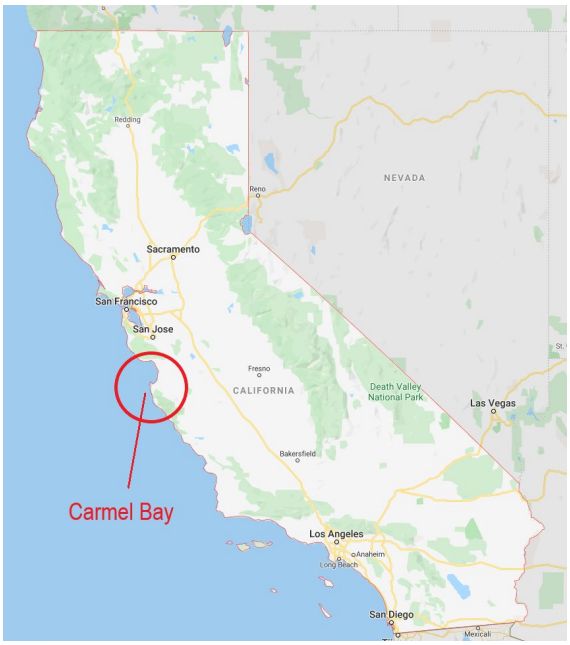
Antipodes diving near Catalina Island, California (2010)

Exploring the Ocean at the Bottom of Carmel Bay

How many people, in the entire history of humankind,
do you think have ever been 1,000 feet down?
I'm guessing not that many!

- Thayer Walker

Building upon our lessons learned from the 2010 Catalina expedition and subsequent local Seattle expeditions, in the fall of 2011 we embarked on a much more ambitious adventure to Monterey, California. In order to explore the deep canyons under the bay, we were going to have to push our limits doing open ocean dive operations. It was a huge challenge for our team, but we felt ready and confident.



(courtesy Google Maps)

After a couple of weeks diving in the shallower waters of Monterey Bay, we decided to organize a day exploring the much trickier depths of Carmel Bay, just on the other side of the Monterey Peninsula. With safety as our top priority, this required significantly more detailed planning, especially since we would be hosting six VIPs as "mission specialists", or guest members of our crew. [6]

Besides being CEO of the company and one of our certified sub pilots, I was also the expedition leader in Monterey, and in that role I was responsible for the success of each dive and for the safety of each crew member. While we worked on the dive operations plan for Carmel Bay, I kept imagining every possible scenario that could go wrong and assessed our proposed response for each. I needed to make sure that we achieved our dive objectives and that our VIP mission specialists enjoyed their experience, but most of all I felt the immense pressure of knowing that everyone's lives could literally depend on my meticulous planning.

During my prior experiences as a soccer player, military officer, and entrepreneur, I had learned a valuable lesson about dealing with the unexpected: *the best possible approach is to make sure you pre-position your team anticipating the worst turn of events*. Heeding that advice, I paid especially close attention to who I was placing in what role during which phase of the dive operations and in what specific

[6] One mission specialist would later serve as the United States' Ambassador to Sweden.

location. This was even more critical because I decided early in the planning process that my own optimal location would be inside the sub with the pilot and three mission specialists; since I would be inaccessible in case of an emergency, the rest of the team would have to be ready to act without their expedition leader. The final lineup was a bit different than we were used to, but by then our team was well-trained and experienced enough that they took their assignments in stride.

The overall dive operations plan was fairly straightforward. We planned to conduct two dives, each for approximately two hours and each to a maximum depth of 305 meters / 1,000 feet. The sub pilot and I would take three mission specialists on the first dive while the other three mission specialists waited onshore. After the first dive, we would surface and swap out the sub crew by ferrying the first three mission specialists to shore in a small inflatable dinghy (our “crew transport vessel”) and returning with the second group. The sub pilot and I would conduct the second dive, and afterward we would take the mission specialists back to shore while the surface operations crew towed the sub back to Monterey Bay.

