SHELL OIL COMPANY

ORAL HISTORY PROJECT

Interviewee: BRUCE COLLIPP

Date: September 21, 1999

Place: Houston, Texas

Interviewer: Tyler Priest

Code: SOC012

Keywords: Prod, Shell, Eng

Bio

Bruce Collipp graduated from MIT in 1953 with a masters degree. He started at Shell in 1954. He worked with Shell's Technical Service Division to develop offshore technology. He is credited as the father of the semi-submersible after the construction and placement of the Bluewater One. His efforts earned him the Holley Medal from the American Society of Mechanical Engineers. He continued working with Shell developing offshore technology, including the Cognac, project until his retirement in 1987.

Summary

Interview has a lot of information on the progression of ideas to a true semi-submersible. He covered the Trident design and most phases of the Bluewater project. There is also commentary on Bluewater 2, and other platforms. He has extended discussion of Cognac, and Shell's technology seminars for the industry.

Side A

TP: The date is September 21, 1999. The interviewee is Bruce Collipp. The interviewer is Tyler Priest. I guess we will start, Bruce, by talking a little bit about your background, your work at MIT and then how you got involved with Shell.

BC: I went to MIT because I was building boat models and took an aptitude test. Somebody said I could either be a marine engineer or a ceramic engineer, and I didn't want to make grinding wheels! I said, "Where do you learn to be a marine engineer?" They said, "MIT," which meant absolutely nothing to me, but I went there as instructed.

TP: Where did you grow up?

BC: Niagara Falls, New York. The biggest boat I had ever seen was a canoe before I got there! It was a five-year course. One year, you had to demonstrate that somebody in the industry would hire or let you work for them. So they helped arrange a job with Lykes Brothers Steamship Company. I went to sea as a cadet with Lykes Brothers. Then I graduated from MIT. I was awarded a Fulbright but I told the president of MIT at that time that wasn't what I had in mind. I went back to sea as the ship's officer and served a year-and-a-half there. I worked for a man that would make Captain Queeg from the “Caine Mutiny” look like a pantywaist. That drove me ashore.

I went back to MIT and got my master's. When you get your master's, you have to write a thesis. Everybody else is writing theses on towing ships down the basin. I didn't want to follow somebody else. I had read some place about this offshore drilling. I think there had only been one rig, the *Hayward-Barnsdall*. I thought about what I would build if I was going to drill in deep water. I had interviewed with Humble and with Shell, both of whom sent me some material on what they had on rigs, which wasn't much. There was a period when the existing requirements for stability should be, in terms of turning over, were being challenged. I sat down and sketched many ways you could think a thing out. That is in my thesis which, being published in 1953, has been cited in defense or offense of many patents, that theses are public domain: "Collipp produced that."

TP: So did you envision a floating rig or a submersible-type rig?

BC: At that time, no. All of these, in effect, were submersibles, or what we called jack-ups today.

TP: So it was kind of a prototype jack-up?

BC: Yes. Were these funny-looking things that didn't look at all like a ship stable or unstable? So most of the thesis was devoted to developing an energy relationship for why things turn over. My naval architectural people could say, "Oh, this is a thesis on naval architecture," not on how you drill offshore, which they didn't care . . .

TP: So this was your 1953 thesis from MIT?

BC: Yes. I think that must have planted the seeds. Why things turn over, why things roll and why things don't roll is partially associated with this energy question. If you have the right energy and the right frequency, things will roll less; things won't turn over.

TP: Are you talking about wave energy or the energy of the structure?

BC: Wave energy and of the structure also. At that time if you would have said, "Are you going to invent the semi-submersible?" I would not have known what you were talking about. In trying to get a thesis put together here, that is probably where it started.

Shell had a technical services division. There were, I think, five of us hired . . .

TP: And the TSD was associated with BRC, right?

BC: In those days, it was . . .

TP: . . . or with Shell Development . . .

BC: Shell Oil. It was downtown, on the fifth floor of what was then the Shell Building. They had four of the technical services division, which was a subsidiary of head

office in New York. There were probably about 15 engineers -- five of us related to the offshore.

TP: But it acted as a liaison between the operators and the researchers, didn't it?

BC: They thought these young kids might come up with something. As proposals went into New York asking for money, they could wire, telex or phone TSD at 8:00 a.m. out of New York, and sometimes apologize. "We don't think this is a good idea. Don't you agree?" We were to come up with technical reasons why they shouldn't spend this money.

TP: I see.

BC: I went to New Orleans to examine the rigs *Mr. Charlie*, *John Hayward* and the *Margaret*. I was went on all three of them. I was a naval architect. They presumed, therefore, I knew about all of these things. And maybe I knew as much as anybody in the world, which wasn't too much! I can recall the time on *Mr. Charlie*. I was there with Doc LaBorde and the rest, and we went over all the stuff. I think it was Bouwe Dykstra, the vice-president or something, who said, "Is this a good idea, Bruce?" or "Will this work?" I had been with the company about a year and I said, "Yes, I think so." Of course, you couldn't say this is better than last year's model, because there was no last year's model.

TP: I think I remember from your earlier interview that the thing was so big that it just couldn't tip over. If you make something big enough, it will survive in 15 feet of

water. The only design criteria was to over-design it.

BC: Yes, this was one of the criteria for the submersibles and the jack-ups. I did use my old energy criteria when *Mr. Gus 1*, the Glasscock drilling rig 1 was being built in Beaumont, and it did not meet Bruce Collipp's criteria for stability. And I met with Bethlehem Steel. Shell had contracted for the rig. Per se, there weren't any written criteria for this. Whether they believed me or knew that Shell was the person leasing this, they did add outboard pontoons on *Mr. Gus 1* and brought it per my suggestion, up to the criteria . . .

TP: Didn't *Mr. Gus 1* turn over at some point?

BC: *Gus 1* was drilling off the Texas coast, I think in the vicinity of Corpus Christi, when a 10-year hurricane came along. It was actually sitting on the bottom. Five legs were in the bottom in an old buried sea bed. As the waves hit it, in effect, they punched through a very thin sand ledge on top of this old buried sea bed. It took about a 40 degree list to that side. The derrick barge comes along to try and bring it into a more upright position. A second storm goes through. The mooring lines fail. The derrick barge runs into *Mr. Gus 1*, destroying it. The derrick barge is hulled. It makes it to the beach, so it doesn't sink. That was the end of *Gus 1*.

TP: You see pictures of that thing and you think, how can this survive these rough waves and tumultuous sea?

BC: Yes. Towering up. It was the first rig that could operate in 100 feet of water, which,

at the time, many people felt, "why"? They never drilled in more than . . .

TP: *Mr. Charlie* was about 20-30 feet, right?

BC: Yes, 20-30. And *Hayward* was about the same. I think *Margaret* was 40-50. So that was offshore, and it is a long ways in terms of water depth. You had mentioned moving them in a water depth that they wouldn't turn over.

TP: Yes.

BC: That was partially a deal worked out through underwriters. I had met with underwriters on what stability should be, and we were getting no place. Underwriters are mostly attorneys. We more or less agreed that as we towed from A to B, if we stayed in a water depth such that one side of the rig would touch bottom so it couldn't turn over, it would be considered a safe tow.

TP: You are talking about submersibles but also jack-ups, too?

BC: Submersibles and jack-ups, right. So if you look at the contours in the Gulf of Mexico, some tows would go 150 miles where they really needed to go only 10 miles if they would have been allowed to go straight across. But we kept them at a water depth so they couldn't turn over, and none did.

I was moved back to TSD in 1956 . . .

TP: You had gone from TSD to . . .

BC: New Orleans.

TP: To New Orleans, to the Delta Division or the Marine Division?

BC: They had a Central Design Group that was all civil engineers. Odeco was proposing these rigs. We needed a naval architect to tell us if what they are doing was sound. I stayed over there long enough for *Charlie*, *Hayward* and *Margaret*.

TP: Did you work closely with Bouwe Dykstra at all? Do you know anything about him? He sounds like quite a character.

BC: Very brilliant, very dynamic and very autocratic. I don't think you could ever question the man's intelligence and the breadth of his knowledge. He could ask excellent questions. If they weren't properly answered, you were dismissed.

TP: He wasn't afraid of challenging head office in decisions or, at least, going to bat for certain things that didn't have unanimous approval in the company, from what I have heard.

BC: Yes, this is just supposition. He was Dutch. At least we all assumed that there was somebody that he talked to in The Hague in Dutch!

TP: He nearly staked his career on *Mr. Charlie*, too.

BC: He was very close to Mr. Laborde, in that Shell underwrote, by agreeing to five-year leases, all of Odeco's early rigs. And they incorporated some of my ideas, too, and were more than willing to . . . If you had what looked like a reasonable idea, let the guy that's paying the check . . .

TP: I didn't mean to get you off track. So you went back to TSD in 1955.

BC: It was probably about 1956. And I was allocated $20,000. "Why are you back in TSD in Houston?" I was told that we should invent a better anchor. I can remember sitting there saying "cavemen tied a rock on a piece of rope and tossed it in the water." Pretty soon, we designed things that had flukes on them. Here is a thing that has been around for ten thousands of years. And I am supposed to . . .

TP: . . . be able to make some improvement.

