



...to go where no one has gone before

Deconstructing a 330m World Record Dive

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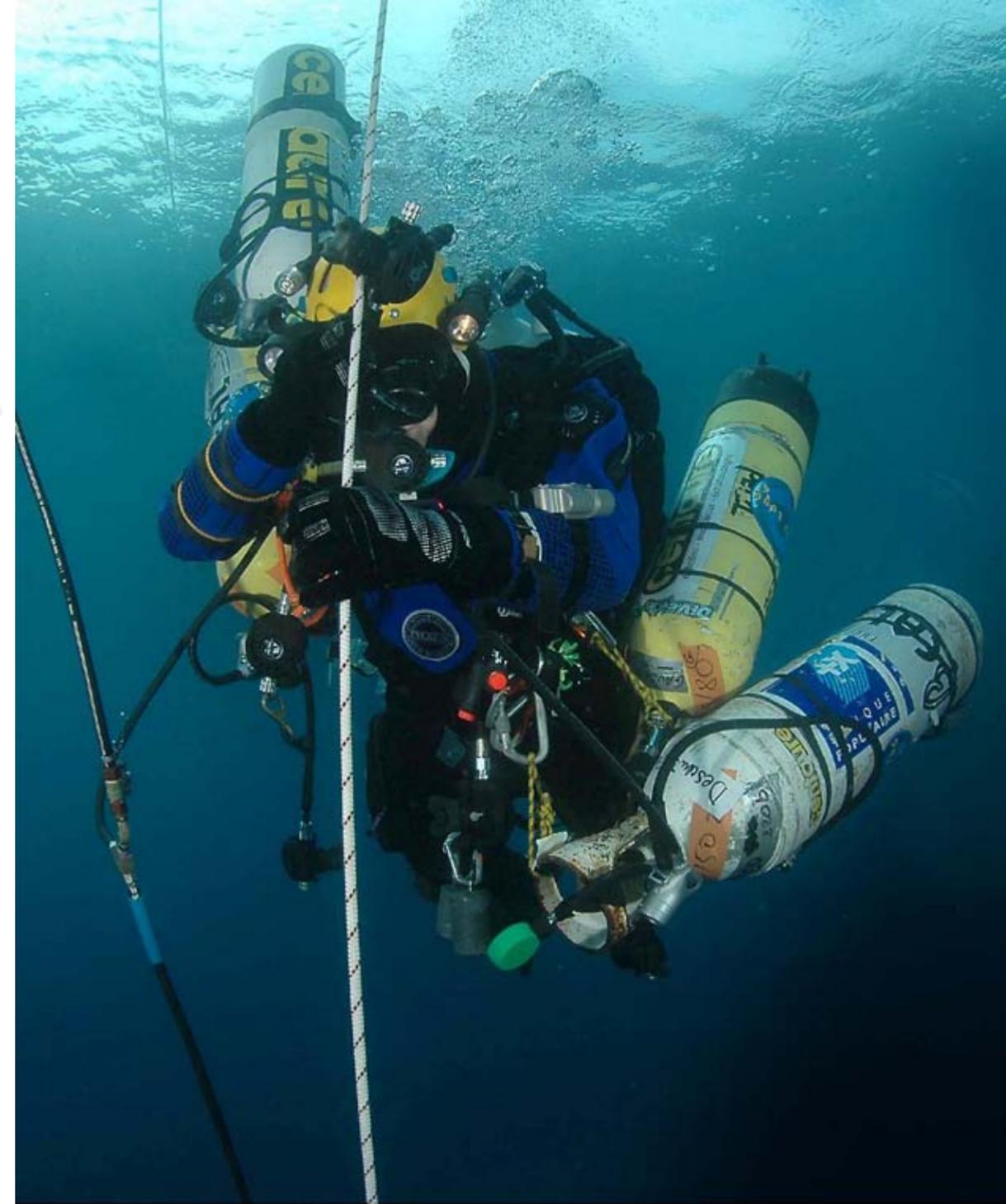
This is the moment I have waited for for years. I sit comfortably on the side of Denis Bignand's dive boat and under my fins, which are already dangling in the water, I have a 400 meter drop off.

