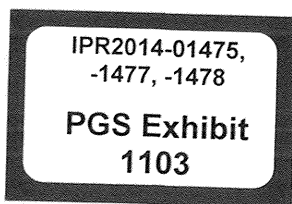# PLANET DEPOS

We Make It Happen >> Anywhere™

Transcript of **MICHAEL S. TRIANTAFYLLOU, Sc.D**

Date: May 22, 2015

Case: PETROLEUM GEO-SERVICES INC., ET AL v. WESTERNGECO LLC

Planet Depos
Phone: 888-433-3767
Fax: 888-503-3767
Email: transcripts@planetdepos.com
Internet: www.planetdepos.com

Worldwide Court Reporting | Interpretation | Trial Services

1

1 UNITED STATES PATENT AND TRADEMARK OFFICE

2 BEFORE THE PATENT TRIAL AND APPEAL BOARD

3 --------------------------------x

4 PETROLEUM GEO-SERVICES INC.　　: Cases

5 and ION GEOPHYSICAL CORPORATION　: IPR2014-00687

6 AND ION INTERNATIONAL S.A.R.L.,　: (U.S. Patent No. 7,162,967)

7 　　　Petitioners,: IPR2014-00688

8 　v.　　　　　　: (U.S. Patent No. 7,080,607)

9 WESTERNGECO, LLC,　　　: IPR2014-00689

10 　　Patent Owner.: (U.S. Patent No. 7,293,520)

11 --------------------------------x

12

13 　Deposition of MICHAEL S. TRIANTAFYLLOU, Sc.D

14 　　　Alexandria, Virginia

15 　　　Friday, May 22, 2015

16 　　　　8:35 a.m.

17

18

19

20 Job No.: 83209

21 Pages: 1 - 422

22 Reported by: Leslie A. Todd

2

1 　Deposition of MICHAEL S. TRIANTAFYLLOU, Sc.D, held

2 at the offices of:

3

4

5 　OBLON, SPIVAK, McCLELLAND, MAIER &

6 　NEUSTADT, LLP

7 　1940 Duke Street

8 　Sixth Floor

9 　Alexandria, Virginia 22314

10 　(710) 413-3000

11

12

13

14

15 　Pursuant to Notice, before Leslie Anne Todd,

16 Court Reporter and Notary Public in and for the

17 Commonwealth of Virginia, who officiated in

18 administering the oath to the witness.

19

20

21

22

3

1 　　A P P E A R A N C E S

2 ON BEHALF OF PETITIONER:

3 　DAVID I. BERL, ESQUIRE

4 　THOMAS S. FLETCHER, ESQUIRE

5 　JESSAMYN BERNIKER, ESQUIRE

6 　ALEC SWAFFORD, ESQUIRE

7 　WILLIAMS & CONNOLLY LLP

8 　725 Twelfth Street, N.W.

9 　Washington, D.C. 20005

10 　(202) 434-5000

11

12 ON BEHALF OF THE PATENT OWNER:

13 　MICHAEL L. KIKLIS, ESQUIRE

14 　CHRISTOPHER RICCIUTI, ESQUIRE

15 　OBLON, SPIVAK, McCLELLAND, MAIER &

16 　NEUSTADT, LLP

17 　1940 Duke Street

18 　Sixth Floor

19 　Alexandria, Virginia 22314

20 　(710) 413-3000

21

22

4

1 　A P P E A R A N C E S　C O N T I N U E D

2 ON BEHALF OF THE PATENT OWNER:

3 　RYAN KANE, ESQUIRE

4 　KIRKLAND & ELLIS LLP

5 　601 Lexington Avenue

6 　New York, New York 10022

7 　(212) 446-4800

8

9 ALSO PRESENT:

10 　KEVIN M. HART, Petroleum Geo-Services, Inc.

11 　TRISHA JHUNJHNUWALA

12

13

14

15

16

17

18

19

20

21

22

5

6

7

1   P R O C E E D I N G S

2   ---------------------

3   MICHAEL S. TRIANTAFYLLOU, Sc.D,

4   having been duly sworn, was examined

5   and testified as follows:

6   MR. BERL: Let's do, for the record,

7   appearances.

8   David Berl, Williams & Connolly. With me

9   is Tom Fletcher, also from Williams & Connolly. And

10   Trisha Jhunjhnuwala, a summer associate with us at

11   Williams & Connolly, and also Kevin Hart from

12   Petroleum Geo-Services, Inc.

13   MR. KIKLIS: Mike Kiklis from Oblon for

14   the patent owner. With me is Ryan Kane from Kirkland

15   and Chris Ricciuti from Oblon as well.

16   EXAMINATION BY COUNSEL FOR PETITIONER

17   BY MR. BERL:

18   Q   Good morning, Doctor.

19   A   **Good morning.**

20   Q   You've done this before, Doctor, right,

21   given a deposition?

22   A   **Yes.**

8

1   Q   So you understand I'm going to ask you a

2   series of questions over the next two days, and you

3   will provide answers to those questions.

4   A   **Exactly.**

5   Q   If you don't understand my questions, you

6   can just tell me, and I will try to explain it or ask

7   it a different way. Okay?

8   A   **Okay.**

9   Q   And is there any reason you can't give

10   truthful testimony today?

11   A   **There is no reason.**

12   Q   Doctor, I would like to hand you the

13   declaration that you submitted in these three cases

14   that's been marked as Exhibit 2042, I believe in each

15   of the three cases.

16   Is this in fact the declaration that you

17   submitted in connection with the three IPRs?

