BOEM DEEPWATER GULF OF MEXICO HISTORY PROJECT

Interviewee:	Robert Christ
Date:	August 21, 2008
Place:	Robert, Lousiana
Interviewer:	Jason Theriot
Ethnographic preface:	Rob Christ attended Louisiana Tech University and emerged with dual degrees in aviation and accounting. After a stint as a CPA, Christ joined up with the work of his father, C.J. Christ, in the subsea diving and remotely-operated vehicle (ROV) industry along the Gulf Coast. Hired by Oceaneering as an ROV technician, Rob Christ was also able to assist with his father's historical work in the Gulf of Mexico, including the search for the sunken German submarine, *U-166*, lost in July 1942 in more than 5,000 feet of water. Upon leaving Oceaneering, Rob Christ founded his own company, Video Ray. After building Video Ray's annual revenues to about $6 million, Christ sold his interest in the firm and founded SeaTrepid, which focuses on small- and medium-sized tele-operated robotics and ROVs in subsea exploration and engineering. After the catastrophic hurricane seasons of 2004 and 2005, Christ's firm was flush with storm clean-up and scientific work.

File 1

JT: This is an oral history interview with Rob Christ from SeaTrepid for the MMS History Three Deepwater Project. SeaTrepid is an ROV company that does underwater exploration and projects. Are you are the president of the company?

BC: I'm the president and founder.

JT: Mr. Christ, tell me a little about your background, where you're from, your college education, and how you got involved in this technology.

BC: I am from Houma, Louisiana, and my father, as you know, is C.J. Christ. We got into this business doing history research for Nichols Date [phonetic] back in the sixties, seventies, and eighties, in the search for the *U 166*, which was sunk in 1942. Through that project, we came to be involved with a whole bunch of pioneers in the underwater industry, including Harold Edgerton from MIT and Dimitri Ribicoff, who was one of the founders of the French Resistance and one of the pioneers of underwater research. Ribicoff also brought down several of his first diver propulsion vehicles, one of them was called the Remora, another was called the Pegasus. I believe he brought the Remora down there, which was the surface-powered diver propulsion vehicle. This was back in the seventies, I believe.

We've had a lot of folks come down here through the ages. Harold Edgerton brought with him what he called his first side-looking sonar, which eventually turned into the side-scan sonar. We currently work with Marty Klein over at L3 Klein Industries. We work with all the big players in the sonar industry because the technology has come so far.

My dad and I just walked along and did all the dives on this Ship Shoal area wrecks. Dad liked to go out there and do the historical side of the project, and most of it eventually came out to him going out there and having beer with his buddies while diving on these wrecks. I wanted to find something, so I eventually started taking over the technical aspect of it, and that's where I got into this.

JT: Can you tell me about your educational background?

BC: I went to school at Louisiana Tech University and I have a Bachelor's degree in aviation and one in accounting.

JT: That's quite diverse.

BC: After I left school I went to work for a Big Eight public accounting firm called Coopers & Lybrand and became a certified public accountant. The stuff that was fun wasn't being a certified public accountant; the fun stuff was aviation. So my avocation after I got out of accounting was to back into subsea work. That's because helping Dad over the years with the historical stuff in the Gulf of Mexico got me into more and more of the technical aspect of doing subsea work and more and more into working with our biggest helper, our biggest supporter, which is Johnny Johnston over at Oceaneering. Johnny eventually Johnny hired me and I went to work for Oceaneering as an ROV tech.

JT: What type of organization is Oceaneering?

BC: Oceaneering is the 800-pound gorilla in our business. They're probably one of the oldest and most established subsea engineering companies. The started out as a dive company in the early 1970s, when three companies pooled their resources to go after large contracts with the oil and gas companies, and formed a company called Oceaneering. Oceaneering was a diving company and diving contractor until the mid 1980s, when they got into what they called ADS, Advanced Diving Systems.

Oceaneering contracted with a company out of North Vancouver by the name of ISE, International Submarine Engineering, owned by James McFarland. And there's indeed some history behind this, but Jim McFarland did a lot of the work and he's probably one of the legends in this industry; I know him personally, we do business together. Jim started out doing work for the U.S. government and survived a lot of the upturns and downturns of the business by doing robotics. One of the first lines of ROVs that was done for Oceaneering was the Hydra line and that was produced by ISE, and eventually Oceaneering began manufacturing their own ROVs.

Now, for remotely operated vehicles there are three basic groups of robotics. One is called remote-control robotics, the second is tele-operator robotics, and third is logic-driven robotics. The ROV is a tele-operated robotics. If you look at some of the [NASA] Mars rovers and you look at some of the first-generation UAVs, the unmanned aerial vehicles, they're all in the same basic concept. They're all robotics going into hazardous environments. ROVs fit into the tele-operated robotics category.

Now, there's not a whole lot of high technology in these tele-operated robotics. It's just a matter of having a data link between the vehicle and the operator, where you change the point of perspective or point of view from you looking at the vehicle and controlling the vehicle by viewing the vehicle, to you looking within the vehicle looking from the vehicle's point of view or perspective. So tele-operator robotics, and remotely operated vehicles in particular, are just a class of tele-operator robotics. I have a rather lengthy article and a book for when you leave here; I wrote a book specifically about observation-class ROVs.

I had my work with Oceaneering when I got to help with my dad's projects. I was an ROV technician, working on mechanical stuff; then once I left Oceaneering and started a company called Video Ray. The genesis of that was I had a tour company that was doing specialty tours in the northern Artic, specifically the North Pole. We were doing ballooning and parachute expeditions to the geographic North Pole through Russia. On one of my trips over there, I saw a couple of guys that worked for the Shirshov Institute [of Oceanology] in Moscow; Boris Roseman [phonetic] and Liev Utshekov [phonetic]. They were the the ROV techs over at the Shirshov Institute, which was the Russian version of Woods Hole.

