UNITED STATES OF AMERICA

NATIONAL TRANSPORTATION SAFETY BOARD

Investigation of:	*	
	*	
LOSS OF THE SUBMARINE *TITAN*	*	
IN THE NORTH ATLANTIC OCEAN	*	Accident No.: DCA23FM036
ON JUNE 18, 2023	*	
	*	

Interview of: DAVID LOCHRIDGE
Director of Marine Operations
OceanGate, Inc.

via telephone

Thursday,
February 8, 2018

APPEARANCES:

PAUL McDEVITT, Investigator
U.S. Department of Labor
Occupational Safety and Health Administration

I N D E X

ITEM	PAGE
Interview of David Lochridge:	
By Mr. McDevitt	4

I N T E R V I E W

(11:05 a.m.)

MR. McDEVITT: All right. The recorder's on. This is Paul McDevitt, an investigator for the U.S. Department of Labor, Occupational Safety and Health Administration. Today is February 8th, 2018, and I am conducting an intake interview of Mr. David Lochridge.

Mr. Lochridge, are you aware this interview is being recorded?

MR. LOCHRIDGE: Yes.

MR. McDEVITT: Okay. The only other thing that I would ask you is to answer my questions as honestly as you can and to the best of your knowledge. Will you do that for me?

MR. LOCHRIDGE: No problem. Yes, I will.

MR. McDEVITT: Great.

INTERVIEW OF DAVID LOCHRIDGE

BY MR. McDEVITT:

Q. So, I got an email from my supervisor forwarding your email where you attached your termination letter and also a quality control inspection report.

A. Yes.

Q. So why don't we start wherever you think you need to start the story as to what happened and what let up to your termination.

A. No problem at all. So as -- well, when I worked for the company, I was the director of marine operations, and also the

senior submersible pilot. So I was the key main pilot for the company. And, so basically what happened is the company is building this new prototype. It's a carbon fiber and titanium submersible which has never been done before successfully. They have taken bookings. So they're booked out for this coming summer to take people to the *Titanic* which is at a depth of 4,000 meters.

And basically what happened is the company and the engineering side was initially being done by the University of Washington, APL Division.

Q. Uh-huh.

A. And then what happened was about a year and a half ago, OceanGate decided to employ their own engineering director who has had no experience in manned submersibles at all. He was an ex-Navy U.S. diver and became a materials engineer just afterwards and then started working for us.

The decision was made at that point for the company to drop APL and Tony took over and no experience and I basically run the operations department and what was happening was he then changed some of the fundamentals that APL had designed for this new carbon fiber sub. And, we started receiving these items in, in the last couple of months. And the key thing to come in, and if we go to my report which I have issued, the hull itself.

So the hull itself, initially it was meant to be designed, it was be 10 inches thick. We had a safety factor of 1.5 at 4,000 meters.

Q. Uh-huh.

A. And then what happened was Tony changed the design and it's now setting at 5 inches thick. Now, when the hull -- the hull was completed and it was wired by a company down in California. What happened then was initially the company, OceanGate, and they had said that they were going to be counting out 4 months to start testing on the carbon fiber before it mated (ph.) up to the titanium end caps. This is an edification as they have done it. There was verification that there was no porosity, no delaminations, and absolutely no voids in the carbon fiber because if you get any of those in carbon fiber, one actually sees compression which is what would happen in our job and going down to those depths, you get basically cyclic loading and what will happen is all the fibers start to rip apart, you get tears, the hull is compromised.

So what happened is the company decided, the owner and engineer director, not to bother getting it inspected any more. And, I voiced my concerns as did several other people in the company. We received the end pieces of the carbon fiber after it was wired and basically it's end caps. We call it scrap, and basically what it is, is the end of the (indiscernible) and then we get a clean cut on it and at that point, everything should be fine.

Now, I have been in contact with a composite failure analysis specialist who deals normally with that stuff, and I have shown

him the cut off sections, photographs and the actual sections and he said himself the sections are an absolute mess. You can see them. They're like Swiss cheese. So when cut towards the back of it, you see all the (indiscernible). You can see all the delaminations where they're red (ph.) and have not been bonded properly.

So I've obviously voiced this concern, and then during my termination interview which I was terminated -- I was told I was terminated for not doing my job properly, I did ask about the non-destructive testing in my report and I also asked on the day of my termination, why we were not doing it? Engineering director and the CEO had decided that they can't get it inspected any more. So I said why not? And they said nobody can do it. And I asked the question, well, Boeing can do it because we were contracted to actually send a 10 inch thick hull there.