18   A   **It's a long declaration, but, yes, it**

19   **appears to be.**

20   Q   And at the end of it after page 88, your

21   signature appears; is that right?

22   A   **Correct.**

9

1   Q   And you signed that on or about
2   March 20th, 2015?
3   A   Yes.
4   Q   In Singapore?
5   A   In Singapore.
6   Q   And you reviewed the declaration before
7   you signed it?
8   A   Yes.
9   Q   You believed it to be truthful before you
10 signed it?
11   A   Yes, I did.
12   Q   And if you reviewed it and believed it to
13 contain errors, you would have changed those errors
14 before you signed it, correct?
15   A   Correct.
16   Q   Are you aware of any errors in your
17 declaration as you sit here today?
18   A   Not as I sit today.
19   Q   I notice you brought with you a binder.
20 What's in that binder?
21   A   In the binder there is a copy of what you
22 just handed me, and there are four principal

10

1   references that were used in the declaration.
2   Q   Okay. Now, appended to your declaration
3   was Exhibit A to 2042. I suppose we can mark this
4   as -- let's keep this as part of 2042 since that's
5   how it was submitted in connection with your
6   declaration.
7   And for the record, I'm also handing you
8   what was marked as Exhibit B to your declaration,
9   2042, as well as Exhibit C to your declaration, 2042.
10   Do you have those documents, sir?
11   A   Yes, I do.
12   Q   Exhibit A is a copy of your curriculum
13 vitae; is that right?
14   A   Yes, it is.
15   Q   And that was current as of March 2015?
16   A   Yes.
17   Q   And your curriculum vitae provides some
18 of your research and experience, right?
19   A   Correct.
20   Q   And on the first page it has a paragraph,
21 the second paragraph about your journal articles and
22 research interests, right?

11

1   A   Yes.
2   Q   And it says that you pioneered the
3   development of science-driven biomimetic robots to
4   study the basic mechanisms of flow control that lead
5   to the outstanding agility of fish and cetaceans; is
6   that right?
7   A   Yes.
8   Q   That's one of your research interests?
9   A   It is.
10   Q   And it says further down that you're
11 currently studying the physics of flow sensing in
12 fish and marine mammals to achieve
13 supermaneuverability in ocean vehicles through flow
14 feedback control; is that right?
15   A   Right.
16   Q   That's another one of your research
17 interests?
18   A   Yes.
19   Q   There's nothing in the summary of your
20 research interests about marine seismic surveys,
21 right?
22   A   This is implied because the whole area I

12

1   developed on fish hydrodynamics and the like sprang
2   out of my work on cables, towed cables and the like.
3   Q   But with respect to marine seismic
4   surveys, there is nothing in the summary of your
5   research interests that talks about that, right?
6   A   It is implied, as I told you, and if you
7   look back in my references you can find plenty of
8   such references. So this is -- we're looking at the
9   cutting edge of the moment which we will advertise in
10 this caption. This is for various reasons.
11   Q   It's for various what?
12   A   We do this for reasons of promoting the
13 students and the like. But this whole research area
14 came as a result of my cable mechanics, which is my
15 sort of bread and butter. That's how I got tenure at
16 MIT.
17   Q   Okay. And my question, though, is a
18 simple one. In this summary of your research
19 interests, it does not say anything about marine
20 seismic surveys, right?
21   MR. KIKLIS: Objection. Form.
22   THE WITNESS: To a layperson, maybe no.

13

1 But to those who can read through the words, it says
2 plenty.
3 BY MR. BERL:
4   Q   It may say plenty, but it doesn't say
5 "marine seismic surveys," right?
6   MR. KIKLIS: Objection. Form.
7   THE WITNESS: It comes together with all
8 the publications here.
9 BY MR. BERL:
10   Q   Okay. So let's look at the publications.
11 You have a 21-page curriculum vitae, correct?
12   A   Yes.
13   Q   And the term "marine seismic survey" does
14 not appear in the 21-page curriculum vitae, correct?
15   A   It is an application of all the things
16 that I have published on the dynamics of translating
17 cables. For example, number 8 on dynamics of --
18   THE REPORTER: Excuse me?
19   THE WITNESS: Number 7 and 8 of my
20 publications.
21   Let me point you out to another one which
22 will be more relevant. The review papers.

14

1 BY MR. BERL:
2   Q   Those are on page 11?
3   A   Page 11, number 2. "Dynamics of cables,
4 Towing Cables and Mooring Systems." The Shock and
5 Vibrations Digest is a journal where people review
6 the literature to find out what is the state of the
7 art, what is the most advanced, what is missing from
8 the area. Whereas, you can see I reviewed the
9 relevant area which is where all the work on towed
10 arrays is based on.
11   Q   Let's take a look at reference number 7
12 that you identified. That's on page 3. That's the
13 Kim article from 1984. Correct?
14   A   Yes.
15   Q   That does not address marine seismic
16 surveys, does it?
17   A   It has applicability to it, not in -- in
18 the application of commercial application. But all
19 this work was the basis for deriving the fundamentals
20 of how towed arrays and the like move.
21   Q   You don't discuss in that paper marine
22 seismic surveys, do you?

15

1   A   I discuss the basics on which the towed
2 arrays are based. If you don't know the basics, you
3 cannot do any progress in the area.
4   Q   I understand that, but my question is
5 very simple. You don't discuss in that paper marine
6 seismic survey.
7   MR. KIKLIS: Objection. Form.
8   THE WITNESS: The fundamental --
9   MR. KIKLIS: Michael, let me get a chance
10 to object.
11   Objection. Form.
12   THE WITNESS: The fundamentals for the
13 paper are very pertinent, whereas you can find from
14 my declaration, that's where I base the whole
15 discussion on the towed arrays. If you don't know
16 those principles that I explained in those papers,
17 you cannot do towed arrays.
18 BY MR. BERL:
19   Q   That may be true, but my question is
20 different.
21   You don't actually discuss marine seismic
22 surveying in that paper, do you?

