IN THE TRIAL COURTS FOR THE STATE OF ALASKA

THIRD JUDICIAL DISTRICT

AT ANCHORAGE

STATE OF ALASKA,

Plaintiff,

vs

JOSEPH HAZELWOOD,

Defendant.

No. 3AN 89-7217; 3AN 89-7218

TRIAL BY JURY
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BEFORE THE HONORABLE KARL JOHNSTONE
Superior Court Judge

Anchorage, Alaska
March 8, 1990

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PROCEEDINGS

MARCH 8, 1990

(Tape: C-3662)

(0003)

(Jury present)

THE COURT: Okay, we're on record now. What can I do for you?

MR. RUSSO: Your Honor, an issue has come up which is not directly related to the criminal action, but because it's occurring in your courtroom, I thought that you should be advised of it; perhaps you can be of some assistance to us in resolving it.

A process server is present in the courtroom this morning, and he was waiting for us when we arrived, and he has a shopping bag full of complaints and summonses, in which he alleges that Captain Hazelwood is a defendant, and he intends to serve process on Captain Hazelwood in this courtroom this morning on those suits. How many suits are there?

PROCESS SERVER: There are 66 civil summonses and complaints and a Cordova suit.

MR. RUSSO: 66 summonses and complaints and a Cordova suit. Your Honor, I think that first of all it's inappropriate for any process server to come into any court of law and serve personal service on any

defendant under any circumstances.

But secondly, according to the Alaska Statutes, specifically section 12.70.230, Captain Hazelwood is immune from personal service while he's in this state appearing on this case. Captain Hazelwood came into this state voluntarily as a result of waiving extradition in New York, and as such under that statute he is absolutely immune from any service at this time.

And accordingly, I think because this process server happens to be in this courtroom, that the court should instruct him to leave the courtroom, and furthermore take notice of the fact that Captain Hazelwood, while he's appearing in this action, is immune from personal service.

There may be other ways that Captain Hazelwood can be legitimately served, and certainly we have answered some summons and complaints on these civil actions when we believed he was personally served properly, pursuant to the law. But this is not the way to do it, and I don't think this is an appropriate time and place to do it.

THE COURT: Okay. Why did you decide to come in the court to serve Captain Hazelwood when you could have served him outside the court or downstairs at any time when he comes through the building?

PROCESS SERVER: Your Honor, I wasn't sure what doors the Captain would be able to use into the courtroom, whether the doors would be locked, etcetera. I wanted to effect service as quickly as possible under instructions from my client (indiscernible - away from mike) Valdez, I want to do so without attendant publicity and without the jury being present and before any proceedings start here. That's why I kind of got here early.

THE COURT: Well, you didn't achieve your goal if you tried to do it without publicity by coming into court here in front of cameras and everybody else, and trying to serve the Captain, so you can step outside and serve him when he leaves. I won't permit you to serve him during the proceedings. This is part of the criminal proceedings and you'll have to serve him when he leaves. He'll leave out that door out there.

As far as the validity of the service, that is not up to this court to decide, that'll be up to another court to decide. I make no determination about the validity of the service. But you can serve him outside when he takes his break or when we recess for the day, and I expect to recess around 1:30 today.

And that's the normal entrance, right over there, the entrance you came through, and he normally

comes up the elevator, I believe, and he comes through the lobby downstairs, and you're free to serve him down there, but I don't want you to be serving him in this court during this criminal proceeding.

PROCESS SERVER: I understand, Your Honor.

THE COURT: Okay.

PROCESS SERVER: Thank you very much.

THE COURT: You're welcome. Ready with the jury now?

(Indiscernible - away from mike)

THE COURT: You got your next witness lined up?

MR. CHALOS: We do, Your Honor.

THE COURT: Why don't one of you step out there ...

(Pause)

THE COURT: Good morning. We're ready to proceed again, you may call your next witness.

MR. CHALOS: Good morning, Your Honor. Defense calls Edward Hoffman to the stand.

(Oath administered)

A I do.

EDWARD F. HOFFMAN,

called as a witness in behalf of the Defendant, being first duly sworn upon oath, testified as follows:

THE CLERK: Please be seated. Sir, would you please state your full name, and then spell your last name?

A My name is Edward Francis Hoffman, H-o-f-f-m-a-n.

THE CLERK: And your current mailing address?

A 318 South Merrick Avenue, Merrick, New York.

THE CLERK: And your current occupation?

A I'm the president of Pronaris & Hoffman, Incorporated.

(0220)

DIRECT EXAMINATION OF MR. HOFFMAN

BY MR. CHALOS:

Q Thank you. Mr. Hoffman, what is the business of Pronaris & Hoffman?

A The business of Pronaris & Hoffman, Incorporated, is we're a group of naval architects and marine engineers involved in new ship construction, building ships in various parts of the world.

Q What were you asked to do in this particular case?

A In this particular case I was asked to visit San Diego, look at the Exxon Valdez as she stood -- as she sat on the waves in San Diego in Nasco

(ph.) Shipyard. I was asked to write a report based upon my observations, take some pictures. I was asked to review some underwater tapes taken of the Exxon Valdez as she was in Prince William Sound. I was asked to develop some speed/power calculations based upon the performance of the engine and the sea trial of the Exxon Valdez, and I was also asked to be here.

Q Were you asked to listen to the testimony of the State's experts and comment on ...

A Yes, I was.

Q ... on that testimony?

A Yes, I was.

Q And did you do that?

A Yes, I did.

Q Okay. Could you tell us a little bit about your educational background?

A I graduated from the United States Merchant Marine Academy in 1969 ...

Q That's at Kings Point?

A That's at Kings Point, New York, it's an academy for merchant officers. I also graduated from Stevens Institute of Technology with a degree in ocean engineering in 1976.

Q Did you receive a degree from Kings Point?

A Yes, I graduated in '69 with a Bachelor of Science in marine engineering.

Q Did you obtain a license at that time, a Coast Guard license?

A And I also received a license as a third assistant engineer.

Q What type of degree did you receive from Stevens?

A A Master's of Science in ocean engineering.

Q Now, how long have you been a naval architect?

A I've worked as a naval architect since 1973, with the former company of U.A. Pronaris, Incorporated.

Q How long have you been president of Pronaris & Hoffman?

A Pronaris & Hoffman started in 1982, so eight years.

Q Now, in your job at Pronaris & Hoffman, you say you design new vessels?

A Yes.

Q Design and build new vessels?

A Yes.

Q How many vessels have you designed and built?

A Since '73 I've participated in the design, construction, specifications, plan approval,

piping diagrams, stability and trim calculations of approximately 55 vessels.

Q Were any of these vessels tankers?

A Yes. They were.

Q How many tankers have you designed or participated in ...

A Between 10 and 15 tankers.

Q Are they single-skin tankers, single-hull?

A Single-skin tankers similar to the Exxon Valdez.

Q What other type of vessels have you designed and built?

A Other type of vessels would be bulk carriers, which are basically a tank vessel with an engine room, and it carries dry cargo. Carry grain products, steel products, scrap iron, things like that.

Q What other type of vessels besides ...

A There was also product carriers. Product carrier is nothing more than a tanker, with coded tanks. And they carry refined products, refined product oils, such as gasoline, heating oil, and then the cyclohexanes, the tylenes (ph.), xylenes, things like that.

Q Are you familiar with the construction and

physical makeup of tankers like the Exxon Valdez?

A Yes, I am.

Q Have you ever inspected damage to vessels?

A Yes, I have.

Q By that I mean plate damage, hull damage?

A Yes. Yes, I have.

Q On how many occasions?

A Well, typically what you have in a shipyard, you have mistakes, and you have problems with the weather. For instance, in Japan we had a couple of typhoons, and the ship went against the pier and crunched a couple of times, we had blocks being damaged all the time, so those were instances of damage to my ship.

Also in a shipyard you have other ships that are there being under construction, and a couple of years ago, I think it was in '87, there was a Malaysian ship in Daewoo (ph.), Korea, right next to us, that was taken out during a typhoon, and she went aground on the rocks right in Okpo (ph.), in Pusan -- near Pusan.

Q And did you have occasion to view that damage?

A Yes, I did. Soon as she came back, they put her on the floating dock, and I went under and I looked at the damage that she sustained.

Q Was that damage similar to the damage sustained by the Exxon Valdez?

A The damage that she sustained was more of a crushing type of a damage on the plates, it wasn't an impact damage that I saw.

Q Now, have you been involved in sea trials?

A Yes, part of the operation of a ship is -- you have to have a full sea trial before the delivery of the vessel to its owners.

Q Would you tell the jury what a sea trial is?

A A sea trial is you take the ship out from -- when it's almost completed, it's not fully completed, but it's almost completed, you take it out to sea and you go through a progressive sea trial, which means different speeds, different RPM's of the engine, and you develop a speed of that ship. You also have an endurance test that's required by the Classification Society to prove that the engine will develop the endurance at 100 percent MCR, maximum continuous rating of the engine.

You also have anchor tests, you also have turning gear tests, you also have steering gear tests, you also have maneuvering tests to make the turns, that's required by the U.S. Coast

Guard.

Q In those instances where you attended sea trials, did they involve slow-speed diesel engines?

A Yes, all the ships that I've built since '73 have been slow-speed diesel engines.

Q And on those occasions, did you have the opportunity to observe the engine power and thrust ...

A Yes.

Q ... characteristics?

A At -- at all times.

Q Now, have you ever testified before as an expert?

A Yes, I have, on several occasions. If you ...

Q In court or in arbitration?

A Well, three times in court as a -- in personal injury cases, and two times in arbitration cases dealing with speed/power consumption testimony and also cargo handling systems.

Q Were you qualified as an expert in those cases?

A Yes, I was.

Q Now, do you belong to any professional organizations?

A Yes, I belong to the Society of Naval Architects and Marine Engineers, and also the Society of Marine Port Engineers.

(0522)

Q Sir, you're appearing here as an expert, do you have a fee arrangement with the defense?

A Yes, my fee arrangement with Chalos, English & Brown is approximately $60.00 an hour.

Q What do you mean, approximately $60.00 an hour?

A Well, it's based upon $500.00 a day, which is $62.50 an hour.

Q Have you calculated how much time you spent in this particular case?

A Very quickly, no, I haven't. I can figure it out right here, but it hasn't been significant. The majority -- most of my time has been spent in the last two weeks here, when I was listening to the other witnesses.

Q Now, let's talk about your trip to San Diego. Tell us specifically what you did in San Diego.

A San Diego, I went out to the ship with Mr. Chalos, Mr. Joe Winer, another consultant, Mr. Mike Walker, he's a -- he's a captain, and Mr. Tom Russo, and Mr. Madson. And we inspected the

Valdez from the wheelhouse, looked at the wheelhouse, we took pictures, we looked at the arrangement of the wheelhouse, we looked at the Captain's -- Captain's stateroom, his dayroom, I went to the cargo control room, I looked at that, noticed that -- you know, the cargo control room is almost the exact same as I have on my vessel that I'm building in Korea now, I noticed that also the loading computer was gone, it was not there, we went to the engine room, the engine room spaces, looked around the engine room, looked at the engine, the engine is a Sulzer (ph.) engine, RTA engine, similar to engines I've put on my ships in the past, bigger, but similar.

We then went on the deck, and I inspected the main deck where they have all the pipes and the valves, the inert gas system, the cargo control system, the manifold, and the access hatches into the tanks, what else on the main deck? That was about it.

Then we went down below, where she was -- to inspect the damage. From there I took pictures of everything, and we saw damage from the forepeak, I'm sure you've seen it, the pictures and etcetera, but we -- I went through the

forepeak all the way back to number 5 ...

Q Before we get into what you saw at the bottom of the ship, I just want to ask you a question. Your Honor, may I approach the witness?

(Pause)

(0647)

Q I'd like to show you Exhibit 80, and ask you, when you inspected the accommodation spaces on this ship ...

A Uh-huh (affirmative).

Q ... did you have occasion to walk from the Captain's room down the hall and outside?

A Yes, from the Captain's dayroom.

Q Okay.

A The Captain's dayroom ...

Q Wait a minute, let's put this here so the jury can see.

A The Captain's bedroom is this area here, and his dayroom is here. So you walk down from the wheelhouse ...

Q Let's take ...

A Okay.

Q All right.

A So here's his bedroom, his stateroom, and his ...

Q Let's put it like this so the jury can see.

A The Captain's office. So you come down the ladder, the stairway, and you go into the Captain's office, and then you can go into the stateroom.

Q Now, is there a doorway leading out to the outside deck?

A Yeah, there's two, there's one right directly aft in this passageway and there's another one here.

Q So in other words, if someone wanted to come outside, or if the Captain wanted to come from his room outside, all he'd have to do is walk down this hall, would you show the jury?

A Yes, he'd walk out his door, it's basically on the centerline of the ship, make a left and a -- a right and he'd be out the door, maybe it's 20 feet or so.

Q And he'd be outside at that point?

A He'd be outside, yes.

Q Okay. (Pause) Mr. Hoffman, can you tell us what it is that you saw when you went down into the dry dock?

A The dry dock -- I started again, I started at the forepeak, which is the -- the pointed end of

the ship, it -- and I went back to number 5.

Q Do you need the model? I don't ...

A Of the ship, yeah.

Q I'll get it. I'm handing to you now what's been marked as State's Exhibit 154.

A Uh-huh (affirmative).

Q Why don't you describe for the jury what you saw?

A The damage I -- I started at the forepeak of the bow area. And I went outside the ship initially to see what type of damage was there, and -- you know, obviously there's a tremendous amount of damage, there was a -- there was a big hole in number 3, there was a lot of plate missing, there was a lot of setups, which means that the -- the structure was just pushed up into the tanks, there was two rocks, one at frame 10, I believe, and frame 11, which is in this area here. The rocks were approximately about five or six feet in diameter, wedged and totally embedded in the steel hull.

In this area, between 2 and 3, there was a tremendous amount of plate missing, it was either sheared off, cut off, or knocked off on its way from Naked Island down to San Diego, or San

Clemente, wherever she stopped.

There was a lot of damage in the aft part between, say, number 4 and 5 center tanks. Then I went inside the tanks and I looked at the damage on the top to get a good idea how the longitudinals and the frames and all this -- all the other material met together, and tried to make a determination on exactly what I felt and what I thought about the damage.

Q With respect to the damage that you saw, in what direction was it situated?

A The direction of the damage was continuously in an aft plane, there were deep scratches in some areas on the bottom where the plate was intact that indicated that the damage started from the bow and went aft and scratched the hull, that means -- indicates that it was -- it went right over a rock and scratched or scored deeply into the hull plating.

The indications of the bulkheads or the -- or the longitudinal bulkheads, so that they go transversely across the vessel, was that ...

Q What do you mean by transversely?

A Well, this vessel -- this is longitudinal, from fore to aft. Transverse is across the

vessel, abeam of the vessel. And there's bulkheads and there's web frames, web frames from here to there are 16 feet separation, and the longitudinal bulkheads separate the tanks from one to another.

(Indiscernible - away from mike)

A All right. So this would be a longitudinal bulkhead, this would be a longitudinal bulkhead, and it means it's intact, and there's no way any oil can pass from this to this. Unless they ...

Q In other words, they're solid bulkheads.

A Solid bulkheads.

Q What are the other bulkheads?

A These are just web frames, they're other stiffeners in the ship, and basically they have holes in them so that oil can pass through back and forth, and they give some rigidity to the hull structure.

Q How far apart are the web frames from each other?

A This is a web frame. This is 16 feet from one to the next, so that's -- that's what the ship is ...

Q Can you draw freehand, if you will, and tell the jury what a web frame looks like?

(Pause)

A What do I do with this?

Q Tuck it into your belt.

(Indiscernible - away from mike)

A All right.

Q Let me get that out of your way.

(Pause)

A Now, this is a wing tank, we call it. Port or starboard side. If you look at the ship in the transverse way, or -- you'd see this picture. And this is a center tank. And what a web frame is, is you would have steel, coming up like this, and other pieces -- this is a hole in the tank. And basically that's it. All this is steel. And the same in the center tank. This -- I'm not an artist. It's something like this. And this is all steel.

So you have holes in the -- in the web frame, again you'd have something like this over here, and all steel. So the oil can pass from one web frame to the other, for the entire length of the tank. And that's what a web frame is, and it runs transversely across the vessel.

So this would be, say, the starboard side, and this would be the port side, this would be a

center tank, and this would be a wing tank. This also would be a wing tank.

Q And of course the bulkhead separating the tanks from each other, that is, the number 1 tank from the number 2 tank, is a solid bulkhead.

A Yes, it would be all solid. All these holes would be solid plate.

Q Okay. Now, at the bottom -- you spoke about longitudinals. What do they look like?

A Well, a longitudinal would look like this, it's just -- if you look at the bottom of the -- of a ship, you'd have a T. And this approximately on the bottom of the Exxon Valdez is two feet, and this is about eight inches. And this would be the longitudinal on the outs -- it's a -- it's a strength member that goes longitudinally from one tank to another, and it passes through each tank all the way back to the pump room.

Q In other words, the longitudinals are nothing more than I-beams.

A Yes.

Q What we would know as I-beams.

A Right. And in this case, the spacing between the I-beams all the way across is, I believe,

three foot.

Q Okay. You can sit back down.

(1068)

(Pause)

Q Now, you were present, were you not, when Dr. Vorus testified?

A Yes, I was.

Q Or Professor Vorus.

A Yes, I was.

Q And you heard him speak about some bowing that he observed in the longitudinals? I think he called it splaying?

A Yes.

Q And you heard the opinion that he gave with respect to what might have caused that?

A Yes.

Q Do you agree or disagree with that opinion?

A Well, I disagree.

Q In what way?

A If I could go back to the chart, or just do it right here. The splaying that he was seeing is that this longitudinal went like this. And that longitudinal went like that. So she came apart. And that could have been caused by a few things. One, a rock forcing this plate up, pushing these

things, pushing the longitudinals aside.

Another thing could have been that, you know, the lowering of the tide just forced the longitudinals apart.

Q What does that mean, the lowering of the tide?

A Well, the rise and fall of the tide as she sat on the reef. It would just force the longitudinals apart and cause the splaying, as he called it.

Q Did you, when you looked at this area, did you see any evidence of rotational type damage?

A No. I didn't.

Q Do you recall Professor Vorus testifying that he saw some transverse damage, he described them as subtle scratches?

A Yes. I did.

Q When you looked at the ship, did you see any such damage?

A No, I didn't.

Q Let me show you Exhibit 146.

(Pause)

THE COURT: Mr. Chalos, they're all in the folder.

(Indiscernible - away from mike)

THE COURT: It's on top now, Mr. Chalos.

MR. CHALOS: Oh, sorry. Thank you.

Q (Mr. Hoffman by Mr. Chalos:) Professor Vorus identified Exhibit 146 as the picture on which he saw the subtle scratches that he described.

A Uh-huh (affirmative).

Q Will you take a look at Exhibit 146?

A Yes.

Q Do you see any subtle scratches of the type described by Professor Vorus?

A No.

Q What do you see in that picture?

A What I see is a weld seam.

Q One second. Your Honor, may I have the witness approach the jury to show?

THE COURT: Uh-huh (affirmative).

