UNITED STATES OF AMERICA

NATIONAL TRANSPORTATION SAFETY BOARD

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

Interview of: MICHAEL LEWIS, Electrical Engineer
OceanGate, Inc.

Everett, Washington

Wednesday,
July 26, 2023

APPEARANCES:

LCDR [redacted] [redacted] Investigator
Marine Board of Investigation
United States Coast Guard

JASON NEUBAUER, Chair
Marine Board of Investigation
United States Coast Guard

LCDR [redacted] [redacted] Legal Advisor
United States Coast Guard

LT. [redacted] [redacted] Recorder
Marine Board of Investigation
United States Coast Guard

[redacted] [redacted] Digital Forensics
United States Coast Guard

[redacted] [redacted] Technical Administrative
Investigations NCOE
United States Coast Guard

LCDR [redacted] [redacted] Technical Advisor
Marine Board of Investigation
United States Coast Guard

MARCEL MUISE, Investigator
National Transportation Safety Board

JANE SHVETS, ESQ.
Debevoise & Plimpton
Counsel for OceanGate

I N D E X

ITEM	PAGE
Interview of Michael Lewis:	
By Lt. [redacted]	5
By Mr. Neubauer	41
By Mr. Muise	44
By Mr. [redacted]	46
By LCDR [redacted]	49
By LCDR [redacted]	64
By Lt. [redacted]	65
By Mr. [redacted]	66
By Mr. [redacted]	75
By Lt. [redacted]	76

I N T E R V I E W

(9:45 a.m.)

LT. [redacted] And we are starting the recording at 9:45 on July 26th, 2023, in Everett, Washington.

Sir, are you currently represented by counsel here today?

MR. LEWIS: No.

LT. [redacted] And what I'll do at this time is go around the room and ask that everyone introduce themselves and your affiliation as well as spelling your last name. And, we'll start with you, Mr. Lewis.

MR. LEWIS: Okay. I'm Michael Lewis, L-e-w-i-s. And what else?

LT. [redacted] Your affiliation.

MR. LEWIS: I'm employed by OceanGate.

MR. NEUBAUER: Good morning, Mr. Lewis. My name is Jason Neubauer. I'm the chair of the Marine Board of Investigation for the Coast Guard. And my last name is N-e-u-b-a-u-e-r.

LCDR [redacted] Good morning, sir. [redacted] That's [redacted], and I'm a advisor to the Board.

LT. [redacted] Lieutenant [redacted] the recorder for the Marine Board of Investigation. Last name is [redacted]

MR. [redacted] Good morning. [redacted] I'm with the U.S. Coast Guard, here for digital forensics and (indiscernible).

MR. MUISE: Marcel Muise. I'm an investigator with the NTSB,

and my name is M-u-i-s-e.

MR. [redacted] Good morning. My name is [redacted] Investigations NCOE, last name spelled [redacted]

LCDR [redacted] Good morning. I'm Lieutenant Commander [redacted] I am an investigator with the Marine Board of Investigation, and my last name is spelled [redacted]

MS. SHVETS: Jane Shvets. I'm with Debevoise & Plimpton, counsel for OceanGate. Last name is S-h-v-e-t-s.

LT. [redacted] Thank you. This is a Coast Guard and NTSB joint investigation. The Coast Guard is the lead in this investigation, and we are conducting the interview under the applicable Coast Guard regulations.

Do you have any questions for us, sir?

MR. LEWIS: No.

LT. [redacted] At this time, we will begin the interview.

INTERVIEW OF MICHAEL LEWIS

BY LCDR [redacted]

Q. Mr. Lewis, thank you again for being here with us today. If you could start out by -- if you could tell me about your background and education and relative work history.

A. Okay. I am a -- I spent about 8 years in the Navy as a nuclear electrician in submarines, fast attack and nuclear deep submersible. And then went to college and then associate engineer, (indiscernible) engineer, telecom, started at work. it was electronic and then into telecom and then into software,

Microsoft for 14 years both software and hardware and another 2 years, and also worked for Viking Yachts for a couple years and forward (ph.), just 2016 through 2018. I retired a couple times and then I joined OceanGate part time seasonally about 2020, early 2020 and then took a larger role in 20 -- spring of 2022 and went out on 6 weeks of that mission in 2022 or missions 1 through 4 out of 5 and continued to work seasonally, mostly in the springs because I'm in Florida -- was in Florida in the winters. And then in 2023, I began to work again in March all the way through until in the first two missions, so for the month of May basically, April -- well, March, April, May and then I was home in June.

And role at OceanGate is pretty much anything with electrons, you know, power distribution, shipboard as well as the submarine, all communications, all aspects of communications for all of the subs, telephone, radio, location, GPS and so on. That was what I did the first couple of years when I was in the shop which was very part time. And then with *Titan* specifically, power distributions and also shipboard power distribution and all things related to that.

Q. So in 2020, you remember the month when you began roughly?

A. The letters -- it must have been March. It was kind of on and off because I was in Florida back and forth a lot. So it was only a couple of weeks a year between 2020 and 2021.

Q. Okay. And in 2020 -- can you walk us through from 2020 to 2023 kind of a timeline of the -- what you remember for the

submersible *Titan*?
A. Never really saw too much because I was only in the shop for a couple of weeks, and I worked on the towboat. So in 2020, I was only in here like 2 weeks or so. I was working mostly on the towboat, *Vito* (ph.), and working with underwater telephone gear and whatnot for the other subs. So really nothing to do with *Titan* at all. In 2021, I drilled a couple holes in the backbone to mount the bracket, but otherwise really no work on *Titan,* in 2021 or 2020.
Q. Were you involved in any way in any of the construction or fabrication of *Titan?*
A. In the original building, no.
Q. And you stated the original building. So further on down the line, did you -- were you --
A. I helped make some -- we made modifications in terms of rewiring the new junction boxes. We made some small modifications to what loads were off of what power. Now, no structural stuff. We changed -- made some modifications to power distribution for lighting, for example, going to relays and stuff on board. It was all limited to that.
Q. Can you tell me about the power and distribution system of the *Titan*?
A. Um-hum. In -- what kind of detail you looking for?
Q. Broad and then, you know, as --
A. Okay.

Q. -- every -- I hate to say this, everything you know, but as best as you can and just if we have any follow-up questions, we'll follow up with some questions.

A. Yeah. There's two battery systems, technically three because there's an emergency backup battery, but the main power distribution internally is 24 volt through 6 volt cells in series under the deck. And externally, you have a pair of 150 volt lithium batteries, and those are primarily for thruster power. The internal power runs all runs all your or most of your lighting and certain cameras and navigation control and all that. That power goes through several breakers, essential, non-essential and lighting, and the CO2 scrubber has it's own breaker. And, of course, there's the main breaker and contactor metering.

And then from there, it goes to a custom designed power distribution box. It's about, I don't know, 30 loads or so on that, by 12 volt, 24 volt. Most of those go -- there's a couple inverters on it, but basically current limiters to most of those, in a very compact box. And, most of those loads are just a couple amps. Six amps would be a lot. Nine amps is probably the most. A 12 volt for a CB, for example, BGen marine radio. So all of those loads go out to things like lighting, thruster pod control, lighting, for example, the change that we made in 2022. It was to run lighting out from the fuse to relays. So everything is protected one way or another, either through current limiting or through fuses.

A PLC, the computer controls, PLC. The PLC is in that box that talks to the board that turns those current limiters on and off or relays in certain cases. Like drop weight motors and lighting used fuses and relays, but everything was controlled. Most everything was controlled by the PLC. Certain things like drop weight motors and variable ballast tank have manual switches, and in the case of drop weight motors, they also have emergency power backup. You operate the motors with a 28 volt lithium battery that was spare. You could power the whole sub with that or just the drop weight motors, the operator's choice. And, there was some lighting in there, just low voltage lighting.

The thrust externally, the lithium batteries are parallel through a diode junction box, and they supply a pair of glass ears which we call the thruster box. Inside the thruster pods is primarily equipment for controlling the thrusters, the motor controller, fuses, PLC. So there's Ethernet in there. There's serial it passes through to the battery management systems of the lithium batteries, and essentially all you're doing is turning the motors on and off, reversing their direction. That was controlled from probably -- you know, controller, all that thing did was control thrusters, nothing else. The thrusters would go -- you had two horizontal on the front and two vertical that are reversible with speed control.

Q. Mr. Lewis, can you hold just one section.

LCDR [redacted] I think we lost -- I can go here and make sure

we're good. We're still recording. We're good.

BY LCDR [redacted]

Q. Sorry, I did not mean to cut you off. I appreciate that. Thank you. Continue.

A. So the thruster pods are oil filled units with a small vacuum space in there, water sensor, pressure sensor, and it's all for the purpose of leak detection and minimizing what would happen if there was a leak because it's filled with oil. A vacuum is there so it can detect the pressure accurately, and we know if anything is in there that doesn't belong in there.

And, again as motor controllers, it takes 150 volt VC (ph.) and turns it into essentially a 3 phase power for each of the thrusters.

The thrusters mount on the hull and then through software configuration, we can configure what the controller does. We can configure the knobs and dials to run a thruster any direction, in any combination, flip directions. So it's, depending on how the motor was wired, it may rotate the same direction as another motor. So we just change the configuration item in a config file if you know where to look. We can flip that easily in the configuration file. So that's pretty straight forward.

So really not a lot in there. We did -- in 2023, we added a couple more inverters to power some external lights from the Subsea (ph.) and there's about eight lights externally, and several cameras, low resolution corrugated (ph.) camera. That's

all external and, of course, besides power, that's kind of a summary of that power.