They had a small ROV that they had designed to go into the *I-52*. That's the Japanese submarine that was sunk at the end of World War II; it's known to have a whole lot of gold and such in there. At 17,000 feet, it was surrounded by quite an interesting story. But the MIRs, the two Russian submersibles, which you may have seen on James Cameron's expeditions to the *Bismarck* and to the *Titanic*, run by Sergei Sergeivich, [phonetic] couldn't get to it.

The ROV was called the GNOM, G-N-O-M, and it's an acronym for a Russian saying, and I forgot what the saying is [GNOM is a transliteration from a Russian word that means "deep water remotely operated survey micro-robet"]. But when I saw that, I really liked the idea of the GNOM. I had the expertise to bring that to market, but I didn't have the money, so I found someone that had money to back me, a guy named Scott Bentley with Bentley Systems. We went into business and we formed Video Ray and built it up to about a six-million-dollar-a-year company; then I sold my interest in Video Ray and started SeaTrepid.

This company started as a continuation of what I was doing at Video Ray, which was doing hull inspections for the U.S. Coast Guard. I wrote the ROV insert into the Port and Harbor Security Manual for the Coast Guard. Then I beefed up that work and turned it into that book I'll give you a little bit later called *ROV Manual*, published through Elsevier out of the U.K. That was pretty much where we started. In other words, we were doing science work and government work up until the storms hit in 2005, and that changed my world completely.

January 1, 2006, the phone rang, it was guys that were running the Coast Guard Center in Port Arthur, Texas, needing ROV support for the cleanup and for the recovery for the *DBL-152*. That's a K-Sea barge that had struck the remains of a platform toppled by Rita and it dumped 42,000 barrels of number-six fuel oil, the same thing that went down in the Mississippi River; some really nasty stuff. So we went down there and tracked the oil spill.

Then from there, ExxonMobil put me to work for a bit, and later a company called Tetra Technologies out of Houston hired me for a three-day training session that turned into two weeks. Two weeks later they said, "We don't know anything about ROVs and we don't want to learn anything about ROVs. Why don't you man our ROV operation." And here we are, almost three years later, blowing and going.

Our specialty is small- to medium-sized tele-operated robotics. We do crawlers, in other words, internal crawlers that go down pipelines; we do small micro ROVs; we operate a couple of Video Rays; we also have about twenty-five Outland 1000 miniature ROVs. And then the next size that we're coming up to is the Benthos Sea Rover, which are 600-pound remotely operated vehicles. Right now we have one system over in Loch Ness, Scotland, and a second one over in Trinidad, running an umbilical life for Cal Dive.

We are probably the largest of the small operators. We're independent and we work with everybody. We're an agnostic dive company, as we call it. At this point we probably have about thirty people and our operations are worldwide. My background is particularly in ROVs. The people I worked with at Oceaneering were either ex-divers or ex-pilots, and I'm an ex-pilot. I've got an airline transport pilot with about 5,000 hours of flying time.

JT: Who was the Johnston fellow at Oceaneering that you mentioned?

BC: His name is Johnny Johnston. You need to talk to him. He's actually retired and lives in Tennessee. He's a brilliant man; one of the drivers behind the birth of Oceaneering. Remember the three companies that formed Oceaneering? He owned one of the three companies. He retired as senior vice president, he was the president of this company, he was the driver behind it, and then bumped down to a vice presidency once it got to the point where he's a tech guy—and like me. The people that start a company up are different than the people who take it to the public.

Oceaneering is a wonderful company. I enjoy working for them; they have a brilliant team there. We actually picked up our director of operations, James Landry, from Oceaneering. Their loss, our gain, so to speak. We picked him up in January.

JT: Tell me more about why the Hydro class of ROVs that came out in the eighties was developed. Were they used for oil and gas exploration or for tie-ins?

BC: You've got to back up a little bit. The U.S. Navy developed the saturation diving tables in the fifties, sixties, and seventies. The diving techniques, the diving tables, and the diving technologies, then transferred over into the commercial industry. Then the navy sort of lost their saturation diving capabilities.

Now, we're going back to the theory of tele-operator robotics, the bandwidth that goes through the water right now for telepresence. Man in the environment is always going to have the advantage over equipment in the environment. But the environment is a dreadfully difficult and dangerous place to put people in. Currently, you have a thousand feet. Saturation will get you down about a thousand feet and it's very technical, and fantastically expensive.

JT: Explain saturation. Is that in a controlled atmospheric environment capsule that goes down a thousand feet?

BC: Again, you have to go back into the physiology of diving. Saturation diving is when the nitrogen or whatever the bubbles are in your system are saturated. When you take a Coke bottle and you open a Coke bottle, the gas bubbles are saturated inside the fluid, under pressure. Once you let out the pressure, it comes out. The same thing happens to people; you've heard of divers getting the bends.

Non-saturation diving means going down to the environment for a certain time table and getting back up under controlled conditions so that the gases don't come out of saturation, that the bubble doesn't come out of fluid, thus causing decompression sickness. Saturation is actually going down there, pumping yourself down there and staying down there so that if you are to come back to the surface at any time there, the gases are saturated in your blood and you'll blow up like a Coke bottle.