16

1   MR. KIKLIS: Objection to form.
2   THE WITNESS: I have answered the
3 question more than once.
4 BY MR. BERL:
5   Q   Well, you've answered about whether you
6 think it has applicability to marine seismic surveys.
7 I understand that answer.
8   My question is a different question, and
9 I'm entitled to an answer to my question, which is
10 that paper does not discuss marine seismic surveys,
11 correct?
12   MR. KIKLIS: Objection to form.
13   THE WITNESS: It discusses the principles
14 that apply to the towed arrays.
15 BY MR. BERL:
16   Q   But not seismic surveys itself.
17   MR. KIKLIS: Objection to form.
18   THE WITNESS: It applies to seismic
19 arrays as well.
20 BY MR. BERL:
21   Q   But it does not discuss seismic --
22   A   But it applies to seismic arrays as well.

17

1   Q   Okay. I understand. So your answer is
2   it does not discuss marine seismic surveys but it
3   applies to marine seismic surveys.
4   A   It discusses the principles of seismic
5   arrays; therefore, it applies to seismic arrays.
6   Don't change my answer, please.
7   Q   I'm not changing your answer. I'm trying
8   to get an answer to the question which is --
9   A   And you got the answer.
10   Q   I don't think you've answered my narrow
11 question, which was paper number 7 does not discuss
12 in the paper marine seismic surveys, correct?
13   A   It discusses the principles that apply to
14 seismic arrays.
15   Q   Okay. Paper number 8 that you identified
16 as well, that likewise does not discuss marine
17 seismic surveys, correct?
18   A   We can go down the list, and I will give
19 you the same answer which you heard before.
20   Q   Which is that it does not discuss marine
21 seismic surveys, but in your view it applies to
22 marine seismic surveys.

18

1   A   No, not the way you put it. The answer
2   is it applies to the principles; therefore, it
3   applies to seismic arrays.
4   Q   But that marine seismic surveys are not
5   explicitly discussed in the article number 8.
6   A   When you discuss the principles of
7   something, it applies to those principles. That's
8   my position.
9   Q   But you discussed the principles. You
10 did not discuss marine seismic surveys.
11   MR. KIKLIS: Objection. Form.
12   THE WITNESS: Someone who is studying
13 seismic arrays will have to go and look at those
14 publications. Therefore, it is pertinent.
15 BY MR. BERL:
16   Q   I didn't hear the end of what you said.
17   A   Someone who is studying the towed arrays
18 will have to look at my publications; therefore, it's
19 pertinent to the seismic.
20   Q   They will have to look at your
21 publications so that it's impossible to understand
22 marine seismic arrays without reviewing your papers?

19

1   A   Or a person like me.
2   Q   Let's take a look at number 2, this
3   review paper you identified on page 11.
4   A   Yes.
5   Q   From 1991. That likewise does not
6   discuss marine seismic surveys, correct?
7   A   Towing cables.
8   Q   It discusses towing cables, but not the
9   problems associated with marine seismic surveys, for
10 example.
11   A   I have to look back whether I used in
12 fact the word, because I meant -- I believe -- which
13 my memory from so many years is not exact, whether in
14 this publication, but I think it was in that one I
15 discussed towed arrays as an application. I have to
16 look at that to reinforce my memory which one it is.
17   Q   Towed arrays in marine seismic surveys?
18   A   Towed arrays.
19   Q   But not in marine seismic surveys, just
20 in general.
21   A   Towed arrays. Whether it is behind
22 submarines, which was my primary field of study at

20

1   the time, or behind -- the principles are the same --
2   or behind oil and gas exploring vehicles, the
3   principles are the same.
4   Q   So the information that one can determine
5   based on work on submarines, for example, you view as
6   being applicable to the context of marine seismic
7   surveying.
8   A   Submarines is more challenging than for
9   gas and oil.
10   Q   But information that one obtains from the
11 literature in the area of submarines, in your view,
12 certainly would apply to the problems associated with
13 marine seismic surveys?
14   A   It would. There isn't much on the
15 literature because of confidentiality, but those
16 which were published, yes.
17   MR. KIKLIS: Could you just wait for him
18 to finish his question before you answer.
19   THE WITNESS: Sure.
20   MR. KIKLIS: Thank you.
21   THE WITNESS: Sorry if I rush ahead of
22 you.

21

1   MR. BERL: No, that's fine. No apology
2 necessary.
3 BY MR. BERL:
4   Q   Doctor, in the field of marine seismic
5 surveying, you would agree that Dr. Evans has more
6 expertise than you do.
7   A   **It depends on how you put it. If you are**
8 **talking about what we are talking today, the dynamics**
9 **of towed arrays, which is what is the field of these**
10 **publications, I would claim that he is not more**
11 **expert than I am. In fact, I would say the opposite.**
12 **In fact, I would say few people in the world would be**
13 **on the same level.**
14   Q   But if we're talking about what problems
15 are encountered in the field when conducting marine
16 seismic surveys, you would agree that in that area
17 Dr. Evans has more expertise than you do?
18   A   **Not in the field of towing arrays. You**
19 **can talk about binning, you can talk about throwing**
20 **additional lines. I think the specific field of**
21 **pertinence, I believe I have more expertise.**
22   Q   But when we talk about binning or towing