(Indiscernible - away from mike)

A This is the part of the vessel that Professor Vorus said that he saw the subtle scratch, and what he's talking about is this line right here. This is the transverse, it's going transversely across the vessel. What that is -- you see, this is a weld bead, when they put two plates together, and they have to weld it, they have to glue it together, and they weld it -- and they weld it, put the two plates together.

So this is in the longitudinal direction. You also have transverse weld seams. And what he's saying, if you could see the weld seam here, just follow it out, and what he's looking at is the weld seam, of the bead of the weld.

And when the rock -- you can see this longitudinal scratches -- the rock goes over -- or the ship went over the rock, and it scraped the weld seam, to cause this problem here, this is what they call -- it'd be transverse, because the weld seam's below the plate, and you would see a transverse scratch.

Q Did you see any evidence of damage caused by the vessel rotating in this area or any other area of the ship?

A No.

Q Okay, you may return to your seat. (Pause) Sir, after viewing the damage, do you have any opinion as to its cause?

A It ...

Q Yes or no?

A Yes, I have an opinion, yes.

Q Okay. So what is that opinion?

A The opinion is that the initial impact, or the explosive impact with the ship and the reef,

caused the majority of the damage to the vessel. Subsequent to that, the rise and the fall of the tide caused more damage -- of the ship sitting on the reef. That's what ...

Q Do you have any opinion as to whether any further damage was caused to this vessel after the grounding by the use of the rudder or engines?

A No, I don't.

Q You don't have an opinion?

A I don't have an -- I have an opinion that there was no other damage caused.

Q Were you present during the testimony of Mr. Milwee (ph.)?

A Yes, I was.

Q Do you agree or disagree with his opinions with respect to the tons aground?

(1386)

A No. I have no disagreement with that at all.

Q In other words, you agree with it.

A Yes, I do.

Q Okay. Do you agree or disagree with the calculations that he made as to the power of this particular engine?

A No, I agree with him.

Q Have you had occasion to look at the power curves of this engine?

A Yes, I have.

Q Tell us what you reviewed in that connection.

A The power curves have developed -- from the engine, they go through a shop test, in the shop test, you load it up to different RPM's, and you measure the power, and then ...

Q What is a shop test?

A Well, when the engine is complete, the main engine maker has to prove that this engine can develop so much power. So he does that in front of the supervisor that represents the owners in the vessel, and they have a shop test. And the shop test, they go through various positions on the engine, with the RPM, and they develop a power. And from that, they develop a speed/power curve. And that's used to determine the power, how she'll react with the hull when you put the propeller on.

The shop test is without a propeller, and it's -- they use a water break test, or a tension meter, to restrict the strength or the turning of the engine.

Q Did you have occasion to review those tests?

A Yes, I have.

Q And did you draw or prepare a chart on the basis of the test results?

A Yes, I have.

Q For the power of this engine?

A Yes, I have.

Q Let me show you ... (Pause) Okay, let me show you what we've marked for identification as Exhibit BA. Could you tell the jury what this is?

THE COURT: There's a pointer behind you, sir, in the corner.

A All right, this is the RPM of the engine.

Q What is an RPM?

A Revolutions per minute. She develops so many turns, and she'll develop so much power. Now, this is the main engine shop test line.

Q Is that the test results of the shop test?

A This is the test results of the shop test. And what you have on this -- on the Y axis, is the horsepower generated at different RPM. So what you do is you plot the revolutions per minute versus the horsepower to develop a curve of the main engine. And that's done at the shop test time.

Q What is the other line?

A The other line is the sea trial results. When the propeller is put on the shaft of the engine, it develops so much power. But what they do, typical engine builders and propulsion people, is they give it a margin. This is called a margin between the main engine shop test and the sea trial -- the propeller. In other words, this is with the propeller on the ship, this is the results of a water break test, or a tension meter, whatever else they're using on it.

This curve is developed from the sea trial results, after you -- if the ship's ready for delivery to her owners, they go through a series of progressive sea trials, 50 percent of the engine power, 75 percent, and so on and so forth. And typically, what this is is the margin between the main engine and the sea trials.

Q Why is there -- why does this margin exist?

A The margin exists because they're afraid of overloading the engine, so they make the propeller lighter, we call it, they change the pitch of the propeller and they make it lighter so it'll absorb less power for the same RPM. That's -- and what they do is they -- the margin

is used so they're afraid of the degradation of the hull, and they don't want the vessel to be operating above its limits at the same RPM.

Q So what would the crew be using, which of the data?

A They'd be using the data from the sea trial results.

Q Okay. Now, on the basis of the data you reviewed from both results, what is the maximum horsepower that this engine can generate?

A 31,600 horsepower.

Q And what is the horsepower that this engine can generate at 55 RPM?

A 55 RPM, 8,600 horsepower.

Q Why is there such a difference between the maximum and 55 RPM's?

A Well, as you see, this is a -- it's not a linear curve. If it was linear it'd be like this, but it's -- it's an exponential type of curve, it fits the -- fits the maintenance and shop test scores.

Q So the maximum horsepower that this engine could put out at 55 RPM's under the sea trial results is 8,600 ...

A 8,600.

MR. CHALOS: Your Honor, I offer Exhibit BA into evidence at this time.

MR. COLE: No objection.

THE COURT: Admitted.

EXHIBIT BA ADMITTED

Q (Mr. Hoffman by Mr. Chalos:) Now, we've also marked for identification Exhibit AZ. Could you tell us what this graph is? Did you draw this graph?

A Yes.

Q Okay, what is this graph?

A This is the speed/power and RPM curves, and to get an idea, the ship's officer, they get an idea how much power and speed he develops at a certain RPM, because most people talkin' revolutions per minute, "I want to go 55 revolutions, I want to go 60 revolutions." You can generate a curve that will tell you approximately how much speed you can develop and how much horsepower the engine is developing at the same time.

For instance, if you go to 61 RPM, then the RPM line, go down 61 RPM across, and you come down on this curve, and you can -- and you can see that it's about 12,000 horsepower, and your speed is about 11.9 knots. This curve was

developed, again, from the sea trial results. It's in the loaded condition.

Q At full RPM of 31,600, what is her top speed?

A Top speed is 15.96. 31,600 is this line here, and you follow it down. The speed would be 15.96 knots.

Q At 55 RPM's, what would her speed be?

A 55 RPM, about -- oh, 10 and a half -- 10.5 knots.

Q And her horsepower again at that ...

A Would be 8,600.

MR. CHALOS: All right, Your Honor, at this time I offer Exhibit AZ into evidence.

MR. COLE: No objection.

THE COURT: Admitted.

EXHIBIT AZ ADMITTED

(1780)

Q (Mr. Hoffman by Mr. Chalos:) Mr. Hoffman, you were present during the testimony of Mr. Greiner?

A Yes, I was.

Q Do you recall the testimony where he opined that this vessel hit twice before coming to -- hit once and went over the rock and then hit a second time and stopped?

A Yes.

Q Do you agree or disagree with that opinion?
A I agree that it's probably a two-rock hit, yes.
Q Do you have any opinion in that regard as to how the hitting occurred?
A My opinion is most likely, the vessel hit -- initial contact was somewhere between two and three. And ...
Q Two and three, you mean tanks 2 and 3?
A Cargo holds, yes. Cargo holds, yes.
Q Okay.
A And she came aft, and she came into the hull and went aft. Then the next hit was where she fetched up on the reef, and she destroyed the bow, and landed on number 2 hull -- number 2 cargo tank, between number 2 and number 3. Because the ship had some momentum when she hit the initial, and then she would follow over and fetch up on the next reef.
Q What do you base that opinion on?
A The plans I've seen and the diagrams.
Q Just on the plans and diagrams?
A Yeah, and looking at the damage myself.
Q At San Diego?
A At San Diego.

Q Do you have an opinion as to what length of time it took between the first hitting and the second hitting?

A No, I couldn't really give you -- I wouldn't know. I wouldn't really know.

Q Now, you did some calculations with respect to the rise of the tide between the grounding and the next high tide, about 2:00?

A Yes.

Q How far did the tide rise between let's say midnight and two a.m.?

A Between midnight and two a.m., the tide rose about three, three feet.

Q And did you do any calculations to determine how far the tide rose between 1:40 a.m. when the engines were shut down and two a.m. when the tide was at its highest?

A Yes, that's 17 minutes between 1:40, and I think it was -- it was one inch that the tide rose.

Q Between 1:40 and 1:57?

A Between 1:40 and 1:57.

Q Now, you mentioned that you also reviewed tapes of the bottom damage that were taken at Bligh Reef and Naked Island?

A Yes.

Q Could you describe to us what you saw on those tapes?

A Well, again, the -- it was the video experts that were taking the tapes of the bottom, and there was a mass confusion in my opinion on how to take the pictures and the -- they were confusing weld seams and whatever, but basically what -- it showed a good detail of the damage done.

There was a tremendous amount of holing, and setups and defamation of the hull. There were also plates hanging down in the neighborhood of 15 -- eight to 15 feet in some areas, just hanging down like a tongue out of the hull.

Q Were those plates hanging down sitting on the bottom?

A No.

Q Were they interfering with the bottom?

A No. At the time they were at Naked Island, so there's deep water there.

Q Okay.

A The time that I reviewed the tape from the -- at Bligh Reef, and you couldn't see the plates hanging down there, because the ship was on the

rocks at that time, and they didn't want to go under that far.

Q If the plates were hanging down at Bligh Reef and interfering with the bottom, would that create a situation where the vessel would be impaled?

A Yes, it would. The vessel would be impaled on Bligh Reef, because of the damage of the ship, yes.

(1976)

Q Now, do you agree or disagree with Mr. Milwee's (ph.) opinion that it would have been impossible for this vessel to move from the reef as she was grounded using her engines or her rudder?

A I agree this vessel was not moving at all.

Q It was impossible for it to ...

A It was impossible.

Q Now, you listened to Professor Vorus' testimony with respect to the four or five scenarios that he spoke about, had the vessel come off the reef?

A Yes.

Q Do you have an opinion with respect to the scenarios that Professor Vorus described?

A Yes, I do.

Q What is that opinion?

A Well, Professor Vorus went through his calculations with no consideration of what could have been done to protect the vessel from capsizing and sinking.

Q What do you mean, what could have been done?

A Well, there are certain things that can be done to the vessel to prevent it from capsizing and sinking. There's -- for instance, they could have done one of many things.

Q Who's "they"?

A The crew. The crew could have acted, and for instance, they could have added water to the portside ballast tank. I think Professor Vorus showed it -- the ship going to starboard, and then down, and then finally capsizing. The number 4 port tank is a ballast tank, which wasn't holed, so there was -- there's an area, you can fill up this tank, and what it does, if you look at it this way, the vessel's leaning this way, you fill up this tank here, obviously she's gonna come back a little bit. And that could possibly save the ship.

There's other things that could be done. The

aft peak is a tank that's in the extreme aft end of the ship, they could fill that, and that would prevent the ship from going down by the head. They also have wing engine room tanks that could be filled with ballast water, and again, it would be on the port side of the ship, could bring it back this way.

Q How would one go about ballasting number 4 port or the after peak or the engine ballast tanks?

A Well, the engine room tanks have to be done in the engine room, by the engineers. There's a pump back there, and they can put the valves -- put the pump on and pump the water in. The number 4 port wing tank is a -- it's a motorized valve that they just have to open. She has a hole, or a piece of pipe down here, and what happens, they can press a button in the cargo control room, and the valve will open, and it'll flood the tank.

So it's a press of the button, valve opens, the tank will start filling with water, up to the level of the depth of the water from the draft.

Q How long would that whole process take?

A Oh, it depends, I don't think it would take

too long. They also could use the ballast tank, I mean the ballast pump. The ballast pump is located in the pump room, and they could fill up the number 4 port with the ballast pump.

Q Well, when you say it wouldn't take too long, are we talking a matter of minutes?

A I didn't really do the flow regs on that, but I really don't think it would take that long to fill this up, because it's under pressure from the bottom of the ship, and there's a 20-inch pipe that is the flood pipe for this number 4 starboard -- port tank. And also, you have the tank -- the ballast pump itself is 15,000 gallons per minute that could get pumped into this -- into this port tank to relieve the heeling of the ship.

(2190)

Q And based on what Professor Vorus determined from his scenarios, in your opinion, if the number 4 port tank was filled up, and the other ballast tanks were filled as you described, in your opinion would the ship have floated at that point?

A I think so. In my calculations, we needed that -- the ship developed a list. A list is

this condition, or that condition. At a three-degree list, this ship is three to four feet down to the starboard side. You need 1,600 tons of ballast to fill this up. This tank is 10,000 tons, so you need approximately 20 percent of the tank's capacity to fill this up to relieve a three-degree list.

If it's a five-degree list, means it's seven feet, or eight feet down, by the starboard side, and you need 4,000 tons on this side to relieve the list. So in my opinion that it could be done very quickly, the chief officer, chief mate was in the cargo control room, there's a clinometer, which gives you the angles that the ship is listing right there on the bulkhead, and you would see what was happening. There's also a clinometer up in the wheelhouse. The Captain could see what was happening, what was happening to the ship, and that could prevent the capsizing ...

Q What is the clinometer that you're speaking of?

A A clinometer is on the centerline of the ship, and it has -- basically it's just a pendulum, and it's a weight at the bottom, and it gives you the

degrees of list either to port or starboard.

Q When we say list, we mean ...

A Heel.

Q ... the angle that the ship is heeled over.

A Yes.

Q The options that you spoke about, were they viable options for the crew?

A Yes.

Q Now, was there anything else that the crew could have done, besides ballasting down to keep this vessel afloat?

A There's a few other things. I think you've heard that the ship has an inert gas system. The inert gas system could pump air into the tanks, the center tanks, the cargo tanks, and keep a pressure, a head, on those tanks to prevent water or oil from seeping in, because it -- Professor Vorus' calculation, he said 75 minutes, or 85 minutes for the ship to finally -- you know, capsize.

It's a matter of minutes to turn on the inert gas system, it's a matter of minutes to turn on the ballast pumps, either in the engine room or in the pump room, so you're talking minutes and hours and I really don't think it would capsize.

Q In your opinion, were there sufficient viable options for this crew had the ship come off the reef to keep it afloat?

A Yes, there are.

Q Was there anything else the crew could have done besides the IG system and the ballasting?

A Well, they also could try their best to blank up the air vents that are controlling the flow of the oil or water in.

Q Is that from the pressure vacuum valves?

A Pressure vacuum valves, and also the air valves themselves at the ballast tanks. They also could use the ballast pump -- number 4 starboard tank was mostly a seepage problem. It wasn't holed that much, and what they could have used is the ballast pump to control the flow of water into that tank, basically keep it dry, and pump the seepage of the water in that tank overboard.

Q What effect would that have had?

A Well, again, that -- you're seeing the ship -- she's heeled here, and the ballast pump was used to deduct the water out of the ship, and relieve this weight, and then she would come back up.

Q So under that scenario, under the scenario of using the inert gas system, and under the scenario of using the ballast tanks on the port side and in the after peak and engine room, it's your opinion that the vessel would have stayed afloat if she came off the reef?

A That's correct.

Q Professor Vorus used, I think, four or five scenarios, and in four of the five, the vessel sank. In your opinion, were there any number of other scenarios that could have been done?

A Yes, the -- just as I described, use the fore port, ballast it, deballast fore starboard, use the inert gas system, keep a pressure on the tanks, and the ultimate would be the Captain driving the ship back into the rocks, that would be the last recourse before she completely sank.

Q Sir, you prepared a report, did you not, of your visit to San Diego?

A Yes, I did.

Q And in this report you render your opinion of what you saw, and you've taken some pictures?

A Yes.

Q Is this the report that you've prepared?

A Yes.

Q Does that report constitute your findings at San Diego?

A Yes, it does.

(Indiscernible - side conversation)

MR. CHALOS: I've marked the report that the witness has just identified as Defendant's Exhibit BB, at this time I offer it into evidence, Your Honor.

MR. COLE: I object, it's hearsay and merely illustrative of his testimony.

THE COURT: Mr. Chalos?

MR. CHALOS: Your Honor, I don't believe that a report of an expert in which he sets forth his opinions, contains pictures of his visit to San Diego which are basically the same type of pictures that were taken by the other experts that Mr. Cole introduced here and were admitted into evidence, I think it's in the nature of the same type of document.

THE COURT: Objection sustained.

MR. CHALOS: I have no further questions of this witness at this time.

(2570)

CROSS EXAMINATION OF MR. HOFFMAN

BY MR. COLE:

Q Good morning, Mr. Hoffman, how are you?

A Good morning.

Q I'd like to talk a little bit about the extent of the damage that you observed during the course of this case. You were hired by Mr. Chalos when?

A I think the initial contact, Mr. Chalos called me, I was in Korea in June, so I think it was in August. July or August, last year.

Q And my understanding is that you reviewed -- you went to San Diego to take a look at the damage some time in September.

A Yes.

Q Of last year.

A Yes.

Q You reviewed tapes done by divers.

A Yes.

Q And those were pretty much the essential areas of your observations of the Exxon Valdez. Plus you reviewed, I guess, some diagrams.

A Yeah, plans, and -- plans I looked at, and power curves, and rain (ph.) engine shop tests, model tests, etcetera.

Q You didn't visit the Exxon Valdez in Prince William Sound?

A No, I didn't.

Q You didn't visit while it was on Bligh Reef.

A No, I didn't.

Q Or at Naked Island.
A No.
Q Okay. You didn't visit it when it was outside of San Diego, waiting to come into dry dock?
A No, I didn't.
Q In fact, the first time you actually saw the vessel was in San Diego, correct?
A That's correct.
Q And when you looked at the tapes of the divers that were taken while the vessel was at Bligh Reef, when were those tapes done?
A I believe it was March 26, 27, something around there.
Q The grounding happened on the 24th, so it would have been two, three days later?
A It was after, yes.
Q Several days after.
A Yes.
Q And there had been how many high and low tides during each day? After the grounding?
A Two.
Q So the vessel would have gone up and gone down on and sat, squatted on the rock, so to speak, four times between the time of the grounding and the time of the tapes that you saw.

A That's correct.

Q So the divers' tapes didn't show you the damage that was done by the initial grounding, it showed the damage that had been done by the initial grounding, and the squatting on the rocks for three to four days.

A That's correct.

Q And you don't have any way of knowing the damage that was done, exactly, by the grounding itself?

A Well, I do know that the rising and lowering tide wouldn't cause plates to be separated from the hull. The damage that you see that's caused by rising and lowering of the tide would be some defamation setups.

Q That's crushing, basically, right?

A Into the -- crushing, right. The plates themselves would be -- were separated from the hull, and that wouldn't be caused by the rising and lowering of the tides.

Q Well, you must have some opinions that when this vessel went through the rocks, and became grounded that early morning of the 24th, it tore up a lot of the plates on the bottom of the Exxon Valdez, correct?

A Yes.

Q And I'm sure that those plates would have -- some of them would have actually been torn away from the fabric of the hull.

A Yes.

Q And they would have been hanging down.

A That's correct.

Q And there would have been a lot of mangled steel down there too.

A Yes.

Q And there also would have been contact with the reef at that time, right?

A That's correct.

Q Because as you said, it's impaled, right?

A It's impaled, it's sitting on the reef.

Q Now, you know that there was a storm that hit three days afterward, correct? After the ship was in ...