I set up the team roster envisioning the worst case scenario: our sub becoming disabled and getting stuck at the bottom of the ocean. [7] As dire as that sounds, the sub is equipped with 72 hours of life support, so our crew knew that even in those extreme circumstances we would have ample time to organize a rescue. If the worst did come to pass, then I knew that it would be critical for me to be in the sub to comfort the three mission specialists. I also knew exactly which of our six sub pilots I would want down there with us, and I worked backward from there. I picked exactly the most qualified team members to be in charge of the support boat, the boat/sub interface from the deck, the communications, and the crew transfer vessel. I even planned exactly who should be on shore (since that person would be dealing with the other three (non-diving) mission specialists) and on call back at our hotel (since that person would have to coordinate the rescue operation). Once I finalized the roster, I stared at it on my computer screen and tried to envision how that lineup would perform in the worst emergency situations. When I was satisfied with the roster, I knew we were ready for the dives.

[7] Statistically, subs are among the safest forms of transportation. The last time one became disabled and the crew had to be rescued was 1973.

Sea Nettle

Two days later, we welcomed our mission specialists and prepared to explore the bottom of Carmel Bay. *Antipodes* had been towed overnight from Monterey Bay and around the peninsula, so she was pre-positioned near the dive site. We were fortunate with the clear weather, even though the sea swells were bigger than we anticipated. From our pre-dive scouting, we knew that it would be risky diving a half-mile offshore from large craggy boulders and small rocky cliffs, especially since the sub's thrusters would not be able to fight the open ocean current on their own. However, we were confident that our surface support vessel, a 38-foot Bayliner named *Kraken*, would be more than sufficient under decent weather conditions.

We proceeded with the first dive, and it went quite smoothly. The crew transfer went well and the sub performed flawlessly as we maneuvered through the walls of Carmel Canyon exploring the sea life. We saw an incredible diversity of fish, shrimp, squid, sea stars, sea nettles (jellyfish), and plants. We even managed to let each mission specialist take a turn piloting the sub.

As we came to the surface after a two-hour dive, the mood inside the sub was jubilant. The mission specialists felt that they had had the experience of a lifetime, and the sub pilot and I were satisfied with the sub's performance. Although we still had work to do, he and I were already discussing improvements for the second dive.

When we reached the surface, the sub pilot opened the top hatch and went outside onto the deck. We needed to connect a towline from the back of the support boat to the front of the sub, so it could hold us in place against the ocean swell during the crew transfer. From the radio transmissions, I knew that the sub pilot was ready on top of the sub and that the boat was starting to back up toward us. Once in range, the deckhand would toss the towline to the sub pilot, he would tie it off, and the boat captain

would give us the go-ahead for the crew transfer. Inside the sub, I told the mission specialists to get ready to exit and head to shore.

Disaster Averted

For an expedition, you plan ahead of time for the 90% you can control,
so on site you can focus on the 10% that will inevitably go wrong.

- James Cameron

Most boats have a single propeller that provides the thrust to move them through the water, and some boats have two propellers for extra power and for redundancy. The boat we brought from Seattle for the Monterey expedition had a single “screw”, which we felt was fine since we planned to dive only in ideal conditions close to shore. Besides, we had been using the same boat for over a year, and it had performed perfectly for our sub operations. For the first two weeks in Monterey, we conducted numerous dives in varied sea states, and each mission went off without a hitch. Until the end of that first dive in Carmel Bay.

Antipodes with a support boat and crew transfer skiff (not in Monterey and not actual boats used)

Connecting two vessels with ropes (“lines”) can often be a tricky endeavor, especially on the open ocean with swells sweeping in toward a nearby shore. This is even trickier when one of the vessels is essentially immobile, since the sub’s thrusters can only move it at a maximum of 2 knots and are normally not used on the surface for safety reasons. To connect the towline, the two vessels rely almost entirely on the

boat's propeller for propulsion. Even worse, the line has to be tied off to the back ("aft") end of the boat, which means that the captain has to drive in reverse toward the sub. The biggest risk is the line dropping in the water and the boat backing up over it to get it fouled in the propeller. Our team was well-trained, experienced, and vigilant, so none of this should have been a concern. Unfortunately, as Murphy is fond of reminding us, sometimes even the unexpected happens.