BC: . . . considering as many ships and as many other people who thought about what makes an anchor. Later on, I would introduce some of the new anchors with bigger flukes. They were called mud hooks at the time. Yes, I am an inventor, so credited. You can't sit down and tell a person to invent something new. As we do this interview, I think part of the thought process started with my thesis. Part of it started as I rode out with *Mr. Charlie* and *Margaret*.

TP: You were on the rigs during their maiden voyages?

BC: Yes, I was 26 years old or so. Laborde and everybody else were quite a few years older than me. I was thinking these people must know what is going on. I discovered that wasn't necessarily true! But I can still remember vividly with *Margaret* a storm that came up. Not a severe storm, but 10-15 foot waves. The owner of the well sites thought that this rig should be allowed to go on a jacket. We would pull it up to a preinstalled four-piled jacket that they were going to drill the well through. We had ballasted the hull so that the hull had gotten under water, and it was sitting there riding on the columns waiting for the waves to subside. This compared with our tow-out when we were on the big flat thing. And I could recall thinking when this hull gets under water and it is riding on the columns, it is sure a lot more comfortable and doesn't move around as much. So I've got to suspect that that is another thing that was implanted in the subconscious someplace.

TP: I hadn't heard that before.

BC: Nobody sat down and said invent a better floating drilling rig. That was never my charge.

TP: How do you make the imaginative leap from submersible ideas to the semi-submersible? When looking at development of offshore technology, or any technology, and talking to engineers about this, there are incremental increases in knowledge. Then occasionally, you have these bolts from the blue which make a quantum leap in technology. So it is interesting to see the various sources of inspiration.

BC: Right. I had many good offers in shipyards but to improve on something that already existed never intrigued me.

I think those are two things that were in my subconscious or conscious. I did go out to the West Coast where *CUSS 1* was drilling a ship. In the Santa Barbara Channel, the swells and waves come in from the Pacific and go down the channel. If you align your ship with the swells, with the bough into it, it rides pretty well. While we were out there, we got a storm whose name I forget at the moment. It came out of the hills there and hit us broadside. *CUSS 1* suspended operations and rolled violently. It was obvious that ships weren't any better than rectangular barges unless they were properly oriented. Once again, nobody had said to invent a semisubmersible or floating drilling rig. But they must have data inputs.

I did go back. With the $20,000 I was supposed to spend on anchors, what could you do? I first designed a circular rig called a doughnut -- a big, round rig with a hole in the middle, to more or less prove the thesis that if you had a thing that had no bough in the stern, that wasn't necessarily the answer. It was still going to act like a raft floating on the waters. I designed a thing called the "Trident," which had three columns.

TP: I have seen photos of that.

BC: Yes. There was going to be this new thing whose natural periods of pitch and roll were out of the range of the natural periods of the oceans. Leon Boardman and a few others . . . If oceanography hadn't improved its knowledge of the oceans, I don't

think I would have improved floating drilling.

TP: Leon Boardman?

BC: Boardman, yes.

TP: Now, where was he?

BC: He was in TSD. He was our oceanographer. Actually he was a mathematician, but I can remember chatting with Leon.

TP: Were you in communication with oceanographers and scientists at universities at this time?

BC: No. I think I was aware of Reed Breckschneider at A&M who was doing some work trying to calculate force on stuff. When I was trained as a naval architect, you were taught the trochoidal waves theory -- water particles web in circles, the big circle at the top of the water, decreasing circles all the way down. What you did with this, they never taught me at MIT other than that is what the ocean looked like. So I don't think the thought of periodicity of waves was commonly understood in academia at that time. I think Shell and others better understood it. Therefore, if you combine the thought that the waves have a periodicity and if you design something that is way beyond that range of periods, it doesn't have time to move.

TP: Enough time to respond.

BC: Enough time to respond. Right.

TP: No one built the doughnut, or was that . . .

BC: No, it was the design approved. It wasn't a question of bough stern, or shape. But if I make a perfectly round rig, which has no preferential orientation, it isn't going to behave significantly better than a barge or a ship.

TP: How about the "Trident?"

BC: The "Trident" was my contribution. This is what they ought to look like. I ought to have this . . .

TP: Was that just a design, or did they actually build a ship, a scale model?

BC: I made a model that I carried around for show and tell. I went out to the University of Berkeley in California with my $20,000 and said, "Yes, we want to make a model of both of these," both the Doughnut and Trident. We want to run them in your wave basin in a board configuration, and I think this is going to demonstrate that the funny-looking triangular one has vastly superior characteristics.

TP: Was the Trident a . . .

BC: True semi-submersible. Right. At that time, the name hadn't been invented. It was

Trident like the Trient that Poseidon used to pierce the ocean bottom. That is where I thought of the name. Plus, it had three columns; it was three-sided. The triangle is the strongest structural configuration we can think of.

TP: The triangle?

BC: Yes, the triangle. It was tested. We made . . .

TP: What was the reception by the people at Berkeley? Did they think, what are you doing this for?

BC: More or less, yes. I don't think . . .

TP: Was there any interest in it?

BC: There wasn't any great excitement, no. A man by the name of Johnson was head of the department, and Bob Wegel with whom I have maintained a relationship over the years. It was actually in the Department of Civil Engineering, but they had this nice, not a long narrow basin like naval architects, but a big wide basin where you could move and moor things. I, in effect, was in residence most of the time we ran the things, and directed the tests myself. We were paying the bill. In those days $20,000 would fund a lot of graduate students for a long time.

Joe Chalmers was the Director of TSD. I had these motion pictures shot, and in effect, you used those. We didn't have sensors in those days to track how a thing

rolled and pitched. So you took high speed camera pictures of it. We ran this against a grid of string in the background, and graduate students sat down, looked frame by frame, and plotted this stuff. I showed those pictures to Joe Chalmers and he had one of the old style projectors that has a reset on it where you can slow things down. When you run models, you have to scale time, and the model goes much faster than real time. But with his movie projector that he brought from home, we cranked the speed down to approximate how things would move in real time rather than model time. He was quite impressed. He thought this was neat. I wrote some reports that were well-received and, in effect, said, if you are going to float and drill, this is what you ought to have to stand on.

TP: This would still be about . . .

BC: 1956 or 1957. There was nobody in Shell who either understood or perhaps cared that much. Like I say, I was hired as a naval architect. Many people understood drilling. Many people understood blowout preventers. Geophysicists were there. The production departments and major oil companies were not marine-oriented.

TP: Was there a sense that 100 feet is as far as you were going to go offshore?

BC: Shell had bought some leases. We spotted our first well in 297 feet of water. I wasn't let in on any secrets. The thought was that at 300-500 feet of water, there could be interesting hydrocarbons. Trident was the proposal. I was moved to New Orleans where, if something was done, it would be done out of the New Orleans area. I think head office, and especially, Burt Easton, was anxious that something

new be done. I don't know that Burt understood any of the science behind it. I think he had great faith in those of us that were working at that time.

We talked about the well that had to be drilled, and the lease sales that you have talked about with Billy Flowers and Mike Forrest.

TP: The 1962 sales or earlier?

BC: 1962. The question of what should we do went on hold. One, Shell owned very few rigs. Two, we got all of our shallow water rigs from Odeco. That is how you did things. I'd better leave it at that!

So should Shell build and own a rig itself, which, in effect, is what Trident might represent? As these lease sales approached, time was running out. In terms of getting a well drilled, which is what exploration was interested in, who cares how? I think certainly, in those days, the industry was in its infancy. If we really didn't know things, we might drill three dry holes. Nobody, to my knowledge, was that enamored with anything beyond 100 feet of water. Shell had the only leases, I believe, beyond 100 feet of water.

TP: These were leases that they got when?

BC: I don't honestly know.

TP: But some time in the late . . .

BC: In the 1962 lease sale, they got them for a very small amount of money. They were way out there! That is interesting! I think some of our competitors thought, who cares? There isn't any oil out there. Even if there is, there was nothing you could do.

TP: But Shell was planning to get these deep water leases, or hoping to in the 1962 sale. Then that set in motion this search for something they could drill on those decks?

BC: Yes. I want to backtrack, because Ned Clark, in about 1955 or 1956, had this little offshore group in the Technical Services Division. Ned Clark was the Executive Vice-President. He was convinced that engineers and technology were what was going to profit major oil companies. He gave this talk several times about how Chevron, Standard of California, had lots of undeveloped property in California on the West Coast. They were tied in with the railroads and with the state government. Exxon had the King's Ranch and lots of other undeveloped property. Texaco and Penn in Louisiana had lots of property. Mobil had lots of undeveloped property in West Texas. Shell didn't have hardly anything. The only place left for us to stake a position was offshore. "That is why you guys are on the payroll. You've got to come up with the tools where we can operate offshore in shallow water. How are we going to do in the deepwater? We will fund you. We will support you. We will keep you very secret." We were very secret, not only externally but even inside.

TP: Even within Shell.

BC: Within Shell. Yes because there was a merger between TSD and Shell

Development, and the senior people in Shell Development were not privileged to know what we were doing. We reported directly to a guy at head office.

TP: They didn't want anything leaking out.

BC: Nothing should leak out, right. My model was kept in a locked box.

TP: The Trident model?

BC: The Trident model, right. A whole new class of reports was developed.

TP: Were they worried that it might get out running tests at Berkeley?

BC: Probably, and I was a little bit, too. I tried to get a vow to never publish from Berkeley, and you can't at public universities. They did agree not to publish anything for five years. Shell went along with that. There were very few basins that could handle a test like this.

TP: So you had to go there.