A Yes, I read or I heard that the -- it happened on Sunday, I think, that the storm kicked up and she spread.

Q And that caused the vessel to twist, correct?

A I don't know.

Q Well, do you think the vessel stayed there, or ...

A I think that -- I have no opinion on that, I have no reason to believe she twisted, no one -- I didn't see any documents to that fact.

Q And, now, you see damage of crushing. Is that correct?

A Yes.

Q And you don't know what damage existed before that crushing took place, right?

A Well, I do know the two rocks embedded in the steel were not caused by crushing. They were embedded in the steel.

Q That was up at the -- close to the fore peak, right?

A That was in number 1.

Q In number 1?

A Starboard. Uh-huh (affirmative).

Q But most of the crushing actually occurred in tanks 2 and 3.

A The crushing -- yeah. Yes. Exactly.

Q Okay, so you don't know what damage was done around tanks 2 and 3 before the crushing.

A No.

Q And if you've got metal hanging down from the bottom of a vessel, and if you've got that vessel making contact with the bottom, and if you've got

the vessel twisting, turning, maneuvering back and forth, you'd expect to see damage from that, wouldn't you?

(2896)

A No. Because the damage that I saw that wasn't caused by crushing were the transverse web frames. At the bottom connection, it was buckled aft, which means that to cause that to happen, it had to -- something had to push it aft. The rising and the lowering of the tides would not cause a buckling in the aft direction on the web frames. The same thing with the -- the transverse bulkheads. They were set up in the aft direction, means it was going backwards.

Q Do you recognize that?

A Yes, I do.

THE COURT: Are we referring to Exhibit 1?

MR. COLE: 103.

THE COURT: Thank you.

Q In Exhibit 103, in the area of -- where was the reef, or the vessel impaled?

A The reef was in this area. This is number 2, and that's number 3.

Q And you ...

A So in the area of longitudinal -- transverse

bulkhead 23, up to say 13.

Q And you're saying that in that area, the vessel was in contact, the ship was in contact with the ground.

A Yes. Various times, with the high and low tide, yes.

Q Well, after the grounding.

A After the grounding, yes.

Q And if you twisted the vessel, it wouldn't cause any damage, even though it's in contact with the ground.

A No, because the damage was already created, damage was already there.

Q It's not doing any more damage?

A I don't think so.

Q So the twisting motion doesn't cause anything to happen?

MR. CHALOS: Your Honor, it's been asked and answered, he asked it three times.

THE COURT: Think so, Mr. Cole.

Q Mr. Chalos asked you to make a report for this case?

A I think I asked him if I should make a report, and he said yes.

Q Now, you've never testified before, have you,

on how damage has been caused to a vessel that's run aground on rocks?

A No, I haven't.

Q In fact, the times that you've testified, the three times in court you testified about a woman on a passenger ship that broke her arm, correct?

A Yes.

Q One of 'em. In another one, you testified about another woman on a ferry who broke her nose and lost some teeth, it was a personal injury case, correct?

A That's correct. Personal injury cases in court.

Q And the last one was a woman who had a door that hit her in the behind, or something like that?

A Uh-huh (affirmative).

Q In the arbitration cases, you testified once about a ship design having to do with a no-defect in cargo handling equipment, correct?

A Yes, they had a defect in the cargo handling equipment.

Q And the other arbitration case that you testified in as an expert was where you had determined the amount of fuel oil of a ship from

Nigeria to the Bahamas.

A Amount of fuel oil consumed by the main engine from Nigeria to the Bahamas. That's correct.

Q In fact, you've only seen one ship that's run aground, been actually, personally seen one ship out in the ocean that's run aground.

A That's correct.

Q And that was one that was blown off its moorings by a typhoon, correct?

A That's correct.

Q And you weren't asked to render any opinion in that case.

A No, I wasn't.

Q You just went out to look at it for your own personal ...

A That's correct.

Q ... gratification, correct?

A That's correct.

Q And you gave some opinions about Professor Vorus' calculations, is that correct?

A Uh-huh (affirmative).

Q Did you design a computer program to simulate what would happen?

A No, I didn't.

Q You didn't.

A No, I did not.

Q Actually, you testified about a number of the things that the crew could have done, correct?

A Yes, I did.

Q But the fact is that you only have a third engineer's license, correct?

A That's right.

Q And the last time you sailed on a ship was in 1971.

A No. I've sailed on ships every time we have sea trials. I'm responsible for them, I'm responsible for the entire operation of the sea trials of vessels on diesel ships from 1973 on.

Q But you never sailed as a seaman since 1971.

A No. I haven't.

Q Those were just trials. Right?

A I'd like to say they're more than trials.

Q Well, that's all they are, they're just making sure that the ship you build is up to the -- what you've been asked to do, correct?

A That's correct.

Q There's generally -- you're not going from port to port.

A No, you're going from point to point.

Q And you weren't even actually handling those

ships when you were on the trials, were you?

A I was responsible for the owner's side of the trials.

Q You were just responsible to be there, and watch and make sure that everything went according -- as it had been required.

MR. CHALOS: Your Honor, I think Mr. Cole is haranguing the witness.

THE COURT: Objection overruled.

Q You were just required to make sure that the owner's interests were fulfilled. Right?

(3223)

A I was required to make sure the ship performed up to its specifications, and to protect the owner's interest in the building of the ship.

Q But you weren't actually the one giving the instructions on how to maneuver the vessel.

A I was the one that was required to go through the sea trial plan. And the sea trial plan details everything that belongs -- that is required by the sea trials. Which means the steering gear test, the anchoring test, the endurance test required by classification societies, the speed trial, the winch pull test, and the cargo system to make sure she performed

up to its capability and specifications.

Q But there was a captain there that was running the ship for you.

A The captain was hired by the shipyard, yes.

Q Now, you've never been involved in a salvage operation either, have you?

A No, I haven't.

Q You don't know what it takes to salvage a vessel.

A No. Not at all.

Q You've never been on a ship that's grounded.

A No, I haven't.

Q So you really don't have any first-hand knowledge on what it takes to refloat a vessel.

A No. I don't.

Q You don't have any first-hand knowledge on what it takes to keep a vessel floating after it's been damaged.

A Well, there's -- well, after it's damaged, there are certain things you can do to the vessel. First-hand knowledge, no, but design knowledge and -- I do have.

Q But no first-hand knowledge.

A No.

Q One thing, you indicated that if the captain

wanted to go outside to take a look, if he went down the hallway and turned right, he didn't go up the stairs but just kept going straight, right?

A No, he had to make a right turn, then -- no, he had to make a left turn, then a right turn, to go ...

Q Yeah, a left turn outside this door and then a right turn -- you go straight back.

A Right turn -- along the passageway, to straight -- to the exit, on the -- on his deck.

Q And that just shows him where -- that just looks at where the vessel's been, right? That looks aft. From that position.

A Yeah.

Q So he can't see where it's going, if he walks out.

A Of course. He can't see anything.

Q Now, you have worked for Mr. Chalos in the past, haven't you?

A Not for Mr. Chalos, for his firm, yes.

Q Mr. Chalos' firm does maritime work in New York, right?

A Yes, they do.

Q And you were paid by them in the past?

A Yes, I have been.
Q Was it the same fee schedule as in this case?
A I think it was a little less.
Q You're getting paid more for this case.
A In one instance, this was -- I guess it was '81, or -- no, '84 or '85, I was paid less, and in the second instance the exact same.
Q So you've worked for him twice in the past.
A Yes, I have.
Q Do you expect to continue doing consulting work in the future?
A Of course.
Q I didn't quite understand, how much have you billed Mr. Chalos up to this point?
A I haven't billed him -- nothing.
Q You've not billed anything.
A No. As I said before, the most time I spent has been up in -- up in Anchorage. The previous ...
Q That's been at $500.00 a day?
A Well, sometimes I -- I came out here two weeks ago Wednesday. That's because I had a job to do, I had to inspect a ship in Portland, Oregon. So when I came up here, to Anchorage, I sat in on the testimony, but I also wrote a report for the

people back in New York that asked me to inspect the ship in Portland. So that has taken some of my time. You know, I didn't really calculate how much time I would bill to Mr. Chalos, nor the other people. Because the report, I would say, took possibly two days to write.

Q How much do you expect to bill Mr. Chalos?

A Well, if I've been here, let's say 15 days, that and including the San Diego trip, one or two days in October, November, December last year, maybe four or five days looking at those tapes, couple days preparing, I'd say it was -- I don't know, 20, 30 days. So that would be 20 -- 10 to $15,000.00.

Q And then on top of that you get your expenses.

A Yes.

Q One point, I just want to clear up one point that maybe you misspoke or maybe I misheard. The longitudinals, they run lengthwise, right? Not this way.

A That's right.

Q Okay. I just wanted to make sure. (Pause) Let's see. I'd like to go back to this -- you're an engineer, is that right? Basically.

A Well, my initial training was as an engineer.

At Kings Point you take -- United States Merchant Marine Academy you also take, you know, cargo systems and officer curriculum.

Q You worked with engines in your job, in fact, you told the jury that you put engines in some of the vessels that you design, correct?

A I put engines in all the vessels I design.

Q Okay. You have a pretty good understanding of engines.

A Yes, I do.

Q Feel that you're an expert in them.

A Well, I ...

Q Engine design and what engines should go in certain types of vessels, how about that?

A Yeah, I would say I know basically what engine is recommended and what engine you could put in a ship like this, yes.

Q Are you familiar with car engines at all?

A That's a gasoline engine. Don't deal with them.

Q Don't deal with them at all.

A No.

Q You're from Merrimack?

A No. Merrick. M-e-r-r-i-c-k.

Q Is there snow in Merrick?

A Snow?

Q Do you have snow at all?

A Oh yeah. It's part of New York State. There's some snow.

Q Do you ever get stuck in your car? In the snow?

A Haven't in a long time.

Q Well, let's say the last time you did, do you remember when you got stuck?

A I really don't remember.

Q Well, let me give you a situation, let's say you did get stuck.

A Okay, I got stuck.

Q If you wanted to get out, would you push the accelerator full ahead? You know, right to the floor, to get out?

(3735)

MR. CHALOS: Your Honor, I object to the relevance of this.

MR. COLE: I can tell you the relevance very simply.

THE COURT: No, I don't want to hear the relevance. We're talking about a 900-foot tanker and not a car, Mr. Cole, so there is no relevance in my opinion. Go to the next question.

Q (Mr. Hoffman by Mr. Cole:) Well, what would the RPM be on the Exxon Valdez 24 minutes after you put it on load program up?

A 24 minutes after load program up?

Q Uh-huh (affirmative).

A It takes approximately 45 minutes to reach full sea speed, so you're talking about 55 RPM up to 82 RPM, let's say it's 30 RPM, so that'd be about half, 15, it would be about 70 RPM.

Q And when you talked about the available power, in this, right here, you compared the RPM on the power of what it would be at approximately, what, 60, 61 RPM to what it would be at 82 RPM? Is that correct?

A Well, you can say ...

Q Actually it's 55.

A You can say I just drew in 61 so you'd have an idea. At 55 RPM on sea trial results, you'll develop a power of approximately 8,600 horsepower. At 61 RPM, revolutions per minute, come up on the curve, you go over, you'll develop about 12,000 horsepower. And the same at 82.6, she'll develop maximum at 31,600 horsepower.

Q Would you explain to the jury what cavitating means?

A The power is designed for certain cavitations. A cavitation is nothing more than -- well, there's a lot of -- there's varying degrees of cavitation. Typically an engine or a ship like this would be designed for a back cavitation, which is a degradation of the back side of the blade, and you'd get bubbles and air back there, and that's cavitation. It'll reduce the power of the -- that the propeller is utilizing.

Q What happens when a tanker is hung up on rocks? Does that cause cavitation?

A It could cause cavitation.

Q Explain to the jury what that means.

A Well, the propeller wouldn't develop as much power.

Q So if it was hung up on the rocks, it wouldn't necessarily, if you put it to load program up, it wouldn't necessarily generate 31,600 horsepower.

A Well, it would reduce it slightly, but it wouldn't reduce it tremendously.

Q What happens to the engine of a tanker when it's sitting hung up on a rock, and you put it to load program up?

A Well, it would continue to go load program up until something happened.

Q It overheats, doesn't it?

(3997)

A It could happen.

Q Have you read the testimony of any of the witnesses in this case?

A Mr. Kunkel's.

Q Did you happen to read Mr. Glowacki's testimony?

A No, I didn't.

Q Would it surprise you that Mr. Glowacki says that he noticed the engine overheating shortly after the vessel hit the rocks?

A Well, I imagine the vessel was on the rocks, and the engine was still running after she hit. That could have contributed to it.

Q And an overheating engine is not a good thing, is it?

A Well, you have safeguards on the engine to protect the engine from overheating.

Q But it can ruin an engine if you run it too long at a -- overheating situation, correct?

MR. CHALOS: Your Honor, I'm going to object, Mr. Cole is mischaracterizing Mr. Glowacki's testimony. Mr. Glowacki didn't say the engine overheated, what he said was the lube oil alarm went off, showing that

there was a high temperature in the lube oil. That's not the same as overheating in the engine.

THE COURT: The objection to the last question?

MR. CHALOS: Yes, the premise ...

THE COURT: You asked him if it could ruin an engine if it overheated, I think is what his question was.

MR. CHALOS: But Your Honor, I wouldn't object to that generally, but I think that Mr. Cole has been mischaracterizing the Chief Engineer's testimony, or mischaracterizing, and that's what I'm objecting to.

THE COURT: Okay, that question's already been asked and answered, the objection overruled as to this last question, you may proceed.

(Tape: C-3663)

(0049)

Q (Mr. Hoffman by Mr. Cole:) ... either forward or backward. Correct?

A That's correct.

Q I would like you to -- let me get this out of your way.

A Sure.

Q Take this marker and explain to the jury your theory of how the damage occurred to the tanker.

How it hit the first rock. Second rock. Can you show it up on the -- with a diagram?

A Yeah, I guess. (Pause) This -- and this ... (Pause) All right, this is one, two, three, four, five.

What I think happened is that she was gonna turn. And possibly a rock entered around here, continued 'cause the vessel was swinging to starboard, and exited there. She continued, slightly, to the next rock or the next reef, and it crushed the bow and landed in this area.

Q Okay, thank you. You may sit down.

So you didn't see evidence -- you sat through the other witnesses' testimony, then, correct?

A Yes.

Q The experts that talked about the damage.

A Yes.

Q And you heard them say that they saw a tunnel from about the fore peak, that ran through the center tanks and all the way out the aft section on the starboard side.

A Yeah. I mean, this is just schematic. The tunnel is -- that they were talking about was this -- I assume that this caused the damage to the fore peak, and number 1, and landed on number

2 and 3. And that embedded the rocks in number 1 tank, the two big rocks. The initial hit -- it could have -- could have come here, or -- I believe it probably entered here some place around here.

Q Well, if it entered right there, some place around there, the first one, did you do any calculations on the amount of turn that the ship was in?

A No.

Q Basically what you're saying is that this ship was making a turn about this point right in here, is that correct, somewhere ...

A Well, you know, whether ...

Q ... something like that, you'd have to be making a turn like that.

A Well, whether it started here and continued -- or here and continued, I wouldn't know.

Q But you didn't see a continuous line from the front all the way to the end.

A I saw continuous damage. But to say that this was continuous, I really couldn't tell you.

Q Now, finally you gave some opinions about Professor Vorus' computer-simulated, for lack of a better word, sinkings.

A Scenarios.

Q Scenarios. Okay?

A Uh-huh (affirmative).

Q But you didn't do any computer-simulated scenarios yourself.

A No, I didn't.

Q You didn't even -- did you call Professor Vorus and talk to him about how he arrived at these conclusions?

A No, I looked at his calculations.

Q Were there anything wrong with the calculations that you saw?

A The thing that was wrong with his calculations is that he didn't consider actions by the crew. I really sincerely doubt that the crew would sit there and watch the ship sink.

Q Well, let's talk about that. You said that what he could have done is -- one of the things he could have done was added water to the aft peak, is that correct?

A Yes.

Q So if he adds water to the aft peak, and he's got a full fore peak, and he's got two full starboard tanks, ballast tanks, what keeps this vessel floating?

A If you add water to the aft peak, it will release the trim of the vessel by the head slightly. This tank full is about 2,500 tons, the fore peak full is about 6,500 tons. So the net difference is about 4,000 tons forward. And that would be it.

Q It's true, isn't it, that the aft is -- the reason you have a ballast tank there is partially to provide flotation for the vessel, buoyancy?

A The aft peak tank?

Q Yes.

A It provides flotation to the vessel and also -- arrangement of the trim. In certain instances you want to be -- coming into port, for instance, you want to be on an even keel, and if you're trimmed by the head, you just trim the aft peak and the engine room tanks down a little bit, and you can get an even keel situation.

Q Well, under your theory, you could also flood the engine room, and that'd bring up the fore peak too, wouldn't it?

A Come on ...

Q Well, isn't that right, under your theory?

A That's not a logical conclusion, the crew would never flood the engine room to bring up the

fore peak.

Q The next thing is you indicated you could open up a pipe on the pump side, and allow water to come in, is that correct?

A No, I indicated that there's a -- it's a flood, a flood control valve. There's a valve in number 4 port, as well as number 4 starboard, and number 2 ballast tanks. That is a motorized control valve that you press in the cargo control room that opens up the butterfly valve, and the water from the bottom will flood the tank.

Q Okay. But it doesn't pump water into the vessel.

A No. There's two ways you can get water into the ballast tank ...

Q I'm just talking about that one scenario right there.

A Yeah, that one, yes, it would flood the tank up to the level of the draft of the ...

Q But water only comes in at a rate that air can go out, correct?

A Yeah.

Q So if there's restrictions on the -- up above, water can only come in as much as the air is allowed to go out, right?

A That's correct.
Q What's the volume of the port ballast tank?
A About 10,000 tons.
Q No, the volume.
A I don't remember, to tell you the truth.
Q So you don't know how long, then -- you said that to pump water into -- the pumps pump about 15,000 gallons per minute, is that correct?
A Yeah. That's the ballast pump. That's in the pump room.
Q You don't know, then, how long it would take to pump up the port ballast tank.
A Well, if you open up the valve, the water starts flooding in, and if you pump -- use the ballast pump, 15,000 gallons per minute is approximately 35,000 tons per hour.
Q And in your opinion, this would have floated, if he had done that?
A Yes.
Q But you didn't run any calculations.
A I ran a calculation to determine how many tons he needed at different list conditions.
Q But that only corrects for the list, is that correct?
A It corrects for the list and it also -- since

number 4 is aft of amidships, it would correct the trimming.

Q But that doesn't stop the water from coming in, it just slows it down. Correct?

A Well, it would stop it up to the level of the draft forward. In other words, there'd be a -- if your ship is heeling, or trimming by the head and heeling to the starboard, and you put water in number 4, which is aft of amidships -- midship point, it will have a tendency to bring the ship up on the trim and over on the heel.

Q But you still are in a condition where it's only slowing down the intake of the water, correct?

A Slowing down the intake -- well, no, it would stop the intake of the water. The water will actually flow out of here, because you're lifting the ship up. Be less water in there.

Q Now, your assumption is that the crew would have been doing all this at the time that this was happening, correct?

A I know the crew would have done something, they wouldn't have watched the ship sink.