Q. I'm sorry, sir. What was the last thing you said?

A. That's a summary of the power.

Q. A summary, okay. Sorry. I apologize.

A. Unless you want a bunch of drawings.

Q. Is there drawings or are there drawings of the power distribution?

A. Oh, yes. Yes.

Q. And those are maintained by OceanGate?

A. Yes.

Q. Do you also have a copy of those drawings?

A. In the -- yes.

Q. On your own laptop or --

A. Yeah, and in the shop, of course.

Q. Yeah.

A. There's some printed ones around, and they're online and --

Q. So obviously you're extremely into the knowledge of the power distribution system. Who created this system?

A. That was done before I got there. Bruce Hanson (ph.) -- Bruce, Bruce -- I forget his last name at the moment. We overlapped for a period of -- short period of time. So I know who he is. We worked together for a couple of weeks during the overlap in my seasonal visits. He designed that, did several revisions. Revision E was what was in there. Revision F was just

testing for -- as a backup.
Q. So if it was designed prior to, but had it been installed? When you arrived, was the power distribution system --
A. It was there from day 1 to my knowledge.
Q. And were any modifications made to it since then?
A. Just the ones that I'm -- well, he got to rev E. So there's a series of modifications during the development of that, right. By the time I worked on it in 2022, it was rev E. That's what was in there. This year, they had really no problems with it in 2022. We left it in 2023, and was just focusing on testing the rev F which was a backup in case we needed it, and that was just a minor modification.
Q. Okay. And just --
A. The only modifications made were things I talked about earlier which was the moving the drop weight motors and lights to fused relays --
Q. Okay.
A. -- because the motors would get a little too warm at full current.
Q. Okay. I just want to quickly just go over the difference between internal and external. So just to -- so the external was operated by the two lithium batteries.
A. Yes.
Q. And were in any way the internal and external -- if external failed, would internal fail or if internal failed, would external

fail?
A. The only way external might fail -- the power systems are not really directly connected. The control system is controlled from internal. So you apply 24 volts to control the PLC relay which in turn enables the battery, and if the battery management system other allows it, then it would come online, but internal does not depend on external. External power-wise does not depend other than on/off control. So they're not connected.
Q. And if you were, if you were to lose external power to the motors, is there a way to internally troubleshoot or --
A. Generally -- well, there -- you can see voltage and current, and then we can see other things like temperature and voltage or temperature voltage and vacuum. So we can see if something's going on major with the pod like leakage. You can see voltage from each battery's BMS or the controllers. We can choose which one we want to watch. So we can look both as current but otherwise beyond those things, there's no way to know anything more.
Q. And by stating that, that we can see, would this be while the *Titan* is operating below in sea? And can you explain and tell me about that or that program?
A. So the main computer -- they have a display. It has several screens to it and several tabs controlling all the relays or loads, controlling thrusters. So you can see RPM, on/off. There's dead man switches. So you have to hold the dead man

switch in order to operate a thrust. If you let go of that, everything would stop. There's current limits and protections that are in the controllers that the computer program respects, of course. There's certain cases of retries, but it's an Ethernet control system.

So there's messaging between the controllers and the control computer, but on that control computer, you'll see things like all the hull sensors, like acoustic and the strain (ph.) gauge. And then you see, of course, the voltage, current of each battery through the BMS typically, the battery management system. And, you'll see currents for certain loads. For things like motors, we can see positions, currents. So when they're operating, we can look at how fast they're turning or watch pulse counting in case the drop weight motors and variable ballast tank motor.

We can look at the currents, the main current or sometimes individual current of those things. What else? So those kinds of control you can see fairly individually what's going on. Take, for example, current. Dropping motors -- drop weight and -- just drop weight and variable ballast tank had its own current sensor. Then there's the overall current sensor. So you can operate one load at a time and watch if the current changes or not and that, you know, had individual current monitoring although the power distribution board and that current limiting do have fault indicators that can bubble up to a general fault indication and you can go into the PLC and look for fault lights that are

connected to those on the PLC IO module itself.

So there is -- most of those have some sort of a fault indication available, not necessarily broke out individually to the screen, but those are pretty minor things like lighting or an O2 sensor or water detector, something like that. Those things, if you don't see a reading in there and you see a fault, you can go and drill in the fault and then you can go back and trace that Into lighting, if you want to go deeper.

Q. And who -- and so -- just so I'm understanding that, that is all available to be seen externally say on the bridge of the vessel?

A. No, it's just the operator in *Titan*.

Q. So the operator internally in the sub while piloting can see what's going on with the system?

A. Oh, yes. Yeah. You've got a screen which bubbles up most of that stuff. Some of it's simplified initially but if you go in, there's messages and there's logging that can open the door if it isn't already open where the electronics data is, and the PLC has a clear cover. You can see inside the whole board, the PLC and all the lights and all that. So they could drill into there. The fuses, of course, can also be seen in there and they were all able to see the spares available. The only thing that communicates externally is what is sent by chat and tracking information.

Q. So if there were to be an issue -- is there a troubleshooting procedure plan in place from OceanGate to where if there was to be

an issue with any of the power distribution systems, you know, to text and chat up for consultation up topside to an electrical engineer or anything like that?

A. There -- I'm not familiar with -- I know they have a whole series procedure. I'm not familiar or did not author (ph.) one while I was there. There may be -- there is a series procedure in things in like reduce electrical I think exists, but I have not viewed them myself.

Q. Okay.

A. But there's a whole book of procedures for areas.

Q. Okay. For operating -- can you talk -- tell me a little bit more about the operating controller and you had mentioned a dead man switch?

A. That's just for thrusters. So that's the wireless controller and joystick and buttons all that does is turn thrusters on and off, forward and reverse and speed, four thrusters, two joysticks, left, right, up, down, twist, turn.

Q. So if you would go over that dead man switch that stops --

A. Stop, correct.

Q. You have to hold that down.

A. In neutrally buoyant presumably or unless you're heavy, but it's the submarine. So you're either heavy, light or neutral. And so you stop that and at that point, it depends whether -- how light or heavy it is, where it goes, momentum.

Q. And how did that controller, it was wireless?

A. Yes.
Q. How did that controller control the thrusters? What -- just what is the science behind it?
A. Oh, it's just -- it's the same as like an Xbox. It's just a wireless connection to basically a fob, and then the computer reads kind of like a mouse or a joystick, just like -- I mean that's what it is. It's a joystick essentially. So it's just reading that along with all the other inputs and outputs to say left, right. What's going to happen is it's going to take the -- like one switch, dead man switch, for example, if it sees that's pressed, then it will operate a relay in the thruster pod that will enable the thruster or the motor controller to operate.

So there's relay for dead man switch. There's a relay for battery enable. There's a relay for -- there's three main relays. It's (indiscernible) and something else. But the basic idea is you press that thing, a relay is enabled. Then that relay's off and it kills the motor controllers. If you do the joystick, then it's going to give a command to go to a -- well, it depends whether it's current or velocity mode. This year is velocity mode. Last year was current mode, but in velocity mode, you're going to go to a target RPM, and it's going to be ramp up and a ramp down, and that's preprogrammed. Current mode is more of a current, moves up to a certain current level. So whatever speed you attained at that current get preprogrammed. So you just stay within whatever the max is. That's just a range of 0 to max, and

the thrusters will speed up to whatever we can do. That's really about it.

Q. And can you tell me about the communications system between the sub and the bridge?

A. Yeah. So this year, we used EvoLogics, have a subside transponder, a topside transponder. There is a beacon on board that was never deployed. That was meant to be dropped down near the bottom as a fixed point that we could use. That was never deployed. It arrived after I got there. The two transponders are basically the same. Well, the topside transponder is -- has got extra information like altitude heading, compass. So it's got -- so there's hep (ph.) fitting, altitude and I think it can do a rate. But the idea is that the USBL transponder and so there's what they call a USBL antenna and the subside does not. It's just omni-directional transducer. They both run essentially the same software which was a very interesting feature for us because the sub would then be able to navigate on their own as opposed to in past years, we had to them to turn left, turn right, through chat. This year because the way the EvoLogics system works, they can position from topside for any available beacons which there were none this year. And, because the ship is moving around, it gets its -- it knows its position because we connect -- it has a phone GPS system and we connect it to the ship's heading to have their gyro for heading information.

We measure the distance for all of the onstenance (ph.) we

kept. In other words, we calibrate the system when we set it up because the GPS is -- if you're here, and you've got some center reference point, called CRP, that you're going to adjust where everything goes, right.

So once you do that calibration, then the ship knows where it's at. It knows the angle and depth, slant range, and all that to the sub through its communications. There's tracking and comms. They're kind of two separate things, but with that data also rides location data. So the location of the ship is sent down to the sub. The sub then has the same chart that we have topside and just a browser talking to the server, point server, and it can therefore see waypoints, their position as plotted by the topside and topside's position. So they'll see two moving spots and waypoints and which is exactly what we see. And then there's a chat capability so they can talk back and forth.

Q. And where is all that information stored?

A. It is -- well, on topside, it would be stored on the -- primarily on the server or in the client (ph.) machine. So there was primarily one tracking laptop we set up on the bridge or behind the bridge. We had two other. So I set all that stuff up. So there was two computers on the bridge, port and starboard. We loaded the application there, and it's mostly just watch. There was no communication being done there, but they plot and had its own waypoints. We put some basic waypoints in there.

The starboard side computer has a remote monitor over the

throttles at the center of the bridge. So we had three screens, two computers.

And back behind the bridge, in the chart room, is the main tracking laptop. That is just a client browser talking to the server. The server in this configuration was another laptop in the focsle. That focsle is hardwired to the transducer via internet. There's a 24 volt power supply there, and it's also wired to the ATM transducer which is another text messaging system. It doesn't work as -- it hasn't worked as deep but it worked well shallow. And that's a serial connection with 20 volts as well. That's all connected to that laptop that was internet connected to the ship's network which is then connected to the -- all the machines on the bridge through the ship's internet over their network.

And so to answer your question, some data on the client is stored locally because you can configure your own waypoints. You can save some config files locally but the primary -- the part that's doing all the calculation work and primary is the server that was the laptop that was operating in the focsle remotely and we would remote desktop into it so we could do ATM chat. So we could bring up just a simple telemet window and just text with ATM which was really only usable for shallow commands and -- yeah.

Q. And that data, was any of that data stored remotely?

A. No.

Q. And then --

A. The biggest stretch I can say is some config files were shared back and forth with EvoLogics for tech support in getting us set up, and they had remote access as well. So there are files that transferred back and forth, configuration files and post -- during the search period, we reconfigured the system to act as a sonar as a listening. So the comms part of it we turned into a listening device. So there's acoustic files, but that was all after.

Q. You said during the search. Is that the search when the *Titan* went missing?

A. Yes.

Q. Can you explain just as well as you can -- what do you mean? How did you reconfigure to turn it into a listening device?

A. So, apparently the communications transducer is separate from the tracking transducers. I imagine there's multiple faces on the tracking transducer, but the comms is more of an omni-directional transducer. So it's yet another transducer inside that USBL that they call the antenna of a USBL transducer in the bottom of the ship. That's mounted on the pole along with the ATM transducer. We can raise and lower that so we -- we mounted it at the bottom of a 16 foot maybe pole, and then we put it through a tube that extends out the bottom of the keel next to the aft cargo hold. So that was really a cargo hold, and then that positions the transducers near the keel in actually a pretty quiet part of the ship. So we actually good sound conditions there acoustically.

