

A Story of Survival at 1500 ft

By

Richard C Castle

Introduction

During my time working on aircraft and six years experience with submersibles, I can say that a significant amount of effort was spent just trying to keep people alive. Yes, it can be acknowledged that the 1970s and 80s were, in many ways, a lot different than today. Frankly you were just expected to get on with your job and keep quiet.

There were times however, when one just couldn't allow questionable practices to be waved through and it was necessary to make a stand by denying flight clearance or diving use. Believe me, it doesn't make you flavour of the month when you tell either manufacturers or practitioners that they were being unsafe. Occasionally, it could even result in pressure being applied to get an offending statement removed from a report, not an uncommon activity where profit is given priority.

Also, certain terms mentioned within this scenario will not mean a thing to most people as they are not in common use these days. Hopefully, the endnotes will help.

The story I am now going to relate is based on fact. No, not the incident itself, but the solutions devised to ensure that people had the best chance of surviving a diving accident. It draws on discussions held at the time and actions that might have been carried out if it were ever to happen, but do remember, I am writing this from a historical perspective and much has changed since then.

When deploying an Atmospheric Diving Suit (ADS) and associated equipment (image 1), the operators must become competent in numerous tasks such as logistics, first aid, hydraulics, electrics and a dozen other trades, in order to ensure that the next dive someone makes is not their last.



Image 1 - Deploying JIM from oil rig

Paperwork is another annoying, but integral, part of the job as well. Why? Because when things go wrong the pre-dive checks you have just made might well help topside to work

out what has gone wrong and actually save your life. 1500 ft below the surface is not in the range of a saturation diver, but for an ADS operator it is just another days work, yet working down there on your own, can be both lonely and dangerous.

The scenario

Now imagine you have completed an 8 hr shift on the seabed in JIM and are beginning to come back to the surface. You will be tired, wet and in need of refreshment, maybe even a good night's sleep. Suddenly, there is a problem with the lifting crane¹ located on the oil rig. The securing braces break and down to the bottom it goes, complete with operator, with you following on behind. When you hit bottom, you are thrown onto your front and parts of the crane fall on top of your ADS. Luckily, you are not hit by the crane's body so, having survived the initial catastrophe, you are now stuck on the seabed, face down and unable to move.

Communications have completely failed and with no power for your outside lights or sound, the only thing you can hear is your own breathing. To start with, every drip of water inside the suit makes you think there is a leak opening up, whilst every creak from the joints or perspex ports might just be the start of an implosion. You are also in shock, but luckily for you, your environment is at atmospheric pressure and you are still alive. However, at nearly 100 atm outside, the magnesium body of the suit is under a lot of compression and you may be wondering if any damage was caused when you hit the seabed.

Topside, there is panic. A controlled panic though, designed to get everyone moving quickly but safely towards a successful rescue. The oil rig is no longer useful for recovery due to the loss of the crane and parts of it are still on deck or hanging in the air by wire rope, consequently the rig support vessel now becomes the rescue centre. Firstly, the standby JIM has to be transferred across from the rig and although it only weighs 700 lbs it requires one of the donkey cranes to work at near maximum load. No 10:1 safety factor for a manned dive, but enough for an empty lift and to lower JIM down into the sea where a work boat will take the suit across to the support vessel. Fortunately, the weather is remaining fairly calm and within 3 hrs the suit is on board and being prepared for diving. Now 3 hrs have passed since the incident and a total of 11 hrs since the dive commenced.

Unfortunately, if the standby JIM suit was deployed and something went wrong there would be no backup, so this must be quickly rectified prior to it going into the water. A backup system must be brought out as quickly as possible and one that can work all on its own. At this point costs are not important as the emphasis is placed on getting everything required and pronto. Typically, DHBC Ltd is quick to respond and another suit is dispatched forthwith from Alton, Hants.

It is now 6 hrs since the accident happened and 14 hrs since the first JIM went down to start work. Questions on life support are being asked by the rescue team. The clock had been set to record the number of elapsed hours and it seems that only 20 remain.