22

1 additional lines, in those areas Dr. Evans has more
2 expertise?
3   A   **He has expertise in certain areas. I'm**
4 **not sure that this is the specific one. I'm just**
5 **saying that -- I don't want to compare the other**
6 **areas, but in the specific area of the patents which**
7 **we're talking about today, I believe I have more**
8 **expertise than he does.**
9   Q   And that specific area that you said you
10 think you have more expertise is the dynamics of
11 towed arrays, correct?
12   A   **And control, yes.**
13   Q   And with regard to designing marine
14 seismic surveys, you would agree that Dr. Evans has
15 more expertise than you.
16   A   **I would put the doubt on this because in**
17 **order to do proper design of the arrays, you have to**
18 **know about the dynamics of the control. You may know**
19 **more on acoustics or anything else. I'm not saying**
20 **that Dr. Evens does or does not, but I'm saying in**
21 **the field of study today.**
22   Q   Let me ask the question this way since

23

1 you don't want to compare. How many marine seismic
2 surveys have you designed?
3   A   **Specifically for the industry, I'm not a**
4 **designer of arrays. I'm the developer of the**
5 **technology which is used -- fundamentals of dynamics**
6 **and control, which are used to design such arrays.**
7   Q   So it's correct to say that you have
8 designed zero marine seismic surveys.
9   A   **Design in the sense of actually doing**
10 **them, this is not my business. I'm a professional**
11 **who develops concepts and new technology.**
12   Q   But with respect to designing how a
13 survey should be conducted in a particular area,
14 let's say the Gulf of Mexico, in a marine seismic
15 survey, that's not your area.
16   MR. KIKLIS: Objection. Form.
17   THE WITNESS: There are aspects of it
18 which I'm very pertinent with, okay? So if someone
19 in the industry calls me up, it's usually for some
20 advanced problem, and I will be part of the team.
21 Now, how you want to grade this up or down, it's a
22 personal choice.

24

1 BY MR. BERL:
2   Q   But you don't actually design the surveys
3 to determine how long it will be, where the boats
4 should go, how many streamers, where the streamers
5 go, et cetera.
6   MR. KIKLIS: Objection. Form.
7   THE WITNESS: I may provide an opinion on
8 such things.
9 BY MR. BERL:
10   Q   But you don't --
11   A   **I'm a part of the team, if -- if you**
12 **want.**
13   Q   When was the last time you actually
14 helped design a marine seismic survey?
15   A   **I don't recall in my discussions with the**
16 **oil industry, but I do not recall it now.**
17   Q   To --
18   A   **I do not recall it now.**
19   Q   You can't give me a specific instance
20 where you helped --
21   A   **No, I cannot.**
22   Q   Sorry. Let me finish my question.

25

1   You cannot provide a specific instance in
2   which you helped design a marine seismic survey.
3   **A   I cannot give you a specific instance**
4   **today. I have to think about it.**
5   Q   Okay. With regard to interpreting the
6   data from marine seismic surveys, that's not your
7   area either, right?
8   **A   If you are talking interpreting the data**
9   **on finding the underground oil and gas or**
10 **interpreting the data of the hydrophones that come**
11 **for control. Which of the two do you want?**
12   Q   Interpreting the data that's obtained
13 from the marine seismic survey.
14   **A   This is typically handled by**
15 **acousticians.**
16   Q   Not -- not you, not people in your field.
17   **A   I may have an opinion, but I'm not**
18 **someone who will be doing this.**
19   Q   Dr. Evans wrote an entire book on marine
20 seismic surveying, correct?
21   **A   Yes.**
22   Q   And that book was directed to addressing

26

1   issues that arise in the context of marine seismic
2   surveying, correct?
3   **A   I haven't read his book, so I'm not**
4   **familiar with the content.**
5   Q   You haven't looked at his book?
6   **A   I may have used it, but not in a deep way**
7   **to give you an opinion, no.**
8   Q   You've never written a book about the
9   problems associated with marine seismic surveys, have
10 you?
11   **A   I have written notes which provide the**
12 **fundamentals of dynamics and control, which apply to**
13 **it, yes.**
14   Q   Doctor, can you identify a single thing
15 you've ever written, other than your expert reports
16 in the ION case and this case, that uses the term
17 "marine seismic survey"?
18   **A   You are asking me to say whether any --**
19 **everything that I published in the area of cables and**
20 **things is used widely in the offshore industry. I**
21 **have all sorts of applications.**
22   **So the question is you want to narrow it**

27

1   **down whether it carries a title. It's applying to**
2   **all those things and other things as well. Okay?**
3   Q   So I understand that's a question you may
4   want to answer. But my question is, can you identify
5   for me a single thing you have ever written, other
6   than your -- in your expert reports in this case or
7   the ION litigation, that uses the term "marine
8   seismic survey"?
9   MR. KIKLIS: Objection to form.
10   THE WITNESS: I told you that my review
11 papers apply to towing arrays, okay? You want -- for
12 us, towed arrays is equivalent to whether it's a
13 towed array behind a submarine or whether it's behind
14 -- towed arrays behind a vehicle. So it's similar to
15 what you are talking about.
16 BY MR. BERL:
17   Q   And I think the answer to my question,
18 but please confirm for me if I'm wrong, is you cannot
19 identify for me a single thing you have ever written
20 in your entire career, other than your expert reports
21 in the ION case and this case, that uses the term
22 "marine seismic survey."

