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mCCR Face-Off: Gemini vs Sidewinder

There's lots of buzz these days among sidemount rebreather aficionados: there's a new sidemount mCCR in town, which h increased noise on the socials. Here geeky Floridian cave explorer Grant Tobin dives into the weeds and reviews Fathom D Gemini mCCR rebreather and contrasts it to his previous breather, the popular KISS Sidewinder.

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By **InDEPTH**

By Grant Tobin. Images courtesy of SJ Alice Bennett unless noted.

Photo by SJ Alice Bennett

I'd like to be able to give a fully independent review of the Fathom Dive Systems' new Gemini sidemount rebreather, but I found myself unable to begin doing so without including a comparison with the KISS Sidewinder as well as my personal justifications for switching.

Disclosures: *I have no affiliation with KISS, a division of Polish-based XDeep (although I am certified to service the units). I have no business affiliation with Fathom but am sometimes involved with Karst Underwater research (KUR). Charlie Roberson, the proprietor of Fathom is on the KUR board of directors. Also, I really don't think any sidemount unit should be a diver's first rebreather.*






The Sidewinder. Photo courtesy of XDEEP

The Sidewinder

I can say, however, that the **Sidewinder** that was invented by Mike Young (and Edd Sorensen, and probably Matt Vinzant for the initial inspiration) has also been responsible for more cave line laid in the past five years than almost any other unit. I do firmly believe in dual oxygen monitoring. All opinions are my own and should be taken with your own grains of salt. [For detailed specs on the KISS Sidewinder see *InDEPTH's* **Holiday Rebreather Guide**]

I did my initial training on the KISS Sidewinder in April 2019, first with Mike Young's unit and then finishing on my own after it was delivered. I put approximately ~350 hours on the unit between April 2019 and Jan 2023. My max depth was 96 m/315 ft, and my longest dive was somewhere north of 6 hours. My lowest temperature dive was 1°C/34°F.

Here are the modifications I made to the Sidewinder:

- Changed the KISS DSV to Golem Gear BOV to Golem Gear DSV (I dislike the KISS one. It was improved in the most recent update and is now easier to service, but I have a strong distaste for the circ-clips that hold it to the loop hoses, as well as the vertical DSV open close vs a horizontal twist).

- Added Loop covers (homemade from SuperFabric or whatever the armored milspec dotted stuff is)
- Added syntactic foam coating to the scrubber
- Changed the Omni-Swivel QDs for the ADV inlet to either QC6 or BC Inflator, depending on the team I'm diving with—Removed the ADV (it either needs an in-line shutoff, or to be removed, or to run on a lower diluent IP, or a stiffer ADV membrane, or two membranes)
- Removed the OPV (it's in a great place to wet your unit if you happen to bump it into a restriction or unintentionally hit it with your elbow)
- Changed the Fischer-driven single monitor with Molex cells to dual monitor FathomHUD hardwired + Petrel 2/3 four-pin off an SMB splitter board (Fischer is silly—the argument for single monitor has improved with the advent of vibration in the Petrel 3, but I still am philosophically opposed).
- Changed the stock towers to Light Monkey towers (not only have there been various shades of manufacturing tolerances over the twenty years of KISS using these, but a few friends have popped theirs off grinding through restrictions)
- Changed the stock-blanked WellsMarine first stage and KISS single button oxygen add (GAV) to a Poseidon XStream MK3 on a KISS dual button orifice needle valve (remove depth limit, add needle flexibility, better access to first stage parts, integral OPV. The stock oxygen add is also prone to breaking when torqued by the wrong people)
- Switched from the plastic loop hose retaining clamps to metal hose clamps

What remained an issue with the Sidewinder unit itself after making these changes? [*Ed. note: Similar to other CCR manufacturers, KISS/XDeep does not sanction the modification of their equipment, as it can create safety issues.*]

Some of the things that make the split-backmount-not-really-a-sidemount unit great also create other issues