Down on the seabed, you are now shaking with cold and feeling very uncomfortable. You are wet and the small cabin light for reading gauges stopped working when the incident happened. Suddenly, there is a muffled sound from the suit and your right leg is pushed upwards. Your heart rate increases and you try to feel around the suit to find out what has happened. The suit is still watertight and you start to relax. After calming down, you remember that during training you were told that if one of the joints should fail, it would fail

safely by being pushed onto an internal o-ring. Mind you, one leg feels shorter and is now jammed solid, but that's nothing serious to worry about.

It is now 16 hrs since you left the surface to begin your shift and still nothing is being done to help you. You start to wonder where they all are.

You do the calculations and work out that the CO₂ level is now about 4% whilst O₂ is down to 17% with cabin pressure remaining at 0. However, there is only 100 psi left in the O₂ bottle. It's just as well then that you broke the rules and left your cigarette lighter in your overalls, otherwise there would be no way to check the gauges. You now know it's the end of the starboard life support system, so the time has come to switch over to the port bank. This is very difficult to do because you are face down and have to reach behind your own back to use the SODASORB[®] change-over valve (shown in image 2). This takes a fair bit of time because it really hurts. 5000 psi of O₂ in an 800 litre bottle and 7 lbs of brand new SODASORB[®] are now yours for the breathing, but don't forget to check the O₂ reducer and flow rate now that you are breathing from a new side. So life carries on, but for how much longer? You are frightened and it is difficult to slow your breathing down, although you know that you must.

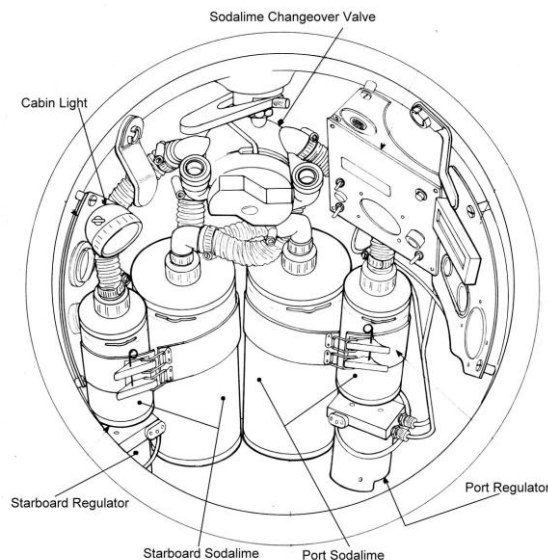


Image 2 – Port & starboard soda lime

Now 18 hrs have passed and you are (somewhat inevitably) busting for a pee, but remember pee is keeping you warm inside and you squander precious warmth if you lose it. So you hang on as long as possible. It is so dark and you begin to wonder if the suit is being sucked down into the mud on the seabed, which begins to worry you even more, as does the lack of clothing you have on. Suddenly, from the top dome port, you see a light in the distance. Could this be real or are you hallucinating?

Topside, the backup JIM has been deployed, complete with work lights mounted on each arm and what's more, your oppo is diving it. He walks to the front of your suit and turns on his cabin light, then waves to you giving the OK signal. You may be cold but you feel better now and respond with a wave. He walks past you to the back of your suit and plugs in a new topside hard-wire communications line whilst also connecting a lifting wire to the auxiliary lift point. You can now talk to topside as well as to your mate. Life is starting to get better.

After giving topside life support readings from the suit and passing on your state of health, you can afford to really relax and catch some sleep, but topside keep on asking you 'silly' questions every five minutes.

Your mate has noticed that the battery supply plug has been disconnected from the rear connector, but luckily he can get at it and he sorts the problem. Suddenly, there is an enormous crunch, which scares you half to death, the suit shudders and sinks further into the seabed.

Topside is busy now because a RAF Hercules has contacted the support vessel (transmitting on 5.680 Mhz²) to let the ship know that they will be arriving in 15 minutes. This transmission enabled the rescue JIM to be deployed because there will shortly be a backup system ready just in case something goes wrong with the recovery system.