So going down there and leaving yourself down there, pumping yourself, pressing yourself down there to the depth requires that you're down there for a good bit of time. Oxygen anything above 100 percent becomes toxic. So if man is exposed to more than 100 percent gas partial pressure, it becomes toxic, and people go into convulsions. So when you press right down, the variants of the gases inside your blood have to be controlled very closely. If you're down at a thousand feet, and you stay for a long period of time, it'll take you a month to decompress, to get back out of saturation. So it's a rough business. Maybe not a month, maybe two weeks, but it's basically a hundred foot a day.

JT: How long can a man stay underneath the water at a thousand feet?

BC: Well, at a certain point your bones start decomposing. That's pretty well known in the industry as a fast burn. Guys make a lot of money being sat[uration] divers, but before three or four years their body's shot. Even for a twenty-year-old guy, in three or four years, his body's shot. Again, I'm not the expert in saturation diving. You need to get to Oceaneering. One of the helpers in my dad's *U-166* project was a guy named Mark Coke; he's still over at Oceaneering, last I heard. He was a very well-known technical diver specializing in saturation diving.

JT: I imagine that's a part of the motivation to innovate and the need to create a robotic system to do what man has limitations on doing.

BC: Right. Man in the environment is going to have the advantage, but the dangerous aspect of that is what's driving the robotic craze; hazardous duty and hazardous environments create the need for robotics that can work in hazardous environments. Financial cost is another major factor. The cost of us going out there and doing the same work as a diver using an ROV is actually less than a tenth of the diver's cost. And the numbers, as far as danger to human life and risk to human life, are off the chart. The JSA, the Job Safety Analysis, for a dive job is ten pages long. For us it's one, maybe two pages long.

JT: It's economically more feasible and there's also a human safety factor.

BC: Precisely. Safety, security, the whole works. Now, what's happened is that ISO got into the ballgame several years ago and came up with the standards that allow manufacturers of subsea equipment the pre-engineering and pre-setting, that facilitates tooling for ROVs. This way, the ROV subsea can go in and turn the bolts, do the cutting, and all the things that divers would normally do in the past. It's a lot easier to do because they set it up so that it's a lot less technical. Robots can't do small intricate turning of bolts and threading and things like that a diver can do. Robots go in with a big cone so we can stab tools into there and turn with torque tools and pull with linear actuators, with tools that robots use to push and pull and do work down subsea in the construction business.

There are basic classes of remotely operated vehicle. The big boys use work-class ROVs. We are in the observation-class ROVs. OCROV and WCROV, that's your two basic types. Then there's special use, which is the third type of remotely operated vehicle. Special use being like a plow, or something that runs on a rail, or some of the drilling platforms use; basically anything that's special use.

JT: A plow, meaning to dig a trench for a pipeline?

BC: For pipeline, for cable. Subsea plows go from the bank down to about to a thousand feet, I think. It has to be buried per MMS regulations. After that, you can pretty much free lay it down.

JT: Let me back up again. I want to make sure I get the early history of these ROVs. So the military is always in the lead in technology. That's no surprise. They create ROVs and from there it moves onto the commercial side; then Oceaneering is one of the pioneers in taking the navy technology of robots and developing them, manufacturing them, and putting them to use

BC: Applying it to the oil and gas industry.

JT: In what years is this happening?

BC: The mid-eighties. The history of ROVs started out in the late 1950s when they were using close-captioned television systems. Ribicoff is probably best known and he is probably the one who made the first ROV. That ROV, I think, was called the Shin Plongeur. Ribicoff did this, and from there the navy came out with the first-generation CURV, or Controlled Underwater Robotic Vehicle, the CURV 1.

The Navy used the CURV 1 in 1966 to recover the hydrogen bomb that was lost off of Palermo, Spain. That was a mid-air collision between a B-52 and I think a KC-135, which was basically a refueling tanker. Six hydrogen bombs that were ejected during the accident; three of them landed on shore and three of them in the water. One was found easily, the other two were lost. The last one was the worst because at first they couldn't find it. Then the Navy put the *Alvin* submersible down there and actually found it. The recovery was made by CURV 1 or CURV 2, I forgot which one, but that's where the navy came out with that.

Then in the 1980s, the manned submersibles went by the wayside. You just can't afford the safety costs of having a man inside a vehicle versus having the vehicle down there with the man on the surface; the cost is huge. You have to look at the history *Alvin* for instance. The *Alvin* came out, I think in the early 1970s, 1960s, 1970s; it had a titanium frame, fantastically expensive. If you're down there and one little leak happens at 5,000 feet, or whatever the number's going to be, that one little leak, the water will cause a stream that can actually cut through steel. There is that much Delta-P or pressure differential.

In deepwater, the chokepoint in ROVs are the air-filled gaps. All of these things use hydraulic fluids, but the electronics are always in an air-filled container, and that container has to be very strong in order to absorb the pressure from the water on the hull.

Getting back to that, I think the first two or three were made by Jim McFarland. Then eventually Oceaneering pulled the whole manufacturing process down to Bayou Vista, and now Oceaneering manufactures all their ROVs in Bayou Vista, Louisiana.

ROVs really aren't that sophisticated. The ROV itself is made like this. You've got a vehicle. Then the flotation is made by Flotation Technologies over in Maine. Oceaneering uses them as well. The cables are made by any number of cable companies. So basically you got a regular set of cables that are fiber optic, run by either multi-mode or single-mode fiber optic. The power generation is made by regular off-the-shelf AC power generator that goes down the tether. The launch recovery system is made over in West Houston by a company called Dynacon. That's what Oceaneering uses. The frame is made of the local fab shop. The pumps are made by Rexroth, which is a typical hydraulic manufacturing company. The fittings are all industry standard hydraulics made by MPT fittings.