28

1   **A   And I told you --**
2   MR. KIKLIS: Objection. Misstates.
3   THE WITNESS: And I told you that they
4   are synonymous. I have written things about the
5   synonymous, so I cannot say -- it's a wrong answer to
6   say that I have not written. It will surprise people
7   in the industry if I made such a statement. It would
8   irritate them if I said -- they are using my thing --
9   my derivations and my equations and my advice for
10 conducting such arrays, and for me to state that I
11 have written nothing would be outrageous.
12 BY MR. BERL:
13   Q   Okay. Let me ask it this way then: Can
14 you identify for me anything you've ever written,
15 whether on your CV or anything, a note to your wife,
16 I don't care what it is, anything, other than your
17 expert reports in the ION case and in this case, that
18 uses the term "marine seismic survey"? If you can
19 identify it for me, please do. If you can't, just
20 tell me you can't.
21   MR. KIKLIS: Objection. Form.
22 Argumentative.

29

1   THE WITNESS: For a person like yourself,
2 a layperson, the words that you are saying "marine"
3 and the like have a specific meaning, and for a
4 specialist "towed arrays" has another meaning. So
5 what we're talking about today comes out of all this.
6 So for me to say an answer yes to your question would
7 be outrageous.
8   I've written the basic equations for
9 towed arrays. I've written controls for towed
10 arrays. I've written predictive control for towing
11 things. I'm doing right now, I just completed eight
12 years study for the Navy for high speed towing
13 arrays. High speed towing arrays.
14   And for me to come here and say marine
15 arrays, I have written nothing about, it's a
16 distortion of words. It's outrageous. I answered it
17 so many times that I will keep repeating it. If you
18 want to go along with this game, fine, but I'm just
19 telling you.
20 BY MR. BERL:
21   Q   You seem to be getting upset. I'm not
22 trying to irritate you or -- or be disrespectful in

30

1 any way. I'm simply trying to get an answer to my
2 question which --
3   A   And I'm not getting upset. I'm
4 getting -- I have a passion for these things. I
5 gotten tenure at MIT because of these things.
6   Q   I -- I appreciate that. And --
7   A   And, therefore, you see my passion coming
8 out. I'm not irritated. You're a very pleasant
9 person.
10   Q   Thank you.
11   MR. KIKLIS: Objection to the --
12   THE WITNESS: I'm not irritated at all.
13 I'm passionate about this.
14 BY MR. BERL:
15   Q   Wonderful.
16   A   So I lived my life doing towed arrays. I
17 participated in the discovery of the Titanic with
18 towed arrays. I worked with the Navy for many years
19 on towed arrays.
20   Q   I understand.
21   A   And for someone to come here and to say,
22 Have you written anything on marine -- towed arrays

31

1 and the like, it's a straitjacket and it's
2 outrageous.
3   Q   So I think the answer to my question was
4 that you've written a lot about towed arrays that you
5 think applies to marine seismic surveys, but as to
6 the specific issue of marine seismic surveys, you are
7 unable to provide me a single document you've ever
8 written other than your expert report in front of you
9 and your reports in the ION case, correct?
10   MR. KIKLIS: Objection. Misstates.
11 Form.
12 BY MR. BERL:
13   Q   If you have such a document, just tell me
14 where it is.
15   MR. KIKLIS: Objection. Argumentative.
16   THE WITNESS: You have plenty of
17 documents.
18   MR. KIKLIS: And form.
19   THE WITNESS: The answer was given to
20 you. If you want to keep going down this road, we
21 will get the answer -- the answer you got.
22 BY MR. BERL:

32

1   Q   Okay. You're familiar with SEG?
2   A   I'm not going to go along with initials.
3 You have to spell it out.
4   Q   You don't know what SEG is, do you?
5   MR. KIKLIS: Objection. Form.
6   THE WITNESS: One thing I tell my
7 students is never to give me initials. And that will
8 have to apply to today.
9 BY MR. BERL:
10   Q   Well, I didn't take your class at MIT. I
11 apologize for that, but -- but let me just ask you
12 the question, do you know what SEG is?
13   A   You have to spell me out what it says.
14   Q   I'm happy to do that, but, first, I'd
15 like to know if you know what it is without me
16 spelling it out.
17   A   You --
18   MR. KIKLIS: Objection. Form.
19   THE WITNESS: I don't -- I don't get
20 quizzed on initials or anything else. You can go
21 down the list, there are technical terms in the
22 industry or in the products and the like.

33

BY MR. BERL:

Q   Okay. Sir, if you don't know what it is,
you can just tell me you don't know what it is. My
question is simple, do you know what SEG is?

A   I don't identify now --

MR. KIKLIS: Objection. Misstates.

THE WITNESS: I don't identify now with
three initials what it is or what it is not.

BY MR. BERL:

Q   Okay. The Society of Exploration
Geophysicists, are you familiar with that?

A   I've heard of it.

Q   Do you dispute that it is the premier
society in the area of marine seismic surveying?

A   It may be in the exploration for seismic
array, but it's not the society that I would go to
for towed arrays.

Q   But it's the society that you would go to
in regards to exploring using seismic arrays.

A   To interpreting the results, to organize
how to process the data of the hydrodynamics. But
not in the area of towed arrays and control, this is

34

not the society I would go to. That's why I'm not a
member of that society, because I belong to the
societies that are relevant to the towed arrays.

Q   Do you dispute that artisans in this
industry, in the submarine seismic industry,
generally are members of the Society of Exploration
Geophysicists?

MR. KIKLIS: Objection. Form.

THE WITNESS: They may or may not.

