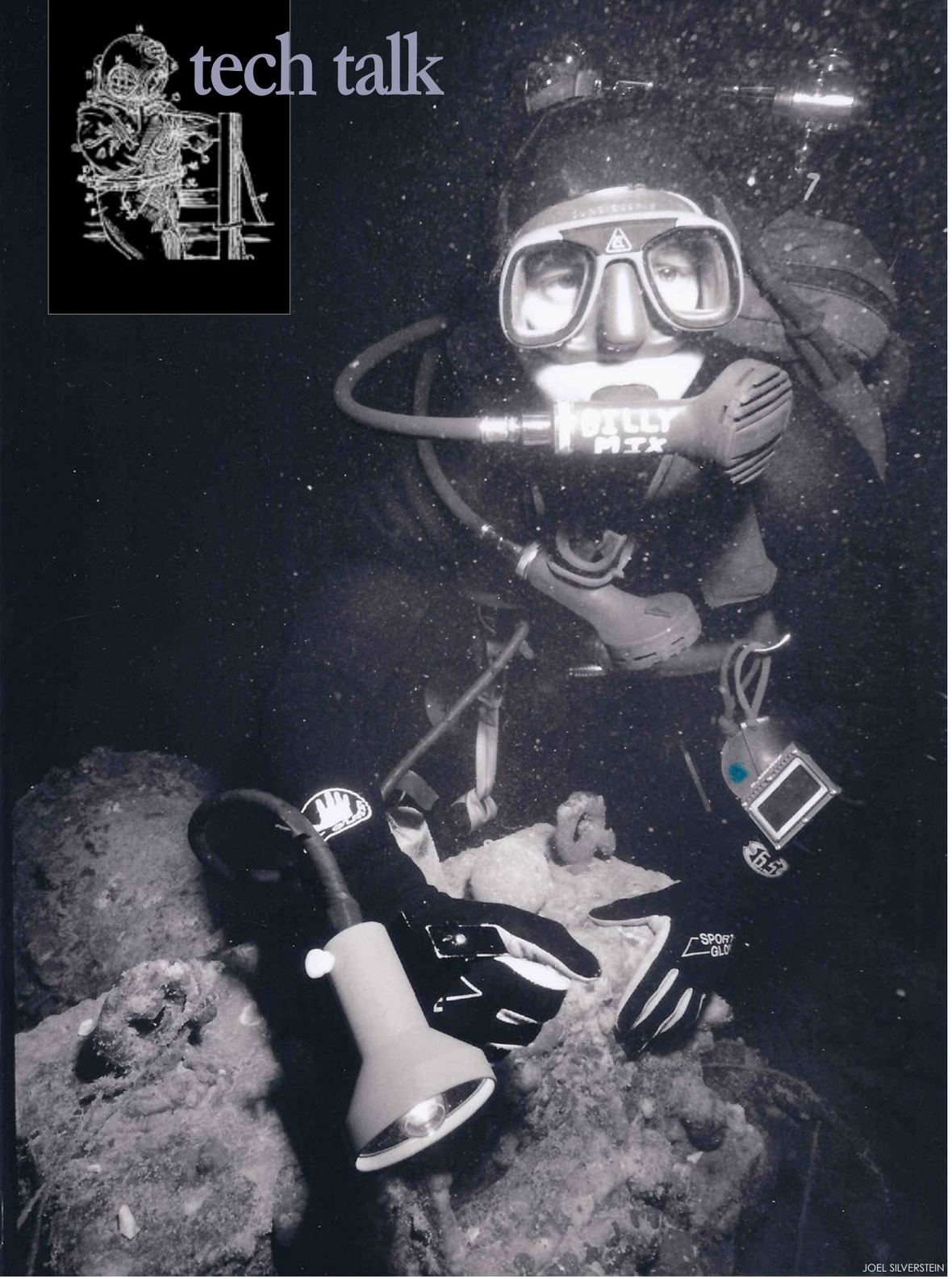


JOEL SILVERSTEIN

Captain Billy Deans—a wreck and technical diver and one of the early pioneers to use trimix for deep diving

With 23 years of hindsight...

Set Theory

— A Look at Rigging Options

—The following article is reprinted from the pioneering American journal for technical diving, aquaCORPS, V4, MIX, January-February 1992.

Edited by Michael Menduno
Photos courtesy of *Lamar Hires, Bob Janowski, Michael Menduno, Tom Morris and Joel Silverstein*

Though double (twinset) tanks and stage bottles are generally a requirement for most technical diving operations, diving sets vary significantly depending on the specific application and diving environment. Here's a look at some of the more common methods of set rigging as practiced today in the "doubles community."