Q. Uh-huh.

A. They go a wee bit (ph.) and, you know, I'm not going to into any sort of what's on the recording, but basically they got angry with me, and I said, okay, well, please be honest with me here. Have you exhausted all measures in saying that you can no longer get it tested because nobody can do it, and they both said no. So basically they haven't approached any other non-destructive testing companies to get it done. They have glued onto the end of the titanium hull. It's basically shaped like a toilet roll chute, but it is a chute, and what they've done is they've applied

the titanium as first segment, segments 1 gets glued on either end of this, okay, with a glue which is supposed to be good down to the depths that we would be going to.

Q. Uh-huh.

A. So I asked the question in the report, have you had the bond line, basically the gluing, had you had the NDT done on it -- NDI done or not, and their reply was no, we don't need to do that. Now once again, this is something that was told it was going to be getting done, and they refused to do it. So basically they have no baseline on the hull integrity. They have no baseline on the glue because if you have any voids on that glue and that glue is not perfect all the way around, you get air pockets. You're going to get compression and that compression can lead to destruction of the carbon fiber underneath.

Q. Okay.

A. So that's the two key elements. The other main element and my thing is the actual -- the ceiling facings. So on the next section, on the domes which go on either end of the hull, in my report, you will see some (indiscernible) in there. There's standard O-ring grooves for a pressure vessel of this depth. You can -- to retain an O-ring, it's basically like rubber O-ring which seals the two components. When you actually bolt them together, that is for as your pressure managing (ph.). Okay. So you have metal with metal facing, but in there, you're squashing this rubber O-ring which is in a groove on one of the facings.

And what happened is the engineering director, who has not had any experience with this before, decided to use an O-ring disk which is out of the spec that the rest of the industry used. It's basically a double dovetail which I've highlighted in my report. That type of O-ring groove is absolutely (indiscernible) for the higher pressure and that's so because what happens is the void area is increased drastically when the water pressure, even though it's metal-to-metal ceiling, okay. What happens is you're going (indiscernible) a depth, a pressure rating of approximately 6,000 PSI. Now, even if you've got metal on metal, that water pressure will find the least resistance to break it's way into the hull.

And what's happened is not only is the O-ring grove out with the specs of the industry, they have also -- they told the manufacturer of the titanium, they could use a plunge hole. The plunge hole they've used for the (indiscernible) they've over exceeded the size of the O-ring, which I've detailed in my report. That plunge hole has created a complete path for the seawater to creep in, even when those two pieces when bolted up tight. What will happen is the water pressure will work it's way down there and they no longer have the (indiscernible) risk of the O-ring going because (indiscernible). We have the solid hole on either side where that water will actually come into the hull especially when the see deeper pressures and when see deeper pressures, I've been doing this for over 20 years, what will happen is each individual face will buckle because the pressures exerted on each

of those is going to be different.

Q. Um-hum.

A. So there's flat faces. There's domed faces. There's horizontal. There's vertical. You can imagine the pressure you get upon. You cannot get away from that. And what's going to happen is when the ceiling faces actually start to buckle, that water pressure is going to straight in there.

Now, the company did put in vacuum. So they mated the domes up in the factory in Everett. What happens is you run a vacuum pump or (indiscernible) and you basically, you know, you can suck all the air out of it so that you get an altitude of say 2,000 feet, same as an aircraft. Then what happens is you join that, and then what happens is there is a huge difference between creating a vacuum in the shop to compared to actually external forces exerting on this thing and the water pressure coming in. That's another key area which is highlighted in my report.

Now, another key area is the viewports on this vessel. I had been asking for several months for all the documentation from the engineering director on the design and also the pressure testing. It was a company called Hydrospace which are in California, and they produce a good percentage of the acrylic domes and viewports for this type of submersible, you know, these submersibles and also for (indiscernible) surface operated hypobaric chambers.

And what happened is I was denied all the information and repeatedly I have emailed, made phone calls, direct

correspondence, speaking to CEO. They refused to give me it. Now, any other company I've worked for, it's basically you've got disclosure -- full disclosure or not because the pilot has to know that what he is about to go into these depth and perform ridiculous things --

Q. Um-hum.

A. -- at the end of the day that it is safe and secure. What's happened is, at my leaving interview, same thing. I asked again, I said, look, I am not pointing fingers at anyone. I just want to know what is the pressure rating for that viewport.