- Water removal. No water dump is available on the small lung. Brett Hemphill remains the only person I know who has used the DSMB style dump available on the larger lung, though I imagine Mike Young and a couple others have as well. Edd Sorensen speaks of intentionally flooding the unit and then proceeding to do a long cave dive on the unit "about 8 times" without ever having had a caustic, and he's not the only one. The shape of the lung on the back makes it less likely for the caustic water to move from the exhale scrubber, through the counterlung, up the inhale scrubber, and into the cells (and eventually the inhale loop). I would not advise trying this yourself.
- Wet sorb. Lung butter and any moisture dumps from the exhale and onto the top of the exhale scrubber. In 22°C water, you can make a sandcastle out of the right-side scrubber after four-ish hours, and a partial sandcastle out of the inhale scrubber after five. Some of this is my drool, some is the byproduct of the scrubber reaction and lack of water trap on the unit.
- No gas inlet across cell faces. Some units (Fathom, for example, or a modified KISS Sidekick) have the diluent-in blowing across the face of the cells, allowing for instant cell verification. Others have cells oriented in a place that is less likely to get wet under normal diving conditions. In cold water, there is enough condensation on the inhale side of the hose that water drips down onto the back of the cells in the Sidewinder and into the Molex connectors. If the cell faces do end up wet, a few dil flushes may help stabilize, partially dry, and hopefully return the cells to function, but it's often a roll of the dice if they all come back.
- Thread on scrubber canister heads. Some scrubbers do and some scrubbers do not have a line indicating max fill. Some scrubbers seem to have more and some fewer rotations of the head nut to lock down the heads on the scrubbers. There have been at least two instances of the user managing to grind through a restriction or otherwise and rotating the nut loose and knocking the head off.

User error? Definitely possible. When the first reports of the tower to loop thread popping loose surfaced, the immediate reaction was to state user error and poor assembly. Having held a pair of the failed ones in my hand, I humbly disagree.

- Scrubber to counterlung connection. These use another pair of the circ clips.
- Internal mesh screen on the scrubber. For the first few years, the bottom of scrubbers had a glued-in circular disc with a mesh screen to support the sorb and keep it separate from the counterlung. I've managed to break two of them. Mike replaced them for me, though I still find the plastic crossbars thin.
- Water from the OPV can drip down into the back of the cells / into the cell head. Short people (and people that have been taught poorly) trigger the OPV each time they reach for their butt d ring or XDeep OPV with their right hand and it's one of the few ways to get a quick caustic on a sidewinder.
- Various iterations of the SW MAVs and needles have had issues at extreme depths. Switching to higher durometer o-rings helped, but anybody that has taken their unit past 90 m/295 ft knows of these issues. Hint, they fail open and it's a nice way to get yourself into a "boom drill." It's not a great trimix unit unless you need to squeeze through something at or on the way to these depths.

The above largely ignores any issues with parts that I've already replaced. An important thing to remember is that much of the Spirit series were simply built by parts on hand from the KISS Classic (and even the Sport). Have I been using this unit differently than intended? Certainly, or at very least differently than what Mike Young set out to make when he produced the units. With so many instructors screaming about how the SW is "the most versatile and simple rebreather made," I did put it through its paces. By the time I retired it, my unit was, at most, half stock components.

The Gemini

FATHOM
Gemini CCR

INDEPTH
Get Deeper Into Diving

Market launch: DEMA 2022
CE certified: Yes: 2015
Rebreather Type: mCCR

CONTROLLER
Primary controller:Shearwater Petrel 3 handset
Redundant Controller: FATHOM HUD
CCR Bailout mode: Yes
Diluent on-board: No
Oxygen on-board: No

SCRUBBER
Scrubber type: Dual axial
Scrubber volume (Kg): 2.2 kg
Temperature stick (scrubber monitoring): No
Scrubber duration CE: CO2 1.6l/m 5mb bypass: 143 mins

DISPLAYS & WARNINGS
Heads Up Display: Yes
Buddy display: No
Other Active Warning Devices: Haptic and visual alarms
Near Eye Computer (HUD): Optional