So we didn't have any baffling or anything acquired. So that seemed to bear out because we had pretty good tracking even on the surface.

Q. Does that transducer store any data?

A. No. It could. That would be a question for EvoLogics. They can go in and configure it. It's -- there's an operating system in there, probably Linux (ph.) would be my guess, only what I saw. I didn't operate in it directly. EvoLogics did but I'm guessing it has some sort of logs, but I don't know what particularly.

Q. You stated this year, 2023, you went with EvoLogics. Why this year did you go -- do you why you went to this year with EvoLogics versus the previous company?

A. I did not make that purchasing decision. I wasn't in that loop. So I can't tell you all the reasons. I do know certain features of -- certain key features why, of the ability to self-track and chart, be able put beacons down. I'm sure it was probably very cost effective. Well, I know it was very cost effective relative to Sonardyne because they're all expensive. The question's what's the bang for the buck. I know in EvoLogics' case, a real key feature that I was working on to help make to come to a light bulb with Jerome, was the ability for the sub to track itself, and they could see -- they could plot where they were going in real time which the old system did not do. The old system was turn left, turn right, you're in grade X, you know, of course, they're in pitch black. How far did they turn? It was

very difficult to tell. You just missed it.
Q. Yeah.
A. That could happen. You can go by something and just miss it. If it didn't get picked up on their local sonar, you can just miss it and not know it. But we could see it, the trail, because they could turn. We don't know how they're turning. We can only see where they've gone through a blinking light trail which is the case of all systems that we have do that, old and new. So Sonardyne, Kongsberg which we also did in 2022, because the mother ship had that. So we had Sonardyne and Kongsberg in 2022 and Sonardyne prior. This year it's just the EvoLogics, and that tracked very well in all of our tests and during the dive.
Q. Who installed the EvoLogics?
A. Primarily me.
Q. Did you receive --
A. So there's two pieces, right. There's a software aspect and then there's the hardware aspect. I was involved in the early part of it that was mostly the drone and then as we got closer to mission, I took over more of that and then all the physical installation I did. So -- and then the wiring and, for example, it has an internal battery. You have to turn that on and off. I consulted with EvoLogics and decided you have to power that, how to control that. We wanted to be able to break that in order to charge it externally, put a connection together and that turns the battery on, and you make that connection. You connect the cable,

it's on. Disconnect the cable, and it's off. If you disconnect the cable, you can also externally charge it. It's a 24 volt battery (indiscernible).

Q. And that's external to the pressure hull?

A. Yes. It's in a titanium -- it's about this big titanium cylinder rated at 6,000 meters.

Q. Okay. So how does the information get from -- can you explain to me the on board system, and how he -- how the operator and/or pilot is actually seeing the data that's being delivered to?

A. Yeah. So the -- your eye is browser. It's basically a chart with some dash boards on either side. You can expand or contract, bring one out, undock it, float it around, but the information that's present is a chart and that chart would have your waypoints and any other plotted points like the ship's location and your location.

It would have several widgets you might call them. Some of them are chat. Some are logs of changes to the configuration. You have all the devices. So on the left side, for example, you have the ship, you have devices and you have targets. And devices are sensors. So -- and they have heading, altitude. So there was a heading sensor, and there was a virtual heading sensor, just ways to configure it.

The bottom line is you have heading. You have depth, and you have -- there's a third one there. I forget it. I think one's

just (indiscernible). So the device -- the targets would be the sub, beacon and the ship. We have basically three targets possible. Of course, like I said, the beacon was never used. So it was just turned off. You can enable, unable all the targets. For example, when you're on the surface, you disable beacon and sub because it's on the surface. You'll never talk to it, and you'll just get alarms. You lose connection, and it will say lost connection. That worked. It'll tell you that there's no connection. It tells you when the last time it had connection, like there's a second count. So 20 seconds, 30 seconds, 40 seconds.

Tracking was pretty good on the dive. I wasn't there for that but I logged in remote and watched the data afterward. And, the -- when I was there, we did some tests, well, shallow dives and surface primarily when I was on board, and it worked pretty well there.

The ATM and the EvoLogics read in their distances which is pretty close at the time. We were all -- we were just testing close to the ship.

And what else is there? On the right side, the heading and GPS location information, the logging chat. There's a bunch of features you can turn on and off to watch, and I watched them. But those are the big things. So you're seeing a chart in the middle, information from each of the sensors if you wish and location information if you wish (indiscernible). It's pretty

straightforward.
Q. And the bridge is seeing all the same things.
A. Yes. So, yeah. On that chart, you can see the waypoint. You can see the (indiscernible) trail of the ship, the (indiscernible) of the sub. If it's reachable, like it's -- if it's on the surface (indiscernible), but once it gets down it's even different colors. The ship is a different color from the sub, and then you can do things like measurements, rulers. You can see distance and you can pin those errors and look at depth and distance, horizontal versus (indiscernible) range.
Q. You had mentioned obviously waypoints and a beacon that was going to be used, and I guess the beacon probably was going to be placed near the *Titanic*.
A. Yeah.
Q. How -- prior to having the beacon, how did the sub and the pilot navigate to the *Titanic*? How did they know where the *Titanic* was?
A. You look at the waypoints. So what that means is you decide -- try to make your best guess. It's 2 1/2 miles down. The currents can do all kinds of things in that water column. So you'll make a best guess about what the currents might do on this particular day, pick a spot to go down. You know, it takes 2 hours to go down, and hopefully you picked well and you land close. Otherwise, you're going to have a long horizontal distance to go, of course, which means time and battery. You've got 4

hours on the bottom -- 2 hours down, 4 hours on the bottom, 2 hours up. So if you land close, you get maximum value out of your time on the bottom. Sometimes it didn't happen. Sometimes it would trick you a long way, and you had to make up from on the ground, going so fast with the thrusters, especially if you're going against the current. So sometimes we chose good, and sometimes we did not.

Q. And how did the -- once the sub began its descent, can you explain to me how it descended? Does it go straight down, horizontally. Did it go in a corkscrew? How did it get to the bottom?

A. I was never on board. I couldn't tell you how much it spun or didn't. We don't have that kind of data. I never heard. I don't know that they really know. Once they lose light, my assumption is, and as I say, it's just an assumption, I don't know. What I can see like over several dives, like all last year's dives and this one I could see -- you can see their tracks. And we can look at past tracks of their dives and see how they drifted. We know what the temperature profile is on many dives because logs are removed from either a CDD or the depth velocity log, the altitude sensor.

So we can get a temperature profile, and it usually starts at like 50 degrees and works. It goes down, it gets cold. Well, the temperature drops down but the sound velocity profile is like this. So it starts out at 1522, goes down to 1485, and back to

1522 down near the bottom. So those are inputs that we can put into the system and are more accurate over time, if we have that kind of input each year. This year we used a default of 1500. So it's the average going down.

Q. And would they power themselves down?

A. No. That would be a very rare case. Like if they -- the only time they would ever use power to go down is if they dropped some weights for whatever reason and were too light. If they dropped all the weights, there's no way they could power down, but if they dropped say a couple weights, and one too many, they may be too light. In that case, they'll have to power down. Depending on how many weights they dropped, how light they are, they have to power down, but you don't need power to go down or up. You use weight for that.

Q. And you had said -- you had stated you only have 4 hours on the bottom or 4 hours to observe?

A. That's all -- based on historical, you only have so much battery. So if you -- 4 hours is historical rule. There's 2 hours down, 2 hours up, and then 4 hours is what's allowed by an agreed procedure, and that historically has shown to say that there will be reserve battery to get to the top and then drive themselves back to the platform and land on the platform and not run out of battery. We have run out of battery just short of that. They got up there once last year, ran out of battery, and they had to be towed over. They didn't quite make it on their own

power. But again, that's just for horizontal maneuvering. So we just use a dinghy and pull them over to the platform and draw them up on the platform and walk in.

Q. You had mentioned the hull sensors with regard to the hull monitoring system. Were you involved in that, in creating that process?

A. No.

Q. Were you -- do you ever monitor?

A. I've seen the logs. Other employees in the past, you know, looked at them, Phil Brooks in particular, but I just saw some of the logs, the outputs. I have nothing more to do with it, and I knew where they were. I could see them, but nothing to do with it other than that.

Q. Where were they?

A. They're -- I believe there are eight acoustic sensors. I don't know how many strain gauges there are but in the case of the acoustic, I believe there are eight. They're between the liner, a perforated steel liner hull and they're distributed forward, back and around. So kind of more or less evenly distributed around the tube.

Q. So the acoustic sensors, can you explain to me what their purpose was and how they worked?

A. Yeah. So on the computer, so they were logged. So they're constantly being processed and logged, and you could reach each sensor and then various charts can be produced from these things.

They could also see real time those logs, and if there was any noise detected above a certain programmable threshold, there would be an alarm on the screen and they could flip screens and go look at the details.

For example, last year's log, we could see that when you launch, there's a lot of noise. A breath (ph.) might look like this, and then one access is time. The other access -- vertical access is depth. Horizontal access is time. So you might see a lot of noise during launch, and then it goes very quiet, and I believe the scale is in decibels. Then it would be very quiet, and then coming back up to the surface, there's a lot of banging going on when you're launching and whatnot. But those are the logged ones.

What they're looking for was things like sharp spikes and they typically expect it to be very loud spikes based on their explanation. Again, I wasn't there for the testing or designing of it. So I can't tell you exactly what their design criteria was, but in the charge, we're looking for loud spikes and if it goes up to a certain threshold, that's a concern, an alarm. We look at those post-dive and count (ph.) those.