As the boat backed up toward the sub and the pilot on top of the sub signaled he was ready to receive the towline, our deckhand tossed the line toward him. It fell just short of his reach and landed in the water. The deckhand called out to the captain that she was recovering the line for a second attempt, but before he could put the engine in neutral the propeller caught the line, which immediately got tangled and seized the engine. This was the sound I heard inside the sub. In an instant, we found ourselves with a disabled boat floating helplessly next to a sub that was designed to dive under the water not move on top of it. With the ocean pushing us toward the rocky shore less than half a mile away, our situation quickly shifted from routine to emergency.

Inside the sub, I felt the sick sense of panic well up inside my chest as my mind raced through the potential loss of life or, more likely, the destruction of our boat and/or sub smashed against the cliffs. I instinctively started getting up from my seat to go out through the top hatch and take charge of the situation. After all, I was the expedition leader, and we were facing a potentially disastrous crisis.

Then my training and experience took over.

I remembered that I had already anticipated precisely this type of emergency and had planned accordingly. I remembered that I had every member of our team pre-positioned exactly where they needed to be so they could best handle the situation. Most of all, I remembered that the worst thing any of us could do was panic, because in reality we had plenty of time to react, as long as we worked quickly and methodically. Besides, I also remembered that we still had three VIP mission specialists inside the sub with me, and it would not help them to see me panic. So I sat back down and forced myself to merely listen to our team do their jobs.

As I monitored the radio transmissions, I found myself relaxing, even as I continued checking my watch and glancing through the sub's acrylic dome at the rapidly approaching shoreline. I felt a surge of pride while I listened to the team doing exactly what needed to be done and doing it precisely in the manner that was necessary: efficient, professional, logical, and calm. I played my pre-assigned role by explaining to

the mission specialists what had happened and what the team was doing to resolve the situation.

Our top priority was to get the VIP guests out of the sub and to safety on shore. The crew transfer vessel was onsite within a couple of minutes, so we disembarked each of the three mission specialists one at a time. Within five more minutes, they were all standing on shore, sharing with their three friends tales of their “epic” two-hour dive and getting them excited for their own upcoming dive. Meanwhile, the crew support vessel made its way back toward us, just in case we had to abandon ship.

As the mission specialists were making their way out of the sub and into the crew transfer vessel, the rest of the crew was already busy devising a plan and executing it.

We would cut the original tangled towline and fasten the backup in its place. To make the cut at the propeller under the boat, someone would have to dive into the cold water of the Pacific Ocean and free the line. We had to do this safely, so everyone would have to coordinate their tasks and time them carefully. In the back of all of our minds was the ticking clock, and we each occasionally cast a quick glance at the approaching cliffs, doing mental math on how much time we had before we had to abandon our efforts. In the worst case scenario, the sub pilot and I would save the sub by diving it to the bottom of the canyon and parking it there to resist the inbound current; the rest of the crew would board the crew transfer vessel and leave the support boat to smash against the rocks. There would be enough life support in the sub to sustain us for up to five days, which would be plenty of time to organize a rescue. None of us wanted to face those dire circumstances, so we fought the urge to panic and instead focused on the tasks at hand.

The deckhand donned her wetsuit, grabbed a mask and knife, and jumped in the water. It took her several dives to finally sever the line and untangle the propeller. In the meantime, the boat captain tied off the backup towline to the aft cleats. On the sub, the pilot and I prepared to dive the sub, just in case we ran out of time. After a few anxious minutes, the propeller was free, and the deckhand made her way back into the boat. The captain fired up the engine and engaged the propeller, and when it connected we breathed a collective sigh of relief. Unfortunately, we were still not clear of danger, and there was still work to do. The deckhand--still in her wetsuit--tossed the backup towline to the waiting sub pilot, who caught it on the fly and deftly fastened it to the sub. After seeing the thumbs-up from the pilot, the boat captain gently took up the slack and turned us all away from the shore. With the rocky cliffs uncomfortably close but finally at our backs, we slowly made our way against the ocean swell and back to the dive site.

The Aftermath … and Lessons Learned

As a sub pilot, you have a lot more time than you think;
unless there's a fire inside, you can take your time to react.