LOOP
Active loop volume (liter): 4.5L or 6L
Counterlung Type: single
Counterlung position: BMCL
Flood Resistant-specify: counterlung w/ opv

HEAD & SENSORS
Number of O2 Censors: 3
Helium sensors: none
Gaseous CO2 sensor: no
Solid State O2 Sensor: no
Oxygen cell Tester (>1 bar): future option

BUOYANCY
BCD lift (kg): Can be clipped in any DIR Harness; CE Version harness 158N; CE version harness 12kg (26lbs.)
Drop weights: integrated weight pockets

HANDSET
 # Handsets: 1
Pressure reading (Air Integration): Yes
Bluetooth on Handset: Yes
Wi-Fi on Handset: No
Digital compass: Yes
Multi-language interface: Yes

FORM FACTOR
Backmount Conversion: No
Completely cased in Tube: no

SERVICE & SUPPORT
Suplied ready to dive (cells, tanks, valves): Option
Warranty (months): Limited Lifetime
Worldwide service/support: NA,
Reccommended Service Interval: Bi-Annual
Return to HQ or Service center: Yes
Cost of Service: 300 USD / 292.10 EUR

SHIPPING & ORDERING
Weight ready to dive: 9.2 kg
Price w/o optional equipment: $7,695
Manufacturer website: www.Fathomdive.com

I began hearing rumors that Fathom was working on a prototype sidemount unit in early 2022. Charlie and the team he dives with are pretty experienced at home builds and have used various rebreathers over the years, from modified Fathoms to Billy Gambrill-esque Lowriders, to Sidekicks and SF2s and Choptimas and others, so I was eager to see what would pop out. Rumors beget rumors and poof, we got to the Diving Equipment and marketing Association (DEMA) trade show in Orlando, Nov 2022, and the Gemini was on display to the public.

According to the **Fathom Gemini CCR Spec Sheet**:

- $7695
- Dual scrubber (hence the name)
- Axial
- potted head using SMB connectors (JJ/Fathom cells)
- No ADV
- OPV/water dump on the lung itself

- Easy integration with GG BOV, GG DSV as stock
- Fathom dual button needle valve with blocked, stiff spring Apeks DS4
- Swappable scrubber baskets
- Integrated HUD

The Gemini and the Sidewinder are obviously units of a similar skeleton (not unlike an xCCR vs a JJ-CCR vs a BMCL Liberty etc), and a few other comparisons can be drawn. That said, the stock and early manufactured Sidewinders (2018, 2019) are probably a Honda Fiat to the 2023 Gemini's Toyota Corolla (or even the old Lexus LS 400)? The 2022-ish Sidewinders, properly configured with a bunch of aftermarket work, (imo) bring them closer to a Gemini. Some gaps are inevitable, though.

Here's some information that's not in the spec sheet:

- Prelim EN14143 testing with 812 sorb has given a 2.5 hour duration at a breathing rate of 40 LPM with 1.6LPM CO_2 injection on air at 4°C. My personal breathing rate is a quarter of that, and my CO_2 production rate (extrapolated from my oxygen consumption) is ~0.375 that. Under normal conditions, that brings the expected duration to something more useful for me.
- Stock 44" LP hose from the DS4 to the Needle.

Price comparison for a 2022 Sidewinder with dual monitors, as of 31 Dec 2022, to be "ready to dive" and excluding harness, regs, cylinder, and assuming one needs a MAV, and that Delrin is a less good insulator than Black Amalgon. The scrubber basket material matters for diving, and thus you need syntactic foam.

KISS Sidewinder	$4,290
Petrel, 4-Pin and head side cable	$1,814
HUD + splitter board	$1,209
2 button MAV	$90
Cells	$327
Syntactic foam coating	$350
Total	**$8,080**

Note, a purchaser could do some other things to cheapen this, but I wished to use the KISS configurator to attempt to bring them together to something many view as safer. Blah, blah—always know your PO_2. If two monitors saves one life, the quant in me says the math of everyone needing two monitors is positive expected value. Even better, an instructor can monitor student PPO_2 on a Fathom HUD farther away than a Petrel (Even scarier: instructors that permit new students to only use a Shearwater Nerd).