The Valinco waters are unexpectedly quiet. There have been so many times where we had to postpone this dive because of wind. Making this dive come true grew into an obsession,

and the idea was stuck in my head. I look around. I see Porto Polo just a short distance down the coast. At my feet is a big buoy under which 350 meters of rope is suspended with a 50kg weight attached in the other end. It is waiting for me. Pity that I still feel this knot in my stomach despite of all my relaxation, calm breathing and the good conditions.

Around me the team has sprung into action: Hubert, François, Tono, Christian, Sophie, Frank and Denis from U-Levante. I have already put on the 18-liter double set with another 7-liter for the dry suit, and very compact double wings. I have reduced the equipment to the absolute minimum in order to lower the risks of making mistakes and becoming confused at the bottom. Only the gas quantities have been over-dimensioned. I have always been afraid of running out of gas.

I enter the water and finish gearing up in a somewhat meticulous manner. I find it necessary, as I don't want to leave anything to chance. I focus on holding on to my concentration despite some small last minute problems. I visualize the dive one more time and make sure I don't forget anything



from the checklist, as if preparing for a spacewalk. The analogy is not entirely out place as the ascent from the bottom will take longer than a return journey from space.

It really is a trip into the unknown for which I am preparing. In spite of all the meticulous preparations, uncertainties remain, especially concerning my state of mind and body at the bottom since there have only been three other scuba divers who have gone below

300 meters.

With my movements being slightly restricted by my six large tanks, I finally commence my dive. I leave the surface, the barrier that separates the air, my friends and security from the depths of loneliness. At this moment, my stress is supposed to disappear only it doesn't. I pause at six meters, but only for a moment, to regain my focus, but I am in a hurry to be at the bottom. The descent commences, slow at first, then

feature

increasingly faster because of my weights. At 70 meters, I hang my 18/50 tank, switch to the 6/72, and start gaining speed.

I pass the 100-meter depth mark without paying much attention and continue gaining speed. I pass the 150-meter tag. During my first mixed gas dives in 1993, that depth seemed virtually inaccessible. But since 1996, between the exploration of underwater caves and assisting Pipin and Audrey Ferreras in their freediving record attempts, I went back

down to between 150 and 174 meters about 15 times, often under challenging conditions and with tasks to accomplish (exploring, unwinding lines, filming, assisting, etc). This gave me a certain psychological ballast and confidence diving to these depths and especially ascending and performing the decompression stops.

I fly past the 200-meter tag. This is the third time since I started practising deep diving. The first time was in the huge underwater cave of Fontaine de Vaucluse in

1998 where I reached a depth of more than 250 meters. The second time was on the open sea off the Catalan coast (Northern part of the Spanish Mediterranean coast – ed.), where I had the same team as I have now. Then, I dove from the *Majunga*, François Brun's boat, and went to a depth of 231 meters. But today, this almost feels like just a formality, since the objective is to go much deeper!

Still no HPNS

The rope runs quickly between

my gloves. Too quickly! I need all my concentration to equalize, to pass the tanks onto the big snap hook that secure me to the rope, to inflate my drysuit, which is fortunately equipped with a big flow rate.

I am approaching the last 20-liter tank, which is attached to the 250-meter tag. It is actually at a depth of 265 meters because of the elasticity of the rope and marked with a chemical light stick as is custom for all cylinders at such depths. I have a difficult moment. I abandon the 6/72 20-liter travel gas that I have been breathing since 70 meters and start breathing on the bottom mix, make the knot... too many things to do at the same time.

The High Pressure Nervous Syndrome is now well developed in the form of light shivers and in particular, difficulties in concentration. Worse still, the travel gas tank I was supposed to attach slips off the rope and gets away from me! My friends get it back a few minutes later without really understanding what is going on and not without a certain apprehension.