BY MR. BERL:

Q   Have you ever reviewed abstracts or
presentation from the Society of Exploration
Geophysicists?

A   The Society of Exploration Geophysicists
applies to geophysics, and I'm a specialist in towed
arrays.

Q   So the answer is no.

MR. KIKLIS: Objection. Misstates.

THE WITNESS: I may or may not have, I
don't remember. But it's not something that I will
do.

BY MR. BERL:

35

Q   Do you have any reason to dispute that
the meetings of the Society of Exploration
Geophysicists is where problems that arise in the
context of marine seismic surveys are often
discussed?

A   Your blanket statement is incorrect,
because if there were problems with control and
hydrodynamics, this is not the place where you would
go.

Q   Have you ever been to a meeting of the
Society of Exploration Geophysicists?

A   I have not, but it's -- I have been to
the meetings of the societies which are about towed
arrays.

Q   So how do you know what's discussed at
the meetings of the Society of Exploration
Geophysicists if you have never been to one?

A   Because looking at the resumes of the
people, I can tell what they know and what they don't
know.

Q   Which people?

A   The geophysicists that I know at MIT who

36

also go to, these people, apply to acoustics, apply
to processing of data. These are the geophysicists
that I have known. So I just know from them.

Q   So you have colleagues at MIT who are
geophysicists who belong to the Society of
Exploration Geophysicists?

A   I'm not sure whether they are or they are
not. I haven't checked.

Q   So you in fact don't know whether you've
ever talked to anyone who is a member of the Society
of Exploration Geophysicists?

A   Maybe. I have talked to many people.

Q   But you don't know whether any person
you've ever talked to is a member of the Society of
Exploration Geophysicists?

A   I can calculate the probability. I can
give you the chance.

Q   Okay. Do you know what EAGE is?

A   You will have to spell it for me.

Q   Okay. European Association of
Geoscientists and Engineers, do you know what that
is?

37

1   A   I may have heard it.
2   Q   It doesn't ring a bell, though?
3   A   It doesn't, but -- at this point I cannot
4   remember it.
5   Q   Okay. You're not a member of that
6   society either, are you?
7   A   No.
8   Q   Let's take a look at your declaration,
9   which we will be looking at a lot today.
10   Your declaration does not provide any
11   opinions relating to secondary consideration of
12   nonobviousness, does it?
13   A   If you can point me to a specific area --
14   point in my -- it's a long document.
15   Q   I couldn't find it either. That's why
16   I'm asking. For example, you don't provide any
17   opinions about commercial success, do you?
18   A   I kept it in mind when I wrote the
19   report, it's true, because my understanding of the
20   secondary considerations is exactly that. You know,
21   the specific need for it, I kept that in mind. So it
22   may be in some phrase in my report, but now you are

38

1   asking me to point blank.
2   Q   So you don't provide any opinion about
3   commercial success, for example?
4   MR. KIKLIS: Objection to form.
5   THE WITNESS: It's a general statement.
6   I --
7   BY MR. BERL:
8   Q   But if you provided an opinion, you can
9   show it to me.
10   A   Ninety -- ninety pages.
11   Q   Well, there is a table of contents. I
12   mean, it's your report, Doctor. You signed it. And
13   what I'm asking you quite simply is, do you provide
14   an opinion about secondary considerations?
15   MR. KIKLIS: Objection to form.
16   THE WITNESS: It was part of my thinking.
17   Whether I put it explicitly right now, I have to look
18   up some of the sections. I didn't make it a
19   paragraph that is in the contents, so I cannot
20   comment. I tried to put as much in the contents.
21   BY MR. BERL:
22   Q   You tried what?

39

1   A   I tried to put as much in the contents to
2   help me, but I didn't put everything.
3   Q   And you certainly didn't put anything
4   about secondary considerations in the table of
5   contents.
6   A   I don't see that right now.
7   Q   Okay. Let's take a look at paragraph 18
8   of your declaration. That's on page 10.
9   Are you there?
10   A   (No response.)
11   Q   Are you there, Doctor?
12   A   Yes, I am.
13   Q   Okay. That's the paragraph where you
14   provide your definition of "the person of ordinary
15   skill"; is that right?
16   A   Yes.
17   Q   And that's the definition of "the person
18   of ordinary skill" that you applied in analyzing
19   whether the claims of the '967, '607 and '520 patents
20   were obvious or anticipated.
21   A   Yes.
22   Q   It was from the vantage point of that

40

1   person of ordinary skill that you analyzed the prior
2   art in this case.
3   A   Yes.
4   Q   And rendered your opinions in this case.
5   A   Yes.
6   Q   You did not provide any opinion as to
7   whether the claims would be obvious or anticipated to
8   some different person of ordinary skill that does not
9   meet your definition, right?
10   A   That's not true, because I considered
11   this person as a representative, as I described it.
12   Small variations I don't think would make a big
13   difference in my opinion. But -- so I wouldn't make
14   a blanket statement.
15   Q   Well, do you provide any opinion in this
16   report, and I'm happy to see it, that the claims of
17   the '967, '607 and '520 are not anticipated or not
18   obvious using a different person of ordinary skill
19   than the one provided here in paragraph 18?
20   A   Can you be specific?
21   Q   Sure. Did you apply Dr. Evans' person of
22   ordinary skill and render any opinion as to whether

41

1 the claims would be obvious or anticipated to his
2 person of ordinary skill?
3   A   I read his testimony. I don't have it
4 handy here. Can you hand me over his definition so
5 we can look at it now?
6   Q   I will in a moment and we'll talk about
7 his definition versus yours, but I have a different
8 question, which is in your report, did you render any
9 opinion that the claims of the '520, '967 and '607
10 patents would be not anticipated or not obvious
11 applying Dr. Evans' person of ordinary skill?
12   MR. KIKLIS: Objection. Form.
13   THE WITNESS: I would have to take a look
14 again so I can give you the answer.
15 BY MR. BERL:
16   Q   No, I'm asking about what's in his
17 report, not in what -- I'm asking about what's in
18 your report, not what's in his report.
19   And so I'm asking whether you applied any
20 other definition such as his in asserting that the
21 claims of the three patents at issue here are not
22 anticipated or not obvious?