What is still lacking on this hypothetical Sidewinder compared to a Gemini? The N@90 heads up display (HUD) is much worse than the Fathom version. You'd still be working with Molex cells and a head that isn't potted. And you have a depth limit in the 70m/230 ft range. (*Mike has made and sent a few SMB style splitter boards, but they're Molex in and SMB out, so you're still drowning in six Molex connectors).

If we were attempting to make this phantom Sidewinder match the Gemini as closely as possible in function (higher depth limit, cap ADV, etc), we'd be out the needle valve ($499 for the SubGravity, which is cheapest publicly available on market, but only allows for oxygen in, as opposed to the Fathom or KISS needle valves with two inlets, and thus eliminating the MAV) as well as appropriate first stage, stiffer spring, blanking cap, and OPV+ADV caps. The price discrepancy would then increase further.

Can someone argue that the Sidewinder is designed to be simple and shouldn't need splitters and dual monitoring and a needle, and that sump heads would solve some of these? Sure. It's not how I use it, and it's not how I think it should be taught. An uncertified user also isn't "allowed" to order sump heads with a new unit. You could order the Sidewinder without dual monitoring, but you can't order a Gemini without a HUD. I can't see a NERD 2 in a true whiteout, but I can see the HUD, or I can feel a (vibrating) Petrel 3. I'd rather be able to stay on the loop and count via the HUD than stay on the unit and trust my—or most diver's—ability to dick around counting breaths in semi-closed rebreather (SCR) mode.

The above information is all pre-purchase for me. I put down a deposit at DEMA and took delivery in early-January. Current instructors as of this writing are Kelvin Davidson (instructor trainer), Jon Kieren, and Giovanni Gastaldo at Third Dimension in Tulum, Mexico, and Jon Bernot (instructor trainer) at Cave Country Dive Shop in High Springs, Florida. After a hiccup with my work coverage interfering with a class with Bernot, I was able to find a mutual timeframe to sneak to Mexico for some time with Kelvin.

First Impressions

My unit arrived at my office on 4 January 2023 in a blue crate weighing about 12kg. My initial thoughts:

- Loop hoses are much shorter, but much more flexible.

- Removable scrubber baskets mean I won't be able to use that dead space for packing (I formerly put two computers and my oxygen first stage inside of scrubber cans.

- Very tight tolerances on all connections. Almost "break an O-ring if you don't lube them" tight.
- Weed Wacker cable seals the bottoms and tops of the cans to the lid. Coincidentally, this is also how the one atmosphere exo suits work.

- Not sure how I'm going to feel about the water dump placement. I debated for a long time drilling holes in the bottom of my sidewinder cans and installing Light Monkey tinkle valves. This way, I could dump water before it hits the lung. I elected not to proceed, as I worried it would harm resale value and, at the end of the day, rebreathers are a means to an end, and I don't have emotional attachment to units.

- I'm pretty compact, the two button Fathom needle valve is not. (I've had one in the past, this wasn't really a shock)
- No loop hose weights (I had them on the sidewinder and never experimented with removing them).
- Holes on the scrubber screens are a little larger than expected. Fractions of a millimeter but would wait to put sorb in them to find out whether this concern was warranted.
- The choice to flow gas from right to left means that for the oxygen valve to remain on the right side, the hose into the needle must pass along the bottom of the harness and up the left side of the back (as opposed to straight up the right side like the SW).
- Cell placement is an improvement. In a horizontal swimming orientation, cell faces are down toward the ground rather than backwards toward your fins. Unlike Molex cells, backs of JJ and Fathom cells are covered with the wire lead.