The control system is really the only thing that's special. The control system and the thrusters are made by a company called either Inner Space or Curve Tech. SubAtlantic makes the other ones. Everything there is off the shelf. Then you've got a couple guys over there that do the software for it, but there's nothing really special about an ROV. There are two fiber optics makers. The fiber optics multiplexer is made by an ex-military contractor by the name of either Focal or Prism.

There's really nothing to a remotely operated vehicle; it's the service that you provide, and that's what we have here. I came from the ROV manufacturing business. There's a whole bunch of ROV manufacturers out there. Manufacturing is nothing special; what really matters is the expertise to be able to apply that technology in the field to give the customer what they want. ROVs are cantankerous, quirky things where 90 percent of the problems that you have to do with saltwater interfacing with electricity, because they are all connector-related. What we do is simply provide the service. We know ROVs; we're good at ROVs, that's all we do.

JT: If you're seeing the innovation that comes online in the eighties and probably takes off in the nineties to the way it is today, you can see how, from an oil company perspective, or from an offshore contractor perspective, this is an integral part of a project. It would be safe, then, to say that perhaps ROVs came on stream around the same time as deepwater development. In other words, without having the ability to go 1,000 feet and to tie all of this equipment into position, it was going to be very difficult to succeed without the assistance of ROVs.

BC: The need for remotely operated vehicles is driven by the oil companies. The diving contractors are all divers, and they don't particularly like remotely operated vehicles. The forethought or the vision of Oceaneering is to actually go with the future instead of sticking with diving contracting.

All of the work is going into deeper water, where the future is in robotics. In other words, the diving has now become less of a service and more of a commodity; you need to lead the pack or catch up with the pack, and Oceaneering leads the pack.

More diving contractors out there and they don't like ROVs. You can tell the difference between an ROV guy and a diving guy by the magazines they read offshore. The divers have *Trucks* and *Guns and Ammo*; the ROV guys all read *Computer Shop* and *Wired*. It's a different mindset. The geeks are offshore. The ROVs are the geeks; the rough riders are the divers. The problem with the ROV company is that when it's a subsidiary of a dive company is always sort of treated as a bastard stepchild, where in reality it is the future.

The push into deepwater comes necessarily with ROVs. There's a pilot program going on right now over at Chevron; it's partially sponsored by BP but run by a guy from the Chevron side by the name of Mark Johnson. He's over in Houston. It's a pilot program where they're doing an inspection of the guide wires and the cables with autonomous underwater vehicles, where the robot sinks to the bottom and goes up once a day. It goes up, runs through the lines, comes back down and plugs back into the bottom with power from the surface. It's got some potential. I don't know if it's 2015 technology or 2020 technology, but it's in the future.

There are some other programs that we just implemented for deepwater flotation technologies. And again, since you're looking deepwater stuff, that's at least 1,000 feet. You've got Bullwinkle, which is a fixed platform, I think at 1,500 feet. Fixed platforms, that's yesterday. They have Lena compliant tower in 1,000 feet of water for ExxonMobil, that's also yesterday. As soon as put it out in the middle of the 1980s, it was already obsolete. It's called a compliant [guyed] tower, which is like a radio tower with guide wires going in all different directions. We know that because we worked on the Lena.

The future are the TLPs. The future are these DDCVs, which are Deep Draft Caisson Vessels. They're cheaper, they're easier to put out there and to pull back off. We worked on the *Hoover Diana*, which is a deep draft caisson vessel out of the Alaminos Canyon, I think twenty-five by twenty-five, for ExxonMobil. What you have there is I think a 750 foot tall by about 122 feet wide tube, or big cylinder. That's vertical. There's some beautiful formations out in deepwater.

The oil companies are developing their technology here in the Gulf of Mexico, then taking it to other places. The Gulf of Mexico is politically non-sensitive. In other words, you don't have to worry about the pirates coming out and attacking you; you don't have to worry about a whole bunch of political instability and somebody nationalizing your infrastructure that you just got finished putting in for billions of dollars over in the Gulf of Mexico. The government of the United States is stable. If you talk about places like Nigeria, like Southeast Asia, you never can tell what's going to happen out there.

So what happens in deepwater in the Gulf of Mexico is that the oil companies develop their technology out there and then propagate it. A formation is down there and you've got 100 percent of the oil. Whatever the 100 percent is, 20 percent is recoverable. You can get all that 20 percent of the 100 percent that's in that formation if you take it in processes properly over a twenty- or thirty-year period. You'll eventually get 100 percent of the recoverable oil out of there, whereas you don't have twenty to thirty years if you go to Nigeria, you don't have twenty to thirty years if you go to Southeast Asia.

Because of the economics of the oil recovery for somewhere in Southeast Asia or any politically sensitive, unstable area, it is better to go over there and get 5 percent of the oil, pull it out in two or three years and make your project worthwhile. It kills the formation, but it makes it economically feasible to pull that oil out there. As the price of oil goes up and up and up through supply and demand, technology will eventually advance where we can get that other 80 percent out of there. That's the future.

Right now the technology is changing on a daily basis, they're always coming out with new stuff, everyone's pushing deepwater. We're talking today about ROVs, and ROVs are a necessity for going into deepwater.

What we're doing here is economics. We specialize in smaller systems; we make small- to mid-sized remotely operated vehicles.

A large work-class ROV is a 10,000-pound behemoth. I call the larger systems, "the Oceaneering fear factor." We at SeaTrepid know our stuff. We go out there and we plan our jobs out. If we get out there and we fail, perchance, the facilities engineers will look bad. Management, the command structure for the facilities engineers over with the major oil companies are going to say, "Why didn't you hire Oceaneering?" Whereas Oceaneering goes out there and does it and they fail, then it couldn't have been done. I call it "the Oceaneering fear factor."