BC: Yes. If you focus your technology on an area that you want to work at, you will succeed, especially compared with your competitors. And if you can develop this, then you can buy leases that other people will think are foolish. Not only that, you can get them at a very reasonable price. We can get an inventory of property like our competitors have that we can hopefully explore and develop the reserves that our

competitors have.

TP: You are still running on faith that the technology will bring you out there. People had a lot invested in you and were counting on you. Did you feel pressure at all? Did you feel liberated by the freedom that they gave you to imagine things?

BC: Slightly liberated. I guess until somebody says, "We've got to have a floating drilling rig and get this well down; therefore, we are not going to build Trident. What else do you have in mind, Bruce." In fact, having developed Trident in 1957, 1958 goes by. At this time, computers can take three days. You can run a computer thing now that will somewhat simulate your model test. I think it was work on subsea blowout preventers and marine conductors. Those things were going on. We were testing them out in the field. I was partially . . . I shouldn't say bored, but a little frustrated. We got this thing, what next? That quite often happens in big companies.

TP: That is about 1959?

BC: Yes, late 1959, I think. I was moved to New Orleans, and I was aware of the *Blue Water 1*. It had two attractions. It had some of the same hydrodynamic properties that were incorporated in Trident. So it should bounce around as well as . . .

TP: And *Bluewater 1* was the semi-submersible . . .

BC: It was a submersible. And there was a period of time where the boundary between

the state and the federal government was in contention. In effect, both ends, "O.K., well, we will just stop drilling until we figure this thing out." So most of the rigs were sitting idle.

TP: This was with Louisiana, mainly?

BC: Louisiana and the United States government. Yes, should it be 12 miles, or should it be 22?

TP: The Tidelands came first, but I think Louisiana kept challenging, right?

BC: Yes. There, in effect, was a big advance in water depths of B*lue Water 1*. If you are in 20 feet of water or less, everybody knew that was the states. But somewhere beyond that, we weren't going to do any drilling or producing.

Blue Water had another asset. It was the only rig Blue Water owned, and the owners of "Blue Water" were four small producing companies, probably individuals in those. I remember Ostril Oil was one. Therefore we entered into an arrangement with them. Some of the other contractors that had started offshore companies, had rigs with other major oil companies, albeit, shallow water rigs. Nobody had a semi-submersible. But we could more or less maintain the secrecy. I called Mr. Sam Lloyd, who was president of Blue Water. He didn't know me, but he knew Shell. I said, "Sam, I need to talk to you." He came over and I said, "Here is the deal. We will enter into a five-year contract. We'll lease the *Blue Water 1* for five years, under two conditions: 1) Whatever we do with it, you cannot tell anybody; and 2)

You've got to let us do whatever we want to do with your rig." His rig had been idle for about six months so he said, "Bruce, do whatever you want!" I remember he said, "Paint it red and yellow." Shell colors. Yes, five-year contracts at that time were unheard of.

We checked a few yards. We entered into an arrangement at Ingalls. I went to Ingalls with *Blue Water 1*, and it was converted into a semi-submersible. It went to sea and drilled.

TP: What were the main things you had to do to convert it?

BC: Some changes in the ballast system and of course, add a mooring system. I don't know if it is that well-understood. Prior to *Blue Water 1*, all the mooring systems were chained. There were some things called drilling tenders out there. You went out to a buoy and you had chain. If you are going to drill in really deep water, wire rope is much stronger and weighs much less than chain. I said, "I think we ought to probably switch over to wire rope." I talked with many "experts" in the field -- marine people -- and wire rope was not what you use in a mooring system. Ships carried chain. People like the American Bureau of Shipping and the rules and regulations dictated what size and kind of chain. Chain is what mooring systems were made out of. So one wire rope as a mooring system, and how you built a mooring system for 300-400 feet of water was a challenge.

TP: The mooring system was basically several anchors?

BC: Yes, several anchors. And this is where you . . .

TP: In an array around a ship?

BC: There had been a little work I had read about where somebody had said in soft soils, maybe we need a different type of anchor. At that time, anchors were designed to be rugged pieces of equipment that would hook onto something, whether it was rock bottom, a sand bottom or maybe mud. And you had to be able to dislodge them and pull them up. I went to the leading anchor manufacturer at this time and said, "What we need is anchors with bigger flukes because where we drill, the bottom is very soft. So they've got to present more resistance than the anchors you are drilling." They then modified one of their anchors and dubbed it "mud hooks." These weren't anchors; they were mud hooks that this offshore industry . . .

TP: They couldn't grab on too tightly because you had to dislodge them?

BC: Yes. In effect, you have a line and back to it, but you pulled them out backwards. The crown buoy had seen service in other places, but I think the anchor industry had never thought about that. But we didn't invent that. The mud hooks and the wire line were first done with *Blue Water*.

TP: And then the pontoons on the . . . was that on . . .

BC: The lower hull?

TP: Yes, the lower hull.

BC: If you would keep the thing floating, it would look like this, no. The pontoons and the submersibles, be it *Blue Water 1* or the barges under the bar grip that *Hayward*, *Mr. Charlie* . . . That is what sat on the sea floor.

TP: But you didn't do anything to convert it?

BC: No, other than some changes in the ballast system, adding some more pumps and rerouting some ballasts.

At that point in time, Paul Wolf and a company called Kerr-McGee had built several of the newer, innovative rigs. In effect, the *Blue Water* was a hull. When it was built, there was some stuff left over from a Kerr-McGee rig. The yard said, "You know, we can build this rig for less money because we got all Kerr-McGee's canceled building. When "Blue Water 1" was drilling out there . . . Senator Kerr was a big-name senator from the big oil industry in those days. He personally circled the rig in an airplane and then in a boat for many days. Many people took pictures of us. We wouldn't let anybody aboard. We wouldn't tell anybody what we were doing.

TP: And the *Blue Water 1* was being converted in the shipyard under tight secrecy.

BC: It was top secret, yes.

TP: In the early interview, you said you were . . .

BC: Laying alongside the world's first nuclear powered attack submarine. Me and the guy that ran their security!

Where we were and what we were doing that wasn't let out. Of course, our agreement with Ingalls was, you won't tell anybody we are here and what we are doing. It could be why they . . .

End of Side A

Tape #1, Side B

TP: When *Blue Water* made its first trip, no one was let aboard. It wasn't like with *Mr. Charlie* where you had a big celebration with all these people following along.

BC: No, we snuck off in the middle of the night. In fact, I was the only one at the shipyard. I went aboard the rig, got it hooked up and off we went. Some other Shell people flew out by helicopter and met us en route to the first well. Absolutely nothing.

While I was in the yard, Bert Easton, the Vice-President of Production, and Bouwe Dykstra visited the yard. They flew in on a small plane. They didn't want anybody in the yard to know they were there, and they didn't want to meet anybody in the yard. Whether they didn't want to be bothered, or whether it was part of the secrecy, I don't know. Those were my instructions as the sole Shell engineer in the yard.

TP: How did the Blue Water perform initially? Was it to your expectations?

BC: I think probably beyond. In terms of motion, we were doing fine. This is what I knew would happen. Many other people were really impressed. You could stand with 15-18 foot seas, 60 mile an hour winds; you are holding onto stuff walking down the deck and this darned thing didn't move. Rumors went out that we were sitting on top of a coral reef.

TP: I remember that the crews didn't even know that you were floating.

BC: The *Blue Water* crews knew we were floating but not the contract crews we brought out having something done with some welders. They cut off a little piece of plate and it fell in the water. I said, "You know, that thing just fell nearly 400 feet!" He said, "What do you mean?" And I said, "Well, you know, we are about 60-80 feet above the water right here. It is almost 300 feet down to the bottom of the ocean." And they said, more or less, "bullshit." You could see our convoy sitting out there and he said, "All those are sitting on the bottom. They can't be 300 feet over here. They are not that far away." They said, "No, those are floating, too." We had a couple of people quit. "This isn't what we had in mind. You don't sit out here in the middle of the Gulf of Mexico in something that floats!" And it was literally out there all by itself. Nothing else could operate in more than 100 feet of water. Most rigs were back in 60, so it was . . .

TP: What depths did it start out?

BC: 297. I remember when we went on location, we were sounding the bottom, and they told us where we were going to be. We were literally measuring the water depth, measuring with wire line, and someone said, "297." I said, "Damn. Let's scooch her over to 300! Why can't we be the first rig in 300! That is three times bigger than anybody else." It was 297 and performed well. My concern was structural. I don't know exactly what the requirement should be for a space frame. We knew how to build ships, so if you built a ship in accordance with ABS or whoever's rules, you could say, my ship is structurally sound. In the submersibles, of course, they would float a little bit, but then they were built to sit down on the bottom and stand as a

stationery building being impacted by waves. This was the thing, sitting out there, rolling, pitching still somewhat, and certainly, heaving. And it wasn't structurally sound, so especially during the early weeks, I used to walk around asking could you hear anything that you shouldn't hear?

TP: Like being in a new house.

BC: Exactly.

TP: You were worried about the structure of the house.

BC: Yes. We had strengthened some parts of the rig, but nobody addressed the thought of what a floating space frame, if you will, should be. I didn't know what the ground rules were either. But it performed well.