Q. Um-hum.

A. And basically the CEO turned right to me and he said, have you been in touch with the company, the fabrication company, and I said, no, I have not. Are you going to be in touch with them? I said, Stockton, and this is Stockton Rush. Stockton, please stop me from going here but what is the problem? Are you hiding something from us here? Is there something that you don't want us to know? And he said, well, you're going to find out anyway. The viewport has only been built and certified by Hydrospace to 1,000 meters. The viewport itself, the design, was done in house by Tony and his engineering team, our engineering team. This is the first job, straight out of school, no experience in the industry before, they have, in their mind's eye designed it to do 4,000 meters. Hydrospace, the company that have built this thing and made it altogether, are only willing to certify it to 1,000

meters.
Q. All right.
A. So these are people -- the company that made this, they have so much experience. They go by PBHO guidelines which is a guideline that's basically a legislation for pressure vessels like this. And OceanGate has decided not to follow those guidelines. So because they're not following those guidelines, that is why Hydrospace are only willing to certify it to 1,000 meters.

Now, they intend to do manned testing in the coming months in the Bahamas all the way down to 4,000 meters. One of the key things I suggest, which you'll see in my cover letter, you know, which is part of this report is basically to do unmanned testing of the pressure vessel itself. So what you do is put it in a pressure chamber at Penn State, and the company decided they no longer wanted to use Penn State even though we had been told that we were going to be going to Penn State with the pressure vessel.
Q. Um-hum.
A. So they're deciding not to do that, and the owner wants to be in the sub to do all the live testing and basically work his way down to 4,000 meters. Now, in any industry that I've been (indiscernible), and I did explain that there would be all the liability if something goes wrong, if you go in that sub, it's the aftermath that the ones left on the surface, we're the ones that's going to have to deal with the accident investigation teams, blah, blah, blah and he said the only person you'd be liable to is my

wife. And unfortunately his ego and his cash flow have just went to his head.

And so I completely disagree with that as remark with everybody else in the industry. You should be -- if you're not going to put it in pressure chamber, put it on a wire, unload it from a ship and basically (indiscernible) with nobody in it. You overweight it. Bring it back up, see how it goes. There has been so many vessels, manned vessels where this has been done, they've brought the sub back up to the surface, and it's collapsed. You know, it's basically imploded. The metal's all twisted.

Q. Right.

A. Even when these people have, you know, built to spec, trying to build it to class. Now, most submersibles out there, they are classed under such agencies, Lloyds, ABS, DNV GL, all these organizations. Most submersibles out there will -- they've been built to specification and what happens is most of the designers, in-house designers will pass their designs to ABS, GL, all these organizations. They will verify that they're happy enough with the integrity of the design.

Then they will also inspect the hull. They will inspect all the sealants. They will do everything, okay. What happens is OceanGate decided they did not want to class this. OceanGate also decided they did not want to insure the vehicle.

So basically -- let me do this. Going in, the paying passengers paid $105,000 each. They're not insured to go in this

thing. So basically what happened is they're booked out to go to the *Titanic* for 2 months this coming summer. Because I've raised all these safety concerns, and because I was dismissed verbally, and because I raised all these, no finger pointing, no malice intended, I just basically wanted an official backup because my capacity as the director of marine ops, I was responsible for the safety of all crew, every submersible and for topside operations. Because I have put in this report the owner come right to me and said, this is why I'm firing you because you've done your job, right. So that was part of my dismissal, and so here I am.

Q. And who was that again? Stockton --

A. The owner. The owner's name is Stockton Rush. He's a very influential person here in Seattle. He's old school Seattle. And he has got very, very deep pockets but unfortunately -- and it's a shame. You know, And the thing is, I don't want to see him (indiscernible). That's the thing. I don't want it on my conscience that nothing is done for people to, you know -- I'm not the only one that's got these thoughts. I mean the HR director, she was sitting next to me, during my leaving interview, and when he disclosed all this information about the viewport, they were so taken aback because they were withholding this information from staff.