But in deeper waters; 1,500 to 2,000 meters, or even deeper, we're able to go into 5,000 feet of water with a small remotely operated vehicle deployed from a 150- to 165-foot dynamically positioned mini supply vessel. We do this economically and still making money at $25,000 a day, whereas an Oceaneering with a large work-class vessel can't do it cheaper than $100,000 a day. So we're better than a quarter of the price.

JT: Let's talk about the service that the small and medium ROVs provide versus what the big behemoth provides. What exactly are the ROVs doing down there?

BC: When I was at Oceaneering, I noticed that 95 percent of what we did was just taking pictures. In other words, all you're doing in taking this 10,000-pound ROV is propelling a camera. So I've heard it said by the guys in the navy—and we had this discussion as a technical and theoretical discussion, which is it's not about the vehicle, it's about the sensors. You've got a vehicle and you've got a sensor. A diver is a sensor and work-package delivery vehicle, if you look at it that way. An underwater vehicle is a sensor and a work package. The sensor package on a diver consists of an umbilical with a camera on it; plus he's got a work package, which are hands. The vehicle is a sensor delivery, cameras, tooling, work-package delivery with manipulators and timing actuators and such.

Let's look at something very isolated, which is turning a bolt at 5,000 feet. Okay, you've got to get down there over the top of this thing, and in order to turn that bolt, you need a socket and a mechanical means of turning that bolt. If you've got a little small vehicle and you turn the bolt, the counter-rotation from that turns your vehicle upside-down.

JT: So you need thrusters.

BC: You need thrusters. But what we do now, if you plan this out, is that you can get the turning actuator; if you lock into it, the bolt turns against itself and not rotating the vehicle. So it's just pre-planning. What we have on our really small vehicles are rotary actuators that are run off of the thrusters. We put 165 volts DC down there and we are able to turn a rotary actuator, to turn an electric motor that's in the gearbox. Well, if you gear-down, they'll turn with enough torque to turn just about anything.

JT: So the subsea contractors who are building the trees and whatnot, like FMC and Cameron, they have now gone by the way of building their equipment to make the ROVs facilitate the actual hookup versus a man down there with a tool or a wrench, is that what you're saying? Is that what has been coming from the eighties, nineties?

BC: Yes. This is sort of coming back into religion issues. At first there was chaos, and then God made standards. Well, at first there was chaos in the electrical industry and then the standards came out with USB, RS 485, protocols, so everybody can play by the same rules.

Same thing's happening here. I'll show you some of the things that we have here. These are some of the tools that are made to ISO standards. They're hot stabs, where you can actually go down there, stab into a hydraulic tool and pump it off the ROV. So an ROV is an electrical vehicle that puts electricity down there to turn a motor that turns a hydraulic pump that you can do many of a number of things with. That right there is a hot stab. You'll see rotary tools in there, you'll see in there cutting tools, you'll see any of a number of things.

JT: This is really fascinating. So these are all components that are fabricated somewhere, maybe by Oceaneering?

BC: Yeah, Oceaneering fabricates to ISO standards. That's Perry; they're independent of Oceaneering. Oceaneering is a diving contractor, Perry is an equipment manufacturer, but they all go to the same standards. This means that FMC makes their subsea trees compliant with ISO 10928-1 or whatever it is, so it runs off of any of those tools, so that this side of it works fine. In other words, the manufacturer's making it on this side and then the tooling operators that run into that all play by the ISO rules, which I think is the Swiss standards organization.

JT: When did all this become standard?

BC: ISO came out in probably late 1990s, so it's only been around for about ten years. Before that, Oceaneering was out there trying to do their work and they didn't have any standards. So we're back to the same thing, which is divers are the only ones with the dexterity to go out there and do the work because they're still making stuff to shipyard standards and not accommodating ROVs. It has been a long road coming out there and it wasn't until standards came about that everyone started to play together and ROVs really started to take off.

Oceaneering was the pioneer; they were the first ones to get out there, and they're still the pioneer. Oceaneering does a fantastic job. We do everything; we're trying to be a mini-Oceaneering, frankly, I'll make no bones about it. I like Oceaneering, I like how they do business, and I like how they run their operations, so we're doing everything we can to emulate them.

JT: Where can I go to find specific dates and maybe some documentation on these ISO standards that were mandated in the nineties?

BC: There are probably some historians over at Oceaneering. I'd go chat with them, because as far as deepwater stuff, they know everything. Those guys are great. The guys over in Bayou Vista are the ROV tech gurus. Talk to Dell Dodson; he was the operations director from probably the early 1990s up until recently. I don't know if he's still over at Oceaneering. The other person you could talk to is Mike James over at Magellan. Guys that grow up in ROVs eventually leave doing fieldwork and become inspectors.

JT: Where are these guys from? Are they from South Louisiana or from all parts of the world?

BC: They are from all over the place. Dell, I think, is from California. Everybody ends up here in South Louisiana because this is where the work is. You get people who are engineers; you get people who are ex-divers. There is all kind of flavor of folks that end up doing this kind of work. Another person you can probably talk to is Mike James over at Magellan. Mike James and John Nealon [phonetic] run what is called an inspect group over at Magellan, and they know everybody. They have a diving contraction section and an ROV section. They've got old gray hair ROV guys, probably about twenty of them and they'll tell you more about it. Again, these guys are fifty, sixty years old and they've been doing this since the eighties.

JT: So Oceaneering was the pioneer and from that there have been a few spinoffs. You were one of them. Are there a few others?

BC: There's Sonsub, owned by Saipem, which is an Italian company. You have Canyon [ROV Systems], which is now owned by Helix Energy and it's a sister company to Cal Dive. That's the old-line guys. You've got Subsea 7, which I believe is a British company. You also want to talk to Drew Michel with Taylor Diving.