Diving in little places

Modern equipment is designed to make diving in an overhead environment as safe as possible. Redundancy is the key to conducting these operations. The question becomes, "How do I rig this?"

A few years ago, the Hogarthian Concept—"dive as simple and clean as possible"—was introduced to the underground. Hogarthians had a number of specific ideas, which created a furor in the cave community, but got people thinking. Though some of the ideas were rejected, the concept is valid and has been implemented in various ways by members of the community.

Equipment is never rigged externally on the sides of tanks, and nothing, in particular the long hose, lies above the manifold crossover bar. All split rings are removed so as not to create a line trap, and so is anything that can foul or break delicate cave formations; many are more than 13,000 years old and can never recover.

The Submersible Pressure Gauge (SPG) is secured to the inside of the wrist as are other instruments. Reels and back-up lights are rigged to D-rings at the shoulders and as close to the back plate as possible on the waist straps using short tethers.

Pouches mounted on the waistband are used for carrying smaller items such as a line cutter, slates and tables, and line markers. The back up second stage regulator is secured by a piece of surgical tubing that is worn around the neck.

Rigging completed, there is no substitute for technique. In order to protect the cave, diving in small fragile places requires the finesse and the brainwork of a technical climber. Like their free hanging counter-parts, divers relay on a series of 'moves' rather than brute force. And the edge is never more than a breath and prayer away.

— E.J. 'Lalo' Fiorelli
Soquel, California

T. MORRIS

Lamar Hires of Dive Rite pioneered sidemount diving in caves. Today, recreational divers have adopted this style of diving and sidemount in open water.

Squeezing by

Originally developed for the tight low visibility sump diving that is common in Europe, sidemounts allowed spelunkers to more easily transport single cylinders through a dry cave to the dive site.

In North Florida, the use of sidemount techniques has allowed exploration into small silty areas that were once thought impassable and has opened up entire new cave systems that were simply inaccessible with back mounted doubles.

Sidemounts reduce the strain of carrying heavy doubles up steep inclines, lowering cylinders down into a hole, and making those long walks through the woods to the dive site. Cave systems known to be silty can now be penetrated without heavy silting.

Sidemount configuration means wearing the cylinders on the hips instead of the back. The cylinders are fastened in the middle with a snap to a harness at the waist. The necks are clipped off at the armpit using bungee material (a bicycle inner tube is preferred) so that the cylinders are forced to lay parallel to the diver's body. Adjustments are usually needed at first to insure a snug comfortable fit.

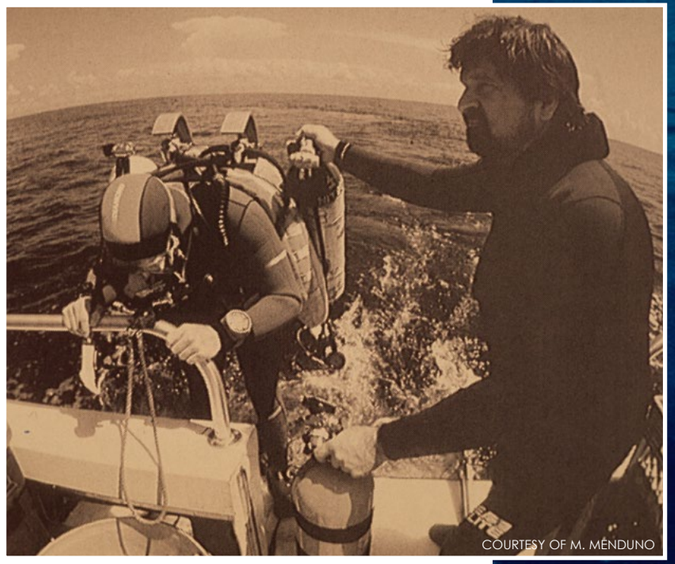
When diving with sidemounts, gas supplies must be balanced for adequate reserves throughout the dive. The regulator and SPG hoses no longer lay across the back and instead are clipped across the chest area. The management of these is critical for proper monitoring of gas supplies and switching regulators during the dive.

Back-up and emergency equipment must be streamlined

Set Theory


T. MORRIS

Divers used to bungee in their sidemount cylinders using bike inner tubes. Today, divers use metal clips to secure their sidemount cylinders because these are a more secure method of attachment.


COURTESY OF M. MENDUNO

Jim King (above) about to go in—quads (four cylinders) were often used in conjunction with diver-carried stage bottles where self-sufficiency was the key; Lamar Hires (right) ca 1990, Blue Springs, Tennessee.


BOB JANOWSKI

and tucked away to achieve the desired profile—no thicker than two cylinders that lay along the diver's hips.