Q. And that sharp spike would possibly be an indication of an issue or problem with the hull?

A. The theory is carbon fiber. The theory, as explained to me, was that carbon fiber would begin -- the fibers would begin snapping and then more and then more and then more and then more,

but it wouldn't be instant.
Q. Right.
A. It would be some time period within that, and each one of those fibers or small groups of fibers at least would cause a very loud noise technical by acoustics and so you can watch for that stuff. If there's any other vein (ph.), you'd also see that, too. It's detecting any sound. So if somebody hit the hull outside, you'd also detect that, and certain if it was loud.
Q. And then the strain gauges, were those internal or external?
A. I believe they were internal. I don't know much about those. I never had the opportunity to touch them or -- they were all working and never had to work on them. Working is determined by -- they weren't determined to be broke if they were getting, you know, values whoever was reading those things at the time when I was working on stuff.
Q. Who -- do you know who was responsible for them?
A. Jerome and Phil Brooks.
Q. And were all of the sensors able to be read externally from the sub or was it only those internal to the sub?
A. They'd be logged, and you had to get the logs off computers.
Q. And where were those stored?
A. There are -- there's several computers. So they'd be stored in the computers in the aft electronics bay where there are several industrial computers. It would be in one of those.
Q. And by aft electronics bay, you're saying inside the pressure

hull?
A. Yeah, inside the pressure hull.
Q. What else was stored in those?
A. The video, of course, the power battery logs, the whole control program is logging all the times, all the things that it touches which is primarily power and sensors that I mentioned earlier, the whole hull temperature and vacuum pressure and -- of the pod, for example, the lithium batteries, the main battery, all those others. So that data is all the control program primary. There's the immediate computer which is Windows, the control program which is Linux, and the logging computer which I believe was Linux also, the 4K camera, the access cameras, those are all -- the access cameras are logged to a SD card in the access hub controller in the aft bay, and the 4K camera that was outside the hull was logging to the control computer through a NFS share, and it was -- this year there was a EK USB camera in the dome that was connected to one of the media computers. I'm guessing, but Jerome installed that. He can tell you more.
Q. You use a lot of acronym. I just kind of want to go back and cover a few of those.
A. Okay.
Q. I'm sorry. USBL with reference to EvoLogics?
A. Right. So that's an ultra short baseline. So USBL is ultra short baseline. There's long baseline versions. Ultra short baseline is using GPS, the ship's position and then the acoustic

connection to the transducer of the sub to figure out where the sub is, where the ship is.

Q. And then NFS?

A. NFS is a file share. It's a Linux, common Linux base file share protocol. So just a remote server.

Q. Okay. I'd like to thank you. This information is phenomenal. I'd like to move further on. So you were on mission -- in 2022, is that your first expedition?

A. Yes.

Q. Missions 1 through 4?

A. Yes.

Q. And where you were on board, what was your, what was your position?

A. Same as 2023, so all things power for the most part, certainly like shoreside power, you know, shipside power, all containers, charting systems and then the cameras, lights, you know, electronics on the sub. Phil, and sometimes Jerome, but mostly Phil would do some things particularly before I got there, and then less as I was able to take over those things. I focused more on those. He focused more on the software. And like rebuilding the pods beforehand. We modified those to add more 24 volt power for external lights. In 2024, lights would tend to come on and off for -- or 2022, and after a while, we had to replace a bunch of lights. And we wanted to add more lights. So we added extra power with lithium batteries that went into the

pods. So pretty straightforward, just relays that turn on and off, 150 volt, 24 volt motors, and we ran one pair of lights off it in the end.

Q. And during the dive phase, the dive days, can you walk me through your responsibilities during a dive day?

A. Oh, it could vary. In 2022, when we did several mini dives, I was primarily in the FRC, the fast recovery craft, operating -- well, helping transport divers back and forth, equipment back and forth, people back and forth to the platform but during the dive, and surfacing, ascent and recovery, I was operating the ATM as well. And, so the ATM, the Sonardyne didn't work very well. It didn't really start working until you're below 70 meters, sometimes further. The ATM would work generally less than 1,000 meters.

So the ATM -- and that was primarily because transducer is pointing up, the ship is pointing down, horizontally separate and Sonardyne didn't like that until it got more like this. The ATM being in the FRC, the fast recovery craft, just so we can cover and be on top of it and move wherever we needed to be just through a transducer over the side a couple feet and we could just be wherever we needed to be. So we could be in communication and the Sonardyne could not. So we got shallow primary communication which would shift to the topside box which was in the FRC and I was for the most part, other people took turns and I was the -- in weeks 1 through 4 -- missions 1 through 4, I was the primary

operator then in 2022.

In 2023, we didn't it that much in missions 1 and 2. When I was board, we were testing the automated platform, rise and dive and some other stuff, so we didn't really have need for that. I did have it out there and we did do some range checks and stuff to test EvoLogics in things like range read within 1 meter. So we really didn't need it in mission 1 and 2 because we didn't do any of those deep dives.

Q. And was there a reason you were only on 1 and 2 -- missions 1 and 2 or is it --

A. Yeah, I was gone pretty long last year, and the wife was not happy with that. I'm semi-retired.

Q. Yeah. So specifically then I'd like to talk about your role at least on mission 5. When did you become aware? Did somebody reach out to you with regards to the sub being missing and how did you work through that remotely?

A. I was able to -- so we had Starlink connection to the ship, and that had sufficient bandwidth that even before we left, EvoLogics was able to use Team Viewer to remote in, and that was successful, to allow operating phone calls. So that was a really good experience. And then I was able to use the same process to -- well, actually I did not remote in. I did not remote in directly. EvoLogics did all the remote in. I was on the phone with them, and then we used Teams to share screenshots that the crew, Jerome primarily or Wendy, or whoever was at the tracking

laptops would be able to get snapshots for me. So I did not remote in myself. But EvoLogics did because they had a Team Viewer connection which is a server. So that worked out really well, and I worked -- I was on the phone a lot with EvoLogics and the ship.

Q. And what did they -- what were their conversations? How were you assisting in --

A. In my case, the liaison to EvoLogics to get the initial data to figure out what was going on and interpret from whatever data we had which was, you know, of course, the tracking information, the profile of ascent versus time, and then probably the bulk after that was just in how we could listen because when the report -- particularly when the report came along that we heard banging every 30 minutes on the hour, on the half hour, there's no whales or ocean currents that have a clunk. So we said, hum, that's manmade. It's not natural, and it could fit our protocol that was well known. So we at that point -- we moved forward under the assumption that it could be them. They could have released from the bottom and be floating along for all we know, especially if it was moving. So we have all kinds of scenarios that we could picture but bottom line was we had to find it.

And so that was -- our primary effort was in locating that sound. And so we worked with EvoLogics, to configure the chat to create acoustic files which we shipped some of those acoustic files, especially the early ones, off to acoustics experts and the

Navy ended up with those. And then EvoLogics examined them, and then we said about regular recording and then they would look at those things, look for anomalies. They had the processing tools because they have a met (ph.) lab back in Germany. So they're out of Berlin. And so they could offload files, process them all offline, produce the charts and look at the spectrum analysis and look for things that they thought and they'd give their interpretation to us. So they would send us a picture of the chart and give me a verbal estimate of what they found, and they said, yep, we see stuff. It's manmade. We don't know what it is, but it's in this frequency range. It's in this period of time. It happened in the logs. Here's the chart.

So we could continue to record the best we could. There's a couple different tools. We tried different tools because some work better than others for this purpose as we experimented and found out, but during that time, we're recording one way or the other and looking at one tool or another, because there's one we could actually watch real time which turns out wasn't very useful for an event that comes and goes. So we stuck -- in the end, we stuck with logging, and then they'd post that logging. So we had the log collect process. So we had a time delay in that. And then the reports of the banging would come and go were not consistent.

So then the discussion at that point was where is that? Can we locate it? It's an omni directional transducer but we're

moving around. So I spent a lot of my time plotting where all the ships were and where we were, where the sounds were reported by the sonar buoys and when we heard them, where were we? And I'd go over all of this to try to figure out what the intensity level was at each location, but it was coming every half hour and all the other variables, that was not a reasonable thing to do especially in a day and a half, it was not possible.

Q. And for the initial information that you had received and the screenshots and the screen shares you received from Jerome, what was he sending you?

A. Well, he was -- so he had gotten screenshots for me and others. And then he was primarily posting it to Teams.

Q. And so it was like the EvoLogics' data, correct? So it was distance --

A. Well, screenshots. In this case, a couple screenshots of some of the real time charts. Most of those charts were post-process and therefore sent to us through email from EvoLogics. In the case of other things that may be on there, that would just be a picture of the chart. That was only a couple of times because at the time, at the time around the *Titanic* and the time that the incident, there was probably a picture taken, maybe once or twice. Most of the charts I did, I got from the ship location stuff. So most of my stuff I was generating because I could go to shipinfo.net and look at all the tracks versus time of all ships. So I plotted multiple ships. So that was my doing. That's

probably where most of the stuff was, and then I wrote a document at some point that had a lot of those pictures and tried to make sense of it which, of course, was useless.

Q. Did you see any of the messages that were relayed throughout the dive?

A. No, I don't think so.

Q. Did you have any discussions with anybody, Jerome or anybody, on the communications team of what the messages were back and forth?

A. The only one that I'm -- that we talked about really was I think he told me what the last two were, I don't know that I saw the exact text, but something -- I just know that they were -- because we were trying to figure out when the last message was. EvoLogics actually told us when the last messages were, and they did chart those of time and depth, and they could place exactly when the communications were in that depth in time.

So they -- so I talked with EvoLogics about that data, and we know that the last two were -- the loss of communication tracking was shortly after but not at the same time, shortly after the last two messages. I don't remember the exact details. It might be like 5 minutes apart on the last two messages. I know one of them was we're dropping weights now which would make sense. They're getting near the bottom. They're going to slow down. They're going to start dropping weight and try working toward a neutral point and as is the standard process. So one of those was they're

dropping weights. I don't know what the other one was. And then tracking was lost shortly after that. I don't know the time period. I had have to go back to the chart or my notes or whatever, but it might have been minutes.

Q. And with that data, were they able to reference where they were in relation to the *Titanic*?

A. Yeah, because we had their position. We could see their -- actually the current was very minimal on that day. They dropped pretty, pretty straight compared to normal. A lot of times they drift all over the place. This one had a small slant which was the best -- when we land the closest is when we have minimal current and they drop, you know, they don't drift a long way, right. This particular one, they did not drift a whole lot. So they landed -- I think where they found them was exactly where we tracked them to, to my knowledge.

Q. Thank you.

LCDR [redacted] We've gone about 50 minutes.

UNIDENTIFIED SPEAKER: Do you want to take break, sir, for 10 minutes or so?

MS. SHVETS: That would be great for me.

LCDR [redacted] We'll take a 10 minute break, and then we'll come back.

UNIDENTIFIED SPEAKER: Break at 11:00.

LCDR [redacted] Yeah.

(Off the record at 11:00 a.m.)

(On the record.)

LT. [redacted] The recording is started.

LCDR [redacted] Mr. Lewis, thank you very much. Again that completes my initial line of questioning. I'm going to go ahead and I'll pass it over to Mr. Neubauer.