For the history of all this stuff as such, look up a site on the Internet called rov.org. Rov.org is the ROV Committee of the Marine Technology Society. I think the Marine Technology Society is a trade group for mostly scientist guys. The Association of Diving Contractors is a commercial group. For the ADC side of it, the trade show is called Underwater Invention and it's in New Orleans every year. The other side of that is the scientific guys, which is the Marine Technology Society. I believe Rob Wernli was the first ROV Committee chair of the Marine Technology Society back in the 1980s. He's my co-author on this book. The present head of the ROV Committee is a guy named Drew Michel. He's from [Morgan City]. He used to work for a company called Taylor Diving where they had an ROV section.

JT: How many ROVs do you have?

BC: Twenty-five.

JT: How many small, compared to the mid-size?

BC: We have two mid-sized, we have twenty-two Outlander 1000s, fifty pound vehicles, and we have two Video Rays.

JT: What capabilities does the fifty-pounder, the mid-size one, have that the smaller one does not have?

BC: They have tooling capabilities. The mid-size system, the fifty-pound vehicle can do any of a number of things. We can turn, we can cut, we turn bolts, we can cut seven-eighths-inch steel rope; any of a number of things.

JT: Do these things weld?

BC: I don't know of anybody doing underwater welding with ROVs, but that's going to be a question for Oceaneering. When you start getting into heavy construction, then you start talking about the big work-class ROVs, and that's not our forté. Tooling delivery and sensor delivery is my expertise.

JT: This is very interesting.

BC: Oh, it's a cool industry.

JT: You gave me a neat description and I want to broaden that just a little. You were talking about a subsea tree and then a bolt. Maybe this is just more for me to understand what is going on down there. If you've got a platform or a floater that's producing, then there's a subsea tie-in.

BC: Right.

JT: You are going down with the ROV to the subsea area and either monitoring or turning and stabbing bolts.

BC: Stabbing tools, stabbing umbilicals, things like that. Traditionally, that's been done with the work-class systems.

JT: Mainly with the subsea or are you also looking at the anchor handling that keeps the system in place, floating?

BC: There are a lot of different things. This permeates many different functions. You have floaters and the moorings in the floaters. We've come up with a patent here recently to inspect the moorings of the floaters. There are risers; we do it mechanically, in other words. I've got a paper I'm doing at the Deepwater Conference in December in New Orleans. This is our deepwater crawler; it crawls the line as opposed to just driving by. These are polyester ropes that are used to moor to these deepwater floaters, there's polyester, there's nylon, there's any of a number of polymers that are used in this. The specific gravity of a polyester line is 1.38, and in seawater, of course, it's 1.04 or whatever the number is. If you've got chain with no flotation, it'll sink your floating production platform. They're using polyester because polypropylene floats but polyester sinks, but just a little bit. Chain sinks a whole lot. So we're now crawling up and down these lines.

JT: Is this in the industry now? Is it being used?

BC: Not yet. We've got our first prototype coming out.

JT: So it attaches to the nylon rope and goes up and down for a few thousand feet and inspects the rope itself?

BC: Yes, it inspects the rope itself and any number of MBT stuff. We have x-rays, acoustics, etcetera. The rope manufacturers are interesting, because they're saying, basically, "You don't need to inspect these things." We've got a bunch of them out there; in other words, twenty or more moorings, and they're good for twenty years." Well, it's twenty years since the first ones were put in, so they're having to rethink their whole thing. If you remember the typhoon that turned over the TLP during Rita and Katrina and grounded Eugene Island Block 313, I think it was, next to the ExxonMobil platform I was working on. So you've got issues with these things. There are inspection issues.

We'll back up some. The old way was having the deepwater platforms back from the times of the Bullwinkle. It meant you had to go out there with a semi-submersible drilling rig, slam a casing in, drill a hole, and then once you're down there, drill a hole, put the casing on there, put a production platform on top of it and then tie into that production platform with a BOP up to the surface. That old process goes from there to the bank.

Well, now with these deepwater floating production platforms, it's another ballgame. For the deepwater stuff, the top of it, there's now one floater with a whole set of completions remotely done and computer-controlled. You drill here, drill here, drill a hole here, and put one production platform with a series of moorings that controls all these things and bring all up into here, into the risers, and then go back down or wherever it's going to be. So it's a whole other ballgame.

JT: It sounds like an underwater world.

BC: It's an underwater world, precisely. Actually, it's pretty cool.

The ROV is the way of the future for doing this stuff. TLPs and floaters don't really do this kind of drilling. The semis are actually still with the anchors out there, drill the holes, come back up and complete it. Once they do that, you put a subsea tree on there and then you can control the umbilical. The umbilical's powered from the production platform.

JT: Give me more of a real-world comparison. You mentioned that you worked on Lena. Give me a run-through of how the ROV operated on a Lena platform in the eighties and then how it's different with the semi-subs in the nineties.

BC: I don't know the history back about Lena back in the 1980s. That would be a good question for some of the guys that were at either ExxonMobil or Oceaneering. I imagine back when they put that stuff in back in the eighties, that probably would have been a diver job.

JT: That was 1,000 feet.

BC: Yeah. That was probably a diver's job. Again, I don't know. That's somebody else's expertise.

JT: Tell me more about Katrina, about kind of the overall damage that was done. There's a lot that we outside the industry don't know about. I'm talking about under the surface. We know about the platforms, the Thunder Horses and whatnot that were knocked out, but what kind of damage was done on the ground?