42

1   MR. KIKLIS: Objection to form.
2   THE WITNESS: I tried to be as wide
3 ranging when I considered my opinions as possible.
4 So in order to answer your question, I have to see
5 Evans' opinion right now so I can remember whether it
6 is one of the ones I considered or not.
7 BY MR. BERL:
8   Q   Okay. There is no disclosure anywhere in
9 your report of you applying some other person of
10 ordinary skill that is not within the scope of
11 paragraph 18, right?
12   MR. KIKLIS: Objection. Form.
13   THE WITNESS: I can't remember the entire
14 report by heart.
15 BY MR. BERL:
16   Q   But you don't remember doing anything
17 like that, right?
18   A   I can't say that I did. I tried to think
19 hard about what is the correct person with the skill
20 in the art, so -- I can't say for sure right now.
21   Q   You thought hard about who the right
22 person of ordinary skill was, and the conclusion you

43

1 reached after that hard thinking is reflected in
2 paragraph 18, right?
3   A   Correct.
4   Q   And you thought hard about it because
5 that was an important part of your analysis, right?
6   A   It was a part of my analysis, yes, among
7 other things.
8   Q   Because that's the vantage point from
9 which you were analyzing all of the prior art in the
10 patents, correct?
11   A   According to the law, yes.
12   Q   Now, your definition says that: "A
13 person of ordinary skill at the time of the '520,
14 '607 and '967 patent would have a Bachelor of Science
15 in ocean engineering or control systems or five years
16 of experience in the field of ocean engineering or
17 marine seismic surveys."
18   Do you see that?
19   A   Yes.
20   Q   That's your opinion, right?
21   A   That's my opinion.
22   Q   And ocean engineering is quite a broad

44

1 field, correct?
2   A   Some will say it's a very narrow field.
3   Q   You don't agree that it's a broad field?
4   A   It's not.
5   MR. KIKLIS: Objection to form.
6 BY MR. BERL:
7   Q   It's a very narrow field. Is that your
8 answer?
9   A   Yes.
10   Q   It includes issues like flow sensing and
11 fish, right?
12   A   It has application to that, but the
13 principles are specific.
14   Q   And your work in biomimetic robots is in
15 the field of ocean engineering, is it not?
16   MR. KIKLIS: Objection. Form.
17   THE WITNESS: It's not a version of
18 engineering. It has applications to ocean
19 engineering, but biomimetics is its own thing. It
20 ranges from doing artificial brains to flying insects
21 to swimming fish. So biomimetics is not part of
22 ocean engineering. It lends some support to ocean

45

1   engineering.

2   So from that point of view, ocean

3   engineering is a narrow field because it has its own

4   principles which can be applied to a number of other

5   fields. And so it appears to be wide, but it's

6   really narrow.

7   BY MR. BERL:

8   Q   Okay. The field of ocean engineering

9   includes the study of oil rigs, for example?

10   **A   It has application to oil rigs in the**

11 **sense of offshore structures and the like.**

12   Q   And seawalls, for example?

13   **A   It will have applications, but it's not**

14 **part -- it's not exclusive for ocean engineering.**

15 **Coastal engineers do some of that stuff too, so they**

16 **are overlapping. But there are certain principles in**

17 **ocean engineering which define the field.**

18   Q   You said five years of experience in your

19 last line in the field of ocean engineering or marine

20 seismic surveys. Do you see that?

21   **A   Yes, that's correct.**

22   Q   How did you choose five years?

46

1   **A   Usually when we talk to people in the**

2   **field, it takes about five years in the offshore**

3   **industry or a related industry for a person with a**

4   **degree, let's say, in mechanical engineering or**

5   **chemical engineering, some engineering field to**

6   **really become proficient with the -- with the marine,**

7   **the ocean field. So that's how I base the five**

8   **years, that it's equivalent to a Bachelor of Science**

9   **in ocean engineering was the closest.**

10 BY MR. BERL:

11   Q   So just to be clear, your definition of

12 "a person of ordinary skill" includes a person with a

13 Bachelor of Science in control systems, who has no

14 experience whatsoever in ocean engineering or marine

15 seismic surveys, right?

16   **A   In constructing the hypothetical person,**

17 **this hypothetical person can be a composite of many**

18 **things, from what I understand. Okay?**

19   Q   But someone who has a Bachelor's in

20 control systems, without any experience in the field

21 of ocean engineering or marine seismic surveys, meets

22 your definition of "a person of ordinary skill" in

47

1   paragraph 18, does he not?