Another sideline story. You carry insurance. Blue Water couldn't get insurance on this thing unless we explained to underwriters what this thing was. And people in Shell were telling Blue Water, "You shall get insurance," and Blue Water was telling me "We've got to tell them what this thing is," and I was telling them, "Well, I've been told you can't tell anybody what this thing is." Eventually, I got Mr. Pittman, who was the area manager, to agree that I could take a representative of underwriters who was a naval architect and ran their office in New Orleans, out to the rig for a visit. I couldn't tell him anything or explain anything to him, but he could visit the rig. Helicopters only flew at night, but we caught the last helicopter going out at night. We landed on the rig. The seas were very rough -- 16 to 18 feet. We had at

least a 50 mile an hour wind, and we are drilling. We got off and went down into the quarters, we were sitting in the quarters. You could see flying out here how rough it was that and the rig wasn't moving. The guy was quite impressed. Pretty soon, he said he wanted to go outside and look. We were supposed to keep him in the quarters but you can't go on the floor. There really wasn't that much to see but he couldn't go on the floor. He was on the heavy-set side. The wind is blowing about 50 miles an hour and it is raining. Literally, you had to hold onto the handrails to go from out of the quarters up to the bough of the rig. Your clothing was flying around!

TP: And the rig wasn't moving!

BC: And the rig wasn't moving. We went down there. As part of the drilling equipment, there were five guy lines. And so, it turned out, as we got there, the five winches that handled the guy lines wound up at that spot. They were on the main pipe rack deck. He stood there, and looked at those and said, "Oh, that is what it is all about." I said, "What's that?" He said, "Well, I can see these winches and those five lines going down." He said, "That is why we aren't moving." I said, "No, those are guy lines for equipment I can't talk about." And he said, "Yes." Anyway, we turned around and went back. Having discovered our secret, we got insurance.

And that was reported in one of the New Orleans papers, that we had a yo-yo mooring system, in that our mooring system actually took off under water. You couldn't see it. If you flew by the rig, it came off the bottom of the hull which was very unusual, just the way I wanted it. But you could see these five winches and you

could see these five lines going down, and it was reported this was a new yo-yo mooring system that went on at the bottom of those lines, with thousands of tons of concrete. And that was keeping the rig from moving.

TP: When you were talking to the underwriters, they asked you what is this kind of vessel? That is when you said it is a semisubmersible?

BC: Close. Yes. I had forgotten that little vignette. Shell and offshore industry was concerned that as we went offshore. The maritime unions -- master mates and pilots union and marine engineers, beneficiary associations, the National Maritime Union -- didn't want to have these things called ships. We were careful not to write anything that referred to these things as if they were ships.

TP: Then you would have to employ the union . . .

BC: The concern was that maybe we would have to employ unionized people from the marine maritime unions. When you build something, it goes to sea and it is a vessel. It is then registered in some country, and it is usually then classified by some classification society. In effect, somebody says this meets our rules and regulations. There weren't any rules and regulations or anything like this, so that wasn't a problem. But this was the thing. I said it probably should be endorsed/registered with the Coast Guard. However, it didn't transport cargo from A to B, it didn't transport people from points A to B, and it wasn't there for a ship. Therefore, the thing had no Coast Guard jurisdiction over it, but it was a thing out in the water. At that time, the Coast Guard, other than aids to navigation, had no jurisdiction on fixed

platforms. You can more or less do your thing. I thought we probably ought to go to the Coast Guard and at least give them the opportunity to either turn it down or to say, "We don't have any jurisdiction. Good luck!" I had several meetings with them. In New Orleans, they didn't understand it. In effect, we had written letters out of Ingalls at that time to the Coast Guard saying, "We're building this thing. If you guys want to have a hand in having this registered with the Coast Guard, let us know." And we got zero response.

Finally, I drove to Mobile, Alabama, where the district was located. Captain McFall . . . unrolled the prints. He said, "What is it?" I said, "Well" -- and this is what I had used with most of the people I presented it to -- "It's like an iceberg." I said, "Most of the mass is under water, and you know, icebergs don't roll and pitch very much." If you tell most people that, they'll say, "Oh, O.K. I know about icebergs." If you told them this has a natural period of pitch and roll, it is out of sync with the period of the waves, you can see their eyes glaze over.

They looked at it. I said, "Yes, if you look at the plans and see all the hulls down here, all of the hulls are under water." And he looked up at me and he said, "Collip, if all the hulls are under water, it is going to sink." So he said, "I don't know what you are describing to me, but this thing is going to sink." And I said, "Well, no. See, it's got these columns in the corners that come up and they go through the water plate area, so it is kind of semi-submerged. But the hulls are under water.

There is a form you've got to fill out, and the first thing, in effect, says, what is this? So he wrote down . . . it was a lot bigger than he thought. There were going to be

people on board. So he called it a super-manned barge. It didn't have any machinery. The next line wanted to know what that was, if it was non-propelled. And then, the question was, what, in effect, what distinguishes this from something else. So, I talked some, and we got back to this. I said, "Well, you know, it is kind of a semi-submerged thing." And he said, "Well, we'll just put down semi-submersible on that line." "That's O.K. with me." The name stuck.

TP: Yes. Great story.

BC: It was not my name. I am the guy that came up with semi-submersible. In a paper in 1955 we wrote, I did come up with "jack-up rig." That is how they operated, and I don't know why . . .

TP: So, how much more work did the *Blue Water* do? You had a lease for five years . . .

BC: I was then transferred to the west coast where we had some shipshape rigs operating, *CUSS 1*, *CUSS 2*.

TP: Shell was a partner in these?

BC: In the CUSS group, yes. And they were largely exploration type rigs. There was a lease sale out there in northern California, Washington . . .

TP: Would you call *CUSS 1* and *CUSS 2* drill ships?

BC: Yes, right.

TP: They mainly do core drilling?

BC: At that time, they were built to core. The state of California said you can core out here as deep as you want, as long as you don't penetrate a hydrocarbon zone. The reason you are coring is because you don't know where the hydrocarbon zones are, so you kind of core away. Exxon or Humble had the *SM1*. Chevron had a rig. *CUSS 1* was the biggest. I went out there. They were built to drill these cores. After you find or think you find something, they might have a lease sale. I guess we'll rig them up to drill for real. For *CUSS 1* I don't think, being a converted YF, that was never envisioned. *CUSS 2* was built with that thought in mind and did do that.

I was Division Engineer out there. We acquired all these leases on the coast of northern California, Washington and Oregon, and especially the Gulf of Alaska where storms developed that were very large, very fierce. In the Gulf of Mexico, the weather is associated with northers that we track across the United States, or hurricanes that we can track. Off the coast of California, Washington and Oregon, there was nothing at that time, other than the track the development of storms. And they roared on within 24-36 hours. A lot of ships are sunk in those waters. To me, it was obvious that shipshape rigs weren't going to be able to drill those leases off California, Washington and Oregon. We were going to need a new type rig. We did go out . . .

TP: Did they transfer you to California to address this problem or did you figure it out on your own?

BC: They had a Marine Division out there. We were developing the Molino gas field that had been discovered by *CUSS 1* and *CUSS 2* was drilling it. I was party to one of the first mixed gas diving crews, a thing called Trimix at Molino. Shell had a big hand in that. I talked them into Trimix.

Going back to the floating drilling rigs, we were turned down by New York on a couple of occasions. We had gone out for bids. A man by the name of Dale was, I remember, the area manager. He kept telling me, "Don't worry, Bruce. They are just having a bad day in New York." We would take the *CUSS 2* to some acreage in the Gulf, in the Cook Inlet up in Alaska. It would drill during the winter time down in the Santa Barbara Channel where the weather wasn't too bad. In the summertime, we would go up and drill some wells in Cook Inlet. Then we bought 95% of all these leases off northern California, Washington and Oregon. They more or less told me, "O.K., why don't you have *CUSS 2* drill one of these wells?" And they'd go to work. I doubled the AFE and a few other things that, never mind. So we anchored up off of Point Raisin, California. The storm was pounding us. We were down 80% of the time. Everybody was getting worn out, bruised and battered -- and so were the rigs. I can't remember the depth we got to, but it was like a couple of thousand of feet on a 10,000 foot well. We'd overexpanded or doubled AFE. They probably said, "O,K., you can build a new semisubmersible if that is what it's going to take." So we built *Blue Water 2* in Oakland, California.

TP: Was it basically the same design as *Blue Water 1*?

BC: Very similar to *Blue Water 1*. On *Blue Water 1*, I wanted to move the draw works back into the center of the rig, so that when you land casing and things that go up and down it was more stable. On *Blue Water 1*, we'd land a casing string, the wave would come off and the rig would really rotate, if you will, pitch to release that weight. It was dramatic! I suspect I was told that if we had the rig place on the end, it would be safer. I argued that even though the blowout preventer was going to be 300 feet below us, in the case of a blowout, the gas won't necessarily go straight up. But it was decided that we ought to have it over the side of the rig. I suspect that when we did *Blue Water 1*, somebody said, "If Collip is wrong, and we put that rig in the center, we won't be able to use it as a bottom supported submersible. We will be tied into that damned five-year lease, and who knows what?" Nobody ever directly said that to me, but *Blue Water 2* proved that we knew what we were talking about. We put the rig in the center and had an improved mooring system.

TP: And you drilled all along the northern . . .

BC: Yes. Many dry holes off the coast of northern California! Quite a bit off Washington and Oregon?

TP: Did you drill up in Alaska, too?