BY MR. NEUBAUER:

Q. Good morning again, sir.

A. Good morning.

Q. Just a couple follow ups, and a couple things we discussed with past witnesses about final missions. One thing that was brought up is that the camera system, three cameras failed during the last expedition. Are you familiar with that, sir?

A. I was consulted. I was consulting with them how to repair that, how to troubleshoot that. So I was not on board for that. That consultation basically was how to break down the problem, how to test the cameras, how to test the hub, based on if you have a short, like a water short in one of the cameras, it tended to take out all of the cameras because of the way the hub is powered. It was power short anyway. So you could isolate each camera just by one plug basically. And then if that didn't do it, they moved onto Ethernet connections, and I think they eventually figured out it was a Ethernet coupler that was underneath that had some corrosion on it, a coupler that I actually didn't know was there.

Q. Had anything like that occurred before to your knowledge, like multiple electronic failure --

A. Yes.
Q. -- because of the configuration?
A. Yeah, individual failure, if they cracked lens in the camera or something but not all of them. So all of them was, to me, it was common is the Ethernet feed to the hub or the hub itself. Like I said, you could take one camera and drag all of them. You could isolate each camera or all the cameras, and then work from there, work upstream.
Q. All right. Can you clarify who you reported to when you first joined the company?
A. Phil. Phil Brooks.
Q. And do you know why Mr. Brooks left OceanGate? Do you have any idea?
A. (No audible response.)
Q. And you mentioned the acoustics and the sound system, monitoring the sounds on the sonar, that there was an acoustic and strain system. I'm thinking about the acoustics. Were you able to review those close to the --
A. Phil or Jerome had pulled those logs, and then they were sent around for review post-dives pretty common. So I had seen the charts and we talked about the charts and the history of those charts and what they meant and how to interpret them and so on. We had a verbal discussion of how to read those charts.
Q. During that --
A. I did not retrieve those myself.

Q. But during those discussions, were there any discussions of a sharp spike concern from past *Titan* dives that were understood to be from a fiberglass source?
A. From the carbon fiber?
Q. Or carbon fiber.
A. It was only -- in my -- in the logs I saw, there was probably one, and we don't know what it was from. It was one day. It was an isolated incident. Quiet, one bang and that was it. It was dive 76 or dive 80 or something like that. We don't know what it was. It could have been external. But we did have -- in our discussion, it would typically be glass (ph.) or noise certainly with different altitudes. This was a single isolated spec.
Q. And do you know, did that occur at depth or was it during like the --
A. I think it was a ways down, and then it was all quiet after that.
MS. SHVETS: Can I just ask one clarification question? Which mission was that on?
MR. LEWIS: This is 2022. I don't remember which one.
BY MR. NEUBAUER:
Q. You said maybe dive 76 or 80, somewhere in that area?
A. To the numbers that I recall from last year were in the range of 76, 77, 78 to 80. I'm thinking it's one of those, and we had a discussion, you know, we all reviewed that and discussed, you know, what that might have been. It was an indeterminate. I

don't have the history of all the testing. They had a history, a context of having done tank testing and seeing actual failures in their tank testing. They knew what failure looked like based on their testing that was done there for that.

Q. And that would be what? Catastrophic failure or just individual support?

A. Again, I can't classify that.

MR. NEUBAUER: Those are all the questions I have right now. Marcel, with NTSB.

BY MR. MUISE:

Q. This is Marcel. I just have a couple about the transponders. Was the intent to leave the USBL transponder on the bottom like between --

A. The beacon.

Q. Yeah.

A. Yeah. So once they got -- of course, they have to make the initial dive down there. So on the earlier dives, they would drop the beacon down there and then we could use that for the remaining dives.

Q. So you would just leave it down there permanently?

A. Yeah. So in prior years, we were diving in mission 1, all the way down to this year, they didn't start, you know, doing that dive to the *Titanic* until much later, I don't know if they were going to deploy the beacon this year because you have to also go down and get it back. So if you're only going to make one dive

and then you're done, you're not going to retrieve it.
Q. My question is, was the intent to leave one down there so it would be all ready?
A. No, I think -- I wasn't first party to that conversation. So I don't know if they would leave it there. I think the battery -- I don't know if the battery would last a year. It might.
Q. Were there any other *Titanic* research (indiscernible) acoustic system down there?
A. Not that I know of. I don't know if there is anything left down there and the intent is -- in general, to my knowledge, the intent not to leave anything down there. The goal is not touch, not to disturb. So I believe that you would drop the beacon down in one and pick it up in a later one. But if you're only going to do, like mission 5, doing your first dive to the *Titanic*, you're not going to take it down there because you won't be back to retrieve it.
Q. And did the *Horizon Artic* or the *Polar Prince* have their own acoustic system for like Sonardyne --
A. They had Kongsberg. Well, the *Artic* had Kongsberg built in. So in 2022, we had a Kongsberg transducer. So we had both Sonardyne -- ATM, Sonardyne and Kongsberg. The ATM was Teledyne Benthos. But Benthos has never worked at full depth. So that's why we had the other ones. We put the Kongsberg on last year so they could see how it worked compared to the Sonardyne, and they tracked reasonably close. The Kongsberg worked better at the

surface and then for 2023, they went on talking and said, well, do more of the same or, you know, should we do something different? So in 2023, they went with EvoLogics.

Q. That was through *Horizon*'s DP system?

A. Well, *Horizon*, it does have DP. That really had nothing to do with it.

Q. Okay. That's all I have. Thank you.

A. Yeah. So the DP would be useful for (indiscernible), but for our purposes, we were following the sub, and we also have a platform we have to tow and we had to make sure that doesn't get out proximity. You're always moving.

Q. Yeah, yeah. All right. Thank you.

LCDR [redacted]

BY MR. [redacted]

Q. Your control, if it failed, would they be able to go to the keyboard then and then control the thrusters that way?

A. On the screen, which is a touch screen. You could also use a mouse. I believe the -- as I remember. I never really used it that way but I'm pretty sure you could the touch it, too. I never actually used that, but it was a touch screen and most of the controls were touchable. I'm pretty sure the dead man would have done that. I never used it that way. And by extension, if that worked, the mouse would have worked, too.

Q. So there definitely was a backup in case that control --

A. I think so, but I never tried that. Jerome would tell you

more. He was, you know, the operator for that.
Q. Rate of descent, would you know what their rate of descent on a normal -- if it was uncontrolled, what would their rate of descent be?
A. Well, it's -- there is no -- I would suggest there is no such thing as uncontrolled. I mean if everything is in one piece, we weighted -- we hang weights on it, hydraulically, electrically, physically, you know, set the ballast tanks. So whatever their buoyant, however heavy they are, that's going to determine the descent rate, and then that's all the way down. That's what they'll accelerate. It's pretty much that once they get going. I think the descent rate was -- it's commonly -- historically it was around 30 meters per minute but it can vary, up to maybe 60 meters, and that's meter per minute. But 30 plus or minus was probably a good number as I recollect. And then -- of course, they're watching the depth rate and time to drop weights to slow down, to become positively buoyant.
Q. The maximum is 30. If they couldn't drop weights for some reason or another, if there was a malfunction --
A. I think they could be -- it depends how heavy they are. I think it could more than 30. It strictly dependent on how heavy they were with the load that was in the sub and trim weights and they drop weights. So it could be more. Just historically, you should hear numbers of 28, 29, 30, because we would announce the weights especially during descent. But their dive would be

announced to everybody, you know. We're watching. We're calculating. We're calculating. Sonardyne doesn't tell you what that is, you know. We were in a tight moment, watch the depth, the tracking, and then we were tracking it mostly out of interest.
Q. Okay. And I asked that because the last comms, was that the last comms you seen was, we're dropping weights now, which indicated they were getting close to the bottom.
A. Um-hum.
Q. If they couldn't drop the weight, how far do you think it would go down?
A. If they were moving -- I don't know how to phrase that. If they're moving at 30 meters a minute or whatever that rate that they did, which we had seen in the chart, I don't remember exactly now, but the chart, you can see it and calculate it. Somewhere between 30 and 60. So then you have to look at, well, what depth, you know, what altitude they were at that point. If they couldn't -- I guess I don't know how to answer that. Are you asking what damage I might think would occur at that rate?
Q. Yeah, yeah.
A. I really don't know. There's certainly parts that are -- I'm not even quite sure how to conceptualize that even. I don't know what 30 minutes is -- meters a minute is in terms of impact rate. When I think of what that is, it's not very fast I'm hoping. But there are parts that will, you know, non-structural parts that move around certainly like the fiberglass in the back. It's just

hanging on there basically. It's just a cover, not structural. So something like that would be disturbed and probably have some damage.

MR. [redacted] Okay. [redacted]

BY LCDR [redacted]

Q. Thanks again, Mike. It's [redacted] Do you have any professional licenses?

A. I have a SEC commercial first class with a radar endorsement and that's the professional license. I have other certifications but not professional licenses.

Q. Okay. What certifications do you have?

A. Several over the years, from IT, IT type stuff, but in electronics and especially more recent, the NMEA which is the National Marine Electronics Association, NMEA Scholar, NMEA Advanced Scholar, NMEA 2000 and NMEA Advanced 2000. So those were mainly working at Viking Yachts installing lighting, navigation, power, and also ABYC electrician, the same time, it was actually all 2016 to 2018. And I was a nuclear electrician before that, ham radio operator, classified licensee, and there's a number of other things but they're more of an IT entity, more software data center related. I've had numerous careers.

Q. Awesome. What about formal education? Did you go --

A. I -- of course, I was in the Navy. Pre-college work in there, and then I did community college in electrical engineering and communications. I never did much advancement placement, took

a bunch of course and then I went to work and then never finished, and then took a bunch of other post-credits in software, meteorology, oceanography, telecomm courses off and on, particular courses to my needs. And then while I was also employed, software development, technology, to computer stuff. I worked in a date center, a big data center for a while and then some privates. So -- but that's the most relevant of the marine stuff.

Q. So compared to your Navy time and other experiences you've had, how did the *Titan* submersible compare to other, you know, submarines and submersibles you've been on?