Q But there is no evidence that they did any of this stuff on this particular night, is there?

A Well, the ship was impaled on the rocks, wasn't going anywhere. Some other scenario.

Q I have no further questions.

MR. CHALOS: Well, I just have a few minutes, it's about 10 after 10, shall we take a break?

THE COURT: Yeah, let's take our break. Don't discuss this matter among yourselves or with any other person, or form or express any opinions.

(0464)

(Off record - 10:10 a.m.)

(On record - 10:30 a.m.)

(Jury not present.)

THE COURT: I understand you needed to take something up before the jury comes in, Mr. Cole?

MR. COLE: Yes. Your Honor, while we were out in the hallway, I was just accused of passing a threat along to a witness by an Exxon attorney. I want to bring something to the court's attention, I believe I have an ethical obligation to -- we had an interview with a tanker captain last night who works with Exxon in the presence of Mr. Chalos and Mr. Russo, talking about how he interpreted the rules of the Coast Guard, and they are different than the Coast Guard interprets those rules.

After the interview, we thought about it this

morning, just to make sure in our own mind that there's no problem arising out of that, we contacted the Coast Guard to ask what they would do if tanker captains testified that they were routinely doing things that were not within the rules.

THE COURT: Now, you say "we contacted," is it you personally, or ...

MR. COLE: That's Trooper Stogsdill, did it.

THE COURT: Okay.

MR. COLE: Sergeant Stogsdill. He's not in the courtroom right now, but my understanding is when he told that -- the Coast Guard had indicated that they had thought about that, and that they would or might look into it, was my understanding.

Our instructions all along have been, when dealing with Exxon officials, to talk with Exxon attorneys. And so I passed that along under an obligation that I felt I had under the case law ...

THE COURT: Passed what on?

MR. COLE: That information that I just gave you. To an Exxon attorney, I did not talk to the witness, haven't talked to the witness ...

THE COURT: You passed on information, what information did you pass on? I'm sorry, I don't understand.

MR. COLE: I just told the Exxon attorney that we had interviewed this person, that there was an indication that his practices might be different than what the Coast Guard regs, pilotage regs are, and that he should be aware of that. And that we had contacted the Coast Guard, and they indicated they might take action.

THE COURT: Is that what they said, they might take action?

MR. COLE: They might look into it. I'm sorry, they might look into it.

THE COURT: What did you tell the Exxon attorney, they might take action, or they might look into it?

MR. COLE: That they might look into it.

THE COURT: Okay.

MR. COLE: I just want to get that on the record. I mean, I felt that that was my obligation.

THE COURT: All right, it's on the record.

MR. MADSON: Your Honor, I want to put something else on the record. I don't know what the motivation of the State was in doing this. It may have been in good faith, and it may not have been. But I don't think that's necessarily the point. The point is that the Coast Guard, who are the Justice Department,

for their own reasons, may decide to use this as an intimidation tactic for witnesses that we intend to call. If that happens, if witnesses are afraid to testify because of action the Coast Guard might take, that prohibits us from getting a fair trial. Even though this is not the State's -- let's say the State isn't directly responsible for that, still, I think this court has an obligation to guarantee a fair trial for the defendant.

And if it's prohibited by some outside interference or force, I think we run the risk of a mistrial here, and I guess that's my concern, is that we're -- now, I don't know, I wasn't party within this conversation, but I'm just saying that that does arise, that just gives me my concern, and I wanted to let the court know what the potential problem as we see it is.

THE COURT: Do you suspect that you're going to call a witness and ask him a question and he's going to take the Fifth Amendment because of that question?

MR. MADSON: Well, until this happened, no, absolutely not, but we don't know what effect that might have to a witness now. This just occurred, just a short time ago. We have witnesses that we would expect to call to say, "Here's what we do as a matter of habit, that's what everybody does. Here's where the

pilot gets off. We have no pilotage. This is what's done."

THE COURT: Okay, so there's no application before the court, you just lodge a ...

MR. MADSON: Yeah, we just want to alert the court, I think, as to -- instead of being surprised, you know, the court at least knows that this is on the horizon.

THE COURT: Okay. Are we ready now with the jury? Okay ...

(Jury present.)

(Indiscernible - whispering)

THE COURT: Mr. Chalos?

MR. CHALOS: Your Honor, during the break I reviewed my notes, and I find I have no further ...

(Indiscernible - whispering)

MR. CHALOS: I have no further questions of this witness.

THE COURT: Counsel approach the bench.

(Whispered bench conference)

THE COURT: Sir, assuming this vessel is 166 foot across at its widest part, how far would you estimate it to be across in the area immediately behind the superstructure, near that area of the deck ...

A Oh, you mean ...

THE COURT: Yeah, right behind that superstructure. Where the bridge is.

A You want to know the length or the width? This is 166, I really -- I don't know if this is to scale. I assume it is ...

THE COURT: An estimate is what we're looking for.

A Okay, about 120 feet.

THE COURT: And the deck that is accessible from the Captain's quarters behind the superstructure, how wide is that deck?

A From his -- well, there's a -- as he comes out, there's a ladder. There's a ladder landing, I guess it's -- there's no deck behind it, it's just a landing, where you could go on the outside, as an outside ladder.

THE COURT: Well, on this model over here, maybe counsel can turn it around for the witness. It looks like there's little decks out there, I was wondering if ...

A Yeah, they're just landings for ladders. I believe -- see, the ladders -- there's only one ladder going from the bottom of the ship or the main deck up to the wheelhouse, so if one came out of any of those, the aft end of the deck,

there's a platform and a ladder going down.

THE COURT: And how wide is the platform, then, or landing as you want to call it?

A I believe it's about three and a half, four feet.

THE COURT: And how far does it go from side to side?

A It goes from side to side 40 feet.

THE COURT: And so, are there any railings around it?

A Yes.

THE COURT: How high are the railings?

A Three feet.

THE COURT: Could you estimate from the farthest side of the railing, side of that little landing, to the edge of the vessel, how far that would be?

A I would say -- half length would be about -- 166 divided by two would be 83, and 20 over there, would be about 50 feet to the edge of the vessel.

THE COURT: Okay, thank you. That's all the questions I have.

MR. CHALOS: I have no further questions.

THE COURT: The witness is excused. Mr. Cole?

MR. COLE: Yes.

THE COURT: You're excused from further participation. Call your next witness. (Pause) You may call your next witness.

(0846)

MR. CHALOS: Yes, Your Honor, the defense calls Peter Shizume.

THE CLERK: Sir, if you would remain standing and attach the microphone -- the small one -- and once you do that, please raise your right hand.

(Oath administered)

A I do.

PETER SHIZUME,

called as a witness in behalf of the Defendant, being first duly sworn upon oath, testified as follows:

THE CLERK: Please be seated. And sir, would you please state your full name and then spell your last name?

A Peter Shizume. S-h-i-z-u-m-e.

THE CLERK: And your current mailing address, sir?

A 33 Kingston Avenue, Hicksville, New York, 11801.

THE CLERK: And your current occupation?

A I'm presently retired, but I'm doing

consulting work.

THE CLERK: Thank you.

DIRECT EXAMINATION OF MR. SHIZUME

BY MR. CHALOS:

Q Good morning, Mr. Shizume.

A Good morning.

Q What type of consulting work do you do?

A Well, primarily marine simulation and algorithm development.

Q What is marine simulation and algorithm development?

A Well, marine simulation is the simulation of the position, velocity, and heading of the ship from information that you input -- for example, rudder and throttle information.

Q And this is all done on a computer?

A It's a computer-based system.

Q What have you been asked to do in this particular case?

A I was asked to run a simulation from Entrance Island down to the grounding site, and in addition, make other scenarios for different rudder angles at different points along the trajectory.

Q This is for the Exxon Valdez?

A That's right.

Q Now, can you tell us briefly what your educational background is?

A I have a Bachelor in physics from the University of Illinois, and a Master's in electrical engineering in the department of electrophysics from the Brooklyn Polytechnic Institute.

Q Can you give us a brief description of your employment background, please?

A Well, I started working with the Sperry Gyroscope Company in New York. I started as an associate engineer, doing work in radar systems, and by 1960, I was promoted to senior engineer, and continued work in electronic countermeasures, which is a means for countering radar that may be tracking the aircraft.

Q This is for the Department of -- as a subcontractor ...

A This was ...

Q ... for the Department of Defense?

A Right.

Q That was back in 1960, what have you done since 1960?

A Well, from 1960 to 1978, I was promoted to

research section head, and I was put into an analysis group working on confidential programs for the Navy. This was also a computer-based system.

Q This is for the Navy?

A For the Navy, yes.

Q When was your first involvement with computers and computer programs?

A Well, it started from the very beginning.

Q When was that?

A Around 1960, from 1960 on, all of my experience has been in computer-based systems.

Q Now, what did you do after 1978?

A I -- from 1978 to 1986, I was assigned to the Computer-Aided Operations Research facility at the National Maritime Research Center, which is at Kings Point, New York, on the campus of the Kings Point Merchant Marine Academy.

Q The computer-aided ...

A Operations Research.

Q It's commonly known as CAOR?

A Yes, right.

Q What was your assignment -- were you assigned by Sperry (ph.) or ...

A Yes, by Sperry -- Sperry while I was there was

merged with Burroughs, and has since been called Unisys.

Q What was your function, or what were your duties at CAOR?

A Well, I was responsible for making new capabilities to the simulator, the CAOR simulator.

Q There was a CAOR simulator in existence when you got there?

A Yes.

Q And what were you supposed to do?

A Make improvements to satisfy the requirements of research.

Q What type of improvements?

A Well, the -- they wanted to do some low-speed tug work, pushing these large crude carriers, so that I had to develop the low-speed algorithm.

Q When you say they wanted to do low-speed analysis, that was done on the computer in the simulated form?

A Yes, that's right.

Q And what did you do, you wrote a program for that?

A For the low-speed algorithm, yeah.

Q Anything else you did?

A Yeah, well, then also I developed the engine that's presently being used, it's a -- it's been written so that it can be changed from a low-speed diesel to a steam turbine engine.

Q Again, the engine that you're talking about is a computer-simulated engine?

A Computer-simulated engine, yes.

Q And you wrote the program for that?

A Yes.

Q Did you do anything else?

A Then there's -- the simulator has a tug panel that has up to six tugs, and the computer that draws -- I mean, the program that draws that is a tug program, which I designed and developed.

Q Anything else?

A The -- they wanted to do some maneuvering in the harbor, so that they needed a rudder that would display the kick effect, so that I redesigned the rudder so that it would accomplish this.

Q What is the kick effect?

A Well, this is a technique used in tight regions where you put the throttle forward for a short time, and at the same time turn the rudder, so that the ship does not get much weigh, and at

the same time it gets a tremendous kick from the rudder, that -- it can turn the stern of the ship.

Q And this is all done by computer simulation?

A Yes.

Q So what you're saying is, based on the computer simulation that you have done, you can predict how a vessel would react by the rudder being at a certain angle?

A Right. Well, the rudder and engine combination.

(1230)

Q And you've done -- you yourself wrote that program?

A Yes, I did.

Q Can you explain what the CAOR facility is all about, I mean, what is their purpose?

A Well, the CAOR facility is a real time simulator, by that I mean everything runs at the regular time, so that a helmsman and pilot can steer the ship. Now the -- a full-scale bridge of a heavy ship is built into the simulator, in a separate room, and the throttle, telegraph, and helm is input into the computer.

Q You mean you actually have a mock-up of a

bridge at the CAOR facilities?

A Right, yes, it includes the helm, the throttle and telegraph, radars, collision avoidance equipment, and -- it has just about everything that a regular tanker has.

Q Does the CAOR system have in its computers various areas around the world, simulates various ...

A Yes, well, we have database -- these have to be made up special for a particular area. We have a database that is the New York Harbor, we have a database that is the Panama Canal Gaylord (ph.) Cut region, and now I think we have a database of Valdez during the early years. And we have enough databases that -- it -- give you the picture of the Mississippi Outlet Canal.

Q So using the real time part of the CAOR facilities, what you would have is a pilot and a helmsman on this mock-up bridge, and ahead of them they would have this scene of the area that's being simulated?

A Right, the scene is computer-generated, and it's synchronized with the position of the ships so that as you go under a bridge or something, you see it go up over your head, and as you

approach Manhattan Island, you see the buildings on the shore.

Q So what you're saying, in effect, someone standing on this mock-up bridge would be seeing what he would see in a simulated form, would be seeing what he would be seeing if he were out in the harbor.

A Right. Yeah, uh-huh (affirmative).

Q And the simulator simulates the various maneuvers that the vessel can make.

A Uh-huh (affirmative). That's right.

Q Okay. Now, is there another part to the CAOR facilities?

A Well, there are radar generators that generate the radar picture, so that you can look in the radar and see, actually see the display of the land masses and so on.

Q What are these mock-up bridges and simulations used for?

A Well, they're -- while I was there, we were doing work for the National Maritime Administration, and for the Corps of Engineers, and the work was mainly involved in harbor development or canal development.

Q What do you mean by that?

A Well, they want to know how much they have to dredge to allow certain size ships to go in, and they want to minimize that dredging as much as they can, because it's a very expensive -- project.

Q So in other words, the simulation would show you the depth of the water, and then you would simulate a ship going through ...

A Yeah, right.

Q ... to see if there was sufficient water.

A And you have to have the channels a certain width, so that it can handle two ships passing.

Q Are the real-time simulators used for any other purpose?

A Yeah, they're used for training, and -- for pilot training, or captain training. I mean, we have a tug program, where we have a tug lashed to a barge, these are used quite often on the East Coast to supply fuels to the ports from up around the East Coast.

Q You can simulate that particular scenario ...

A Right.

Q ... in the real-time simulation?

A And this was used extensively to train pilots -- I mean, not pilots, but captains, tug

captains.

Q Are the facilities used to also train the midshipmen at Kings Point?

A Yes. The -- we had a program while I was there, I'm not sure it's still in existence, but every evening, we'd shut the simulator down and change it over for these midshipmen, who would have courses during the night.

Q Now, is there another part of the program called the fast-time program?

A Yes, there's two fast-time programs, and these are -- well, in order to run a simulation on the real-time system, it might take more than two hours to complete the whole simulation. And ...

Q In other words, if you were simulating a situation where you're going from Point A to Point B, and it takes two hours, in the real-time simulation, it would take actually two hours.

A Yeah, right. Yeah. But then the fast-time simulator is -- it can do the same thing in a matter of a few seconds, so that you can make many runs, and -- but then, the ship is controlled by a track-line follower, which simulates the action of the helmsman, and the engine can be made to speed up when the ship is

in trouble, or else it can be made to speed up at specified times.

Q If you were using the fast-time simulation to simulate what would take, let's say, two hours, does the computer go through all of the functions that it would go through if you were doing it in real time?

A Yes, it's the same program, yes.

Q And it makes the same plots as it would in real time?

A Uh-huh (affirmative).

Q And whatever pressure would be on the ship in real time would be picked up by the fast-time simulation?

A That's right.

Q Now, were you the author of the computer programs that are being used now at CAOR?

(1574)

A Yes, I designed the two fast-time programs. One fast-time program is just a single ship, and the other one is two ships, which was used in canal development for the Panama Canal. And the point of this study was to determine how wide the Gaylord (ph.) Cut would have to be wide in order to get to a passage in the Gaylord Cut.

Presently they only allow one-way passage for the large Panamax (ph.) ships.

Q Are the computer simulations, whether they be real time or fast time, are used by the industry for various purposes?

A Yes, well, we've had contracts with shipping companies that wanted certain studies to be done, and we've done studies for the Corps of Engineers to determine what sort of dredging was required.

Q Have your simulations been used by the National Transportation Safety Board in accident reconstruction?

A Yes. We've done it for a number of accidents, but it was a policy at the company not to testify, because they had contracts with the ship owners as well as the Corps of Engineers and the Coast Guard.

Q Well, let me ask you about that, have you ever testified before?

A No, I never have.

Q Is that because of the policy that you just spoke of?

A Yes.

Q Have you published any papers on computer simulations?

A Yes, I've published two papers that were -- one was for a national conference on simulation, and the other one was for the -- ship control in restricted waters for the Society of Naval Architects.

Q The paper that you delivered on simulation, are you talking about "Vessel Course, Speed, and Direction Simulations"?

A Yes, that's right.

Q In that paper, were the practices -- sorry, let me strike that and start again. Are the practices discussed in that paper that you delivered the type of practices that you used in simulating ...

A Yes.

Q ... the Exxon Valdez course?

A Well, not specifically the Exxon Valdez, but courses of any kind of research project that you would want to run.

Q What I'm talking about is the techniques, were the techniques that you discuss in those papers the same that you use in simulating the ...

A Yeah.

Q ... Exxon Valdez course?

A Right.

Q Now, you're appearing here as an expert at our request?

A Yes.

Q Do you have a fee arrangement with the defense?

A Well, it's time, and computer time, and time -- it's on a time -- per hour basis for work done from my home, and then during witnessing, it's on a per day basis.

Q Have you estimated what your charges will be in this matter?

A I can only estimate at this point, but I think it's something between seven and 10,000.

Q Dollars?

A Dollars, yeah.

Q Now, could you tell us what you did in this particular case to simulate the course, speed, and direction of the Exxon Valdez on the evening of March 23, going into the morning of March 24?

A Well, I first had to develop a mathematical model for the Exxon Valdez.

Q What do you mean by mathematical model?

A Well, this is a -- equation of motion that relates the mass of the ship and the forces acting on the ship to its motion.

Q How did you develop the mathematical model?

A Well, the basic model has been developed for some time, but then -- the model contains constants, or quasi-constant terms. And these constants relate the forces that are generated as the ship maneuvers. And in order to develop these, you can either start from a scale model ship, which is a kind of expensive way of doing it, and you tow the ship through a tow tank and measure forces acting on the ship.

Q Well, what type of forces are you referring to?

A Well, as the ship makes a turn, it doesn't make a turn like a car, it slides sideways. And that generates a force that causes the ship to turn. And also, as the rudder is extended, it produces more resistance to the flow of water, and so the ship starts to slow down. And these -- you have sets of equations for the XY direction and the yaw-moment (ph.) equation, and the fore and aft equation, which all are coupled, and they give you the dynamics of the moving ship.

Q And you say you have a model such as that in the library already?

A Right. But then we need these constants to make it simulate a specific type of ship.

Q So what did you do to simulate the Exxon Valdez?

A Well, I took a ship that presently is in the CAOR library of ships. This particular ship was a 220,000-ton tanker. And I reduced the length to 945 feet, which is the wetted length of the Exxon Valdez.

Q What do you mean by "wetted length"?

A Well, the overall length is 965 feet, but then you have an overhang from the bow and an overhang from the rear, which is not in the water, and the only thing that's important for the dynamics of the ship is the wetted length. So ...

Q Meaning the length of ship in the water itself.

A Right. And then I reduced the beam to 166 feet, which is the width of the Exxon Valdez, and the draft, which is the depth from the water level to the bottom of the ship, I used 56.3 feet, which was the draft of the Exxon Valdez at the time of the grounding. Then I changed ...

Q You mean prior to the grounding?

A Prior to the grounding. Then I changed the

mass of the ship to correspond to this reduced draft, and the moment of inertia, which is a term that's similar to mass, only it's for rotation.

Q And this is all being done on the computers?