BC: I never did. I was given an assignment in Lafayette. I was gone when the second lease sale occurred out there in the Santa Barbara channel, and Shell got aced out to

the dismay of several of us, and certainly to the people out there.

TP: *Blue Water 1* made its voyage in 1962, right? *Blue Water 2* was built when?

BC: 1964 or 1965 and drilled in 1966 or 1967. We got in trouble with the piledrivers union in Oakland. In fact, work came to a halt. We had the commissioning, but the rig wasn't finished. What the crews built during the day, the guys would tear up at night. There were several occasions when people would negotiate the deal with Kaiser. Kaiser, in effect, couldn't control the unions. We did engage two big Dutch tugs. It is illegal for a foreign tug to pick up a cargo and go port to port in the United States. And a lease offshore was considered a port in the United States, so we could not tow the rig from Oakland out to a lease. We'll tow the damned thing out of here, I'll hire my own crews out there and we will finish it.

I still remember meeting with Al Curry. He owned a tug in San Francisco. I was having dinner with him and I said, "I want to engage you to tow this rig out of the shipyard, out into international waters where two big tugs will pick it up and take it from there." This guy knew about the labor problems and said, "You know, everything here in San Francisco Bay is unionized. If I make that tow, that may be the last job I ever have." I said, "Well, what will it take to do this?" He said, "Shoot, I would like to help you, but it may put me out of business." I said, "What is your tug worth?" At the moment, I can't tell you, but he gave me a number and I said, "Well, guess, what? That is what we are going to pay." He said, "Oh, O.K." I said, "That way, if you don't go out of business, you got a free tug. If you do, you can take the money and go do something else." So some of us went down about

midnight after the crews had knocked off. It was dark, and the tug picked up the lines. We literally fire axed the lines holding it to the dock. It was afloat at this time. In the middle of the night, in the middle of the fog in San Francisco, we towed it out of there. Public relations was a little upset because the only pictures they got of it was partially in a fog bank on the wrong side of the Golden Gate Bridge! We towed it out to sea. The big tugs picked it up. We anchored it and finished building the rig out there.

In effect, the hull, drilling equipment, and crews came from an outfit called Home Welders in the Gulf of Mexico. We moved our headquarters into a Holiday Inn in South San Francisco. The union couldn't find us. Kaiser was in between; they didn't know we were going to do this.

TP: I guess that is the nice thing about having a vessel that is stable out in the water. You can do all sorts of things out there.

BC: That's right. It serves as a good platform to finish itself.

TP: Meanwhile, the *Blue Water 1* was still drilling in the Gulf of Mexico?

BC: Some time after *Blue Water 2* went to sea, I was out on *Blue Water 2* when I got a radio call from *Blue Water 1*. I was impressed. This was 1964, roughly. A guy offshore in the Gulf of Mexico can talk to a guy off the coast of California. Today, everybody would say, ho-hum, I can do that on my telephone. That was not true in 1964. That was the most impressive thing. They were securing for a hurricane, and

they had to start it soon enough. But they weren't going to have time to pull a marine conductor. If they didn't pull the marine conductor, they asked what should they change in the securing scenario I left with them when I left the Gulf of Mexico? Offhand, I can't remember anything dramatic that I would change very much. That hurricane came through. It spawned a tornado, and *Blue Water 1* capsized during that hurricane. And that was its end.

TP: Which hurricane was that? There were two in 1964 and 1965.

BC: Yes. it capsized the rig. I heard nothing more about it. A year later, underwriters made three unsuccessful attempts to write the rig, which is a story I tell as part of a lecture. A second hurricane, almost to the day, went through the Gulf of Mexico. The rig was floating upside down. It had only a small portion of the mooring system they had installed. It fills that mooring system, drifts across the Gulf of Mexico for 14 miles and slams into a Shell platform, which had just been constructed. My boss said, "we're going to sue those son-of-a-bitches." I want you to work on this, Collipp . . .

TP: For people who were trying to avoid it?

BC: Yes. John Meecham of the Shamrock fame owned the rig. He thought we are going to collect damages to our platform and all kinds of things, which was a little. In those days especially, majors didn't do much suing. We had some suits against us. I remember when I was told about it. Picture a 200 foot by 200 foot square, and then go 14 miles away, and then picture 150 by 100 feet square over here. This little

speck over here drifted across the Gulf of Mexico and ran into that little speck. You'd say, "Bullshit!

TP: And the fact that it was a Shell platform, too.

BC: That's true. An old Shell rig ran into us. What is the probability? Fortunately, when it ran into it, it left one of its columns inside of the platform. So we had some evidence of who or what did it. We did successfully develop a lot of technology and won that lawsuit. It turned out the platform was sitting on a location where there wasn't any oil and gas, so it worked out very well!

TP: But *Blue Water 1* had been drilling in 300+ waters?

BC: Yes, and in seas more severe than it encountered during that hurricane. I think we all convinced the underwriters that it was a large tornado. It looked like you could take this thing, pick it up with one hand and turn it upside down. It was still in its mooring. It was still within about 50 feet of where it should have been. The forward end of the rig where the big massive structure with substructure and the derrick was gone. The substructure was 48-inch-wide flange beams. This was just twisted and mangled. The back end of the rig had sheet metal buildings housing machinery. You wonder what 60 mile an hour winds might have done . . . completely intact, untouched. So everybody that investigated it agreed that somehow a tornado had gone across the starboard bough corner of *Blue Water 1*, and in the process, turned the rig upside down.

TP: There weren't waves that . . .

BC: No. According to oceanographers, there was no wave. Nothing was damaged as if it had been hit by waves. It was four-feet-tall wide flange beams, literally twisted like perhaps a tornado might do. And the derrick was completely gone. It was found 1-1/2 years later 1000 feet north of location in one piece, as if you picked up the derrick and gently laid it down here.

TP: Can you talk a little bit about the Shell seminars that you gave to the industry? I guess this would have been 1962 or 1963? The bringing of industry up to speed on the technology that Shell had developed.

BC: The secrets were still kept. You can come at this from many angles, and I don't really know what was in the minds of the highest people in Shell. I am going to first put forth a personal thought, because it was expressed by many. This maybe shouldn't be in the history, but there were only four, five or six of us in Shell who knew what we had done. When we were told we had to write all these manuals -- all these books and disclose all this stuff -- it was some fool that said, "You know, I know why they are doing this. If two or three of us quit, there is going to be a big hole." It had been kept very secret. It was kept to a select few and a couple of the select few left. Yes, there was going to be a big hole. So that was one theory of why we were going to do this.

TP: I hadn't heard that one.

BC: I think most people would be smart enough to remain silent.

TP: This would make complete sense.

BC: Yes, I suspect it contributed, in the minds of the senior officials.

TP: But you had patents and . . .

BC: Shell had patents . . .

TP: . . . on a lot of what was developed?

BC: Yes. You can have a patent on something. Exactly what that patent means and how you translate that patent into reality was still in the hands and minds of a very few people in Shell.

Why do we have a school? Eventually, this technology was going to leak out. Let's make sure it leaks out so that exactly what the technology involves is properly presented so that people don't go out there and make mistakes and develop a bad climate safety-wise. I think if you believe that argument, then why don't you start publishing something in the oil and gas journals that would reach the largest audience, or some forum like that? The patent division, in effect, they had been trying to license people under the patents with not as much success as they wished. They said they will get the engineers to put on a school and write these books. If you come to the school, you get certain license privileges. If people came to our school

and accepted this, this was recognition by the industry that this was good stuff, then we could go after the other people, which might not necessarily come to the school. How many are going to come? Nobody knew.

I recall John Payne was one of the people in Shell because I remember chatting with him about how much we should charge. You didn't want to charge too little. It was going to cost us some money to put on the school. And you didn't want to charge so much that nobody would come. In 1962, $100,000 was a big number. It would be like one million dollars today. Seven people signed up. I think it was a two-week course. Collipp and floating drilling got the first four days. Ron Geer was going to do his portion on the Rudac system, one who had guidelines. Howard Shatto was going to do his on the guy line tests, ROV, MOBOT system that had developed on the West Coast. We were the three principal people.

Shell had just built a new auditorium at the Bellaire Research Center. They sent out invitations to everybody in the industry. We are going to have show and tell; you are invited if you want to come. The auditorium filled up. The vice-president of patents and licensing, a senior officer from the West Coast, a senior officer in the Gulf of Mexico, Junior Collip and Shatto were sitting on the stage with vice-presidents and senior vice-presidents from Shell and every other major oil company. It was quite an impressive audience. I doubt if there had ever been a collection of this number of high ranking people such as gathered that morning for the two-hour show and tell.