- Stockton Rush

Once we arrived at the relative safety of the drop zone above the dive site, we re-assessed our situation. Even though our nerves were rattled and we were still pumping adrenaline, we worked our way through a checklist and found that the only damage we sustained was the cut towline. Since we carried three total lines, we still had a backup for the backup, so we decided that losing the original line was not a show-stopper. After catching our collective breath, we agreed to proceed with the second dive and radioed back to shore to go ahead with the next crew transfer.

That second dive went smoothly, and the rest of the expedition was essentially uneventful from an operations perspective. However, later that night we conducted an extensive debrief, including input from the six VIP guest crew. Several observations and lessons learned emerged from this exercise.

OceanGate crew for Monterey 2011 Expedition

(1) **SAFETY, SAFETY, SAFETY.** First and foremost, the most important result was that our team was able to handle a potentially life-threatening emergency in such a way that no one was hurt. The fact that we also did not lose the boat or the sub

was just a welcome bonus. All in all, the only casualty was a towline, which we could easily replace.

(2) **Accidents Happen.** Hooking up the towline between a surface support vessel and our submersible is normally not a difficult task, since it is a critical step in every standard dive operation. We have done it dozens of times in extremely difficult sea states and even swapping out team members so everyone knows how to do it. No matter the expertise of the deckhand and sub pilot or how calm the weather conditions are, often it takes more than one toss for the pilot to catch the line. Therefore, it is not uncommon for lines to get caught in the propeller. Unfortunately for us on that fateful day, it happened right when we were at our closest point to a rocky shore with a large incoming sea swell. Call it bad luck, Murphy's Law, or whatever, but the bottom line is that sometimes accidents just happen, without warning and through no one's fault.

(3) **No Such Thing as Over-Prepared.** When I was agonizing over the dive operations plan and team roster, the other sub pilots questioned me repeatedly about why I was spending so much more time than usual on this particular mission. Perhaps it was the six VIP guest crew that would be joining us? Perhaps it was the overnight tow to pre-position the sub that would leave us a couple of crew members short for the actual dive day? Or perhaps it was some gut feeling or sixth sense that prompted me to be extra meticulous in the planning stages? Regardless, I was certainly happy that I took the time to game-play every possible scenario two days before the dives.

(4) **Stay Calm / Don't Panic.** The consensus feedback from the six mission specialists was that they were thoroughly impressed with how "calm, cool, and collected" everyone was. In fact, they did not fully appreciate the seriousness of the situation until our debrief that evening, telling us that our demeanor made it seem like we were simply executing a routine repair on the propeller. I was especially proud of every team member. As expedition leader, I did not have to do much other than ensure that everyone remained calm. While they executed their plan, I tried staying mentally a couple of steps ahead, continuing to survey the situation and evaluating responses in case Murphy hit us again in unexpected ways. It certainly helped that four of the seven crew members were certified sub pilots, each trained to remain calm under pressure; the other three were similarly trained as surface boat captains.

Conclusion

When we train sub pilots, we usually tell them that everything moves slowly inside a sub, so there are virtually no emergency situations that require the pilot to make split-second decisions. The key is to stay calm, think clearly, and act methodically. That said, the only crisis that requires immediate pilot response is when a fire ignites inside the sub. After all, our life support system relies on pumping pure oxygen into the sub, so a small flame can easily and rapidly become a huge problem. This leads to our mantra, "*unless there's a fire, don't panic.*" Of course, the caveat is "*even then, don't panic; just quickly cut the electrical power, turn off the oxygen, extinguish the flame, and don emergency breathing gear.*"

Extrapolated beyond the confines of a small submersible, this serves as a valuable life lesson in thoughtful decision-making. Although it is crucial for leaders in particular to embrace this principle, anyone can benefit from its simple message: there are very few situations where you are better served by emotional, irrational, knee-jerk reactions than by carefully considered, methodical, calm solutions.

This lesson--along with the memories of our dive in Carmel Bay--has stuck with me for the past ten years. I have passed it along to other sub pilots, expedition leaders, CEOs, entrepreneurs, colleagues, friends, and even my three kids. As we grapple with the COVID-19 pandemic and the global economic crisis it created, it is easy to think that the world is "on fire." However, the best path forward is to avoid panicking and instead make thoughtful decisions.