Contents:

- Lung (4.5L)
- Scrubbers
- Scrubber baskets
- Gas addition head
- Electronics head with HUD + 6" female 4-pin (Charlie will make it longer if you ask/need)
- 40" Inflator Hose DS4 w button gauge and beefy Apeks OPV
- Needle + hose to head
- QC6 male + hose to first stage
- Flow meter
- DSV + nipples
- Three bolt snaps (can tops, bungee across front)
- Bungee

- Paracord
- Fathom hat and sticker

Taking The Class

I built the Gemini to copy over the rigging from my Sidewinder but did not get it wet before class. I made it to Tulum, Mexico, and took care of my crossover. Kelvin was using a Razor 4, Lanny an XDeep Rec, and myself a Katana2. Takeaways are listed below in positive, neutral, and negative order.

The Positives

+ SMB cells. Larger surface area, fewer small connections. Molex are trash, and I'm happy to fight anyone that says they prefer them.

+ Proper threading on the head to loop connection. The LM ones aren't super well machined, and most people have a chip on their first thread because of it. The KISS ones are…well KISS ones. Caveat: Dobbykins and I had the first retail set of LM towers, so I don't know if this has been improved in the past two years.

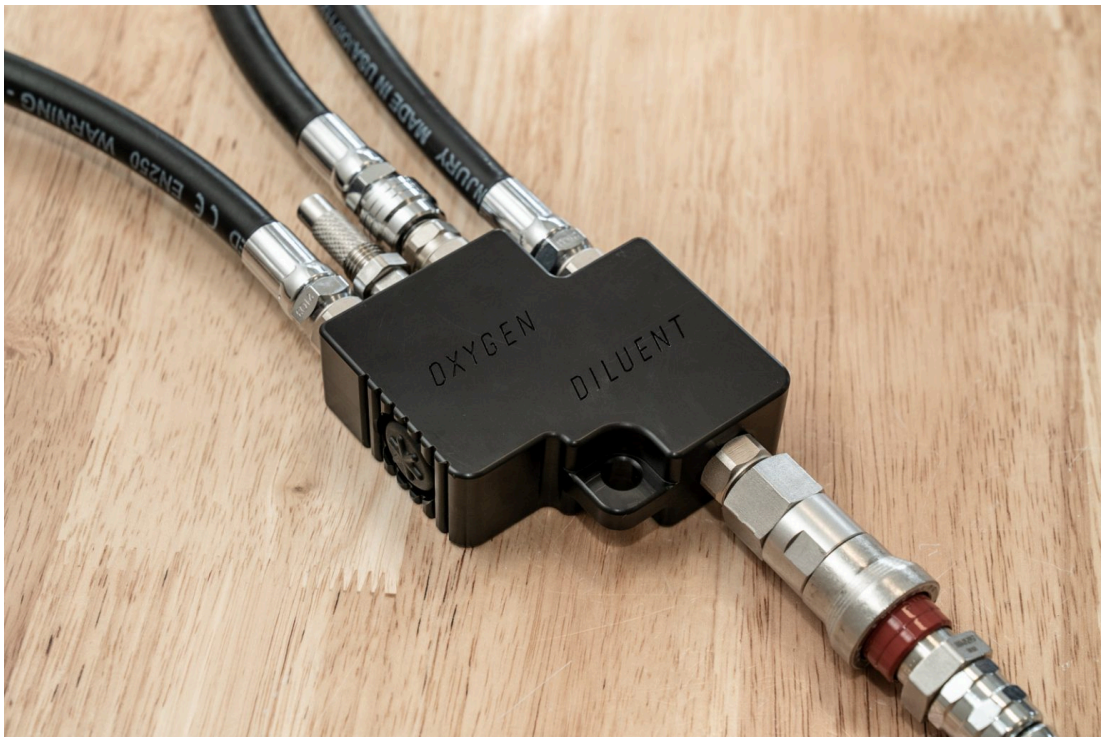
+ Connection from the cans to the CL do not have a circ clip that could break or be lost.