Shatto, Collip and Geer would get up and make a five minute presentation on our

thing. Then we would sit down. After the vice-president of the patent and licensing finished, we'd get up and answer any questions. I think he fully expected the questions would have to do with patents and licensing. I think the audience that had assembled there probably didn't come for that. The first question that came in was what happens if a ship runs into a semi-submersible? Mr. Johnson, the vice-president of Patents and Licensing, turned to the senior man from New Orleans and said, "I think maybe you ought to field that." And Dick said, "I don't know anything about that. Collip, you field that." I gave a response. There was a man with Global Marine who I had worked with on the west coast and they didn't have any semi-submersibles. Bob Bauer and Global Marine thought everything ought to be a drillship. So he was asking the question, in effect, if he ought to build drillships, because if a ship runs into a semi-submersible, bad things are going to happen. That was not true because of the way they are ballasted. I had been asked this question several times before this meeting by the same guy. I must have had somewhat of an irritated presentation because afterwards Mr. Easton, the Vice-President of Production called me over. He said, "Collipp, when you get a question like that, you shouldn't be as annoyed as you appear to be." And I said, "Well, Mr. Easton, he has asked that question before. I am getting tired of answering his question." And he said, "That has got nothing to do with it. Do you realize who is in the audience?" It was a very senior officer of another major oil company and he said, "I want you to meet Mr." so-and-so, who was standing there with Mr. Easton, who was a very big man to my very young eyes. He shook my hand and said, "Good job, Collipp. Do you know what you should have said when your friend asked that question? You shouldn't have given the explanation that you did, which most of us didn't understand. You should have just said, if a big ship runs into a

little semi-submersible, the semi-submersible sinks. But if a little ship runs into a big semi-submersible, the ship sinks! Then we all would have laughed and we could have gone on."

The school was a success. Seven companies signed up, because we had put out in the flyer that $7 million had been spent over seven years to develop this technology.

TP: Seven million is all?

BC: Yes, this was 1960.

TP: That was quite a bit of money.

BC: Yes. I was being paid $4,000 a year. If you spent more than $200,000 on a well, that was a big number. I think New Orleans' net contribution to earnings was a couple of million a year. And if this well was unsuccessful, you were going to spend one-third of all the money you were going to return to the company. As it turned out, seven companies signed up. A fairly senior manager with Mobil said, "Bruce, I want to ask you a question. How did Shell decide that 10% was the right amount to charge for the school?"

When I met with John Payne, $100,000 sounded like a right number. But I replied, "Well, Bob, you know, the thing is that the secret was getting out. All of your top people, as well as Exxon and some others, came to this school and we've written these big thick manuals. "We are a couple of years ahead of you and we are putting

on the school. The reason we are doing it is because you are going to spend a year or so trying to figure out what we wrote here. And you will stop your own development program and we will pick up another year technically than the rest of you." Six months later, he called and said, "Do you know, that is exactly what happened. I have talked with some guys in Exxon and he said we're still presenting what you guys developed three years ago and showed it at the school."

TP: Was there concern that offshore contractors needed to be brought up to speed on the technology you had. Not just the oil companies but people that you would be contracting with.

BC: Yes, I heard some of that. Obviously, if they are going to work with us, we would disclose everything they needed to have or we would tell them what we wanted to have done, which we did on *Blue Water 1*, *Blue Water 2* and some other rigs, including the *Ocean Driller*.

I think they have had a glimmer. Could patents and licensing, since they were the godfather of this, be the source of revenues? I have given you the other reason. The technology is going to affect the wells. The effective argument is that the technology is going to get out anyway, so let's sell it.

TP: The other argument I heard, in Ron Geer's interview, was that Shell had bid on a lot of deep water leases. But since they were the only bidder, they were turned down. So they needed to bring along the competition to be able to obtain these leases in federal waters.

BC: As for leases we put up for sale, the government said, "You are the only guys if this is going to be a competitive lease sale." Certainly, that probably entered into the equation.

TP: Yes.

BC: Yes.

TP: It just seems unusual, having developed all this technology under such secrecy and giving you such competitive advantage. So why . . .

BC: Yes, why sell it?

TP: But there seems to be another way of reading it.

BC: Especially Mr. Easton, who would die suddenly. You mentioned this. I had many conversations with Mr. Easton when I was on the West Coast and in other places. When I was on the West Coast, we had under contract to us all the offshore rigs. So either we would drill the well, we might sublet a rig to you, or you could go jump in the lake. I think partially, with that thought in mind, Mr. Easton felt we should . . .

End of Tape #1, Side B

Tape #2, Side A

TP: We were talking about Easton and buying out . . .

BC: Yes, in effect, we developed the technology. Certainly, we had sold it, but shouldn't we, in effect, form a company that controls most of these offshore rigs. We were spending money to put other people in business. They were making a profit at it. I don't know what all was going through Mr. Easton's mind but he kept raising the question to me, in effect, "Why shouldn't we do this, Collipp?" And he probably did the same with Geer and others. Shell never did.

Interestingly, the Group did have a majority interest in some rigs where Shell Oil never did.

TP: We always leased.

BC: We always leased, right.

TP: But these rigs you are talking about went overseas?

BC: Yes, they were drilling overseas, none in the Gulf of Mexico, but the same company. The place that developed this stuff never did; the group did. These five-year agreements -- *Blue Water 1*, and *Blue Water 2* -- it's new technology, and the banks were not the least bit interested in loaning money to somebody whose only asset was this funny looking thing that who knows what it will be good for? In the case of

Blue Water 1, Shell co-signed the loan. It was also a stipulation that we sent our day rate payments to the bank. We took their money and then sent the rest to Blue Water, and the only stipulation in the contract with *Blue Water 1* was that they had to provide whatever manpower was required to man the rig. Whether or not it worked, whether or not it drilled, whether or not it floated -- the bank didn't want any of that in the contract. They wanted it very clear that if anything didn't work, or if it stopped working, they could get the money from Shell. So no, we didn't own it, but we had every responsibility that an owner would have. And this carried through on *Blue Water 2*.

TP: By the mid to late 1960s, there were all sorts of semi-submersibles being built and developed?

BC: There was more than I expected. Maybe you've got the *Wall Street Journal* article that was written in 1962, when we had our press preview in several leading newspapers. We took them out to *Blue Water 1*, and had a show and tell in New Orleans. The total money invested in *Blue Water 1* at that time was approximately $5 million. The *Wall Street Journal* man who was writing it was in the group I was escorting. He said, How can you spend that much money on something like this?" I said, "Well, I don't think there is going to be that many built. There may be a couple more in the next 10 years, but we are out here on the fringes of exploration. They are trying to prove big reserves and that industry has to come along. So for that reason, maybe you will see two or three more in the next 10 years." I missed it completely. It was 10 times that!

TP: How many did Shell have operating under lease by the late 1960s?

BC: I'm going to guess three or four. But other people were starting to understand floating drilling! It took off much faster in the 1960s and 1970s than I imagined.

The governor . . . became governor of Texas, Bill Clements. In fact, Dillard Hammett had left Shell. They built the Sedco rigs, which were triangular and were not unlike Trident if you looked at them. Odeco was building rigs but certainly, Sedco's 135s . . . .

TP: Did you maintain the relationship with Odeco? Did they build semi-submersibles for you?

BC: Yes, I think they knew what was going on. I'd better not say any more than that because they came to me. It was interesting after the rig went to work with Kerr-McGee, we allowed no one on the rig but the senior people. Kerr-McGee visited me at my home in New Orleans. Odeco visited me in New Orleans and proposed a rig that was 1,000 feet across! They said, "This is our rig." I think I have lost the letter but they said they'd lease it to us for a very nominal sum. But if it wound up costing a little more, they would have to charge us a little more. I remember talking with my boss and saying, "1) They don't understand what a semi-submersible is. 2) You can't build this for $5 million. You can't build it for $20 million. I don't even know if you can build it!" So they lopped off pieces of it after the conversation they had with me and a few others to build the *Ocean Driller*. I think it was the first rig that went to work. And then the *Ocean Explorer* went to work for Shell. Then Sedco

started building these 135s in 1966. They built one to drill off of Canada. The *Sedco B* unit was contracted by Royal Dutch Shell, who was still in Japan. While under tow, suddenly, from Japan down to Indonesia, there was a loud pop. The tug skipper said, "One minute it was there. In one minute it wasn't there."

I had been concerned about structural details. The Sedco rigs had three columns. They were structural things that came together in a cruciform in the center of the lower hull. This was, in effect, what kept it all together. When the rig was built, they had sublet the cruciform, or the center piece. One company then sent the tubes that were coming out to another company. They were smart enough in the drawings. They had doubled up the steel thickness where these two things would come together, but what you really want to do is double it up, especially across the place where it came together where you joined these members. They beefed up on either side of where they butted together. If they didn't beef up where they came together, it was a structural catastrophe waiting to happen. It self-destructed under tow. Word went around all the 135s that there was a peculiarity of how this one was built. All the rest were in good shape, but I guess it kicked off certainly in the early days, closer looks at the structural integrity.

TP: Were you involved at all in designing later generations of semi-submersibles, when companies had the need to consult?

BC: I got a couple of very nice job offers, but I don't know if I should have taken them! I was having fun doing what I was doing. I had had some job offers that would have doubled or tripled my salary. I wasn't too certain if I was going to be spending a lot

of time as a salesman. If you design a thing, you've got to sell it. I had spent two or three years trying to sell the semi-submersible in Shell. I don't mind selling but I don't want it to be . . .

TP: You are a technical person.

BC: Yes, doing full-time, whatever. It is a lot more fun being the guy who contracts for them and tells them this is what I want. As a person in Shell, as you know, you had to sell yourself. To write this book, you had to sell the font of the book.

TP: Right.

BC: So yes, you do a lot of selling regardless of where you work. And I think the knowledge was out. I was called in on some patent litigation and at times, would give testimony. I had a hand in developing mixed gas diving in Molino, which if I had the mask?

TP: Were you a diver yourself?

BC: No. It is like, when did you invent the semi-submersible, and I described its . . .

TP: . . . evolution.