A These are all in -- prepared in the file that the computer will use.

Q In other words, you're inputting into the computer certain values.

A Right. Yeah.

Q You've taken them out, only you've reduced it to match the Exxon Valdez values.

A And there's one other thing that's ...

Q Is that right?

A That's right.

Q What else did you do?

A There's one other thing that you have to do in order for the ship to act correctly, is to scale the constants that determine the force acting on the hull. And these are -- can be done in an empirical fashion, using literature -- papers that are in the literature of ships. It's -- so if you don't do this correctly, then the ship won't yaw correctly as it makes the turn.

Q Did you review the literature that you're talking about to make the corrections?

A Yeah. Yes, this ...

Q What specifically did you review?

A The name of the paper?

Q Yes.

A It was a Japanese paper by Ugamo (ph.) -- I don't recall all the names.

Q Okay. In other words, you took whatever values are discussed in that particular paper, and incorporated them?

A Well, they did a -- using ship models, they did a parametric study where you could just about -- and they did it for three classes of ships, the bulk carrier, oil crude carrier, and the bulk carrier, and they -- container carrier. And these are -- the crude carriers are the more blunt ships, so that you could -- and they did it parametrically for different size ships, so that you can pick off your value based on your shape factor and your length and ...

Q Did you do that?

A Yes.

Q And you incorporated it into your simulation.

A And I incorporated it into the file, input file.

Q What did you do then?

A Then I made a rough track line using the Exxon Valdez course recorder and the engine bell ringer, and ...

Q The data logger, you mean?

A Bell logger, yeah.

(2100)

Q Okay.

A And then I ran the ship down this track line, and you get the actual velocity. The velocity along the chart line does not remain constant, it's continually changing, so once I know how it changed, I can adjust the track line so that I get the exact proper lengths for the track line.

Q Well, what causes these changes in velocity?

A Well, as the ship turned -- it -- first of all, the throttle may be reduced, like it was when they allowed the pilot to disembark from the ship, and also -- and then there's a speed-up, engine build-up time, and there's gradual build-up of the speed. Then also as the ship turns, the resistance of the ship increases, and so it starts to slow down.

Q You took all those factors into account?

A I took into account the actual velocity that was involved, so that I could determine the

correct length for the legs of the trajectory.

Q And what was the conclusion of that exercise?

A Well, after adjusting things as best I could, I used four fixed points that was taken from the VTS radar and from aboard the ship, and laid those along their coordinates, and tried to get the ship to follow not only the course recorder output, but the position fix output, to generate a course that's similar to the -- or very close to the Exxon Valdez course.

Q And this is part of the exercise to simulate the movement of the ship?

A This is to verify that the ship does indeed act like the Exxon Valdez, because if it doesn't, then I can't ever get these things to match.

Q All right. After you went through the exercise that you just described, what did you find?

A Well, I found that I could match 'em very closely, and the heading, simulated heading was very close, you could over -- just about overlay it on the Exxon Valdez course recorder.

Q Did you prepare a chart that indicates the results of that particular exercise that you're talking about?

A I ...

Q Let me show you. (Pause) Let me show you what's been marked as Defendant's Exhibit BC for identification, and ask you, is this a chart you prepared indicating how close the simulation came to the actual?

A Yes. This is the recorded position ...

THE COURT: There's a pointer off to your right side.

A Oh. This is the recorded value, that was taken from the VTS radar, and this is the simulated value.

Q How close are they?

A Well, this is exactly the same, and the position is very slightly different. Then there is an error in the actual route position fix, similarity -- this is for the position fix at 053.

Q Is that 10:53 p.m.?

A Yeah.

Q Okay.

A And this is the recorded value, and this is the simulated value.

Q Again, they're very very close?

A There's only a tenth of a degree different.

Q Okay. What's the third point you took?

A This is at 11:39.

Q P.m.?

A P.m. The recorded value and the simulated value are identical here. The position is just slightly different.

Q Okay, and then you took a position at 11:55 p.m. on the 23rd?

A Right. And this was taken by the third mate. And it's 80.5, they're identical as far as the heading goes, and the position -- longitude position is only like one minute off.

Q Okay. After having done this exercise, were you satisfied that your simulated model was the same as the actual Exxon Valdez?

A Yes, I think that shows the accuracy, I think it was very similar.

Q Now, having satisfied yourself that your model, your computer model acted in the same way that the vessel would have acted in similar circumstances, what did you do next?

A Well, then I ran the whole transit from Entrance Island down to the point where the turn was -- just before the turn was initiated to avoid Bligh Reef.

Q All right, let me mark -- Your Honor, at this time, before I introduce Exhibit BD, I would offer Defendant's Exhibit BC into evidence.

MR. COLE: My only objection, if I could just voir dire this briefly ...

(2430)

VOIR DIRE EXAMINATION OF MR. SHIZUME

BY MR. COLE:

Q Mr. Shizume, the point at 11:55 that you have recorded, see that point at 11:55? That's 180.5, correct? That's the heading at that time?

A Yes, that's right.

Q And that's based on the assumption that the course -- the vessel was .9 nautical miles off Busby Island, correct?

A The heading is independent of where it is.

Q That heading right there was used -- it goes through a .9 nautical mile mark, right?

A Yeah, okay.

Q And if the third mate testified that it was 1.1 miles off Busby, then that wouldn't be correct right there, that wouldn't be the third mate's testimony.

A Well, there is a difference in the mat and maw (ph.), accounts for that.

Q My only objection is to, Your Honor, is to the two stars that indicates that's the third mate's testimony, that was not the third mate's testimony. The third mate's testimony was that they were 1.1 miles off Busby Island, not .9 ...

MR. CHALOS: No, but he shows that in the latitude and longitude, is what he said.

MR. COLE: That's not my understanding of the graph.

MR. CHALOS: I can ask the witness, Your Honor.

THE COURT: Go ahead.

DIRECT EXAMINATION OF MR SHIZUME, CONTINUED

BY MR. CHALOS:

Q Mr. Shizume, the latitude and longitude that you plotted for -- on this chart of the vessel's position as reported by the third mate, it differs from the one that the simulation shows, does it not?

A Yes.

Q And that would account for the testimony of the third mate saying he was about 1.1 miles off, and your simulation showing that the vessel was .9 off.

A Right. Yeah.

Q So the numbers that you have here, then, are correct, are they not?

A Yes. It's about a tenth of a mile different.

(Indiscernible - whispering)

Q You mentioned that you drew a track line from Entrance Island down to the point of the initiation of the turn, is that right?

A That's right.

Q I'll show you what's been marked as Exhibit BD, and ask you, is this the track line you're referring to?

A Yes.

Q What does this represent?

A This represents the passage of the ship from Entrance Island, point where -- the pilot disembarked, and then the -- goes down to ...

Q Can you use a pointer?

A Off Busby Island, and then they continue down to this point before any rudder was initiated.

Q When you say "rudder was initiated," you're talking at what time?

A This is 12:01.5.

Q A.m.

A A.m., yes.

Q One and a half minutes after midnight.

A Right.

Q Okay. Is this the simulated track line?

A This is the simulated track line.

Q And you compared it to the actual track line?

A Well, we don't have an actual track line -- but I compared it to the course ...

Q Recorder?

A ... Exxon Valdez course recorder.

Q And how was the match?

A They matched right on top of each other.

Q Okay. Your Honor, at this time I offer Exhibit BD into evidence.

THE COURT: Admitted.

EXHIBIT BD ADMITTED

Q All right. So you made this simulated track line, and what did you do next?

A Well, then I ran down the track line and -- well, first of all, I looked at an expanded view of the course recorder in the time between 11 -- I mean, 12:01.5 minutes down to -- down to the 12:10. And I have an expanded view of that, do you have that here?

Q No. What was the purpose of looking at the expanded view?

A Well, that was to determine what sort of

rudder was used.

Q Are you talking about this one?

A No, that's the course recorder. Then there was one with the triangular points and the circular points ...

Q Oh ...

A Oh yeah.

Q Are you talking about this document?

A That's right.

Q Let me have it and mark it. (Pause) Let me show you what's been marked for identification as Defendant's Exhibit BE. What does this document purport, or this draft purport to show?

(2730)

A Well, these triangular points are points taken from the Exxon Valdez course recorder. And we notice that there's a sudden change in slope at this point ...

Q What point is that, in time?

A Well, that's around six -- 12:06.5, up through 12:07.5.

Q So the actual course recorder shows a change in slope ...

A Right.

Q ... between those two periods of time.

A Right.

Q Six and a half minutes after midnight to seven and a half minutes after midnight.

A Yeah. And then it falls off like this. This is -- this trace here is for a constant four-degrees rudder, and ...

Q May we move it closer to the jury to see?

THE COURT: All right. That cord is plenty long, so ...

A Okay. This curve here is for a constant four-degrees rudder, it shows how they -- the course changes as a function of time.

Q Well, before we go on, let's explain to the jury what you have here. Starting over on the right-hand side, what do these numbers represent?

A This is -- represents a course, 180 degrees, 200, 220, 240, 260, and 280 degrees. I mean, the direction that the ship is pointing.

Q And I notice that you start the various changes at course 180.

A Right. 0.5.

Q Okay. And what time did you start the changes?

A 12:01.5.

Q That corresponds with the time that the ship's

headings started to change.

A Yeah, right.

Q Okay. And what does this represent, with the triangles again?

A That's -- these are points, triangular -- the triangular points are points taken from the ...

Q Actual course ...

A ... actual course recorder.

Q Okay. What does this line here that's marked "four degrees" represent?

A That's the course change as a function of time, when a four-degrees constant rudder is applied.

Q Okay. In other words, a four-degrees is what you're using to compare the actual course?

A Right.

Q Okay.

A Then this is the same thing for a 10-degree swerve.

Q So in other words, if 10 degrees right rudder was applied at one and a half minutes after midnight, by 12:07, the ship's heading would have been what?

A 200 -- 290. No. Yes -- yeah, 290.

Q 290. And by plotting the actual ...

A The circular points?
Q No, plotting the actual course recorded ...
A Uh-huh (affirmative).
Q ... course, what course was this ship on at the same time, at 12:07?
A It was 108.5 degrees.
Q No, at 12:07.
A Oh, 12:07. It was about 250 degrees.
Q Okay. So in other words there would have been a difference of course change had 10 degrees right rudder been applied at the same time, of something like 40 degrees?
A (No audible response)
Q Okay. What does this dotted line represent?
A Well, this is my attempt at simulating the course recorder output during this time, and in order to get this, I had to use a left rudder of six degrees to make it flat mount, and even at that I didn't really get it as flat as shown there.
Q In other words, for you to simulate what the actual course recorder showed, at the point around 250 degrees, you had to use six degrees of left rudder to get the flatten?
A Right, yeah.

Q Is that what they call counter-rudder?

A Counter-rudder, yeah.

Q Do you have an opinion as to whether a similar counter-rudder was used in the actual maneuvering of the vessel to get this flattening of the course?

A Well, if you looked on the trajectory plots of the turns, you -- in this region, you're still in deep water, about 20 to 30 fathoms, so that the only way you could get such a change in course would be to apply reverse rudder.

Q Or counter-rudder.

A Counter-rudder, yeah.

(3048)

Q Now, what is the net rudder that was used starting at 12:01 and a half till about 12:10 on the basis of the actual and your simulated course recording?

A What was the ...

Q Net rudder used.

A I -- by net, you mean the average rudder, or ...

Q The average, right.

A Well, it was something like four degrees, but then, it occurred at different times, it was

stretched out.

Q Okay. What do you mean by average rudder?

A Well, you -- there's a number of averages, but then the average width might be to these squares, that -- to the four-degree line.

Q Well, what you're depicting here is the rudder has started a total one and a half, the actual heading change right on through to the time of the grounding.

A Yeah, right.

Q And what you're saying is that the average rudder during that whole period of time was about four degrees?

A Well, yeah, but then the fact that four degrees didn't stretch out to 12:10 means that the rudder in this -- during this region eased off.

Q Maybe it would have been even less.

A Yeah, right.

Q Now, when we say "average of four degrees," it doesn't mean that the helmsman only put four degrees right rudder on the whole time, does it?

A No. I -- in fact, I think he was doing a lot of things here, because I couldn't match it with a simple ...

Q Well, what is your opinion as to what he was doing on the basis of the simulation?

A He might have been trying to come to some heading, it looks like he was swinging the rudder back and forth.

Q In other words, put five degrees on, take it off, put ten degrees on, take it off?

A That's what it looked like.

Q Okay. Let me return to your ...

A But then, you know, there's many ways you can get the same trace.

Q Now, having analyzed the various rudder angles that may have been used between 12:01 and a half and the grounding, what did you do next?

A Well, then I used -- I initiated a turn on four degrees, and then at the course recorder simulation, and at 10 degrees to see just how close I was to the grounding point.

Q All right, let me -- before we leave this subject, Your Honor, I would offer Exhibit BE into evidence.

MR. COLE: No objection.

THE COURT: Admitted.

EXHIBIT BE ADMITTED

MR. CHALOS: I think I've already offered BD

into evidence, Your Honor, but I can't remember. It's there? Okay.

(Pause)

Q (Mr. Shizume by Mr. Chalos:) Okay. Let me mark the base of this exhibit as Defendant's Exhibit BF. Now, sir, did you prepare this particular exhibit?

A No, Joe Winer did.

Q Mr. Winer prepared it?

A Yeah, he used data that I logged out for him.

Q In other words the data that he used here is the data that you provided to him?

A Yes.

Q Have you had an opportunity to review this work here?

A Yes, I have.

Q And does this data accurately reflect what you gave to him?

A Yes.

Q Okay. Now, Exhibit BF is what?

A Well, these are very -- turns of various magnitude ...

Q Well, starting here. That's just ...

A ... initiated at six and a half ...

Q Wait a minute. BF is just a blown-up version

...

A Oh yeah, right.

Q ... of the nautical chart in the area of Bligh Reef and Busby Island, right?

A That's right. And the mark of the grounding site.

Q The mark's the grounding site here?

A Uh-huh (affirmative).

Q Okay. Let me show you what we've marked as Exhibit BG. What does Exhibit BG represent?

A Well, this is the course recorder simulation that I showed on the other chart, and it shows that it crosses the shallow region and then heads very close to the grounding site.

Q This is the simulation as done by the computer.

A That's right.

Q Okay, so Exhibit BG is the simulated course of this vessel.

A That's right.

Q To the grounding site.

A Uh-huh (affirmative).

Q Okay. Now, showing you Exhibit BH, what does that represent?

A I think that's -- that's a constant four-

degree rudder applied to the ship at six and a half minutes after passing Busby Island.

Q Okay. All the simulations that you've done in this particular exhibit, or the exhibits that we're marking, start the initiation of the rudder at a minute and a half after?

A Right.

Q Okay. And using the constant four-degree right rudder, what does that do?

A Well, it looks like the -- passes a little bit above where the previous one.

Q Looks a little below.

A Below, right.

Q Right. So in other words, it would bring you to the same grounding site.

A Yeah, right.

Q So does this verify, this particular exhibit, that -- BF, I'm sorry, BE?

A BE?

Q Right. In other words, using a four-degree right rudder ...

A Yeah.

Q Brings you to the grounding site?

A Uh-huh (affirmative).

Q And that verifies that the average rudder used

was about four degrees?

A Is like four degrees, yes.

Q Okay. Showing you now what I'm marking as Exhibit BI, what is that?

A I think this is five degrees. Yeah, this is a five-degree turn, which looks like it would pass without grounding.

Q You mean if ...

A A difference of one degree seems like it makes the difference of whether you ground or not.

Q Well, let's stop there. You're saying if five degrees of right rudder was used starting at one and a half minutes after midnight, in your opinion, the vessel would not have grounded?

A Well, that's what it appears from this data.

Q Okay, let me show you what I'm marking as Exhibit BJ, it's another overlay. What does this represent?

A This is a 10-degree constant rudder, so that this clears the grounding site by -- by a little more than a half mile.

Q So is it your opinion that if 10 degrees right rudder was used, commencing at a minute and a half after midnight, the vessel would have missed Bligh Reef by a half a mile?

A Yeah.

Q That's your opinion?

A Yes.

(3756)

Q Okay, let me just get a couple more stickers. Showing you now what I'm marking for identification as Exhibit BL -- BK, rather, can you tell me what this overlay represents?

A Well, this is a 20-degree rudder, and it clears the grounding site by a large margin.

Q In other words, if 20 degrees right rudder was used at a minute and a half after midnight, it would have cleared Bligh Reef by a margin larger than using 10 degrees right.

A Yeah. Almost three quarters of a mile.

Q Okay. And I show you now what I'm marking as Exhibit BL. Can you tell me what this overlay represents?

A Well, this overlay is when a rudder of 10 degrees was held for five minutes, and then a rudder of 20 degrees was held for two minutes, and then the rudder was hard over to 35 degrees.

Q Okay. Where did you get that information, 10 degrees ...

A Well, that was ...

Q ... for five minutes, 20 degrees for two minutes, and then hard right?

A Well, that was the testimony of Mr. Cousins.

Q And what result did you get from that?

A Well, it's not much better than a constant 10 degrees, although the ship starts to turn quite fast up here.

Q Now, we're showing in an exaggerated way what the ship would have done if it had continued in its turn, right?

A Yeah.

Q That's not necessarily how the ship would have gone in this particular situation.

A No, probably as soon as he hits 90 degrees, it -- veer off to ...

Q Okay. In other words, when he gets abeam of Bligh Reef, as this course would take him, he could straighten his course out to take him back into the ...

A Yeah.

Q ... into the VTS. All right, so in this particular simulation, it's your opinion then that if as little as five degrees right rudder was used at 12:01 and a half, the vessel would have probably cleared Bligh Reef.

A Probably, yes.

Q And if 10 degrees right rudder was used at 12:01 and a half, she most definitely would have cleared.

A Yes, right. That'd be an ample margin.

Q Speak up, please.

A If 10 degrees was used, that'd be an ample margin of clearance from the grounding site.

Q Okay. Did you do any other simulations?

A Well, I did a group of simulations when -- if the rudder was initiated at the Busby Island light ...

Q Okay, before we get into that, Your Honor, at this time I would offer Exhibits BF through BL into evidence.

MR. COLE: No objection.

THE COURT: Admitted.

EXHIBITS BF-BL ADMITTED

Q I'll take this now. (Pause) Let me get some more identification stickers. (Pause)

Again, did you prepare this particular ...

A Yes, I did.

Q Well, you didn't prepare this particular exhibit itself.

A Oh, Joe Winer did the actual ...

Q Again, was it based on information that you supplied to him?

A Yes.

Q And have you had an opportunity to review what Mr. Winer did?

A Yes, I did.

Q And is it an accurate representation of the information you provided to him?

A Right, it looks correct.

Q Okay. Let me mark the base chart as Defendant's Exhibit BM for identification. Again, that shows the grounding site, on an expanded version of the nautical chart, am I correct?

A Uh-huh (affirmative). That's right.

Q Okay. Let me mark as Exhibit BN for identification the first overlay. Can you tell us what that represents?

A It's the course recorder simulation, which we did before in the previous -- and it's initiated at 12:01.

Q Okay, this is similar to the previous exhibit that was marked?

A Yeah, right. Same one.

Q Incidentally, at what time does your

simulation show this vessel going aground?