+ Dewatering ability. I have not tested it. There's enough alkalinity in the freshwater in the cenotes in Mexico that I was worried about frying the cells. Next time I have a bit of sorb time left and the ability to pull my cells out, I'll hop back in the water and totally flood the thing a couple times to see what happens. Between Edd and one or two others' experiences having flooded one side, I'm not super concerned with some moisture, assuming the inhale side remains unflooded.

+ Easy BOV integration. I've danced both sides of the BOV DSV debate. On a Sidewinder, the integration with a BOV was either very messy, or needed Fathom parts, or would add an additional hose somewhere. I did the Jason Richards thing for a while but grew to hate the ADV and all the additional hardware necessary. On a Gemini, going from DSV to BOV requires a single 30" LP hose and an elbow (plus the BOV). One could ditch the necklaced backup and thus ease gearing up. On all CCRs, I firmly believe you need either a BOV or a necklaced backup that is always breathable.

+ The two button needle (and the other Fathom needle and other Fathom MAV) are upstream. I'll use a quote from Charlie here to avoid confusion: "The manual addition button flows gas opposite of normal buoyancy compensator inflators. We did it to prevent the leaks that the SW

MAV is plagued with. Increased IP pushed it open in the normal downstream direction but assists in keeping it shut with upstream flow. It eliminates leaks and free flowing MAV. That also means that a HP seat failure on the oxygen 1st stage won't result in a boom scenario." I actually didn't know this, and I don't currently know why it isn't advertised more heavily.



+ Swappable canisters. Credit is due to rEvo designer Paul Raymakers for conceiving of the split or dual scrubber canisters—the ability to swap scrubbers does present interesting possibilities. Say I fly down to Florida or Mexico for a week. Arrive by midday Saturday and want to get a shakedown dive in before doing much larger dives over the next few days. Now, I can get a two hour dive in, swap the old inhale into the new exhale, repack the new inhale side, and be happy putting in a very long dive (Caveat: you'll all need to figure this out by yourself, and I'm not going to tell you my rules for sorb use. If you're pushing max scrubber durations, you should be in a big boy or big girl state of mind and be able to evaluate these risks.)

+ You're more likely to hurt yourself trying to disassemble the unit topside than you are to hurt it under water.

+ No battery box on the loop hoses

+ WOB. I saved this one for last, as I don't think humans can measure these things objectively by feel or with much precision, and I don't want to lead readers astray. I feel that the Gemini breathes slightly better than the Sidewinder. 10%? 15%? And then I had to ask myself why (and question as well whether I was still in the honeymoon phase with the unit). I think, very simply, it has fewer bends for the gas path and slightly less turbulent flow through the hoses. The towers run straight out of the lid, there is less dead space in the heads, and the entry at the bottom of the scrubber is smoother.

Hopefully xDeep/KISS will publish the results of the testing they did, Fathom will do the same, and we will have some data. The important thing to remember is the manner the cans and lungs are rigged will have the highest impact.

Neutral

- SW users are split running their MAV and GAV across their chest vs over the shoulder. I will need to get used to this being on my left shoulder.
- Packing sorb is going to take longer. I'll trade this for the ability to pull scrubbers out to let cells dry without needing third party caps or to be able to toss the scrubber baskets into a drybag.
- Haven't squeezed into anything that makes me prefer the straight routing vs the angled-in routing of the KISS and LM towers. If the straight piping did improve build quality and WOB, I'm all for it, and I do believe the straight plumbing puts the incompressible parts lower on the body
- Flow right to left
- Fathom advertises Black Amalgon as 400x better insulation than aluminum. Aluminum 6061 is in the ~167 W/m-K range, Acetal (Delrin) is 0.23 W/m-K range, and epoxy coated fibrous synthetic materials seem to be in the ~0.04 W/m-K range. I don't have the equipment to test whether the dual design of Amalgon + inner scrubber basket material is superior to the newer Sidewinder Delrin cans + syntactic foam coating.