Offshore Submersible Equipment Ltd (OSEL) has also contacted the support vessel to inform them that a MANTIS will be leaving Great Yarmouth within the hour and will arrive on site within 5 hrs. The plan is coming together now and the Hercules has just parachuted the RN's sub-smash divers and equipment, complete with operators to assist with the sea rescue. Both the rig support vessel and work boat are ready to assist just as soon as the parachutes land, but the weather is starting to get worse. An exclusion zone has been set up around the scene to keep all unnecessary vessels and aircraft away.

It is now 22 hrs since you left the surface. You have calmed down after all the commotion, mainly because the cabin light has just come on! "You b*****d" is your response to topside telling you what had already happened, and 'why didn't you tell me what you were going to do?'

You are feeling warmer now, but suffering badly from cramp and are still unable to move. There is a lot of pain, added to which you are thirsty and hungry. You can hear your mate clearing the area of debris by attaching lifting wires to one piece at a time, but you are now told by topside that they have to lift part of the jib arm from the crane, which requires a thick wire rope to be hooked on to it some 20 ft above you. JIM is a bottom walker, not a mid-water submersible though. With MANTIS, the only system with mid-water capability, still 4 hrs away you settle in for a long wait.

Topside, the FLYING JIM is ready to dive. To ensure there will be no problems with crossed umbilicals, the inflatable boat stands off from the support vessel to avoid fouling moorings and other lines reaching to the bottom. This will be its deepest dive and so there is a little consternation amongst the occupants of the inflatable. OK it's time to go. At 1500 ft, another JIM arrives from the surface and is hovering right in front of you. Your mate stands by you during this part of the rescue telling you what is going on and after another hour, the jib has been cleared. Now it's just a question of getting you up to the surface.

Topside, the weather is getting even worse (image 3), but with the area now cleared of debris, both rescue submersibles are ready to surface so the lift can begin shortly. There is a problem, due to the positioning of the four point moor wires³ on the rig support vessel and with the rising wave state, there are some concerns about bringing you directly onto the support vessel, so an alternate solution must be found and quickly.

The Flying JIM returns to the safety of the inflatable moon-pool, where the operator is decanted from the suit and the dome is then sealed. The cable connecting JIM to the power umbilical is cut-off, doubled over on itself and 3 clamps are placed on the cable

forming a loop where a shackle can be fitted. During this activity, the work boat comes alongside and accepts a tethering line connected to the FLYING JIM and tows it away. It will be recovered on board later. A 40 lb lead weight is attached to the inflatable's wire cable by means of a slip knot and the modified⁴ umbilical is then lowered onto the seabed.



Image 3 - Fair weather in the North Sea

Down below your mate in the standby JIM now cuts off your original lift cable, slips the 40 lb weight from the new line and connects the boded cable to the main lift point, but you don't really care about all that because topside awaits you. The standby JIM then moves away, leaving you alone, yet feeling quite warm now. However, for some reason, the CO₂ level in the suit is increasing. You wonder why, but are not overly concerned because 'it won't be much longer now will it?' yet 'why is it getting so hot in here now?' and 'why am I panting so much?'. Topside ask you for some final safety check readings and you have difficulty on focusing on the gauges, so you say 21% and 0 because that is the normal reading 'anyway, who cares?'. Topside realise it is now or never because the time for discussion has run out. It now becomes a panic lift (image 4).



Image 4 - Lifting JIM

People are still talking to you from a long way away and suddenly you are pulled upright. The pain gets much worse because of cramp, but never mind since you will be aboard the rig support vessel within a couple of minutes. It is a rough lift for some reason and the suit is swaying to and fro as well as up and down. 1500 ft later, you break surface seeing a

grey sky and immediately go into a square-shaped object, actually it is a small moon pool (image 5).