BC: Well, all of the 118 of the platforms received some varying degree of damage. I have some great pictures here, stuff that we took in the 2006 era. What else have we got here? This is basically what it looks like when something turns over. We got a bunch of shots.

JT: How many employees do you have?

BC: Thirty. Remember when I told you about when we were out there tracking the oil spill? This is south of Port Arthur.

JT: I think I saw that on your website.

BC: This is going out to the Cal Dive; this is the Cal Dive 4, it is about three-fourteen on a Cal Dive boat. Let's see what all I got here. Essentially what you'll see is that all of these platforms had varying degrees of damage. This is one of them here. Subsea number—

JT: What kind of boat takes you out there? You mentioned a utility vessel.

BC: Well, on this particular job, a helicopter took us out.

JT: Is there a special boat that's got special kind of equipment that you guys normally use; is there a particular boat company that you guys go with?

BC: We've been recently using Bordelon Marine because they have small, dynamically positioned vessels. That's where the industry's going. Oil companies don't want boats tying up to their platforms, so the newest thing is called dynamically positioning, you don't have to tie up anywhere.

You've got satellite positioning, and satellite positioning's now plugged into your thrusters on your vessel.

I've have been asked a number of times, "What's the difference between what you guys and the Oceaneering guys do?" It's pretty simple. What they got that I don't have is the old saying. We've got the same camera, we've got the same ROV.

If you go down to a place to go take a picture and you don't have a dynamically positioned vessel up there, you're down on your project and you finally get down there and work your way down in low visibility with the use of a sonar to find your target, and you get to your target and just as you get to your target, the boat drifts off there and pulls you off spot. You know, you look bad. What they have that we don't have is a dynamically positioning vessel. Well, we now have that, because it's now economical on the smaller DP vessels to have dynamically positioned vessels so you have a stationary platform on the top of your work site. You have to either have four-point, or some way of staying over the top of the worksite and do it repeatedly.

JT: You said small Bordelon ships 150?

BC: One hundred and fifty. I was trying to show you some pictures here. This is a great picture. I have one on the wall downstairs. I took this one. Yeah, that right there.

JT: What is that?

BC: That is a big oil slick. That is a 300-foot diving support vessel. This is not coming from that.

JT: This is coming from underground? How deep is that?

BC: Two hundred and thirty-five feet.

JT: Okay, so it's shallow water. Is that a platform that broke off and disappeared?

BC: No, it didn't disappear; it was all down there. [laughs] I've got a video for you too. I'll show you what it looks like down there when we were doing all this cleanup stuff. We'll start here. This is what it looks like when you start going down there. See, this is the reason why we got going over here.

JT: What is that?

BC: This is cutting a conductor.

JT: Incredible.

BC: That's the conductor right there with a circular saw. We got more things that blew up. This is off the [unclear boat name]. That's a small ROV in a cage off of a dynamically positioned boat.

JT: Are you inside or is someone inside with a remote control?

BC: Right. And the next one here, this is on the Ocean Tower [unclear] 313. This is a Cal Dive diver. We've just cut this conductor and we're stabbing tools inside there. This is our ROV manipulator. We're at 160 feet, and this is a diver with an umbilical going to the surface. We're stabbing a tool in there. He just put a wellhead on top of this one.

Let me show you what's happening down here. All this stuff was a platform that turned over. We have to cut it all back. The problem is when a platform goes down, it's now down and it's sitting on top of the well bay. You may have twenty wells down there and all of them have pressure on them. The only thing that's stopping the oil from coming to the surface is an SSCV, a subsea control valve there, and the valves on the wellhead. Because when a storm comes in the Gulf, they close the wellhead and SSCV comes in. So that's the only thing stopping this oil from coming out of there.

So what you have to do in order to get to those casings, in order to plug it and abandon it, which is a requirement so you don't have an ecological catastrophe, that is you have to pull all of the members off of here to get down to the wellbay. You cut here, cut here and the cut here has all this stored energy. But it's cut, cut, cut to get down to there, and then you have to get to the point to where you have vertical pipes so you can do some work on it, because if you try to do work while you're here, you got a mess.

So you have to get the vertical pipe. If the vertical pipe is below the mud line, you got to jet down there in order to get to the vertical pipe so you can start cutting on it. You've got to hot-tap into the well several strengths. You've got forty-eight-inch casing, because you're producing from several different layers. So you have the inside layers, the deepest one, the next one out, and you maybe several different completions.

JT: Let's talk about P&A. Particularly with an aging fleet of platforms or with offshore wells, if we're looking at the stuff on the shelf that was slowly declining in the late seventies, eighties, and the deepwater picks up in the nineties. You have a lot of aging infrastructure out there that the MMS and other organizations are requiring that these independents, maybe a few majors, begin considering the economics of removing. Does that provide the ROVs and companies like yours with potential customers with some long-term projects?

BC: Absolutely. We're a shelf project. Deepwater is the future, we're going into that. But you've got a lot of players. The titans are fighting that one out. We can do deepwater market with really expensive projects, but so far our success has been staying with the shelf projects. The P&A market, with all these sunset projects that are out there, the problem is with $125-doller-a-barrel oil, the MMS states that if your platform doesn't produce for X period of time, it needs to be plugged and abandoned and then cleaned up. The wells have to be cut sixteen feet below the mud line with all the cement into all the producing layers.

JT: You have to cap that, I'm sure.

BC: Right. It has to be capped. Not only does it have to be capped, you've got to pump cement down there into the formations so that it permanently will not ever make its way back up that way.

JT: And that whole process that you just described, including hiring and contracting out for ROVs and divers is, to my understanding, more expensive than the original installation in some cases.