Q. Yeah. It sounds --

A. And then obviously he explains all this to me, I was devastated. I mean I felt absolutely gutted and, you know, they

kept telling me having the engineering director, who was my equal, you know, in charge of engineering, they kept telling me saying I obviously have no confidence in senior management, and I will be honest with you, Paul. I told them, and I said, well, for you to come out and say that you are willing to put a viewport on there that is only gauged for a quarter of the depth that you're going to be taking it to in the coming months with paying passengers, then I don't have confidence in your management. I'm sorry. And he -- the owner said, well, we've reached an impasse. If you don't have confidence in me, then I can't have you on the team and (indiscernible) and I'm just trying to think what else.

Q. Well, how about some background, how about some background information? When did you start working for the company?

A. I started working for the company at the end of May 2015, and I was employed as the director of marine operations. So basically I was in charge of all submersible operations and pretty much, basically everything. When the sub's in the water, it was me.

Q. Um-hum.

A. I've been on one dive in the last 2 1/2 years, I've been in the sub. So basically all the safety of the crew, paying passengers, because people are willing to pay a lot of money to go in these things. And it's basically down to me. So I'm responsible for all the maintenance. I was responsible for all the training, training pilots, and all the upkeep for the submersible itself.

Q. All right. So were there other submersibles that were being used or has this been all about design at this point?
A. No, negative. We had -- so OceanGate owned two other submersibles. They owned *Antipodes* which is -- it's an older vehicle. That vehicle and when he purchased it 9 years ago, long before my time, it was classed by ABS, the American Bureau of Shipping. It was hard to convince the company to keep classing that. To keep classing a vehicle, you need to do test dives with the engineers. You need the engineer to basically (indiscernible) the vehicle every year (indiscernible). They got everything and they verified every system on there is tight and aboveboard. They do pressure testing. They want to make sure also the (indiscernible) are okay.
Q. And what -- I'm sorry. I didn't catch the name of the agency that certifies it. What did you say?
A. So for the *Antipodes*, it's a company called ABS, the American Bureau of Shipping.
Q. Okay.
A. And they have offices here in Seattle and in Portland. There are two main people we deal with, Sean (ph.) and Robert.
Q. All right. And is this the same company that certifies the *Cyclops* that we're talking about?
A. There is *Cyclops I* which is the other submersible. So they've got the *Antipodes* which is the older one which is classed. They've got *Cyclops* which is another vehicle which is the one

that's -- basically the hull is verified through GL, and it's good to 500 meters. So other than that because they were basing that as a prototype vehicle, nothing else was classed on it. So that was an operational sub which is based on Everett sitting on the barge. So that's another one that's there.

Q. That's *Cyclops I*.

A. *Cyclops* -- yeah, that's *Cyclops I*, and then *Cyclops II* is the one that I've got all these issues with --

Q. Right.

A. -- and basically now what's happened is, even since I've left, you know, it's all over Facebook and Twitter. They've basically put this thing down on the dive barge, and they are literally ready to start trials on this thing in the coming weeks.

Q. All right. So what, what company certifies the *Cyclops II*?

A. Nobody.

Q. Nobody. They don't have anyone.

A. He does not, he does not want --

Q. Because it doesn't conform to any standards.

A. It does not. No, not at all. None of it. He does not want to. He -- initially he made me reach out to -- I've got a lot of good contacts because of my work in the UK, Singapore, Australia. I've worked all over the world doing this, Paul. And I've made a lot of good relationships with these classification agencies, and I like things to be above board and as safe as possible because it's a risky job even when you're going in something that's

classed. To go in something that's not classed, it's -- you know, at times it could be verging on the ridiculous, and people will call it cowboy. They'll call it rogue. Call it what they want. And basically -- and I kept pestering the owner towards the end of last year, I said, look, you need to try to get some of this stuff classed by Lloyds of London. You know, they may be willing to do it. So I reached out to Lloyds. They said there would be methods that they could individually test, the life support system, the high pressure air system. They could look at the hull, but because they weren't going to be part of the design, they couldn't verify that the hull was actually intact.

So -- but then what happened was the owner turned right just after Christmas, and said, nope, don't bother following up any more with Lloyds. We're not classing anything. So it's not going to be classed. It's not going to be insured.

Q. Okay. All right. Okay. And so I notice this -- the date on this document you have is January 18th, and I think you were terminated what? The very next day.

A. You're right. Yes, I was.

Q. Okay.

A. The 19th.

Q. All right. So, okay. All right.

A. One of the other things, Paul, sorry. You'll see in my report and it's the issues with the material they're actually using for the flooring inside the cabin of *Cyclops II*. It's made

of a product called HDPE, high density polyethylene, which is a very flammable material. And I did ask them, have you carried out tests on this? And I kept asking for the MSPS sheets, you know, all the data sheets on it.