A It looks like it's 12:10.

Q About 12:10?

A Yeah.

Q Okay. Now, let me mark as the next exhibit for identification Exhibit BO, the next overlay, and ask you what does this represent?

A I think this is at least a three-degree right turn.

Q Started when?

A Starting at Busby Island ...

Q At 23:55?

A 23:55. And it clears the grounding site by more than a mile.

Q Well, let me see if I understand you. In this particular overlay, you simulated just a three-degree rudder being used, starting at 23:55?

A Yeah.

Q And how far did it clear Bligh Island by? Bligh Reef?

A By about -- more than a mile.

Q So what you're saying is, if the helmsman just put three degrees of right rudder starting at 23:55, the vessel would have cleared Bligh Reef by over a mile?

A Yes.

Q Let me show you the next overlay, which I'll mark as Exhibit BP, and ask you what does this represent?

A Well, this is when a constant rudder was applied at Busby Island light of four degrees, so ...

Q Okay, if the helmsman applied just four degrees of right rudder, starting at 23:55, abeam of Busby, that would have also cleared Bligh Reef.

A Right.

Q By what distance, do you estimate?

A Oh, I don't know.

Q Do you have a scale here?

A It's a big -- it's about a mile and a third.

Q 1.33 miles?

A Yeah.

(Tape: C-3664)

(0003)

Q Okay. Let me show you the next overlay, which I'll mark as Defendant's Exhibit BQ, and ask you what does this represent?

A Well, this is when a constant five degrees rudder was applied at 23:55.

Q And what does that show?
A Well, it shows that it misses the ...
Q Grounding site.
A ... grounding site by ...
Q An even greater distance?
A Even greater, yes. Almost -- mile and a half, or more.
Q And that's just five degrees of right.
A Right.
Q Okay, what does the next overlay represent, which I'll mark as Exhibit BR?
A This is the trajectory if 10 degrees of a constant right rudder was applied at 23:55. And of course they wouldn't -- he wouldn't hold the rudder that long, it'd probably come off this way.
Q Uh-huh (affirmative). This exaggerated depiction just shows what would have happened if the rudder was held ...
A Yeah.
Q ... all the way through, it would ...
A Right.
Q ... make a complete circle, in other words.
A Uh-huh (affirmative).
Q Okay. Using 10 degrees of right rudder --

strike that. If 10 degrees of right rudder were used at 23:55, how much would this vessel have missed the grounding site by?

A Just about two miles.

Q And the last overlay, which I'll mark as BS, represents what?

A This is for when a 20-degree right rudder was initiated at 23:55.

Q In other words, BS is an overlay indicating what would have happened if 20 degrees right rudder was used.

A Right, yeah.

Q Starting at 23:55. And that would have missed the grounding site by an even further distance.

A Right. More than two miles, yeah.

Q Okay. Now, I want you to assume for the moment that the turns that you're talking about here were not initiated until 23:56, or one minute after 23:55. Would that have made a significant difference to the distance by which this vessel would have missed Bligh Reef?

A Well, it's just essentially moving it down one minute, which would move the lower curve down here somewhere.

Q How much of a distance are we talking about?

A couple tenths of a mile?

A Well, one minute is about ...

Q Point ...

A ... 1,000 feet.

Q Just about a ship's length?

A Yeah, right.

Q So in your opinion, if they had started the turn at 23:55 -- or 23:56, that wouldn't significantly alter your opinion as to how far the vessel would have missed Bligh Reef.

A Probably just move everything down by about 1,000 feet.

Q Okay. If the turns were started in this area here, the 55/38 fathom mark, would that significantly alter your opinion as to how far the vessel would miss Bligh Reef?

A I think it'd still miss by quite a bit.

Q Over a mile if 10 degrees right rudder was used?

A Oh, yeah, 10 degrees. But then even this three degrees.

Q Three degrees being Exhibit BN, sorry?

A No ...

Q BO?

A Yeah, right.

Q Even three degrees would have missed it?

A If it had moved down to here?

Q Yes.

A (Indiscernible - unclear) It'd miss it by quarter of a mile -- half a mile.

Q Okay. Your Honor, at this time I offer Exhibits BM through Exhibits BS into evidence.

MR. COLE: No objection.

THE COURT: Admitted.

EXHIBITS BM-BS ADMITTED

Q Sir, do you have an opinion as to the cause of this grounding?

MR. COLE: Objection. Lack of qualification. Speculation.

Q I'll rephrase it, Your Honor. On the basis of the simulations that you've made, do you have an opinion as to the reason for this vessel going aground?

A Yeah, I think the problem was that rudder was initiated late, and also it wasn't -- there wasn't enough rudder, was used.

Q Is that in combination?

A Yes, in combination.

Q When you say "initiated late," do you mean at one and a half minutes after midnight?

A Right.

Q And when you say "not enough rudder was used," what do you mean?

A Something greater than four should have been used. Something on the average of greater than four.

Q And it was your opinion that if five degrees right rudder was used at a minute and a half after midnight, she would have missed the reef -- or the grounding site?

A It looks like it would miss the reef, yes.

MR. CHALOS: I have no further questions, Your Honor.

THE COURT: Mr. Cole?

MR. COLE: I just would like to get to ...

(Pause)

THE COURT: While you're getting those exhibits, I think we'll just take a break. Ladies and gentlemen, we'll break for about 10 or 15 minutes. Don't discuss the case among yourselves, or with anybody else, don't form or express any opinions. (0251)

(Off record - 11:45 a.m.)

(On record - 12:04 p.m.)

THE COURT: Mr. Cole?

CROSS EXAMINATION OF MR. SHIZUME

BY MR. COLE:

Q Thank you, Your Honor. Good morning, Mr. Shizume.

A Good morning.

Q You were instrumental in designing some programs at CAOR that basically simulate the track line of vessels through the water, is that correct?

A That's usually a hand process. I don't have a program that does that.

Q But the fast-track simulators at CAOR can do that. Is that correct?

A No.

Q Develop a track line.

A Develop a track line?

Q Of a vessel. Based on information that's given to them.

A If you have rudder information, yes.

Q And the reason that we have simulators to do that is because tankers and other ships don't have little black boxes like are in airplanes, right?

A Right.

Q And those black boxes in airplanes save a lot

of valuable information that people can use to reconstruct the flight patterns of airplanes, correct?

A That's correct.

Q And basically, on a tanker, all you have is just the maneuvering characteristics and the course recorder and the bell logger. Correct?

A Yeah, but the course recorder and bell logger tells you a lot.

Q Sure. Now, it would always be better to have a demonstration with the real vessel, but that's not very practical in a lot of cases, right?

A Right.

Q And so what they've done at CAOR is design smaller models of these vessels in their computer programs, their library, and use those to simulate track lines. Correct?

A Why do you say smaller? They're full size.

Q Full size. Okay, full size. But they use 'em to simulate track lines of vessels, right?

A They don't -- the main purpose of the math model is to simulate the dynamics of the ship, not the track line.

Q Now, the people at CAOR did this simulation.

A Yes.

Q Right?
A Yes.
Q And they did a report, and it came out in December 1989, correct?
A Uh-huh (affirmative).
Q And they plugged in all the numbers that you talked about to simulate the dynamics of the Exxon Valdez, correct?
A That's true.
Q And they did that back in July of last year, correct?
A I don't know whether it was in July, but yeah.
Q It was some time ago. Correct?
A What?
Q It was some time ago, correct?
A Yes.
Q And so what you did is that you went to the CAOR computer and you just verified the information that they did, that they inputted?
A Yes. Well, I made sure that there was no errors.
Q Did you make any changes? In what they had inputted?
A No, I couldn't.
Q So basically your simulation is that you put

in the same information that they had put in to the computer, and you put it into their same computer, and you came out with the same results that they had come out with.

A No. We did different scenarios.

Q Oh, that's right. You did a couple more scenarios if the vessel had turned at a certain point, correct?

A And also we simulated the course recorder.

Q Okay. Now, the CAOR input -- it assumed a vessel of 220 tons, correct?

A No. It was derived from a vessel of 220 tons.

Q Okay, it was derived.

A 220,000 tons.

Q 220,000 tons. The Exxon Valdez is a vessel of 209,000 tons. Correct?

A Uh-huh (affirmative). Yes.

Q And the CAOR report used certain turning characteristics, or did tests of the simulator, of the simulated vessel, and got certain measurements as to the turning characteristics, correct?

A That's right.

Q And they compared those to the turning characteristics of the Exxon Valdez, correct?

A Well, they used the chart in the bridge from the Exxon Valdez, to tune up the rudder.

Q And the difference between the post -- there was some difference between the posted turning characteristics of the Exxon Valdez and the simulated characteristics, as were designed by CAOR, correct?

(0429)

A Yeah, but they were within the measurement error of the trial data.

Q Well, the measurement error was -- for instance, in a turn ...

A It's in nautical miles. One tenth of a nautical mile was the accuracy.

Q Within one tenth, but the time was different in what it took to turn a vessel, correct?

A It was a small difference, yes.

Q Well, at full sea speed, with a 35-degree rudder, fully laden, it took 168 minutes for the Exxon Valdez to make a starboard turn, and it took 151 for the simulated, correct? Does that sound about right?

A That sounds about right.

Q So there was a difference of about 10 percent.

A With that particular turn, yes.

Q And at full speed, with a 35-degree rudder, to do a 90-degree turn, the posted on the Exxon Valdez was 336 seconds, while the simulated was 305 seconds, correct?

A Yes.

Q So that was again another difference of about 10 percent.

A Right.

Q And in each case, the Exxon Valdez turned slower than the simulator, according to the posted measurements. Correct?

A Yeah.

Q Now, the CAOR project also made some assumptions in this case when they were inputting data, correct?

A What assumptions?

Q Well, they assumed ...

THE COURT: Excuse me just a minute, would you take that microphone off and put it on your right-hand lapel, up a little higher? Because it's difficult to hear you. Thank you.

Q Well, number one, they assumed that the vessel, the simulated vessel was fully laden, correct?

A No, they did not.

Q They did not?

A No. The simulated vessel mass was reduced, and the draft was reduced.

Q Oh, I see. Well, let me rephrase that. They assumed that the vessel maneuvered at the same as a fully laden tanker. Correct?

A Well, that's from experience. But we know that the turning radius of the ship is largely dependent on the length, and not the loading.

Q But it is a little bit dependent on the length.

A No.

Q Not at all?

A You can't detect it.

Q You can't detect it at all. Okay, so it wouldn't make any difference whether it was half laden or fully laden as far as the turning characteristics.

A Yes. Well, the acceleration would change.

Q The acceleration would change. Well, that would affect -- it would be slower if it was fully laden. Is that correct?

A If it accelerates slower, yes.

Q And that wasn't taken into consideration.

A It was.

Q It was in there?
A Because we changed the mass.
Q Okay. Now, the CAOR report also didn't constrain themselves to the bell logger notations, did they?
A No, they varied from that. And I think mainly because they were using a track follower, which is much better than a pilot, because it updates every half second. So the track is very straight.
Q But they assumed that the RPM's had to go over 55 RPM's during the course of the transit, correct?
A Yeah.
Q But that would mean that it would have had to go up to sea speed, because 55 RPM's is just full maneuvering speed, correct?
A Yeah.
Q And they also disregarded a number of the -- they disregarded several of the fixes that were on the map.
A Because they were inconsistent with other measurements.
Q Now, when you said that you used the 180.5 track ...

A Yes.

Q Were you assuming that the vessel's speed was 11.74 or that it was 12.3?

A I'd have to look at the -- do you have that?

Q I'll give you this.

A No, I don't think it's in there.

Q How about the CAOR report?

A No. I need the transit log.

Q Oh, okay.

(Pause)

A What was the question?

Q When the vessel was traveling -- when you were making your calculations as to the rate of turn, five-degree, 10-degree, 20-degree, were you assuming that the vessel was traveling at 11.74 or 12.3 knots?

A From Busby Island or from ...

Q Yes. From Busby.

A Well, it started at 19.7 feet per second. What is that?

Q You don't remember right offhand whether it was 11.74 or 12.3?

A Knots? I would have to change that into knots.

Q Okay. Well, we can go beyond -- we have other

things. Now, you said that you took into consideration the 12:55 plot, or 11:55 plot? That was one of the four fixes that you used?

A Yes.

Q If I showed you a copy of the 11:55 plot, do you recognize that at all?

A Well ...

Q How about that? If I told you that that is the plot that the third mate made ...

A Yeah, right.

Q ... at 23:55, does that seem consistent with how you understand the evidence to go?

A Yeah.

Q Okay. Now, at 11:55, which -- this is your simulated track line, right?

A Yes.

Q At 11:55, your blue line runs to the right of the 84/72 mark, right?

A Uh-huh (affirmative).

Q Mr. Cousins' 23/55 runs to the left of that mark, doesn't it?

A Yes. Well, he estimated 1.1, that's why.

Q But that, the simulated model, is .9.

A Right.

Q Now, if a vessel -- if you move the track line

over to here, is the turn required to get from here to here to here greater or lesser than the turn required here?

(0836)

MR. CHALOS: Your Honor, I object, unless Mr. Cole can put a distance between the two lines. Are we talking about a mile and a half, two tenths, or what?

Q Two tenths.

A Two tenths of a mile. That's 600 feet.

Q 600 feet.

A Well, I mean, I don't think it'd look that much different. I mean, you got a -- you don't have it -- at most, you're right at the 90-degree point, and there's not gonna be much difference with this one at 90-degree point.

Q Well, let's assume that my drawing's a little bit off. But let's assume that there's two miles difference.

A Oh, then there will be a ...

Q Does it take a greater turn to get from here to here than say from here to there?

A Well, if you were two miles off, you'd start coming off.

Q Right, but let's assume you end up in the same spot right there.

A Then you're not using a constant rudder.

Q It would really take a shorter turn to get from here to there than it would to get from here to there, wouldn't it?

A A shorter turn or less rudder or ...

Q More rudder. To get from there to there than from there to there.

A No, I don't think it ...

Q Wouldn't change it at all.

A The difference would be like a few feet. Because you're at the tangent point of the curve.

Q Wouldn't change it at all?

A It would change it by a few feet.

Q Well, would it be a greater rudder that you would need to get there, or less rudder?

A You'd need less rudder.

Q Now, the other thing that the CAOR didn't take into consideration is the shoal water.

A That's right.

Q Correct? And that makes a vessel turn less also, correct?

A Right.

Q And your calculations show the simulated track going over shoal water for a period of time.

A Yes, but we didn't know that until quite some

time later.

Q But it would have made it more accurate if it had used ...

A Right.

Q ... the shoal water for that period of time.

A Yeah, right. But we'd need a good survey map to verify that.

Q Now, Mr. Chalos asked you to use simulations, assuming that the turn began at 12:01 and a half, correct?

A 12:01 and a half, yes.

Q Did he ...

A Well, no. That's what the transit indicated.

Q Right. But then he asked you to run simulations of different turns.

A Oh, yeah, right.

Q At 12:01, right.

A Uh-huh (affirmative).

Q Correct?

A Right.

Q Did he ask you to do any simulations of, say, if the vessel had turned at 12:03? Or 12:04?

A No.

Q What would have happened if this vessel had not turned until 12:03? Where would it have ...

A It'd probably hit the grounding site.

Q If it had not turned until a minute or two later ...

A Then it might miss the grounding site altogether.

Q Okay, but the depths got shallower down here, right?

A Yeah, right. Uh-huh (affirmative).

Q So if they had waited until 12:02 or 12:03, there wouldn't have been any turn that would have allowed them to miss Bligh Reef, would they?

A Right.

Q And that's the same all the way down here, correct?

A Yes, pretty shallow.

Q Now, Mr. Chalos asked you to do a number of simulations with the turn at Busby, correct?

A Uh-huh (affirmative).

Q And that would have been three degrees, was that the smallest?

A Three -- four.

Q Three degrees?

A Five and 10 and 20.

Q Four degrees, five degrees, 10 degrees ...

A And 20 degrees.

Q ... and 20 degrees. Is that right?

A Uh-huh (affirmative).

Q Okay. (Pause) So let's call that a half. Now I think you testified that if the turn at Busby had begun at 11:55, and it was a constant three-degree turn, this would have missed Bligh Reef.

A Yeah.

Q So if Captain Hazelwood had been on the bridge at 11:55, and made sure that a three-degree rudder angle order was executed, he would have missed Bligh Reef. Right?

(1100)

MR. CHALOS: Objection, Your Honor. It's independent whether Captain Hazelwood was on there or a chimpanzee.

THE COURT: It's argumentative, Mr. Cole. Objection sustained.

Q And at four degrees it would have missed it also. Correct?

A Yeah.

Q And five degrees it would have missed it, right?

A Uh-huh (affirmative).

Q And 10 degrees it would have missed it?

A Right.
Q And 20 degrees it would have missed it, right?
A Yes.
Q Now, 20 degrees at 12:02, way down here ...
A 12:02?
Q Way down here, at 20 degrees it would have missed it.
A Yeah. Right.
Q So we can assume that it would have missed it all the way up from here to here, right?
A Yeah, right.
Q At 10 degrees, would it have missed it, if he had turned at 12:02?
A Yeah.
Q So we can assume he would have missed it all here too, right?
A Uh-huh (affirmative).
Q How about at five degrees, would it have missed it?
A It looks like it would miss.
Q Can we assume that it wouldn't have hit at all there?
A Yeah.
Q Would have missed at all the rest? How about at four degrees?

A Well, it hit.

Q It hit at four. And we can assume it would have hit at three also, right?

A Right.

Q You indicated that at a four-degree turn at 11:56, it would have been okay, right?

A Uh-huh (affirmative).

Q And a three-degree turn? It would have been okay?

A Yeah, I think so.

Q Now, these last ones, are you sure about any of those, or should we just put question marks?

A Well, I'd have to move the -- with a pair of dividers, move it down.

Q Okay. Well, would you feel more comfortable just putting question marks there? Or do you think it would have made it at 11:57, at three and four degrees?

A 11:57 is -- it probably would make it.

Q Okay. We'll put P for probably. And four?

A Yeah.

Q Made it.

A Made it.

Q 11:58?

A I think four would make it but not ...

Q Three?
A Three.
Q And question marks here?
A Yeah.
Q So under all those scenarios where there's a Y, if the ship had kept on that course, it would have made it by Bligh Reef. Is that what you're saying?
A Yeah.
Q Now, I'd like you to take a look at this diagram. And if I told you that this green part represented ice, can you see that?
A Yeah.
Q And that is right around the 84 and the 72 fathom mark, you see that?
A Uh-huh (affirmative).
Q And that's represented by that 84 and that 72, right?
A Yeah, I guess so.
Q All these turns that you've talked about in your drawing right here, unless corrected, would have ended up in the ice, wouldn't they?
A Well, if that's where the ice was, yes.
Q So in all your scenarios, the vessel would have missed the reef, but it still might have hit

the ice.

A Yes.

Q So basically, you started your simulation at berth 5, off of the Port of Valdez, correct?

A At what?

Q Berth 5, at the 720 or the 920 ...

A Yeah.

Q ... position mark?

A Uh-huh (affirmative).

Q And you ended up on Bligh Reef, is that correct?

A Yes.

Q And basically, what your scenarios have shown is that had someone responsible been on the bridge, this wouldn't have happened.