A. Well, they all share common knowns, of course. I was in a SX submarine for 3 years and then a nuclear powered nuke submersible and so I'm familiar with sitting on the bottom for hours or days and the process of going up and down and safety procedures and all that because we all wanted to get to the top because the submersible had one hatch. We were down 3,000 feet. We could sit and roll on the bottom, count fish, bury cable, expand cable, and recover lost parts. So this -- and all the deep submersible share the same traits. So it's very common, very transferable. Obviously this is much smaller. It doesn't have 300 volt giant batteries, much smaller batteries, but very common especially, you know, the concepts of control, navigation are very similar. You know, power, buoyancy, variable ballast tanks. In those cases, bigger ships, we have trim tanks aft and forward. But, air, like CO2, oxygen and CO2 control, those are all common.

Q. What about the specific design materials? Was there any concerns of yours when you saw because maybe you're used to working in the one medium, you know, which is say steel or titanium versus carbon fiber delivery? Any concern?
A. I did not have any. I did not do structure work. I was an electrician. So I never -- I was ship test engineer in the shipyard, you know, in set conditions. I was parallel to the ship test engineer. I was a (indiscernible) duty officer. In those cases, we would set conditions for all the welding and -- welding of piping, welding whatever, x-ray, radiology on that, but I would say I was an on watch person setting the danger tags and valve line up and clearing -- making sure they were clear. That was my role there. The interpretation of the performance of the welding and all that was not me. So the fact that it was novel, it was interesting, but I had no insight into that, you know, on that.
Q. In your opinion, do you believe the sub was safe?
A. Yeah, I had no concerns.
Q. Did you ever go down? Did you dive in it?
A. In that one, no. I went down in the other ones, but I never went down in those.
Q. Any reason why you didn't go down?
A. I didn't -- he asked if I wanted to. I said, no, because I'm more interested in working on it. I spent years on the bottom. That was like 35 years ago. So I went down for some test dives in the other ones. I thought that was interesting. In this case, I

was more interested in working on it. Really *Titanic* isn't my thing. It's all interesting but I'm more interested in the sub and making it work.

Q. So nothing from a safety standpoint that made you say no?

A. No.

Q. Talking about safety, can you just kind of describe the safety culture at OceanGate?

A. I thought it was pretty significant, you know, in the positive way. You know, certain pre-dive, there's maintenance. We're talking about, it didn't change, of course. I wasn't involved in most of those changes that involved structural stuff. That was other conversations and outside the things I'm involved in anyway. They certainly weren't structural. They were just, you know, if we power this, you lose this, what's the backup plan? My interest making sure that we've got the right wire sizes, proper fuse ratings, you know, that things are done the right way so that wires are protected by proper fuses and things like that.

So my focus was on making sure that things break up. Things are reliable. What's the backup? You know, what's the backup plan? So how do you get emergency power? How do you drop weights and emergency power making sure those features work. We changed the motors out, and those motors (indiscernible), made relevant changes, make sure the switches worked and tested them. So those are -- that was kind of the extent of my area of expertise. From the actual operational which was, you know, all 2022, four mission

in 2022 and then two. Everything is prefixed (ph.) but here's the work list. Does any of this impact things? If it does, you know, we ask you to fix it and test it.

And, of course, the risk indication. I'm sure you've seen that before but we're looking at all the things that matter, like did people get enough sleep? Has it been used before? Is it the first time? So that was always present every dive. So those kinds of things were -- I felt needed to every time be very consistent. So I really concentrated or concern is the consistency in that approach from in the lab, in the shop. We didn't do much to touch the hull and the structure. It was mostly just cameras and lights and junction boxes and some software. We had really not a whole lot going on. With my stuff, it was pretty straight forward.

Q. Do you feel like if you saw something that was unsafe, you could speak up and --

A. Oh, yeah, yeah.

Q. And you were encouraged to?

A. And people did. I don't remember specific instances, but if there was something, whether it was safe or not, it was say something that we wanted to see, maybe should fix or not, or just discussed and it was certainly brought up, yeah. I don't remember any particular instances, but there weren't a lot but, you know, people -- I know there were cases. For instance, people would say I think we should, you know, do this or change that or, you know,

add -- make that thing longer or add another buoy or something, but I don't remember a particular instance, but it has happened I'm sure. So that was never a given cause for -- I probably brought up some things myself, not as much in the safety vein as much as I think I'd like to maybe do this instead of that kind of thing. And that's not really pre-dive blogger (ph.). That was more of what we do before the next dive. Do we want to change that? These lights are blinking on and off. Do we want to change a cable or you want to just swap things. You can't see lights from inside or which one's blinking, so those kind of challenges. That would be more what I recall that really was missing.

Q. Do you know if there was any position descriptions for, you know, each job at OceanGate?

A. Versus job position as --

Q. Your position, did you have a position description about what you were responsible for?

A. I've not seen one.

Q. When you were back in Everett at the company when you were working, did you have pretty an assigned kind of tasking that you completed and kind of stating the work, more electrical type --

A. Yeah. I'd like to go back to the question. I didn't see a generic role assignment. However, my offer letter has a description of all that stuff. So there is a pretty complete, you know, wide ranging description there of things that we would be doing. So your second question was --

Q. When you were back at headquarters, do you have like a set -- kind of set duties that you completed as part of your job?
A. We were small crews. So we did -- we crossed over a lot within our specialties anyway, within our capabilities. I would help with mechanical as well. I have mechanical skills. So it was fairly known that I could drill holes and put like connectors in boxes and things. That was all normal. So all of a sudden I'm getting duties on the junction boxes, fill them with oil, that kind of stuff.

I would say generally we stuck within what our main roles were. There was smaller crossover in cases where, for example, if say Jerome, he was our software guy. He wasn't a hardware guy, but it doesn't mean he wouldn't do anything. It was usually under my supervision or Phil's supervision. It would be something, you know, did you do this? Did you do you that? Yes. Okay. Let's check that. Putting tags on cables. I don't think he did much rewiring. I don't know that he did any rewiring, but he certainly tested things and he did that stuff with connectors which are pretty straightforward. So I'm sure he did those. Those are easy. You just squeeze up and stick them together.
Q. Do you have checklists when you're completing this work on the job?
A. No, not in that way. There are -- there is -- I work items. So JIRA is our work item tracking.
Q. Say that again. What is it?

A. JIRA, J-I-R-A. So there is work formal tickets that you work up, and in there are comments and drawings and statuses and open, close and broken down by project, by technical activity type things. So that's usually where the work goes into that. So there are formal work items in there that we track, we comment on, close. So that is the way we manage most work. And then there's another set of documents which I was not involved in directly. That was the maintenance log. That was more of a (indiscernible).

Q. You talked about crossover. Was there a lot of crossover when you guys went on the expeditions?

A. Crossover from a maintenance point of view?

Q. Job, by job duties.

Q. In the sense that you could be -- if you're up in the tracking station, for example, many of us -- a couple of us would rotate and do that. Several of us would rotate through there. Communications, tracking. But working on the -- then there's other things which is dome closing crew, hanging weights, charging batteries, charging the 1,000 pound air, charging low pressure air, various people would be cycled through on jobs out there, under supervision, learn, training how to do that over time (indiscernible). There are also procedures also that they would have. There were also more procedures constantly being made. The goal was to have a -- because you had mission specialists coming in, you know, in that sense you had people coming and going all the time. There were certain things that there was constant

process of creating checklists. They were really making checklists. So there was a whole lot of checklists being made for all kinds of things. How to use the (indiscernible)? How to use the (indiscernible), for example. So there was -- yeah.

Q. So if somebody came in and wanted to let's say hang weights, was there a specific set of procedures that they had to complete? Did they have to be signed off to be able to do that job?

A. No, that one was a little more simple. Weights, they would say we want 25 or 30 pound weights. So we would make -- put steel shard into a bag, tie it off. There was squibs (ph.) and line and you'd hang them four on a side. It was pretty straightforward. However, the pre-dive checklist would verify all that stuff. So the pilot was generally the one doing pre-dive checklist. So Scott or Stockton, in the case of *Titan*. And then me or somebody else would go along with him and assist him with that because they're inside the hull or outside of the wings (ph.), each end watching thrusters run or not run, lights on, testing all the things out. And so they have a pre-dive checklist that would be done before the briefing and then everybody involved, the whole crew briefing, everybody goes over their roles and then back out again, where they do the final preparation for closing the dome and launching.

Q. The job like closing the dome, there are specific -- like you have to be qualified to do that job. If you're not qualified you can't do it.

A. I wouldn't say there's -- no, there's not a formal qualification, but there is an experienced person -- persons on there, and there is a checklist, like there's torque wrenches, screws. There's a process that you have to know, and the air, the dome dolly is air. You have know how to operate that to lift the dome and slide it and to keep it level. So people like Ryan, you know, there's people that have done it a lot. There's always somebody present on that crew to oversee that, and there's a checklist. That was one of the earlier ones that was used more than anything.

Q. So the *Titan*, were there any issues that you saw, I mean any sort of -- any maintenance issues or things that went wrong that had a comment or outstanding innuendo?

A. No. No. Again, there's always issues. There's always something somewhere. Most of it was related to lights and cameras. Cameras occasionally would fail. Maybe a camera sheath got cut by fiberglass, walking around. Lights were probably the biggest single pain in the rear. Lights were just unreliable. Power was good. I'm convinced of that. I replaced cables on every single on, you know, do installation checks, replace new grounds. Lights were the number one problem, and it wasn't only in the beginning. It got worse as time went on. I just believe they were getting old and some lights we replaced and it fixed the issues. Some of those were subsea. Some were deep sea. We had two different kinds of lights. So replacing them, fixed them in

many cases.

You have -- there's always small issues like the BMS board, inside the lithium battery, they would tend to fail after some period of time. They're under full pressure in oil. So there's been various revisions to those boards over time. So I've replaced a couple of those boards. We had a couple modified by Triton Subs to be more oil resistant. You can't squeeze crystal. The CPU depends on crystal and you can't squeeze it. So you have to have PT (ph.) electric or some sort of solid state resident unit.

Q. Okay. Were you aware if there was like issues with the Newport (ph.) at all, issues with the end caps, rings?

A. No, never. Other than Newport coming in and out a couple of times, that stuff was never touched.

Q. Okay. Any penetrators?

A. No.

Q. Do you know how many dives that the *Titan* took? I know you've dived 76 or 80. I mean was there a log of how many dives?

A. Every dive was logged whether it was successful or not.

Q. Okay.

A. So each dive had a number. We may have reused a number if it never started, but if it was moving out there, it had a new number for every one.