For me, of course, things are not getting better with the depth. But I now feel comfortable with only four big tanks filled with bottom mix. Strangely, passing the depth of 200 meters, I am shaking less than I was at the Fontaine du Vaucluse. I am not having any obvious visual disturbance (distance problem) either, except for an advanced "tunnel vision" effect—my visual field seems restricted and being without much peripheral vision.

My Apeks regulators and my Aqualung Titan are working wonderfully well. I hardly notice the

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300-meter tag that really should have grabbed my attention. A flasher is blinking, indicating the very deep zone. I reach the 320-meter depth tag (actually situated at more than 335 meters) when a big deflagration occurs in my right ear, along with a

sharp pain. My stress, which left me when I passed 70 meters, returns with a vengeance. There and then, I am convinced that I have a big lesion on my eardrum. I quickly inflate my wings and begin the ascent. The pain in my ear doesn't get worse. I try not to



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think about what may happen next and concentrate only on the ascent.

Reaching 265 meters, I am glad to get to the decompression tank for my first deep stop. Then the ascent starts again, this time at a slower ten meters per minute rate. This is another big difference between this dive and diving the Fontaine du Vaucluse dive. Back then, I was hit much sooner by HPNS, and it left me later, too, around -70 meters.

By contrast, today, I feel few symptoms above 220 meters. At 215 meters, I make the second deep stop while I hang the second deco tank on. From here on, the ascent gets even slower with a snail pace five meters per minute until I reach the 165-meter deco stop and the next tank. My ear doesn't hurt as much as I thought it would, and I feel as if I am back in familiar territory.

From 150 meters, the ascent slows further to an excruciating slow three meters per minute ascent speed, and I have all these tanks accumulating around me dangling on the rope and on my har-

ness.

When I get up to 70 meters, there are nine 20-liter deco/travel tanks that I have to manage. Reaching 65 meters, I get onto the second rope. There, I am happy to see François Brun, with whom I usually explore deep shipwrecks, in particular, one located off the Catalan coast at 110 meters. Our last journey was as exploration training dive three weeks ago. He's using a Inspiration rebreather. He comes for an update and to provide me with food and drink. I let him know about my pain in the ear and a light nausea. He rids me of four tanks, and after spending a little while with me, he has to perform his own decompression profile.

Hubert Foucart relieves him at 50 meters. He is a follower of what he calls "baroque" diving—deep dives either in caves or on the open sea, down to an impressive 211 meters, and he assisted Pipin, too. He gives me a mix of water and Vogalene in order to prevent nausea. Then, it is Denis' turn to come to



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The team

Sixteen people in total, divers or mariners from Toulouse and from Catalonia, have followed this project (and other projects: shipwrecks, cave diving, etc) and have carried it on their shoulders since the beginning; everyone has his own specialty but continues to multitask. Preparations, cancellations, and doubts have all been commonplace since my 231m dive in 2003. Without these people or the patience of their families, none of this could have been done. I will never thank them enough for their kindness, efficiency and devotion:

- François Brun, a well known shipwreck explorer

- Christian Deit, specialized in raiding, cave diving, canyon exploration, scuba diving
- Hubert Foucart, cave diver and shipwreck explorer, with his passion for the deep dive
- Sophie Kerboeuf, highly skilled diver who cooked good little dishes for me
- Patrick Tonolini, cave diver and rebreather diver, who mixes everything with his Bauer-Purus
- And all the ones who were not able to come, amongst whom were Laurent and Paco.

In Propriano:

- Denis Bignand and his instructors from U-Levante

- Francis Machecourt from the CREPS of Ajaccio and his wife Sylvaine
- Théo Laumonier
- Laurent Grillot (Lolo)
- Pierre Schiffer and Christian Gay-Capdeville from Aquasport Contois
- Pascal Vieux and Jean-Louis Léandri, a mariner from U-Levante
- Louis Lari from the Pilotine Santa Maria and his son, Jean-Marie, pilote of the port

Thanks to Henri Benedittini who brought us all of his help one more time; Bernard Gardette, the Comex scientific director, for all his valuable advice; and Professor Bourbon of the Nervous System Functional laboratory (CHU Toulouse-Rangueil) for his formation on mental preparation. ■



Technical decompression

Some important points and notes:

Some initial one to two-minute very deep deco stops were performed from 265 meters. And from that depth, the ascent speed decreased in order to avoid serious accidents of Type 2—that is, vestibular/neurological accidents whose symptoms may start deep in that type of dive.