MR. CHALOS: I object, Your Honor. Argumentative.

THE COURT: That's right, Mr. Cole.

Q Well, you in fact were fairly surprised when you charted this and saw that this vessel had not turned until 12:01, correct?

A Well, I ...

MR. CHALOS: I object, Your Honor. I object, there's no foundation for that question.

MR. COLE: I have -- I'll lay the foundation.

THE COURT: If the objection's foundation, go ahead and lay a foundation.

Q (Mr. Shizume by Mr. Cole:) When you charted this, and you saw that this vessel had not turned until 12:01, you were surprised, weren't you?

A I was surprised because I knew a four-degree rudder was be -- gonna be attempted. But that was my surprise, because I knew that the next run would be a four-degree rudder run. And I knew it was going to hit.

Q Well, you were also surprised about the fact that it had taken so long to respond, six and a half minutes, in a very obviously dangerous area, without any rudder.

MR. CHALOS: Objection, Your Honor, it's argumentative, there's no foundation, and I think it's irrelevant whether this witness might have been surprised.

THE COURT: Objection as to relevance sustained, Mr. Cole.

Q No turn happened until six and a half minutes after the vessel went by Busby.

A Right.

Q Correct?

A Right.

Q Thank you. I have nothing further.

(1425)

REDIRECT EXAMINATION OF MR. SHIZUME

BY MR. CHALOS:

Q Would you like some water, Mr. Shizume? Sir, with respect to the CAOR information, before you started to do your simulation, did you verify the CAOR information?

A Yes, I did.

Q Did you assure yourself that the information was correct?

A Yes.

Q Did you run and verify the information yourself on the computer?

A I did.

Q Now, Mr. Cole asked you if the model that you used was a 220,000 dead weight ton tanker?

A It was scaled from a 220 one.

Q In other words, you brought it down to 209,000 tons to represent the Exxon Valdez?

A Right.

Q Now, Mr. Cole asked you some questions about the maneuvering characteristics that were simulated, as opposed to what was posted ...

A Uh-huh (affirmative).

Q ... and he brought up some differences. How would you characterize the differences?

A Well, I mean, those were extreme rudder conditions ...

Q Meaning hard right or hard left?

A Right.

Q And your simulations, except for one, doesn't take hard right or hard left.

MR. COLE: Objection, leading.

Q Go ahead.

A That's right.

THE COURT: Objection overruled.

Q Okay. Were the differences that were noted in the hard right or hard left condition within the acceptable error ranges?

A Yes.

Q Did they in any way, did those differences in any way affect your simulations?

A I don't believe so.

Q Now, Mr. Cole asked you a question about the full sea speed. Did your simulation take into account the actual revolutions per minute that the engine was being run at at any particular time?

A Yeah.

Q So if you looked, let's say at 11:30, whatever RPM's the engine was doing at that time, that's what your simulation would show?

A Yes.

Q Would take into account?

A Yes.

Q Just picking 11:30 as a point in time, and if you looked, let's say at 12:05 a.m., your simulation would take into account whatever RPM's were being used at that time.

A Well, yeah, okay. But the actual RPM that was written on the bell logger ...

Q Right.

A ... there was no indication at what time that was taken.

Q But your computer is geared to take into account the fact that the engine is loading up ...

A Yes.

Q ... the program's loading up?

A Uh-huh (affirmative).

Q Now, Mr. Cole asked you about the difference in the fix between what Mr. Cousins showed on the chart of being 1.1 miles off Busby ...

A Uh-huh (affirmative).

Q ... and your simulation being .9. Sir, would the difference of two tenths of a mile affect in any way your simulation?

A It would just move everything over by two tenths of a mile, which since it's ...

Q You mean over laterally?

A Yeah, right. And since it's flat, I mean it's at 90 degrees, it probably wouldn't make it much different at all.

Q It certainly wouldn't affect the distance by which Bligh Reef would have been missed in any one of these scenarios, would it?

A No. I don't believe so.

Q Now, Mr. Cole asked you about the shoal water or shallow water not being taken into account by CAOR when they ran the program initially.

A Yeah.

Q What we're talking about is the last minute before this vessel ran aground, are we not?

A Yeah, right.

Q So if there was any error, it would have been in that very last minute.

A Yeah.

Q Do you have an opinion as to whether any ...

A Well, I don't think the ship will respond to

something that occurs only for a minute. It's got so much momentum that you probably won't see the difference in its track.

Q Well, my question is, would it have made any difference in any of the simulations that missed Bligh Reef?

A Well, those simulations that missed it were in deep water.

Q So they wouldn't have been affected at all.

A Right.

Q We're only talking then about those simulations that show the vessel going aground ...

A Right.

Q ... and we're only talking about the very last minute.

A Yeah.

Q Now, Mr. Cole asked you hypothetically as to the turn starting at 12:03 or 12:04, do you remember that?

A Yeah.

Q And he asked if you did any simulations for that. In fact, the course recorder indicates that the vessel started turning at a minute and a half after midnight, does it not?

A Right. Uh-huh (affirmative).

Q Mr. Cole also asked you about what the mate may have been seeing in terms of ice that particular night. You don't have any first-hand knowledge of that, do you?

A No, I don't.

MR. CHALOS: I have no further questions.

(1660)

RECROSS EXAMINATION OF MR. SHIZUME

BY MR. COLE:

Q Essentially, Mr. Shizume, this is your best attempt at trying to simulate the Exxon Valdez track line that evening, the 23rd. 24th. Correct?

A Uh-huh (affirmative).

Q And it's not perfect and it's not totally accurate.

A Well, there's a small error for everything.

Q If the vessel didn't start turning -- no, I'll withdraw. I have nothing further.

MR. CHALOS: Just one quick question, Your Honor.

REDIRECT EXAMINATION OF MR. SHIZUME

BY MR. CHALOS:

Q Mr. Shizume, when you say there's a small

error for everything, are you talking about everything in life?

A Everything that requires a measurement, there's an error. There's an error in the position fixes, there's an error, small error in the ship because it's -- but then you won't see it in a two-hour scenario, probably have to let it run 12 hours to see the difference.

Q Well, in any event, whatever error might be involved here, were they within the accepted tolerance accepted by your community?

A Yeah, right. So, in fact, it's very -- very, very much better than what we normally get.

MR. CHALOS: No further questions.

THE COURT: You're excused, sir. You may call your next witness.

MR. CHALOS: At this time, Your Honor, the defense calls Mr. Joseph Winer.

(1778)

THE CLERK: Sir, if you'd please remain standing and attach that microphone. And raise your right hand.

(Oath administered)

A Yes, I do.

JOSEPH WINER,

called as a witness in behalf of the Defendant, being first duly sworn upon oath, testified as follows:

THE CLERK: Please be seated, sir.

A Thank you.

THE CLERK: Will you please state your full name and spell your last name?

A Sir, my name is Joseph Winer, W-i-n-e-r.

THE CLERK: And your current mailing address, sir?

A Kingsland Road, Boonton, B-o-o-n-t-o-n, New Jersey, 07005.

THE CLERK: And your current occupation?

A I'm a consultant, a marine surveyor, and I also perform at times as an arbitrator.

DIRECT EXAMINATION OF MR. WINER

BY MR. CHALOS:

Q Good afternoon, Mr. Winer. What does a marine surveyor and consultant do?

A A marine surveyor and consultant performs for owners, charterers, underwriters, law firms, on behalf of the owner or the charterer, P & I Clubs, insurance companies, with respect to vessel condition, with respect to casualties, with respect to purchase and sale of ships, as well as operation of ships.

Q What do you mean by "owner and charterer"?

A Well, the owner being the person that actually owns the ship, who at times charters it out to some business person who charters the ship for his use, for his company, or to subcharterers.

Q And what's a P & I Club?

A P & I Club is that type of insurance which is called protection and indemnity, which covers risks outside of the ordinary hull and machinery policy, such as third-party injury, accident, pollution, damage, to structures. I do a substantial amount of work for that type of club.

Q Now, what were you asked to do in this particular case?

A There were three facets to my assignment. The first was to attend a survey of the vessel on dry dock at San Diego, to make an overall examination of the ship, which I did, and I did that in the company of the attorneys and some representatives of the owner.

We examined the decks, forecastle, the quarters, the wheelhouse, the engine room, the auxiliary machinery spaces, the outside of the ship including the propeller, the rudder, and then we got to the bottom damage portion, where I

was assigned to examine and develop an opinion as to the cause and sequence of that bottom damage. Along with that, I was asked to take photographs, which I did. That was my first assignment.

The second assignment was to take into account some material supplied by Mr. Peter Shizume with respect to his simulation, and to prepare exhibits based on the data in that simulation to show the course of the ship, the track of the ship, along with an over -- overlays to show precisely when and where the ship was at different times.

The third part of my assignment was to make a basic review of the machinery on that ship to determine what thrust could be provided at various propeller speeds, in the interest of could it or couldn't it get off the reef, based on how much thrust could be provided by the ship's machinery.

Q Would you tell us a little bit about your educational background, please?

A Certainly. I did my undergraduate work at Stevens Institute in Hoboken, New Jersey, and I graduated there 1944 with a degree of mechanical engineer. My subsequent education, also at

Stevens, was to receive a certificate in nuclear engineering in 1957, and then ...

Q What was that for?

A That was in preparation for the company for whom I then was employed, the American President Lines (ph.), we were looking forward to operating and managing the nuclear ship Savannah, and I was part of the nuclear team for APL.

After that, I attended night school at Stevens Institute during the years 1957 through '63, and received my Master of Science in nautical engineering, also at Stevens, in that year.

Q Do you hold any Coast Guard-issued licenses?

A Yes, I do.

Q What do you hold?

A The license I hold is Chief Engineer Steam Unlimited Horsepower. That license was issued to me originally in 1947, and the issue number, 912, is currently valid and expires, subject to renewal, of course, in 1992. It's valid.

Q Did you hold any other licenses before you got your chief engineer's license?

A Yes. After college, I sailed in the unlicensed crew of various tanker companies. One was the Hilcone (ph.) Steamship Company, and then

I sailed for Gulf Oil Company. I sailed as wiper, fireman, oiler ...

Q Well, what's a wiper?

A A wiper is sort of like a -- a little below a janitor. You cleaned up, you emptied wastebaskets, you made beds, you wirebrushed the floor plates, you emptied the garbage in the engine room. Then you worked your way up to fireman, where you took care of firing the boilers, and oiler, where you took care of oiling machinery, and I worked my way up to pump man, again on tankers for Gulf Oil, where you took care of the pump room and the cargo handling machinery.

I then sat for my original third assistant's license, which I received in 1945, subsequent to which I received my second assistant's license, first assistant's license, and I got my chief engineer's license in 1947.

Q You sailed as a chief engineer?

A Yes, I did, I sailed for American President Lines on their round-the-world liner series, on one of their new post-war ships, what they refer to as a C-4 steamship, and we were on the round-the-world service. I sailed for them as chief

engineer, subsequent to which I sailed for a company which was called Luckenback (ph.) Line. I sailed for them for a few years, and I came -- I ceased my seagoing career in 1950.

Q You were going to say you came ashore?

A Yes, I did.

Q When did you come ashore?

A I came ashore in July 1950.

Q Now, can you give us a brief history of your employment background since 1950?

(2080)

A Certainly. In 1950 I came ashore, again for American President Lines, as port engineer, and within a year, I was promoted to superintendent engineer Atlantic, which gave me the territory of Europe and the East Coast of the United States for vessel maintenance repair surveys, damage surveys, survey repairs, and things to do with spare parts and the engine room crew. I stayed in that position for about 20 years, up through 1969 or 1970.

Q What did you do in 1970?

A 1970 I was promoted to operations manager and general manager, Atlantic Coast, again for American President Lines.

Q What did you do in that capacity?

A In that capacity I was in charge of the operations, the terminal, the ship operations, the ship personnel, and after that I was promoted to general manager Atlantic, which put me in charge of the marketing, subsidy, rates and conferences, sales, marketing, the entire division. Later I was promoted, 1971 to '73, I served as vice president Atlantic for American President Lines.

Q What did you do after 1973?

A After 1973, I left the steamship company after almost 30 years, and went to work for Hudson Engineering Company, a ship repair and general structural fabrication company. I was president of Hudson Engineering.

Q How long did you stay there?

A Stayed there for three years. With Hudson, and with Hudson's brother companies, there was Heat Exchanger Engineering Company, Jefferson Electric Company, Perth Amboy Dry Dock, and then later we merged with a firm called Cornell and Underhill, and I assumed the position of chairman of the board for Cornell and Underhill at that time.

Q When did you leave that job?

A I left that job in 1976.

Q What did you do after that?

A After that, I went out on my own, started my own business, the same as I'm doing now, as a marine surveyor, a consultant, and later I became active as an arbitrator.

Q Do you hold any professional stationary engineer licenses?

A The licenses I hold are PE license, professional engineer's license, for the states of New York and New Jersey. I received a New Jersey license in 1954, a New York State license in 1956.

Q You said that you're also an arbitrator. What type of arbitrations are you involved with?

A Most of the arbitrations I'm involved with are admiralty matters, matters of maritime arbitration, mostly in New York, and I serve as a panel member, and also chairman when so appointed.

Q What do you mean by chairman?

A Under the usual procedure, in most disputes clause, they state that if any dispute arises, it's to be settled by arbitration, structured so

that each party appoints an arbitrator, and those appointed arbitrators together appoint a chairman, who is the so-called -- that's called procedural chairman, in running the show. And then hearings are scheduled, hearings are held, and arbitration awards and decisions are handed down by those panels.

Q And you've acted as chairman from time to time?

A Yes, many times. And I'm still active in that capacity.

Q Have you ever testified in court before?

A Yes, I have.

Q How many times?

A I testified in State and Federal courts in New Orleans, in Connecticut, and in New York and Philadelphia 17 times. One of those occasions I referred to was when I served as a special master under what they call Rule 53 for -- in the southern district of New York for Judge Mary Johnson Lowe (ph.). Under those conditions, under the rule, if the court finds that there are accounting or technical matters that the court is unwilling to have to learn for the purpose of resolving a dispute, the court appoints a special

master.

In this case, the court asked both counsel to agree upon a special master in a very serious collision, insurance, damages, cost allocation case, and I was appointed in that capacity. I worked that through and gave my report to the court in keeping with the rules.

Q Now, have you been qualified as an expert in those instances where you've testified in court?

A Yes, I have.

Q In all instances?

A Yes.

Q Now, you've testified as an expert in arbitrations?

A Yes, I do.

Q How many times have you done that?

A I've testified about 50 times as an expert in arbitration, and I'm currently active in about 10 current cases.

Q And in those cases, were you qualified as an expert?

A Yes, I was.

Q Now, have you ever given testimony as an expert with respect to grounding matters?

A Yes, I have.

Q On how many occasions?

A Oh, about five or seven occasions.

Q Were those groundings similar to the grounding of the Exxon Valdez?

A Some of them were. Those are the cases where I've testified. Actually, in some of my surveying consulting work, I also attended groundings on behalf of, or as assigned by the owner, as assigned by the cargo underwriter, or as assigned by the P & I Club.

Q You've actually seen vessels grounded before?

A Oh yes. Yes.

(2368)

Q Have you seen vessels grounded on rocks?

A Yes.

Q How about on coral?

A Yes.

Q And what was your role in those groundings?

A For the most part, my role in those groundings was to examine and make a determination and provide an opinion as to the damages sustained by the grounding, any damages sustained in the efforts to take the ship off the ground, and even in some cases damages which preexisted the incident, which were there before the ship went

aground. So it breaks down into about three categories.

Some get even more complex. In one case, last year, a ship called the Golden Unity, it was a coral grounding, the ship grounded once, and grounded again, and grounded a third time, so that determination was preexisting due to the grounding, second grounding, third grounding, and all efforts to refloat. Yes, I've been -- I'm currently active in that.

Q All right, have you in your career seen damages of the type sustained by the Exxon Valdez in this grounding?

A Yes, I have.

Q On how many occasions?

A Oh, at least six occasions. The Clara Mersk (ph.) was one, the President Harding was the second, the President Garfield was the third, the Arcangelos (ph.) up in Canada was the fourth, the Conchio (ph.) off Staten Island was the fifth, and the Golden Unity, currently -- which is currently active in my activity -- six, I've seen others too.

Q You've been asked to appear here as an expert for the defendant, have you not?

A Yes, I have.

Q What is your fee arrangement?

A My fee arrangement is on an hourly basis. My fee is $90.00 an hour.

Q Do you know how many hours you've -- can you approximate how many hours you've worked on this matter so far?

A Yes, I can.

Q How many hours?

A About 160 hours.

Q So your fee, then, is somewhere around 14, $15,000.00 so far?

A Yes, it is.

Q Now, let's talk about your trip to San Diego. Can you tell us specifically what you did in San Diego?

A Yes. Went down to the shipyard, entered, joined the group, went aboard the ship, and I think our sequence was deck examination first, showing the deck structures, the cargo activity, including the IG system, the access trunks, the deck piping, the winches, the sounding machines, we went up as far as the forecastle, examining the windlass and mooring arrangements, came back through the accommodations. We did make a

careful inspection of the navigating bridge, the wheelhouse, the chart room, the wings of the bridge, the controls, the radar, the instrumentation in the wheelhouse, I took numerous photographs to indicate that activity, after which ...

Q Let me stop you there, because I want to introduce some photographs into evidence.

A Certainly.

Q By the way, who was in this group of people that accompanied you?

A Best of my recollection was you, Mr. Chalos, Tom Russo, one member of the Coast Guard, Mr. Madson, Ed Hoffman -- there were some people from Exxon too, keeping us company.

Q Okay, let me show you what we've marked for identification as Defendant's Exhibit AV ...

A Yes, sir.

Q AW ...

A Yes.

Q AX ...

A Yes.

Q AY ...

A Yes.

Q And BW. And ask you, did you take these

photographs?

A I took some of them. I took a -- I took AY, and AV.

(2578)

Q Okay, let's take these two first. What does Exhibit AY represent?

A AY is a photograph taken from the port bridge wing, looking to starboard and inboard, toward the wheelhouse. It shows the radar mast, ship's name, wheelhouse windows, and it shows these three instruments outside the port wheelhouse door, which are the telegraph, the rudder angle indicator, and the engine RPM indicator.

Q Where is -- could you hold that picture up for the jury? Where is the rudder angle indicator, on the winch?

A By my finger. It's a round gauge, it shows five degrees rudder at this time.

Q That's right over the doorway?

A Yes, it is.

Q Let me show you now Exhibit AV. Is that a close-up picture of the rudder angle indicator over the door?

A Yes ...

Q Could you hold that up?

A ... this is a close-up picture here, this is the rudder angle indicator, the instrument currently shows a five-degree left rudder. The center instrument is the tachometer, showing the engine RPM ahead and astern, and the third one is the engine order telegraph, showing the orders from the wheelhouse to the engine room.

MR. CHALOS: Your Honor, at this time I offer Exhibits AY and AV into evidence.

MR. COLE: No objection.

THE COURT: They're in.

Q (Mr. Winer by Mr. Chalos:) And the other three pictures that I've shown you, do you know who took these pictures?

A Yes, I believe -- I'm sure Ed Hoffman took those pictures.

Q Taking a look at them, do they accurately represent what you saw on that particular day in the areas depicted by the photos?