Q. Okay.

A. So if it went down 10, 30 foot or went down 4,000 foot or

12,000 foot, I believe it had a new number.
Q. Okay. Going to your interactions with Stockton, can you just describe your normal interactions with Stockton?
A. In the first year, I didn't a lot. In 2022, when I took on more responsibility on *Titan*, electrical, so we ended up working pretty close together in the end on all things from all the pre-dive checklists, of course, repairs and, you know, going through with everybody involved. Sometimes in the larger setting, I'd also be out there, you know, midnight working on hanging weights and charging the batteries and getting all of that done. So several of us would operate interchangeable in that regard. It usually took two or three people to do many of those things and get them done and get them all set right.
Q. So he was pretty hands -- it sounds like he was hands on?
A. Oh, yeah, totally.
Q. Now, would you --
A. Oh, no, he wouldn't, he wouldn't do -- I wouldn't say hands on. He's very involved in it. From an electrical perspective, he didn't do much but other things especially the operational things like bags and, you know, turning screws and cutting fiberglass or whatever, you know, those things that he would certainly be involved in but electrically speaking not so much.
Q. Okay. Would you describe his personality, how he carried himself?
A. Certainly confident. I would say for me, I am not a -- I'm a

very tolerant person. So I deal with Type As pretty well. And so he's very -- he knows generally what he wants, or at least he knows the questions to ask and will ask them, and we'll answer them. And then this could result in a debate, pros or cons, and so he's very direct about those kinds of things. I thought he was relatively easy to work with. Given his directness and all that, you weren't left guess what he meant. I meant that in a good way. I had no -- I really had no negative relationship aspects with him. It was all very professional.

In 2022 or 2023, we were close together. I think we worked pretty well together. So I don't have -- there's nothing that really stands out. He doesn't go after (indiscernible). He has mostly a business perspective. He didn't have a temper tantrum. That would be a bit much. As I said, he put words over things certainly but not from a engineering, you know, perspective or working on something. It does what it does, and if needs to be fixed, it gets fixed. There's no if, and or buts about that. We discussed how to get it fixed, the best way to get that done is, what parts we have, what can we get, what timeline we have, you know, and the choices there. Sometimes we may not be able to get a part in time, but we have something else we can do. Again, that's in my realm, my lane so to speak. We worked well together and that usually come down to cameras and lights.

Q. Did you ever feel, you know, pressured or any sort of time constraints about getting stuff done? Did he ever pressure you,

like, hey, you need to get it done?
A. There's always that, we need to get it done in time. So there is schedules. There's dates we're going out. So that's always there. I can certainly say I was always able to push back and say you cannot do this in this time. So, for example, and just as an example, that power distribution board. We had to let that there, but that was never installed. I want it installed. Well, we need time to do that. So I just did it. I wanted to actually put it in and take the old one out, but the timeline didn't. So we debated on that and debated on that. I wanted to put it in. We don't have time. So I'm sure it'll work. (Indiscernible). So we have -- go back and forth on those kinds of things, but it would never be -- we come to some agreement.
Q. Did you ever feel like he or anybody else in the company cut any safety corners on anything?
A. I don't think so. I'm not aware of any, but that certainly worried me. Yeah, I mean in my lane, it's electronics. My case is more about making sure that wires don't burn up, loads don't burn up and things like that. So standards, things like that.
Q. And going back to the beginning, I should have asked this, but did you ever work on any other submersibles other than in the Navy, any submersibles whatsoever whether they're steel or titanium?
A. I only -- the other two I only helped in the underwater telephone VHF and AIS, the towboat. So they have a towboat. They

have two towboats, but they have a state boat, 28 foot state boat. So it has VHF and AIS, an underwater telephone. The underwater telephone unit is portable and hardwired versions. There's fiber underwater telephones. To the other two subs, *Antipodes* and *Cyclops*, both use underwater telephones as well as VHF. So I worked on those.

Q. Anything outside of OceanGate where you worked on submersibles?

A. No.

Q. Thanks. That's all I have.

A. Um-hum.

BY UNIDENTIFIED SPEAKER:

Q. The state boat, is that -- was that Newfoundland or is that here?

A. No, that's in North Carolina presently.

Q. Okay.

A. It was in Everett and then it went with *Cyclops* to North Carolina for missions over there, and it's stored there. It's not used -- well, it's not used in our missions, *Titanic* missions.

Q. Are you familiar with FMEA, failure mode and effects analysis?

A. I've heard of it, but I don't use it. It's limited.

Q. Did such (indiscernible)?

A. (Indiscernible).

Q. Then you mentioned JIRA. What was JIRA?

A. That's the work tracking project management system, work tracking trouble tickets system. He liked that term. So all work items, planning items, you know, were in there or most all would be there.

Q. Okay. Thank you.

LT. [redacted] LCDR [redacted] online has a question.

LCDR [redacted] Go ahead, Ms. [redacted] You have a question?

LCDR [redacted] Yes. Thank you. This is Lieutenant Commander [redacted]

BY LCDR [redacted]

Q. Are you aware of any updates or changes that required changes to the penetrations? And can you confirm that there were no penetrations in the actual pressure hull? There were just penetrations in a different location on the submersible?

A. So the few penetrations there were, hydraulic and electric, and they are -- I think they're all in the titanium ring. I don't think there's anything in the dome or certainly not in the graphite.

Q. Great. And when changes were made to equipment, were those -- the penetrations, was any changes made to those or were the changes that were made didn't affect the penetrations?

A. Changes, like what you thinking on?

Q. Like you were talking about, you were updating lights, updating cameras. So any equipment that was related to that.

A. Oh, that stuff was -- over time, I know connectors and

fittings, you know, certainly they've been serviced, removed and reinstalled. Ryan could tell you more about that. I did not do that. There was -- there's connectors that we were changing but it was mostly because like burns -- there's a burns connector, but that's just because it has that 90 degree bend in the new one, just for better cable routing. But there are no -- any changes, we're pretty much using, to my knowledge, my time, the changes are at the ends of the wires, not in the penetrator itself for my purposes. There's changes from year to year that can repurpose some of those connectors but, you know, changes I make, for example, are at the junction box. I may move a load on one set of wires to another set of wires or new internet (ph.) data or serial data, but as far as penetrators go, I don't touch those.

Q. Okay. Thank you.

LCDR [redacted] No further questions for me.

LCDR [redacted] Thank you, ma'am.

LT. [redacted] I have a question.

BY LT. [redacted]

Q. At what point or time did those presumed manmade sounds stop? And how long into the search was that?

A. I believe they started Tuesday evening. So Sunday is the incident and then Tuesday afternoon or evening, I think was maybe -- I don't know when the first reported ones were. I don't know that I -- it filtered all the way down to me because it was Navy, and it went to a different set of people. I'm at the end of that

chain. But I became aware of it, and I think it was Tuesday afternoon, and then we tried to track where that was all of Tuesday and continuously Tuesday, Wednesday into Thursday.

Q. Thursday was presumed the last --

A. Oh, Thursday, the ROV went down.

Q. Right.

A. And then that's when they found the parts there. Subsequent to that part -- I don't remember when the noise stopped, if it ever stopped. It seemed to come and go at times, but there's a lot of moving parts there. Also I don't -- in my position, I don't think I got all the reports that were available. I was remote here in Seattle and trying to figure out what was going on by phone and I'm way down the list. But, there was several that were at times reported directly from the bridge over the VHF radio that I was able to hear. So I don't know the exact log of all that, but it seemed like there was -- it was fairly consistent overall. There was a couple I noted that were missing. Mostly it was there.

Q. Okay. Thank you.

LCDR [redacted] Mr. [redacted]

MR. [redacted] Just a couple of questions.

BY MR. [redacted]

Q. The JIRA data, where is that stored? Is it stored in the --

A. It's cloud based.

Q. So they're using iCloud using Microsoft --

A. I don't know. I don't know who they're hosting on. It could be Amazon for all I know.
Q. Okay.
A. I don't know.
Q. Are you familiar at all with the servers or the NASes (ph.) that are located at OceanGate?
A. No.
Q. In relation to the setup on your (indiscernible) expedition, you mentioned you have a server located on the focsle?
A. That was for the communications and tracking.
Q. Why the focsle?
A. Because it was in close proximity. It was temperature controlled, dry environment in close proximity to the moon pool which was the pole where the transducers were. So we could run cable easily to there and then we ran the Ethernet back and just a single Ethernet went back into the main -- in the super structure where it met up down in the engine room basically and joined the ship's network at that point.
Q. And the moon pole is?
A. That's just a large steel pole that has a plate on the bottom with our two transducers.
Q. And can you describe more accurately?
A. Yeah, the ATM and the EvoLogics.
Q. And that's hardwired connection to the two laptops aboard the starboard on the bridge?

A. Well, the port and starboard -- well, all of those were Ethernet connected. And so the port and starboard had browsers running on the server as well as the main tracking laptop which is also right at the (indiscernible).
Q. I heard you say that you remote desktop into the focsle server?
A. Oh, that was --
Q. Not from -- you're not saying on --
A. Yeah, from the tracking laptop in the chart room, we remote desktop into the server, mostly for the purpose of getting the Telemet Window up, the serial connection to the ATM transponder which is just attached in ATM commands, ATR for range and --
Q. So if that configuration changes, you'd have to remote desktop it. Is that what you're saying?
A. Yes, for -- yeah, for each --
Q. But for viewing purposes, you could just use the (indiscernible)?
A. Yeah, you'd have to chart.
Q. Everything's on the browser. And then I heard you mention Teams. Was the Teams for viewer use on the board the --
A. So Team Viewer is the remote access that was used by EvoLogics for support. For EvoLogics, that was into the tracking lab dock.
Q. Was that already prearranged, the you'd have Team Viewer already installed?

A. No, we installed it in port in the very beginning when I was first configuring EvoLogics. I asked them to check it all out. So we had questions on configuring this versus that and what value do we choose for this or that or if we had a software problem. I couldn't get -- I wasn't able to enter a server range. There was a limit. So we had technical questions in the beginning, and then we -- so they offered to go through and check any out ports which we said yes. So they have a Team Viewer license, professional license.

Q. Yeah. So Teams Viewer was strictly used by EvoLogics.

A. Yes.

Q. That was designed for them to do configuration.

A. That was their remote capability and my knowledge that they were the only ones that ever used it.

Q. And then you mentioned Teams. That was used through the OceanGate Office 365. You used a Teams site that communicated. It sounded like you had it for chatting --

A. Yeah.

Q. -- sending screenshots.

A. Yeah. So there's very credits on Microsoft Teams.

Q. Do you know the name of Teams site that you guys used or is there just a general one that used?

A. It's just --

Q. You don't have multiple Teams channels that you guys use?

A. In Teams, you have all kinds of subdivisions of ways of

organizing that data, right. So there are -- if you want to call them channels, there are, but they're all in the OceanGate account.