The Negatives

— HUD uses a 2032 battery. Time will tell how long this lasts me, and it's another thing to keep in the kit. Takes about three minutes to carefully change.

— My finger fits and has the dexterity to remove the heads via fingering. If one doesn't, you'll need a guitar pick or a spudger or a relatively high amount of grip strength to remove the heads when you need to disassemble the unit. I think Charlie should include a plastic bike tire lever, as I promise you someone is going to use a non-coated tool and either mark the cans or the head or chip the head loop connection. There is a trick to it, but GFL if you didn't lube the o-rings sufficiently.

— The fishing crimp on the end of the weedwacker line could mar the canister. The Gemini is a tool I'm going to scrape through rock, and the crimp is not in a place to cut my suit. That said, I

wrapped it in heat shrink so I could grab it better with wet hands.

— I'd like to see a notch machined into the head and canister to ensure future users always line the heads up properly. It's minor, and matters less than on the Sidewinder because of the straight piping. The argument against doing this is that the bottom of the cans can also be removed (but seems to be more for maintenance and manufacturing ease than a need). Fathom would need to mark tops and bottoms or one could use a sharpie and be done with it. There's an unfortunately high amount of variation among SW instructors on correct counterlung bung to head tower angle.

— The mesh screen size is ever-so-slightly too big. I'm going to use some JJ scrim material (filter paper) on the cans to ensure less dust and no granules poking out. I popped through 5? 10? granules per time I packed the sorb. At very least, there needs to be a scrim on the side of the basket nearest the cells and one nearest the water dump on the lung. UPDATE: scrims are now included.

— I don't think the spring on the scrubber basket adds much value. As more classes come through, I think a standard will end up developing. I'm kind of worried a muppet will bend the screen via the bolt, and the bottom screen (top as packed) isn't of the same machining tolerance as every other piece of the unit.

— No water trap. I've experimented with different ideas on the Sidewinder (including a very small t piece in the middle of a loop hose) to absorb the sickening amount of spit I drool into the cans), but as of now, drool path is the same. Sorb works decently whilst wet, but eh. Still a complaint people will have.

— I have to suck it up and return to using an Apeks product.

— I dislike the stock GG mouthpieces. I've switched to a Divex (JJ) which I like better than the soft Scubapro one, which I prefer over the Comfobite for CCR use. On OC, my needs are slightly different. I'll inevitably end up with a gag strap should I move back to BOV use.

Conclusions

The Gemini works about as I expected it to. It's not wildly different from the Sidewinder, but it is better, and I trust it more. Any issues that I have with the Gemini are minor or are inherent in the design of split-backmount-not-really-a-sidemount-unit units. If you believe (as I do) that dual monitoring is a need, then I do not believe there is a reason to buy a new Sidewinder as of Jan 2023.

If you do not believe in dual monitoring but do believe in reducing the number of things that can go wrong on your unit via plugs, or sump heads, or LM towers, or a new first stage, or not using Omni-Swivel QDs, or dislike circlips, etc., then the question is a little more difficult. If demand outweighs availability of the small instructor pool for the Gemini, there's an inevitable bottleneck. Currently, there is also a three to 12-month lead time for a new Sidewinder, depending on who you ask.

On an ending note, my motivation for putting such effort into this review comes from the fact that I have one of the first couple non-prototype units, and wanted to share what I learned.

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Grant Tobin is a derivatives trader and risk analyst based out of Chicago, IL. A native Floridian, he began diving in 2006 and cave diving in 2009. His last several years have been focused on dives and projects ranging from participating with Karst Underwater Research (KUR) in Florida, to caves in Missouri and Mexico, to the wrecks of Bikini, Scapa, and the Great Lakes with MWUE. Outside of diving, he can be found racing long distance triathlon and rock climbing.

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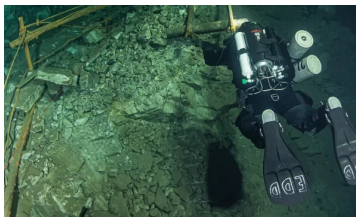

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