BC: Not really. Well, there was one project, this one in particular you see right down here this was a sixteen pile platform that when Katrina came through, it pushed the platform on top of the well bay and landed on top of there and it started just blowing oil like crazy. The problem was, they could never figure out how deep to cut to get down to the oil because all the oil would come up, hit the platform, and then bubble up on all sides. It was a real mess.

JT: Wow.

BC: This is actually fairly close to Grand Isle, Louisiana, and it's only 95 feet of water. Here we put a micro-ROV in the water and dug down into it to try to ID which one of the wells were there and to get some idea of what's going on with it.

JT: So for a case like this, you're talking about a big price tag as far as plug and abandon, recovery, Coast Guard.

BC: Billions of dollars.

JT: For a well that was maybe producing a few hundred barrels a day?

BC: Well, the reason why this one was so difficult is that the platform fell on top of it. Normally, offshore, if you want to plug an abandon a platform—take the hurricanes out of the equation—you simply come out there with a lift boat, tie into it, go into the well head, from the well head, pump cement down to the well head and it kills all the wells. From there, you cut the conductors sixteen feet below the mud line, pull all the scraps up, put it on a barge, and bring it to the shore. But to pull you either, (a), topple over the platform and have it as an artificial reef, with MMS permission, or, (b), cut it up and bring it back to the bank. That's the sunset portion of that.

With the higher-priced oil going on like it is, the majors are selling it off to second-tier and third-tier companies that can continue to operate at a lower operating cost per day. That's where your Taylor Energies, your W&T Offshores, your second-tier companies have come along.

JT: That's fascinating.

BC: Well, it's an interesting business. It certainly has kept my wife and kids in — —

Unidentified: Diapers?

BC: Diapers.

Actually, this will show you what it looks like right here. This was actually a Tetra project. I don't really want to tell you which one. It shows you what it looks like on a turned-over platform.

JT: Is that the platform in the background?

BC: Yeah, look at that. That's a mess. It's all about 100 feet below the water. The top of the platform is at fifty feet, and it's turned over and it's a mess.

JT: How many platforms were turned over?

BC: A hundred eighteen, in varying degrees. The ones that are no longer on the surface and are completely turned over, 118. I've got some great pictures on here, showing you a little more.

JT: Has it all been cleaned up?

BC: No, we're still out there.

JT: Is the core of your business right now working on post-hurricane cleanup?

BC: From 2006 to 2007, yes. In 2008 we actually started retooling and getting back into production and facilities, platform inspections, umbilical lays, things like that. That's been the core of our business for the past few years.

JT: And some of the fun things you get to do, like go find monsters, right?

BC: Yeah, like go find monsters. There's some more I want to show you. This one right here, this is what it looks like. This one also turned over. If you look real closely, you'll see that we're stabbing, we're pumping cement into this well right here.

JT: You can pump cement with an ROV?

BC: No, this is actually from the surface. The ROV goes down there and watches the tool from the surface. They've got a crane on there. We're operating off of a jack-up barge, a jack-up by rig. This one actually turned over and it chopped everything off. It doesn't kill it all the way down there; it's just the surface that goes over, the bottom part of it actually stays in place. You've got to cut everything off of there down to the point where you're into the well bay. They've already cleared off all the rest of the stuff here, so now we're down there pumping cement. They're actually pulling this off. We're finished pumping and the ROV's down there.

This is one ROV looking at another ROV, so we're actually watching when they're putting it on there. The diver is watching all this stuff come down there, versus the ROV watches all this stuff go down there. If you get real close to it, even with these smaller ROVs, you can push it over a little bit to get it on there and drop it down.

JT: And I can see the cement mixture coming out and he's moving probably from one well to the next.

BC: Right, right.

JT: Wow.

BC: And this is what's going on with that one. See, they put caps on top of these other ones here, and this is what it looks like. It's called wedding caking. If you've got several production strings, you put a well head on top of it, you can squeeze each one of these down there so you can isolate one of the production strings and pump different stuff down there.

JT: And then you said that in order to fully clean up all of this, you have to cut all of that scrap 16 feet below and remove it?

BC: Yeah.

JT: Wow. How do you get 16 feet below the mud line? You got to dig?

BC: Dig, absolutely. Just keep cutting. Once it's killed, it doesn't really matter. You just dig down, you know; jet down to it, chop it, and come back up.

This was also another turned-over platform in the South Marsh area. I'll show you some of the mess when we get a little further into this, because this was a mess.

JT: What's the typical work time for you guys on something like this? A week or two?

BC: Look at all these things we did. These are all turned over.

JT: They're just bent, so you've got to cut it at a straight angle.

BC: This is a mess.

JT: And your guys stay out there for long periods of time?

BC: Oh, yeah. Months.

This is a diving wire that got caught on here, a diamond wire saw. They cut this vertical diagonal. This is what it looks like if you look real close on the right-hand side here. You've got a handle on it, a strap on it, and then it just goes.

JT: And they pull it out and put it on a barge?

BC: Yes.

JT: It didn't damage that saw when it did that?

BC: It cut the wire, but—this is what it looks like when you're actually doing the work.

JT: That's also part of why you can't have a man down there. You get a pipe snap, it's liable to kill him.

BC: This is what it looks like. See, this is it. We're three-quarters of the way through this cut right here.

JT: Is that something that was sent from a vessel, a utility boat?

BC: We're on a barge right here. This is the *Southern Hercules*. See all that stored energy down there? That's what it looks like.

Let me show you some pictures. It's not really polite to tell you which companies these are, but it's pretty obvious.

JT: Let me do this, Rob. Let me go ahead and turn this remote control off.

BC: Okay. I've got some pictures of some damaged platforms.

[End of interview]