Clearly, sidemount diving is not for everyone because of the potential hazards that exist; low visibility, line traps and squeezes that seem to get smaller and smaller are only a few of the obstacles to be overcome.

A diver must be totally comfortable in all these conditions before considering sidemount as an alternative. Suitably equipped, divers who are, can usually find a way to squeeze by.

— Lamar Hires
Dive Rite, Lake City, Florida

China cult

Previously isolated from the underground and fellow wreckers to the south, the east coast wreck diving community evolved its own style of set rigging suitable for the cold dark waters of the north and the available technology. Still seen on the boats that work the *Doria, Texas Tower,* the *Virginia* and the *San Diego,* a typical east coast wreck diving set consists of a pair of double 80s or 95s (10.5 or 11.5 liter) or secured to a large capacity BCD jacket with a manifold system, or commonly two independent regulators, which are rotated throughout the dive.

A 40cf (5.5 liter) pony mounted between the doubles serves as a bailout, along with a handmade upreel (hemp rope wrapped around a forearm-length aluminum spindle). For the most part, stage bottles, typically air, are something divers leave tied off to the anchor line at 10ft (3m), and oxygen for decompression is still used sparingly, if at all.

Now with the advent of larger tanks, harness and manifold systems, improved decompression methods and mix technology, all that is changing. Today, a well-outfitted high tech wreck diver carries a pair of cold-filled Genesis 120s (14.5 liter) with DIN crossover manifold and valve protectors, shoulder mounted stage bottles, or 'wing tanks', containing decompression gas (EAN and or oxygen)—do you really want to bet your tissues on that cylinder clipped off to the anchor line? Harness, bag and back plate system, argon inflation system and of course an upreel.

The result? Wreck divers are staying down longer, getting more of that first class china, and most importantly are doing it safer. After all, when you come right down to it, the most valuable artifact that you'll ever bring home is yourself.

— Billy Deans
Key West Diver, Florida

Quads

For long deep exposures, particularly those associated with expedition-level pushes, carrying sufficient gas volumes to do the job becomes a major operational consideration. Fortunately, most of these dives are conducted in cavernous passageways or open water where restricted space is not the issue.

According quads (four cylinders) are often used in conjunction with diver-carried stage bottles in order to carry sufficient bottom gas, and that required for decompression, where self-sufficiency is the key. DPVs are generally a requirement to overcome hydrodynamic drag.

A typical quad set-up consists of doubles, often 104s (18 liter) with crossover manifold containing bottom mix, mounted to a pair of side tanks containing decompression gas; an enriched air nitrox and a bottle of oxygen, each with an independent regulator.

In addition, divers typically carry an 80cf (10.5 liter) bail-out bottle of bottom mix, and a second cylinder of deep nitrox mix (some-


M. MENDUNO

Does this face look familar? It's a young Richard Pyle wearing a Cis-Lunar MK2. This unit is the ancestor to Poseidon's current MKVI and SE7EN. Pyle was part of the development team on both these rebreathers.

times air) for decompression—six cylinders in all—making the diver relatively self-sufficient. High performance regulators, such as the Poseidon, are the standard, as well as double buoyancy compensator bags. Gas and quad equipment management are critical, and takes practice to get down.

How much gas? An explorer with a good quad set and stage bottles can carry just over 600cf (16,900 liters) of gas. An awful lot until you consider that gas consumption in the 300-500ft (90-150m) range being broached by leading explorers, will drain an 80cf (10.5 liter) cylinder in a little over five minutes, and the gas requirements for decompression—often in excess of four to six hours—are stiff.

Of course, once closed circuit (C2) technology hits the street, quads and six plus tank dives will become a relic of the past. With a virtually unlimited gas supply in a 50 lbs. (22.7kg) pack, gas won't be the issue. But then that's technology for you.

— Michael Menduno

Futures market

If Dr Bill Stone has his way, we may all be taking another breath. Rated to 300m (meters!!), Cis-Lunar's MK-2R fully-redundant closed circuit rebreather will change the way we think about diving, blazing a trail for others to follow. Offering a 13- to 18-hour heliox gas supply, near optimal decompression, and a fail-safe systems architecture that would send any self-respecting tekkie into orbit—literally, the MK-2R, now in beta test, is scheduled to make its début sometime in 1992

The tougher issue is whether Cis-Lunar's initial production run of six units will saturate the market. Considering that IBM first estimated the worldwide market for computers to be only four systems, Stone and his colleagues may not have to worry for long. All they have to do is hang in there. But then that's exactly what Stone has in mind. Microbells anyone? ■

M. MENDUNO

A youthful Kevin Gurr acts as dive valet to Bill Stone—ten years later Gurr designed the Ouroboros "Boris" rebreather, and more recently the Hollis Explorer rebreather.