A Yes, they do.

Q What does Exhibit AW for identification depict?

A Exhibit AW depicts basically the instruments shown directly above the wheelhouse windows looking forward. Here in the center we have

another rudder angle indicator, which also shows the position of five degrees left rudder. To the right of that, we have the maneuvering RPM sign showing the RPM for each ahead and astern order, and above that we have the rate of turn indicator in degrees per minute, showing the change of heading of the ship while changing course.

Q These are all on the bulkhead in front of the helmsman?

A Yes, they are.

Q Okay, and what does Exhibit AX depict?

A I'm sorry, I misidentified this instrument above the maneuvering RPM. That instrument is the actual engine RPM indicator, showing the ahead and astern RPM. The second photograph shows the wind indicators on the right-hand side of the photograph, first is the wind direction, and the one in to the left of that is the wind speed. The instrument at the center is the one I referred to before, that's the rate of turn indicator, showing how fast the vessel is changing heading in -- and it's calibrated in degrees per minute.

Q If someone wanted to see how quickly or how slowly the vessel's rate of turn was, what would

they do?

A They'd look at the rate of turn indicator.

Q And if, for instance, if you knew that the vessel should turn 20 degrees per minute if you use a certain rudder, could you look up and see if in fact it was turning at that rate?

A Yes, you could.

Q Now, Exhibit BW, what does that represent?

A That represents a view, I believe, taken from the wing of the bridge, looking down, showing some of the mooring machinery, showing a protective shield, a water barrier, and showing some of the main cargo piping leading from the -- directly forward of the house to the port end of the ship.

Q What is this, this right here, this opening right here, in the upper left?

A The opening in the upper left is called an ullage trunk, or ullage opening, it's a large access going into one of the cargo tanks.

Q Is that ullage trunk on all the tanks in this vessel?

A It's on all of the cargo tanks.

(Pause)

MR. CHALOS: Your Honor, at this time I offer

Exhibits AW, AX, and BW into evidence.

THE COURT: They're admitted.

EXHIBITS AW, AX, & BW ADMITTED

Q I'm sorry, Mr. Winer, I interrupted you, you were telling us about the inspection at San Diego.

Q Okay, then after we left the wheelhouse, again after taking numerous photographs, we made a complete tour of the machinery spaces, the engine room, the pumping arrangements, pumping machinery, the -- those portions located in the engine room, the auxiliaries, the lower engine room, after which we went to the steering engine room, in the very after end of the ship, and carefully looked at the steering machinery, the controls, the after steering station located on the after bulkhead, the communications equipment, as well as the hydraulic machinery there.

Q What did you do after that?

A After that, I believe I went back down below and took some additional photographs, and that was the end of the survey.

Q Did you go into the dry dock to look at the damage?

A Yes. Yes.

Q What did you do in that respect?

A In the dry dock to look at the damage, I -- I first made an overall walkaround under the ship on dock. It was fairly well -- it was an easy walkaround, because they had four-foot blocks which are pretty high. I made a complete walkaround, then I started to make photographs, take photographs, on a station-by-station basis, to try and portray by photography the important aspects of the damage, including the unique starboard side supports, which were made necessary by the severe bottom damage away the starboard side. I took about 100 photographs of the bottom.

Q Now, could you describe the damage that you saw?

A Yes, the damage was generally fore and aft.

Q What do you mean by "fore and aft"?

A From the fore end of the ship, from the bow, to the stern, including gouges, severe physical distortion of the shell plating as well as the internals, some scraping, both heavy and light, generally confined to the forward end of the ship, the starboard portion, and the centerline tanks. The port wing tanks were generally

unaffected.

The damage started about 50 feet aft of the actual bow, due to the shape of the ship and the forebody, and ran straight aft with a slight curvature to starboard, and the damage seemed to leave the vessel, or the vessel went over the damaging rocks, off the starboard number 5 tank and the starboard slop tank.

Q Do you have an opinion as to the cause of the damage you viewed?

A Yes, I do.

Q What is your opinion?

A My opinion is that the damage was caused by two contacts with a hard ground material. The first contact occurred under a situation where the vessel contacted and kept moving, until it passed completely over that obstruction, leaving a trail of indents, distortions, and wrinkles at the location I mentioned before, where the 5 starboard cargo tank, and the starboard slop tank. It appeared to me, in my opinion, the ship then proceeded for a short distance, and struck a shallower hard protrusion, which arrested the ship's motion, and that's where the ship ended up impaled on the rock. That's where she finally

stopped.

Q Do you have an opinion as to the length of time between the first hit and the second hit as you've described?

A Yes.

Q What is your opinion?

A My opinion is that the entire procedure of the first and second hit took less than one minute.

Q Why do you say that?

A Sir, that's based on the -- the distance between the two underwater rocks, which are defined on the detailed depth chart, the velocity of the ship, and the statements by various crew members, all put together.

Q Do you have an opinion as to what time this vessel struck the first rock?

A Yes, I do.

Q What is your opinion?

A In my opinion, the vessel first made contact on the seven-fathom mark shown in the chart at about eight and a half minutes after midnight on the 24th of March.

Q And what do you base that conclusion on?

A I base that conclusion on the state of the tide as displayed to me by the tide table and the

tide fluctuation chart, the soundings shown on the various harbor charts, and the draft of the vessel, which was slightly over 56 feet.

Number one, based on the tide charts, it appears quite certain that the tide was coming up, it was about 10 feet above mean low low water level. On that basis, you would take the depths shown on the various charts, which are in fathoms, and add ten feet onto that, and that would give you the depth of the water over the eight-fathom mark, over the seven-fathom mark, and over the six-fathom mark.

Q Have you reviewed a detailed sounding chart for this area?

A Yes, I have.

Q And did you take that chart into consideration in reaching your conclusions?

A Yes, I did.

(3290)

Q Let me show you what we've marked for identification as Defendant's Exhibit -- I believe it's AN. Yes, Defendant's Exhibit AN. Let me ask you, is this the chart that you reviewed?

A Yes, it is.

Q And who produces this chart?

A It's produced by National Ocean Survey, A.L. Powell, Director, Hydrographic Survey Number 9384.

Q That's a governmental agency chart with the responsibility ...

A Yes, I believe it is.

Q ... for producing such charts?

A Yes, it is.

MR. CHALOS: Your Honor, at this time I offer Exhibit AN into evidence.

MR. COLE: No objection.

THE COURT: Admitted.

EXHIBIT AN ADMITTED

Q (Mr. Winer by Mr. Chalos:) Now, at what time did you say you believe the vessel struck the reef the first time?

A About eight and a half minutes after midnight.

Q Did you plot the movement of this vessel to come to that conclusion?

A Yes, I did.

Q Let me show you what we've marked for identification as Defendant's Exhibit BU, and ask you -- Your Honor, may we approach closer to the jury?

THE COURT: Let's get the foundation and get it ...

MR. CHALOS: Okay.

THE COURT: ... in evidence before we do that.

Q Is this a chart that you prepared?

A Yes, it is.

Q Where do all these figures come from, what does this represent?

A What I did to achieve that is I took the appropriate section of this chart ...

Q Exhibit AN.

A Exhibit AN, and I enlarged that to an appropriate scale, which is shown in the green rectangle ...

Q Did you prepare this scale?

A Yeah. I prepared that both in feet and miles. Then I took the trajectory from Mr. Shizume's simulation, and then scaled the actual vessel size and overlaid them to put it on one piece of paper.

Q And what do these ship lengths represent?

A Those ship lengths represent the position and heading of the vessel at one-minute intervals.

Q Starting at ...

A 001 and a half, at the upper right-hand corner

...

Q A minute and a half after midnight?

A Yes, sir.

Q And what does the length of the vessel that you have depicted here represent?

A That represents the ship length of 987 feet.

Q Is that to scale?

A Yes, it is.

Q And you've marked the minutes on here in green?

A Yes, I did.

MR. CHALOS: Your Honor, at this time the defense offers Exhibit BU into evidence.

MR. COLE: No objection.

THE COURT: Admitted.

EXHIBIT BU ADMITTED

Q (Mr. Winer by Mr. Chalos:) May we get a little closer so -- why don't you bring the pointer with you, Mr. Winer?

A Sure.

THE COURT: If you want to take the amplifier with you, it's on the top, metal black box, it'll fit in your pocket.

Q All right. Now. You listened to the testimony of Mr. Greiner, did you not?

A Yes, I did.

Q And do you recall Mr. Greiner saying that he believed that the vessel struck the first reef somewhere around five and a half minutes after midnight?

A Yes, he did.

Q Do you agree or disagree with that opinion?

A I disagree with that opinion.

Q Why do you disagree?

A I disagree with that opinion simply because the simulation following from the four checkpoints on the way down from Valdez project onward to 0001 and a half at a given location, and the subsequent locations shown on an XY axis shown in the simulation brings the ship at a position here at the time 0005 and a half.

Q How much water is indicated according to the sounding chart at that time?

A Over 40 fathoms. Which is ...

Q Meaning how many feet?

A Over 240 feet.

Q Do you believe that the vessel struck a reef in 240 feet of water?

A No, I don't.

Q Okay. Where was the vessel at six and a half

minutes after midnight?

A At six and a half minutes after midnight, the vessel was in this position here, and the water depth ranges from approximately 18 fathoms to 33 fathoms.

Q How much is that in feet?

A That'd be 108 feet to 300 -- to -- 180 feet to -- over 100 feet to 180 feet.

Q Do you believe that the vessel struck a reef at six and a half minutes after?

A No, I don't.

Q Now, you say you believe this vessel struck the reef for the first time at about eight and a half minutes after.

A Yes, I do.

Q What is the basis for that opinion?

A The basis for that opinion is the fact that following the track, the vessel was always in deep enough water -- the vessel passed over this range of eight-plus fathom protrusion shown here ...

Q What depth would have been at that point?

A Nearly eight-plus fathoms. The eight-plus fathoms would be 48 feet, plus 10 feet of tide, well, it's 48 plus -- I think that's 8.2 fathoms,

so it's about 49 feet, plus 10 feet of tide, which would be 59 feet. The vessel was only drawing 56 feet, so in my opinion, the vessel cleared that particular hazard. It didn't ...

Q All right. You have the ship at eight and a half minutes down here. What kind of shoals do you have there?

A The water depth here shows as low as 7.1 fathoms, which would be about 42-plus feet, and allowing for the 10 feet above mean low low water, the depth there would be slightly over 52 feet, which would have provided about a four-foot interference, that is, four foot too shallow water compared to the draft of the ship. At that point, at 008 and a half.

Q There's been some testimony about a tunnel that was noticed down in San Diego.

A Yes.

Q What was the depth of that tunnel?

A The depth of that tunnel shows on the sketch to be four feet.

Q Which is what you're talking about here?

A Yes, it is.

Q Does that support the conclusion that you just stated?

A Yes, it does.

Q The fact that you saw that tunnel at four feet?

A Certainly does.

Q Okay. At what time do you believe that the vessel struck the reef that caused it to stop completely?

A I believe that the -- the vessel struck the approximately six-fathom reef within one minute after contacting the seven-fathom reef.

Q So by nine and a half she was hard aground.

A Yes.

Q In your opinion.

A Yes, it was. My opinion.

(3789)

Q You prepared another chart in this regard, let me -- and we've marked it as Defendant's Exhibit BV for identification. Can you tell me what this chart represents?

A Certainly. That chart represents a magnified portion of the prior chart. The first chart was prepared with the idea in mind of showing the entire vessel's track from the time the turn commenced at 0001 and a half. This portion shows a close-up, if you may, of the vessel as it

proceeded over the eight-fathom reef and -- another scale model here, down to the eight-fathom reef, to the seven-fathom reef, where it made contact, and then onward at a slight attitude difference from its course to the final six-fathom reef.

Q When the vessel hit the six-fathom reef, do you have an opinion as to whether she changed heading at all?

A Yes. Some of the transcript by the third mate and the helmsman indicated that counter-rudder was given at that time, and ...

Q What do you mean, counter-rudder?

A Well, there was right or starboard rudder giving -- given, in the effort to make this turn, and then the testimony is that when the vessel fetched up on the six-fathom rock, they gave counter-rudder, or left rudder ...

Q Are you talking about Mr. Cousins' testimony about hard left rudder at that point?

A Yes. That also shows up on one of the exhibits that I studied, and that is the exhibit of the course recorder.

Q Now. Was this diagram done to scale?

A Yes, it was. And the scale is shown on the

upper left, this model I'm using here is also to scale.

Q All right. Does the course of the ship accurately reflect Mr. Shizume's simulation?

A Yes, it does.

MR. CHALOS: Your Honor, at this time we offer Exhibit BV into evidence.

MR. COLE: No objection.

THE COURT: Admitted.

EXHIBIT BV ADMITTED

Q (Mr. Winer by Mr. Chalos:) Okay, you may resume your seat.

A Thank you.

Q Sir, you spoke about the eight-fathom mark, and you said you thought there was 8.2 fathoms?

A Yes.

Q Let me show you what we've marked as Exhibit BF. Can you tell us what the eight-fathom mark indicates on this?

A Yes, it shows eight and a half fathoms, or 8.5 fathoms.

Q That would be 52 feet, would it not?

A Yes, it would.

Q Sorry, 51 feet.

A Six, eight -- 51 feet. 48 plus three,

correct.

Q All right, so if you had 10 feet of tide at that point, then this area would be 61 feet.

A Yes, it would.

Q So when we talk about the eight-fathom area, we're talking -- as shown on the chart, we're talking about an area that had at that point in time 61 feet ...

A That's correct.

Q ... of water.

A Yes.

Q Okay. Now, you spoke about the course recorder. Did you make a chart of the course recorder?

A Yes.

Q Is this the chart that you made?

A Yes, it is.

Q What was the purpose of making this chart?

A Purpose of making this chart was to place the entire pattern of the course during the interval involved in one scale without changing quadrants. The original course recorder is ...

Q Let me get that exhibit, so we can compare it. Let me show you what's been marked as Plaintiff's Exhibit 16, and ask you, is that the original

that you're referring to?

A Yes, it is.

Q Okay, what's the difference between Exhibit 16 and what we've marked as Exhibit BT for identification?

A The difference is the quadrants, or the 90-degree segments of the total compass, are shown in four different scales here. First is 0 to 90, second is 90 back to 180, and 180 to 270, and 270 to 360. And which quadrant you're in is defined by where this quadrant identifier stripe is, whether it's in the 0 to 90 range, the 90 to 180 range, the 180 to 270, or the 270 to 360.

Technically, this is a fine way to record them, but for rapid evaluation and inspection, what I did is I actually unfolded, to keep the whole thing in one range, which I renumbered on the left-hand corner to show from 180 down to 310 in one expanse.

(Tape: C-3665)

(0034)

So in fact what I did is, I took the portion as shown in the title from the hour 12:09 and a half, in here, and I merely folded it over, and that shows up here. I didn't redraw this, what I

did is I reproduced the original chart on an acetate sheet, and then simply inverted it and re-Xeroxed it. So I have an actual original just turned over.

Q So this chart more accurately reflects what was happening with the vessel's rudder?

A Well ...

Q When I say "more accurately," more pictorially.

A Yes.

Q In other words, starting at 12:01 and a half, the vessel carried right rudder right on through to about 12:10 and a half or something?

A Yes.

Q And it got all the way down to about course 305?

A Yes, it did.

Q And then there was this hard left that you're talking about?

A Yes.

Q Okay. So it's just an easier way to read the course recorder.

A Yes. Because in that fashion, the right rudder and the change of heading toward the right or starboard is continuous down to the change

here, directly after the time 12:10, and then this in the upper direction shows a change in the left-hand or port side direction.

Q Okay. Is this an accurate representation of the course recorder as depicted in Exhibit 16?

A Yes, it is.

MR. CHALOS: Your Honor, at this time we offer Exhibit BT into evidence.

MR. COLE: No objection.

THE COURT: Admitted.

EXHIBIT BT ADMITTED

Q (Mr. Winer by Mr. Chalos:) Mr. Winer, at about 12:06 and a half, there seems to be a hitch, if you will, in the course recorder, where the course appears to have flattened out.

A Yes.

Q Do you have an opinion as to what caused that hitch?

A Yes, I do.

Q What is your opinion?

A In my opinion, it was some variation in the helm or the steering of the ship.

Q What does that mean?

A That means instead of holding a 10-degree or whatever right rudder they were holding at that

time, a counter or left-hand rudder or reduced rudder helm was imposed, which interfered with the change in course depicted by the straight line shown here. That slight hitch at 12:06 and a half occurred at course approximately 246. At that time, the vessel was in deep water.

Q Well, that was going to be my next question. Do you have an opinion as to whether that hitch might have been caused by the vessel interacting with the bottom?

A Yes, I do.

Q What's your opinion?

A My opinion is it was not caused by interaction with the vessel bottom, because at course 246 and time 0006 and a half, the vessel was in deep water.

Q I would like you to hypothetically assume for the moment that the helmsman said that at some point in time he applied counter-rudder, trying to steady up on course 245. Would that kind of statement be consistent with the hitch that you saw in this course recorder?

A It certainly would.

Q Sir, in that regard, I'll show you what we marked as Exhibit BE. Have you had opportunity

to review this exhibit?

A Yes.

Q And is your opinion about the counter-rudder being applied at about 12:06 or so depicted in this particular exhibit?

A Yes, it is.

Q Can you point out where that is?

A Certainly. That is shown with the code of the triangles, which define what the course recorder indicates. And these triangles come down at the various times, 12:02, 12:03, the hours and minutes are marked on the bottom scale, and the course and degrees marked on the left-hand scale. It shows a steady movement on the course recorder up to the time of 12:06 and a half. At that time, it changes direction significantly and abruptly, and makes almost no move whatsoever for a full minute, after which time it goes back on to the same slope it had before.

Q What does that indicate to you?

A That indicates that there was, at the time 12:06 and a half, an abrupt interruption of the previously steady change in heading.

Q Is that consistent with a counter-rudder being put on?

A Yes, it is.

Q Now, can you explain to us what the rudder angle 10 degrees indicates there?

A Yes, that indicates what the course would have been had a 10-degree rudder been applied at time 0 or time 12:01 and a half. The course would have followed the value detected by this line. So ...

Q In a steady manner.

A In a steady manner, so for example, say, at 12:05, the course would have been, as shown here, about 260, instead of being 260 where it shows for the actual rudder applied.

Q Well, let me ask you this, take 12:07 for instance. What would the course heading have been at that point, had 10 degrees right rudder been used?

A The course at 12:07 would have been 290 degrees.

Q Meaning that the vessel would have swung past the 270 by that point ...

A At 20 degrees.

Q ... and headed sort of northwest.

A Yes, it would.

Q Okay. What course is indicated that the

vessel was actually on at the same time, at that time?

A About 250. About 245, 246, 250. In this range here.

Q And that's because less than 10 degrees of right rudder was being used then?

A Yes.

Q Okay. You may -- Your Honor, this probably is a good place to stop.

THE COURT: All right. We'll recess until tomorrow morning, I'll see you back then, remember my instructions not to discuss the matter among yourselves or with any other person, or form or express any opinions. Anything we can do, counsel, before we recess?

MR. COLE: No.

MR. MADSON: No.

THE COURT: We'll all recess, then.

(0268)

(Off record - 1:30 p.m.)

CONTINUED