Q. Gotcha.

A. Yeah. I can see all kinds of different subdivisions of organizing the data, and there's chat screens and file screens and videos and if somebody recorded a video, that could be there, too.

Q. Okay. And you said, I think I'm clear, you said none of the onboard data other than EvoLogics -- EvoLogics data was communicated up to surface meaning comms, depth, position. That was all seen at the -- on the bridge, right? But no on board, you know, failures, electronics.

A. Yeah, yeah. Only what they type into a keyboard and the position information are the only things go back through --

Q. Everything else is located on board the ship?

A. Yeah, there's no telemetry so to speak.

Q. Right. And on that point, you had two CPUs mounted to the aft cap, right, sort of stored and managed, and I believe you mentioned --

A. I think -- well, there's several CPUs from raspberry pie, for water detect, but those are subsystems. Then there was three main industrial computers, one computer, main computer and control computer. And then there might be a raspberry pie as well as water detection.

Q. Understood.

A. And it bubbles up to the control computer.
Q. So are those built computers or are they off-the-shelf computers that are mounted? What are they?
A. Those are, those are industrial grade --
Q. Sitting in a rack?
A. -- bandless computers in -- yeah, mounted in a rack behind a glass wall and covered. So the equipment bay is -- it's got three -- two side angled areas and there's covers in front of each, and then everything is mounted on a structure in there.
Q. So as in a server rack --
A. Yeah. So you could pop up things and pull them out a certain distance to get to the back of them.
Q. And have you done any maintenance on those, those CPUs? Not -- I mean hardware maintenance is what I'm talking about.
A. The only thing done is change out hard disks like we had one hard disk that failed and we put a backup into it.
Q. Okay. What type of disk do you guys us?
A. And, of course, USB connections, all the data connections were fine.
Q. What type of hard drives do you guys --
A. Those are solid-state disks.
Q. All of them. Do you what capacity they were?
A. It could vary, 250 gig, 500 gig, terabyte.
Q. Okay.
A. Yeah. I think where there was kind of media, I think may

have been even a 4 terabyte on the -- in a disk one but generally they're 250 to 1 terabyte.

Q. Okay. And so you have solid-state drives. You have how many solid-state drives?

A. Some of them have internal and then there was a slot you could change out. So for the camera footage was a slot. You pulled that disk out and take it up to the media team and then they would offload all the video and bring us back a blank disk.

Q. And that's a SATA connection and solid-state driver?

A. That is a SATA connection.

Q. Okay.

A. It's a hot plug type SATA.

Q. Gotcha. And then you mentioned there's SD cards as well?

A. There might be inside. I never opened one of those up. There might be on the inside. I'm not sure what the internal one was but external was a standard 2.5 inch disk.

Q. Any spinning drives located --

A. I'm not aware of any spinning drives.

Q. Thanks.

A. Um-hum.

BY UNIDENTIFIED SPEAKER:

Q. I have a quick follow up, sir, just to understand the operations that may have occurred. For the beacon, that would have had to have been deployed and retrieved by a ROV. Is that correct?

A. No. That would -- the sub would drop or take it down, drop it, and then pick it back up with a hook.
Q. Okay. I didn't realize there was a hook.
A. I believe it had one on and then basically a float with loop, a loop that would float and then they could drive up to it and put the hook through it in front of the -- down in front of the cameras.
Q. Had *Titan* ever done anything like that before?
A. There was practice runs for a current last year. We did some testing with a dummy system that would deploy a current sensor and type sensor. That would sit down on the bottom. There were two of them. They were expensive items. We wanted to put weight on there and test the structures and how to deploy it, because we didn't have a manipulator (ph.) on. So we had to use a hook and it would have to move. So it was questions. We didn't want to put it down there and find out we can't get it again. So we had a dummy system, to stand and weight put on and there was a few -- a little bit done with that, not a lot. We didn't spend a lot of time on that, and we never deployed those because we didn't spend a lot of time on that. That was a last dream type of request. We weren't going to put a lot of time into that.
Q. Where was the testing conducted?
A. That was in days, you know, the test dives.
Q. And then just one question about the 2022 expedition. You were on the *Horizon Artic* that time?

A. Yes.
Q. Did those missions, from what I understand, there were a lot of weather issues and there weren't a lot of dives. Is that an accurate description?
A. Well, we made dives, 1, 3 and 4 and 5. You know, so only mission 2 was in doing repairs but the other ones, there was -- I think there was, if I recall, seven complete dives through 1, 3, 4 and 5. So each one may have had more than one trip down there.
Q. To reach the bottom?
A. Yes.
Q. Did the CEO of the company ever present any challenges from a pressure standpoint? Did anyone ever mention having the CEO involved in the operation onsite created like a pressure to get things completed?
A. That's funny you mentioned it because he actually acknowledged that that could exist in and they set up certain -- in the ways that things were run was purposely designed to avoid that scenario, you know, that potential scenario where because of who was, his role, that he might act differently. So different people at times would run certain things, like Kyle or Scott or Ryan, in an effort to mitigate against that. He was fully aware of that potential where people -- I guess as the CEO you might cave in and do something instead of speaking up or whatever, right.
Q. Sure. So how would they set it up? Give me an example.

A. I'm trying to remember. Actually, it was -- I don't remember the exact phrase but I remember we had that discussion that, you know, hey, this is a possibility and therefore we will do this. And the idea was is that certain things like mission briefings and stuff might be done by somebody else at times. Reviews are done, not just by him. So other folks would be involved. He was -- he and others were very aware that that dynamic could exist. Historically, you know, in other organizations that it was happening historically.

Q. So I guess the goal of that system would be that during the briefing by somebody else, maybe somebody else would feel more comfortable speaking up if there was a concern?

A. Yeah, definitely. Well, he did some briefings. Others did briefings as many, if not more times. At the briefings, he was more of a spectator, and a good -- so he did briefings, but he wasn't the pilot. But he didn't -- he certainly didn't do all of them.

Q. Did he attend all the briefings?

A. I think so.

Q. That is the last question I have.

BY MR. [redacted]

Q. Just one follow up if I may. This is [redacted] Any encryption that you know of, TrueCrypt or anything on any of those devices that are in the end cap?

A. Not that I'm aware of.

Q. Thank you.

BY LCDR [redacted]

Q. I just have one kind of final round up question, and this is -- do you know what happened to the *Titan* on the 5th, on expedition 3 in the fifth mission?

A. No, I just -- I saw the chart and I saw it, you know, disappear at a certain depth in time, and that's the extent other than reading stuff afterwards. I do not know. I don't have any insight into that.

Q. And do you have any professional and based upon your knowledge, any -- or I guess your relationship with the company, and do you have any belief what you think may have happened?

A. No, there was a -- you know -- of course, one -- when we were searching, we had all kinds of things, scenarios that we were trying to say, well, could this be, might have this been possible, is it possible to rule things out, because we were trying to search for it and figure out, are they floating or are they on the bottom? Are they stuck? Are they still there? Because there's all kind of release mechanisms, right. They can release the cradle and especially when -- you know, the cradle's there and not the sub. Well, that's a good thing. The sub released and is going somewhere. Now, we've got to find them. So those -- there's a lot of scenarios we ran through that were possible but, no. So it's one -- all kind of things we thought maybe could happen because we're going through the list of possibilities in

how to search for them. But, you know, we'd go to the bottom but we lost track well before the bottom. So, no, not reasonable that they went to the bottom because we lost track even well before that. If you assumed you lost track because of something catastrophic. A collision with the bottom I ruled out, and so at that point, it's just kind of no idea. I wouldn't think anything electrical, and certainly all kinds of, all kinds of stuff and theories out there. You don't need power to go up. No submarine needs power to go up. So power problems are not, you know, typically not -- very little, very little concerns I would have in terms of power. Things are external. The AGM batteries don't blow up typically, you know, oxygen, spark oxygen. Well, they control the oxygen pretty tightly, not likely. So, no.

Q. Thank you very much. I appreciate it again, and I appreciate you coming here for this interview.

LCDR [redacted] And I believe -- it's 12:02, and we'll complete the interview and we're going to stop recording.

(Whereupon, at 12:02 p.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 Michael Lewis
ACCIDENT NO.:	DCA23FM036
PLACE:	Everett, Washington
DATE:	July 26, 2023

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.

[redacted]

Kathryn A. Mirfin
Transcriber

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

Errata

Interview with Mr. Mike Lewis

Loss of the submersible *Titan*
DCA23FM036

Page/ Line	Original	Correction
7/2	saw too much	saw *Titan* too much
18/25	the onstenance	all the offsets
20/7	internet	ethernet
22/24	grade X	grid X
23/7	blinking light trail	bread crumb trail
23/18	mostly the drone	mostly Jerome
24/3	(indiscernible)	NiCad
25/1	just (indiscernible)	just a duplicate
25/17	read in their	agreed in their
26/4	(indiscernible) trail	bread crumb trail
26/5	(indiscernible)	bread crumb
26/10	(indiscernible) range	slide range
30/7	one access is time. The other access --	one axis is time. The other axis --
37/4	met (ph.) lab	MALAB
45/3	there it	there or set up an LBL array
45/7	research (indiscernible)	research organizations'
46/8	(indiscernible)	ROVs
49/8	SEC	FCC
49/14	NMEA Scholar	NMEA Installer
50/14	Advanced Scholar	Advanced Installer
58/13	innuendo	anything like that
59/12	Newport	viewport
59/13	Newport	viewport
62/6	We had to let	We had Rev F there
62/7	that was never	Rev F never
63/1	state boat	SAFE boat
63/3	There's fiber	There's diver
63/12	UNIDENTIFIED SPEAKER	Mr. Muise
63/23	Did such (indiscernible) ?	Did such an animal exist for *Cyclops* or?
65/12	internet	ethernet
67/8	on your (indiscernible)	when you're on

Page/ Line	Original	Correction
70/20	raspberry pie	Raspberry Pi
70/23	raspberry pie	Raspberry Pi
72/21	UNIDENTIFIED SPEAKER	Mr. Neubauer
73/11	type sensor. That would sit on the bottom. There were two	tide sensor. That would sit on the bottom. Last year we were given two of them
73/14	manipulator (ph.)	manipulator arm
73/15	it	the sub
73/20	last dream	last minute type dream