Image 5 - JIM in the moon pool

You are hot, dizzy and so sleepy, then the dome is opened. Fresh air at last and a blast of 100% O₂ hits you in the face, waking you up. As the pain in your muscles is now so great, the rescuers have to bodily lift you out; you are smelling of Castrol R 40 whilst dripping with pee and are now dragged under a small canopy where you are covered in blankets and given a warm drink. As the effects of CO₂ poisoning wears off, you realise that the 'boat' is actually a small inflatable.

The weather conditions are not exactly good, with waves of around 10 ft, and you feel sick, but on coming alongside the rig support vessel you are quickly lifted up by hand in a Neil Robertson stretcher⁵ and taken to the Sick Bay, where you are treated for a serious case of advanced hypothermia. Three ADSs have now managed to save your life; once from the original disaster, then again when your mate comes down to recover you and finally when someone else turns up to clear the crane jib. After a shower, food and drink, you are put into a cot and are told that you hold the world record for a single dive in JIM of nearly 30 hrs ... and you couldn't have cared less!

This scenario never happened, but it easily could have and the outcome may have been completely different because hypothermia kills as does the dreaded CO₂. Remember, other submersibles did actually find themselves on the bottom with similar problems, requiring emergency recovery.

The survival of an ADS operator, as I have just laid out for you, has been dependent on a lot more than just luck. People who you do not know and will never meet had to do a serious amount of work on the capabilities of the JIM suit before being able to declare that it was fit to keep people alive for 40 hrs. Actually, the designing of a JIM with mid-water capabilities that could be deployed from a small inflatable⁶ took a lot out of those involved.

It is certainly worth considering whether a manned submersible could be deployed from a small inflatable (as shown in images 6 and 7) these days.

Finally, and for the sake of accuracy, it must be stated that when there is an emergency at sea or underwater, it is common practice for all offshore companies as well as the military

to offer their services and to immediately respond if required. Indeed, there are numerous examples of this altruism and, over the years, it *has* resulted in the saving of many lives.



Image 6 – Loading JIM and inflatable



Image 7 - Deploying JIM from an inflatable

NB: All images are credited to *Ein Herr und ein Hund*. (1983). [DVD]. Directed by Hans Hass. Germany, apart from images 2 (which was based on an image from the DHB Construction Ltd Manual) and 7 (which is my own).

Acknowledgement

- Many thanks to my wife (Janice) who has spent much time and effort in preparing this document for inclusion on the website.

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Endnotes

¹ There have been many occasions when cranes have fallen overboard from offshore platforms, which have resulted in crane operators drowning. It was said that at one point more crane operators died than divers. A quick Internet check revealed that in the UK there were a total of 777 offshore crane incidents between 1990 and 2007.

² The following frequencies were used during the 1970s and 80s for emergencies. 500 Khz, 2182 Khz, 156.8 Mhz (CH16 VHF), 121.5 Aircraft Guard and emergency, 243 Mhz for military aircraft, as well as 282.8 Mhz Search and Rescue only. Today, communications are much easier as you can use a Satphone.

³ Ships that required four-point mooring could not be easily moved, so it was far easier for them to stand off from the scene of a rescue, relying on submersibles to make their own way to the rescue site. The mid 80s was the changeover period to Dynamic Positioning.

⁴ There were many occasions when equipment and lift cables were modified to achieve a quick solution to a problem when at sea. Cost did not enter into the equation.

⁵ The Neil Robertson stretcher is made from canvas and bamboo. These were used on rescue helicopters and for boat transfers because the rescued person could be kept completely immobile. They were produced at HM prisons in Britain by the prisoners themselves. Having been placed in these stretchers several times, I can say that you feel completely helpless, especially when dangling 60 ft above the ground on a helicopter winch wire.

⁶ The use of an inflatable craft to deploy an ADS was initially tried out in Portland Harbour using a 3 m Zodiac and SAM suit. Further tests were carried out in the English Channel using a larger type with built in moon pool. The system we designed could work in 10 ft swells and deploy to 1500 ft. Even though it was an unpleasant and dangerous place to work at times, the potential for a quick response system should have been investigated further.