Q. Uh-huh. Uh-huh.

A. Once again, I was refused. So I did my own homework and I turned to them right then, I said to them, quote, "We need to do a fire test on this to actually make sure that this isn't super flammable." You know, I mean everything's flammable at the end of the day, but as flooring, sets on top of 3,000 PSI of oxygen and what's right next to that? The batteries. So basically it's a fire triangle under your backside. Okay.

Now, I took a sample of that which you can see from the photographs. I lit that. Took the flame away. And I just took the flame away, and it just continued to burn. It dripped on the asphalt, and it reignited. So that material, and it's highly toxic as well, the fumes that were coming off it, you can see that in my report, and I did videotape of it as well.

Q. And the flooring, what was that called again? H what?

A. It's HDPE. You'll see in my report.

Q. Okay.

A. It's a high density polyethylene.

Q. Okay.

A. It's like a plastic material. It's a very heavy plastic, very durable. Do you know what they use it for? Chopping boards

in kitchens for chopping up your food.
Q. Okay. Yeah.
A. Yeah.
Q. All right. All right. I think --
A. There was so much more, Paul, that I've not shown in my report because I would have deemed it too personal because of the owner's I would say bloody attitudes, but basically the venting system on that thing has actually got, and it's on there, and I would love somebody else to look at it. He's got shop vac hose on there and that's the ballast system. He tends to run a vent which is run by an automatic fishing reel winder immersed in oil outside the sub, and this thing is going wind. You can image little (indiscernible) on either side of the submarine, moving this shop vac hose up and down. That is his ballast system for this sub which is a no-no, and I didn't want to put it in my report because, you know, he came up with this idea, and I said him, it's not going to work and verbally he went off but I wasn't the only one that voiced the concern with this.
Q. Okay.
A. But it's just diabolical, you know. It really is diabolical.
Q. Okay. I think, I think I've got everything I need right now.
A. Okay.
Q. I'll turn the recorder off, but I want you to stay on the line.
A. Sure.

Q. Okay.

A. Yeah, yeah, no problem.

MR. McDEVITT: All right. This concludes my intake interview with David Lochridge. Today is February 8th, 2018. The time is 11:30 a.m.

(Whereupon, at 11:30 a.m., the interview was concluded.)

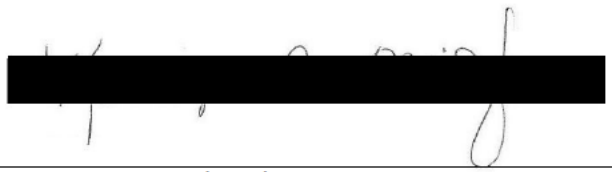
CERTIFICATE

This is to certify that the attached proceeding before the

NATIONAL TRANSPORTATION SAFETY BOARD

IN THE MATTER OF:	LOSS OF THE SUBMARINE *TITAN* IN THE NORTH ATLANTIC OCEAN ON JUNE 18, 2023 Interview of David Lochridge
ACCIDENT NO.:	DCA23FM036
PLACE:	via telephone
DATE:	February 8, 2018

was held according to the record, and that this is the original, complete, true and accurate transcript which has been transcribed to the best of my skill and ability.



Kathryn A. Mirfin
Transcriber

NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF MARINE SAFETY
WASHINGTON, D.C. 20594

Errata

OSHA Interview with Mr. David Lockridge

Loss of the submersible *Titan*
DCA23FM036

Page/ Line	Original	Correction
6/22	counting out 4 months to start testing on the	carrying put non-destructive testing on the
6/20	We	They
6/21	(indiscernible)	winding
7/4	(indiscernible)	the way through.
7/5	red (ph.)	the resin has not been bonded properly.
7/25	chute	tube
8/22	ceiling	sealing
9/2	disk	groove
9/5	(indiscernible)	no use for
9/8	ceiling	sealing
9/9	(indiscernible)	going to be seeing a depth
9/21	(indiscernible)	type of groove they've selected
10/6	ceiling	sealing
10/10	(indiscernible)	a Hoover
12/4	PBHO	PVHO
16/9	(indiscernible)	basically strip
16/10	(indiscernible)	year – viewports off.