BC: Evolution. It is not invention. When I got to the West Coast, two of the wells had been drilled out there in close to 300 feet of water. "How are you going to hook

them up?" We'll have these divers go down and we will pull the pipelines out. The divers will go down, and they will put a steel pipe from the end of the pipeline out there over to the wellhead. The water is very deep and everybody kept saying at that depth, there are not very many divers that can stay alive, let alone do anything productive. So I did contract for some divers. We took them up into Ventura where we had some wells, and we put up an artificial tree, just like the ones that were being installed under water. And everybody told me these guys could do minimal tasks. We hung them by a crane and, in effect, five guys came down to do step one. Like tieing your shoes; the first thing you do is you grab the laces. Step two, you twist the laces. There were about 15 steps. We had about 40 divers up there. We had five guys that could do each of the steps. They kept doing it until they could do it with their eyes shut. We brought the coring rig *Eureka* down. We jumped the first divers to make sure everything was going O.K. None of the first five guys survived. Some were moaning and crying.

TP: What depths were you were working on?

BC: It was close to 300, and that is a water depth where a mortal man can't operate on compressed air. We didn't kill anybody, thank goodness!

Word got out that we had this thing.

Charles Lindberg's son, John, who I got to know and respect, and a man by the name of Nordens, who did the bomb site in World War II, had been working with Lindy air products and the Navy, on oxy-helium diving.

TP: The Navy experimental diving unit?

BC: They had been doing it with the Navy. They came and said, "We can help you out. The Navy really hadn't done anything other than gas tank stuff. So we met with them and heard the presentation. I remember it was at lunch. There are things like catalysts in a cat cracker, and they put in a little platinum. Therefore, the chemical reaction took place. Without the platinum, it didn't take place. Platinum was an inert metal. We don't know exactly why it has to be present. Of course, nitrogen is an inert gas. They were going to take the heavy nitrogen molecule and substitute it with a light helium molecule. I remember asking "John, how do you know?" We have been alive for thousands of years. We breathe nitrogen in, we breathe nitrogen out. I know it isn't necessary; it's the oxygen we need. The nitrogen that we are breathing in and out every day is also necessary for something we don't understand. And you are taking it all away from these guys." He said, "Well, you know, it is too heavy." And I said, "Yes, but how do you know?" I was really asking a question, and they didn't have an especially good answer. I said, "Well, shoot, couldn't we put in just a little nitrogen in case, you know, it is good for something?" So we did at Molino. We jumped with a little nitrogen. About 15 years later, I got a call from Duke University. One of the divers who was out there who I had known said, "Bruce, you ought to get up here. They finally came around to your mixture." I said, "What is that?" He said, "Well, do you remember in Molino, you made them put nitrogen in the mixture? It is called trimixing. They are taking these guys down to a record simulated depth of 2100 feet. All the evidence shows that when you take most people down under the heliox, they develop what is called high pressure

nervous syndrome. Many people get the shakes. When you put a little nitrogen in, they don't get the shakes."

TP: Who were the divers you were working with? Was there a diving company in particular?

BC: Yes.

TP: It wasn't Taylor Diving, was it?

BC: No. I can tell you the names but I honestly don't know. Lad Handleman is being recognized this year. Whitie somebody. They each went on to found their own diving company after Molino.

TP: I think I remember from the earlier interview that you were also involved in developing some of the ice structures for the Cook Inlet. Is that right?

BC: Yes. I had worked with Kaiser when they said, "What should we build, where should we build and how should we build?" I said, "Let me take you up to meet Bernie Hillsey with Kaiser." We sat that one up for the Cook Inlet structure that was built.

Before that, in 1955, a civil engineering man by the name of Lowell Johnson had come to me. He was in what was called the Houston area. They were going to put in some things. As you brought up four pile tubular jacket structure and crossed

over to a thing that would be a deck, how should you make that transition from vertical members to horizontal members? How should it tie in. "You're a naval architect, Collipp, you know about these things. You build ships." I didn't say it but not very many ships look like jackets. I went home that night and I thought, "That's a good question!" I got some straws, built the jacket and the deck section and eventually kept moving around. Then I took it to Lowell and said, "You know, this is the way we ought to do it. This is the way I would do it." It is the way we did it.

It is about a year later. It is Offshore's first rig at an American Shipyard.

TP: So you are backtracking to the mid-1950s, right?

BC: Yes, this is the mid-1950s, and they are building their first jack-up. I am told to go over and meet with these guys at American Ship and find out about the first Offshore rig. They are in a meeting and they said, "Yes, they are expecting you but it will be about an hour. Would you like to look around the yard?" And I said, "Sure." I am walking down the yard and here is this structure sitting there nearly finished. I remember looking at it and saying, "By George, that is exactly the way I told Lowell to do this about one year ago!" And I said, "Whose jacket was this?" It was not Shell's. And I said, "Man, who came up with this idea?" He said, "Well, you know, we got some of the drawings of those Shell platforms. They know how to do it, and we copied them." I tell the story, in effect, to brag, but I guess sometimes a lot of things were born out of necessity or mother invention.

TP: Offshore seemed to be like that from the very beginning. Trial and error. You build

what you can and hope it works. On some of the early platforms, they really didn't know how high the deck should be off the water.

BC: They weren't high enough.

TP: Let's build it high enough to . . .

BC: And the waves are reaching bigger . . .

TP: It also testifies to Shell's reputation in the industry, and certainly in offshore, that people were trying to emulate what Shell was doing.

BC: Yes, and that is why I want to tell you the story about Ned Clark and why Shell did it. I think it was a fortunate group of people whom Shell hired. We did have a lot of latitude. We were all young people. Had they hired 45-year-old people from shipyards or from some other place, I don't think they would have achieved success. We didn't know it couldn't be done. Nobody else had ever done anything like this, and we were given freedom and latitude.

TP: The other people who were involved in the group were Ron Geer and Howard Shatto?

BC: Howard Shatto was out on the West Coast where they were developing the guyline-less system with the robot. There were civil engineers doing their thing like John Haber, who had gone and become president of Retco. Frank Poorman did for a brief

time, and then Lynch became a general manager onshore and didn't spend that much time. Lloyd Otteman. Most of these people came in late. Originally, it was Haber and Bruce Collipp. Then, Geer joined us later on and Lloyd after that. John Leiss used to do a lot of computer work on the marine conductors.

TP: All of you were young, right out of graduate school?

BC: Yes, some like Ron had spent a few years in West Texas with Shell, but a lot of us were fresh out of school. We went through the training program. We worked on and were showed what a drilling rig was. I think they were fortunate in who they got, and we were still of that age where we didn't know we couldn't do it. It is like why 18-year-olds make better soldiers than 40-year-olds. Charge what hill? Why? [Laughter]

TP: I suppose you didn't have counterparts in other companies at this time.

BC: To my knowledge, there wasn't a nucleus of people, and especially a nucleus of younger people. Some other companies had marine departments because they had tankers and other things that Shell was not allowed to have. This thing that caught on was drilling tenders. We didn't have one. I was the guy eventually who was selected . . . "Collipp, I want to know why we don't have a drilling tender. What are they? Everybody else has got them, why don't we?" I did that study, and it more or less . . . I am trying to figure out how to tell this story simply.

Drilling tender thought comes about that you build a big platform out there, it costs

you a million dollars. You build half a platform, and it costs you a half million. You can't put everything on that platform, so you put the other half on a tender. The tender stays there while you drill it, and then you move it some other place. If it is a dry hole, you still lost a half million dollars.

TP: And that was a significant step for the industry. In the late 1940s . . .

Tape #2, Side B

BC: We were talking about "Cognac." In the Gulf of Mexico, you have the worst of weather hurricanes. Working with oceanographers at that time, the question I put to them was how long a window do you have from when everything is calm until we would have to suspend operations? If we were going to launch these things while they were tied off to these two derrick barges that straddled where they were going to be lowered, we were going to have this big massive thing floating in the middle between these two derrick barges which couldn't move. But if a big storm came through, it wasn't going to be a very nice thing to witness. And I believe the number was five days. If we would have launched them like you launch a conventional jacket, you would have launched it and kept one line attached to it. Then you bring it into an upright position, and then you haul it around to make sure you get it to where you want it to be. Then you hook up some other lines on the derrick barge, you ballast the jacket and you lower it. The only way we could get this thing in the water really fast was to hook up the lowering lines before we even launched. So we had to have . . .

TP: All the lowering . . .

BC: All the lowering lines were hooked up prelaunch. Yes, it was brought out. The lowering lines were hooked up and we kept watching the weather. It would take us two days to cut these lowering lines. Then we maneuvered the launch barge, especially with the middle and the top. We didn't launch directly over the base section -- it just didn't seem like a good idea -- and launched. Then we had some

very nice computer work that was quite revolutionary for its time period. There were computer programs that would say, "O.K., I have an object and I've got eight lines out to me. If I do this with these lines, I will move here. O.K., we've got two derrick barges that have eight lines going out the sides that are tied together with themselves when we are going to lower them with two more lines. They've got lines or devices on them. They are holding a jacket that is floating around in the middle. And the object is to get this thing that is floating in the middle down at the right place and in the right orientation, and within two or three feet."

TP: The size of the Astrodome.