The late John Bennett suffered from these kinds of symptoms after his record breaking dive to 308 meters. He suffered from dizziness and vomiting from 66 meters upward and during the whole decompression, which lasted nine hours and 37 minutes.

In this light, it is mindboggling that it was not too long ago that the accepted standard rate of ascent was 30 meters per minute (30 meters/min).

These slow ascent speeds and the deep deco stops require large quantities of gas. That is why we used 20-liter tanks at 265 meters, 215 meters, 165 meters (8/62), -145 meters, 115 meters, (13/57), 95 meters and 80 meters (18/50) as well as on the second line that was about 60 meters long—at 60 meters (20/50), 51 meters (25/50), 39 meters (25/50), 30 meters (38/33), 21 meters (50 percent O₂), 15 meters (60 percent O₂). We also used two O₂ sets of surface supply diving equipment at minus 6 meters.

We used a large fraction of helium in the decompression mixes, which we considered easier to eliminate in the last deco stops. We avoided exceeding 30 percent of nitrogen during the ascent up to 21 meters.

All those elements allowed me to have a relatively short decompression,

compared to the 12 hours decompression that figures on my longest diving tables and is also Nuno Gomes' decompression time when he dove to a depth of 318 meters three weeks earlier in Dahab, in the Red Sea.

Therefore, I opted to use those tables because of the water conditions, the pains and the seasickness. I thought that staying longer would overexpose me to exhaustion.

Moreover, I felt reassured knowing that in the 1960s, Keller had only a three-hour decompression (in a chamber) after a 300-meter dive! Plus, in 2004, Mark Elyatt performed a dive to 313 meters in only six hours 36 minutes. So, I felt that there was plenty of decompression time.

Helium—a sword that cuts both ways

In order to limit narcosis below 40 to 50 meters, we used increasing proportions of helium in the gas mixes. The downside is that helium also subjects you to additional loss of body heat and facilitates the onset of High Pressure Nervous Syndrome (HPNS).

This syndrome gets aggravated by helium below 150 and by the high speeds of descent characteristic for those dives. It has also been demonstrated during many experiments in chamber, and a few ultra deep TEC dives showed that the presence of another narcotic gas, usually nitrogen, masked the effects of the HPNS, which is characterized by shaking of the extremities and then of the whole body, visual problems, difficulties in concentration and impaired performance.

A few years ago, I was thinking about adding hydrogen, but I gave up

the idea because of the dangers of handling this gas as well as a remaining uncertainty concerning decompression and the effects of a fast compression.

But of course, the more nitrogen we add, the greater the risk of nitrogen narcosis or even the combined effects of narcosis and HPNS! Everything is therefore about getting the dosages right. It is a balancing act. Too much helium means increased risk of HPNS. Too much nitrogen means too much narcosis and increased risk of being bent.

In the practice, while attempting relatively fast descents in the chamber (10 to 30 meters/min), it appears that levels of 13 percent to 18 percent nitrogen noticeably decrease the HPNS effects, without causing too much narcosis. On extremely deep TEC dives, the equivalent air depth for the divers at the bottom was 70 to 100 meters.

An equivalent air depth of maximum 60 meters seemed reasonable to me. This is associated with a partial oxygen pressure of 1.4 to 1.5 bars. That didn't prevent me from being significantly affected by HPNS from 260 meters. However, the mix I used probably minimized its impact, and kept me from developing a dangerous case of narcosis.

Concerning the descent speeds, it seems, according to the experiments in chambers, that descending one meter/min or even slower, will notably improve performance. But it doesn't seem useful to reduce the speed from 30-40 meters/min to 10 meters/min. On the contrary, it is even likely that it only gives HPNS more time to manifest itself. It will also considerably increase the already very long deco stops. ■

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see me, also with his rebreather and brings me Sophie's good little purees and soups, in giant syringes. This salty food is a good alternative to condensed milk, sweet chestnut puree, marmalade, jelly and water already absorbed. Then, he brings me a rebreather that, however, won't work. Consequently, the rest of the ascent will be done with open circuit, but at least without any particular technical problem despite of the high percentages of helium.

From 30 meters, I start feeling the effects of the strong swell on the surface. The pain in my ear increases and soon enough each movement of the rope is becoming a nightmare. The decompression turns into torture. And that is not all. At about 12 meters, I get seasick.

Dealing with the pain and the nausea begins to exhaust me. The end of the decompression is done with Christian, Pierre, Lolo, Théo, Francis and his wife Sylviane, who stay with me up to -3 meters. I finally break the surface again after a

dive of 8 hours and 47 minutes.

The return to the surface that I dreamed about during the whole long time of the decompression is brutal—I am shaken by the swell, which only makes my seasickness get worse. My friends help me get rid of my equipment, while I raise myself with difficulty on the Zodiac. There, I am taken care of and quickly rushed to the shore by my old buddies, Tono and Deit. Still exhausted, I keep breathing the oxygen for another half hour on the ground while rehydrating myself abundantly (water and water plus Adiaril).

I should be happy. But I just feel a little bit more serene, and a little bit frustrated by the vertiginous, but too short descent that already just feels like a memory.

The game has worked today; my blood analysis wasn't too bad. However, I am already thinking about what could be improved. ■

Equipment:

It is simply of vital importance that, on such a demanding dive, the equipment is simple, rugged and extremely high performing! We entrust it with our lives, here more than anywhere else, and under the most extreme conditions!

AQUALUNG: One of the regulators that I used at the bottom was a Titan, which worked admirably. We often use it in cave diving, because the second stage is easy to disengage. Le Gend regulators (the top of the line) were settled on all decompression tanks, even the deep ones. Hubert and I had used Aqualung regulators during assisting dives with Pipin, between 140 and 170 meters. Hubert had also used them during a -211 meter dive. aqualung@airliquide.com
+33 4 92 08 28 88

APEKS: All bottom regulators were Apeks ATX 100, whose breathing capabilities are really impressive at 330 meters. With an Apeks, it feels like breathing at only 20 meters! I used those regulators with total confidence, since they had successfully been used by a

Norwegian at 225 meters, and even by John Bennett at 308 meters. It is also the most commonly used regulator amongst English Tec and cave divers in the worst conditions. www.apeks.co.uk or Aqualung France

AGA: AGA supplied ten Helium tanks and six oxygen tanks.

PETZL: Fifty snap hooks specifically for each situation were used—locking snap hooks to secure the deco tanks as well as quick opening ones for delicate or fast operations. Petzl also supplied all the spelunking handles, which helped with manipulating ropes and bringing the tanks back up. www.petzl.com

TORTEC: Tortec supplied the seven to 18-liter tanks used at the bottom and during the decompression.

BÉAL: Béal supplied all the ropes—descent, decompression, shot line, etc—more than one kilometer in total, as well as the cord and lines. www.beal-planet.com

www.segytek.com ■



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PARTNERS IN CORSICA:

- Diving Center U Levante in Propriano

Without the help of Denis Bignand who knows the bay like the back of his hand and all the best places, and who organized everything there, without his competence and his efficiency, we might still be looking for a site. He and his friendly instructors were a precious help to us, and I thank them. www.plonger-en-corse.com
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- Vigna Maggiore Camping in Olmeto Beach
Location with a beautiful view. Jacques Bidani the friendly owner, welcomed us with opened arms and put us in two comfortable bungalows. He also entertained us with hearty local stories.
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