BC: Exactly, the size of the Astrodome. If you've got the middle of it dead on, which is really what a drilling rig has to do, that is interesting. You don't care which way the drilling rig is pointed. This thing has got to be pointed in the right way, in addition to being at the right place. Fortunately, I had the right people to work on the computer programs. We instrumented all the lines. We could read tension. We could read them out a line out, and it all fed in. This big, beautiful control room was built so we could launch, maneuver, lower and get it over with. This thing was very big, and when we launched when the currents were of a certain magnitude, as the jacket went in the water, we had some slack in these lines. If the current caught this darned thing, it might move farther away than we had line. And also during lowering, the first current profile. We took current profiles and discovered some very large currents at "Cognac." The first instruments that ever ran up and down a line and measured currents and depths were necessary to pull this trick.

TP: You instrumented the current into all this . . .

BC: Yes, before and while we were out there, the current readings were coming in. We didn't have satellites and we didn't have computers you could carry around with you to feed this information back to some people in Houston, who would run it, call me back and say yes, no or this is what is going to happen. There were many firsts involved with this thing.

We got the bottom. All we got done the first year was the base section. Then piles had to be drilled, and driven. We came back the second year and, for a day and a half, we couldn't find the base section. I don't think that word ever got to New Orleans. We were busying doing this, we were busy doing that. It's got to be down there! Wouldn't this be neat? We would call in and say, "Well, guess what, Jack?

TP: Why couldn't you find it?

BC: I don't know. I understand what you are saying. My mooring system was still there, and all the lines were tied in so the center of the buoys and the mooring system were awfully close to where it ought to be. But when we would jump in our ROVs, we couldn't find it for about a day and a half.

We did find it. But if you can put yourself in the size of the Astrodome, you've got these two docking poles where they are going to drop. Then three or four feet into these two cones, one on either end. Once that is done, then you lower it and everything goes together. Rightly so, the people in charge of that envision that we

maneuver this thing into position and the docking pole 1 or docking pole 2 would line up. We would drop docking pole 1, and make sure we got plenty of things in the system so when we pushed the button, we don't accidentally drop docking pole 2 because we can't pull her up and start over. Once dropped, it is dropped. We drop one. Collipp maneuvers a little more. We drop two. We had very nice manuals written. We went through dry runs, if you will, and some simulations with the computers to the extent we could. We went out there. The year before, when we did the base section, we made 50 foot steps from where it was launched until we got to where the location was because we maneuvered it with the two barges. We were about 600 feet away and I said, "You know, I don't see a thing wrong. Let's just go for the final location. That will save us 24 hours, rather than going step by step." It was fine with the McDermott people. They were being paid every day. They had been seeing if there were any hazards of the derrick barge to do this, so we did. And then we sent out instructions to each of the winches of what we wanted them to do. Everybody should report back when they got their winch. And it takes a little while for these two derrick barges and this midsection to respond. It did. And I am in this control room and there are these TV cameras that are looking down from the docking poles. There were some of the other people who would be associated with dropping the poles. And, by George, pretty soon, somebody will go, "Hey, look at that! Docking pole 1 looks like it is a few feet from it. It lines up." And I am looking with the other camera and, by George, docking pole 2 is lined up.

TP: It just happened to have the perfect orientation.

BC: Yes, I think it was 90% luck. There was a lot of science and technology, but what is

the likelihood that this would happen? It wasn't in our books. As I tell the story, I say, "O.K. Shoot, they are both lined up. Go for it, guys!" And it was 12 hours later that others went into a meeting. "What should we do?" "I kept telling you, don't sit here too long. The current or something is going to drop the poles." About 12 hours later, they finally decided they'd drop one and then two. Faced with success beyond what the manual described, we came to a shuttering halt. That is an interesting part of that story.

TP: Then both the middle and top sections were done the summer following the base section?

BC: Yes. It's construction and installation, the whole thing.

TP: It was quite a project, possibly the most spectacular one ever done offshore.

BC: Yes, this received some awards. Today, we've got bigger equipment than the rest of them. Bigger platforms have been built, but this was a whole different departure.

TP: When did you retire from Shell?

BC: I think in 1987.

TP: Were you involved looking at TLPs?

BC: A rig called *Zane Barnes* early on . . . I ought to tell this story. We drilled the east

coast, and I was working on TLPs and some other things that, once you have been around MODUs and semis . . . I had many contractor friends and some other people . . . most of my job, I didn't think. It was more my hobby, I guess. What are you guys scheming and planning? A rig would come to be known as *Zane Barnes*, and some good friends of mine said, "You know, we have come up with a scheme that is going to minimize heave, like the semi-submersible that takes care of pitch and roll." I said, "No kidding?" So I watched some of their model tests and the rig. A guy by the name of Camshire . . . I can't think of his name at the moment, I can't think of the man that really invented it. It was all through the company and Reading and Bates. I must have at least mentioned to my boss that they were working on this really neat thing. They are going to build this rig. So I got a phone call one day from Shell Offshore in New Orleans. I was still in Houston. The division manager said, "We are going to be reporting some things to vice-presidents and head office. Bruce, I understand you've got some ideas and proposals on rigs we should be putting under contract. I am going to put you down on the docket." I didn't even know I was supposed to be working on rigs," one of the bosses said. He was in New Orleans, and I was in Houston. I was doing TLPs and some other things.

We had put together a proposal that said we took *Seven Seas* . . . Shell invested some $45 million. We drilled dry holes. More than half of that spilled in the *Seven Seas*. There is no way we can get our money back.

TP: *Seven Seas* was?

BC: *Discoverer Seven Seas*. We converted the rig for 7,500 feet of water. It is a very

good rig. It was a smart thing to do. The holes were dry. At the moment, we don't have that much demand for a 7,500 foot capability. Wouldn't we be smarter as we think ahead to get a new rig or to get a new state-of-the-art? I was enamored with this heave reduction. In effect, brand new semi-submersible with the latest electronics, electric and drilling. More power, partially dynamically positioned, new mooring system. I developed the phraseology. This is a new generation. Today, people talk about the first generation and the second generation. I said, "Yes, this is a new generation in drilling rigs." There are more generations now used in the industry. I took it into Shell. We have the meeting. And what I was going to say in the rest, I had not been exposed to anybody, somewhat with apprehension . . . I had gotten some drawings from Reading and Bates, but you are talking to the vice-presidents and executive vice-presidents. I knew from my days of *Blue Water 1* that the industry could care less! So, the philosophy was . . . yes, East Coast . . . the money was sunk there and there was a new rig that was going to be built, and it was going to be a whole new generation of semi-submersible that was going to be able to do things that other semi-submersibles could not do, or at least could not do them nearly as well.

Someone had told me they were going to go to lunch at 11:30 and that I should leave time for some questions. I never said a thing about what its name was or what it looked like. At 11:20, one of the vice-presidents looked down at my division manager/boss and said, "Have you got this rig under contract?" He said, "No." He said, "You know, we just wanted to come over today and let you know some of the things we have been working on." Another one said, "God damn, you are just sitting on your ass. Collipp's got a proposal here; we've got to take advantage of it. If we

don't, Exxon will." And this flew around the table a few more times. Afterwards, I went up to my division manager and got a chewing out for not having it under contract. I can still remember the big smile. He shook my hand and said, "That was great. You know, I used to work in head office. We came to head office and we got an answer! That rarely happens." So we did contract for the rig that was called, *Zane Barnes*. That was a new generation.

TP: New generation semi-submersibles.

BC: New generation, yes.

TP: And it managed to minimize heave?

BC: Yes, it does.

TP: And is it still working?

BC: Still working. A few others have incorporated that feature. It is dramatic. If you are on a semi and you can watch the telescoping drawing the marine conductor, heats up and down. And you get out on *Zane Barnes*, and the darned thing stands almost still. And the water is going up and down. I don't think so! It does stroke some but you can't remain in XY and knock out all heave. It is a more complicated thing than described in roll and pitch and in effect, it is the relationship between the mass of the hull that is below the columns and the corners, and the mass in the columns themselves. In effect, it provides an interaction that dampens out a lot of the hull,

and a lot of the heave.

TP: So it is not a kind of vertical dynamic positioning?

BC: It is a hydrodynamic thing. It's not a platform that goes up and down in the rig itself. And it certainly does allow you to drill in more severe weather. When you are drilling/floating/drilling, you have tools directly above the bit, that telescope in and out, so the bit can stay in the bottom and let a drill cower above it. You have much better control of keeping the bit on the bottom with certainly much less range of motion. I was aboard and came in at the Gulf of Mexico. Seas are 15+ miles per hour. I am on *Zane Barnes*. The Japanese exceeded all the sound criteria. It is quieter than One Shell Square or Plaza. The seas are running and the bolts are trying to run the mooring lines. The waves are crashing in the back of the big work boats. They asked for a piece of one inch steel plate because the waves had store back into where they were trying to run the mooring lines on the work boats. I told this in OTC. I sat there and I looked at my pitch, roll and heave. It was deafly quiet in the controlled room. The pitch roll indicators weren't moving.

TP: I suppose we can always come back for more information. Maybe we should stop here for now, unless there is anything else you want to add.

BC: No. With dedication and perhaps luck, what happened to offshore was not an accident. The fact that Shell did many of these things was what they set out to do. They did succeed. When people say, 'yeah, you guys from Shell think you did everything," to a certain extent, we did do everything.

TP: It wasn't serendipity.

BC: It wasn't serendipity, exactly. That is a good way to summarize it. It is what we were told to do, and what we were allowed to do. I think they were fortunate to hire the right group of people of the right age and gave them the freedom to do it.

THE END