2   **A   He would fulfill the requirement of being**

3   **able to -- I will give a further explanation why -- I**

4   **thought hard about this. I didn't write this or --**

5   **because exactly I was thinking how is this person**

6   **going to understand the -- the nuances of fluid**

7   **mechanics when he is a control person?**

8   **So let's say he came out of electrical**

9   **engineering at MIT and has not had a course in fluid**

10 **mechanics. So I thought hard in order to put this**

11 **sentence down.**

12   **So there is a phrase in the Bittleston**

13 **patents, which we'll have plenty of time to discuss**

14 **I'm sure, where Bittleston and -- I'm calling them**

15 **the Bittleston patents, but we all understand what it**

16 **is -- where he says "model-based control,**

17 **behavior-based predictive," which means model-based**

18 **control.**

19   **Model based for control engineers means**

20 **one thing. You have to construct an accurate model**

21 **of the system, because it's based on it. We can make**

22 **approximations, but it has to be accurate in the**

48

1   sense of containing the essential features, not that

2   **it has to be finicky, but it has to contain the**

3   **essence. If it doesn't have the essence, it's not a**

4   **model-based compensator or control.**

5   **So someone with a control system**

6   **background upon seeing "model-based" would say, Ah, I**

7   **have to know what the system is doing. Therefore,**

8   **what do you do if you're an engineer from a good**

9   **school or an American school, as we say. You go**

10 **immediately and you find the models, then describe**

11 **the process. And, therefore, he will have or she**

12 **will have a few years in front to learn the stuff.**

13 **You could not do it on the spot. For example,**

14 **Dr. Bittleston, it took years to derive this.**

15   **So that's the meaning of all control**

16 **systems that I put there. I thought hard about it.**

17 **So I didn't put it lightly.**

18   Q   I appreciate that. Dr. Bittleston, you

19 said, took years to derive his model.

20   **A   Yes. And he had a Ph.D. in physics.**

21   Q   And you said a lot in that answer, but

22 I'm correct in saying that you thought hard about

49

1 this sentence, and after thinking hard, including
2 about the specific issue, you decided that a person
3 of ordinary skill would be met by someone who had a
4 Bachelor's in control systems and no experience in
5 the field of ocean engineering or marine --
6   **A Of course --**
7   MR. KIKLIS: Objection.
8 BY MR. BERL:
9   Q -- seismic surveys?
10   MR. KIKLIS: Objection. Misstates.
11   THE WITNESS: When I say he would have to
12 work out the equation, for which he would have to
13 read the patents and all the relevant patents, so
14 we're not talking about a person who just graduated
15 from the school and was put to the task.
16   What I'm saying is even if such a person
17 with the experience of having read the patents, so
18 it's not someone with no experience. I was more
19 addressing the control systems because that's what
20 you asked me about.
21 BY MR. BERL:
22   Q And you say it's not someone with no

50

1 experience. You're saying they have experience
2 because they read the patents.
3   **A They read the patents and the relevant**
4 **literature.**
5   Q Okay. In the paragraph before, you list
6 various factors that you say are relevant in
7 determining the level of ordinary skill. Do you see
8 that?
9   **A Yes.**
10   Q And you list some of those: "Education
11 level of the inventor, the sophistication of the
12 technology, the types of problems encountered in the
13 art, and prior art solutions to those problems."
14 Do you see that?
15   **A Yes.**
16   Q Those are the factors that you considered
17 when you thought hard about this and came to your
18 definition of "the person of ordinary skill" in
19 paragraph 18, right?
20   **A Yes.**
21   Q And I think you said this a moment ago,
22 but you mentioned the inventor, one of the inventors

51

1 Bittleston. What was his education?
2   **A He had a doctoral degree.**
3   Q A Ph.D.?
4   **A A Ph.D.**
5   Q Let's take a look at Dr. Bittleston's CV.
6   MR. BERL: For the record, this is being
7 marked as Exhibit 1076, and it will be 1076 in all
8 the cases.
9   (Exhibit No. 1076 was marked for
10   identification.)
11   MR. KIKLIS: Objection. Scope.
12 BY MR. BERL:
13   Q Do you have before you Exhibit 1076,
14 Doctor?
15   **A Yes.**
16   Q And does this appear to be
17 Dr. Bittleston's curriculum vitae?
18   **A Yes.**
19   Q And on the second page it provides his
20 education, including his Ph.D.; is that right?
21   **A Yes.**
22   Q And that confirms what you said a moment

52

1 ago that your understanding was that he has a Ph.D.,
2 correct?
3   **A Yes.**
4   Q And do you see underneath, it says
5 "Professional Qualifications and Affiliations"?
6   **A Yes.**
7   Q Do you see he's a member of SEG?
8   **A Yes.**
9   Q And at the top of that page that we're
10 looking at, which is the second page of the exhibit,
11 it provides work experience starting in 1993, the
12 earlier work experiences on the first page, right?
13   **A Yes.**
14   Q And starting in 1993 he was a project
15 manager for streamers, Fjord Instruments in Bergen at
16 Geco-Prakla, correct?
17   **A I can read what it says. Geco-Prakla,**
18 **yes.**
19   Q And he was working on streamer
20 development, correct?
21   **A That's what it says.**
22   Q Including initial lateral bird

53

1   feasibility, right?
2   **A   That is what it states here.**
3   Q   And then do you have any reason to doubt
4   that it's correct?
5   **A   I'm replying to you.**
6   Q   Okay. But you analyzed Dr. Bittleston's
7   background in determining the person of ordinary
8   skill, correct?
9   **A   I looked at his education level, yes, and**
10   **his experience.**
11   Q   And among the experience that you looked
12 at was that he worked on streamer development and
13 lateral bird feasibility, correct?
14   **A   Yes.**
15   Q   And the next line, from 1994 to 1995, he
16 was a project manager and he developed the Nessie-4
17 streamer system and commercialized it. Do you see
18 that?
19   **A   I see that.**
20   Q   And in 1995 through 1997 he was a section
21 manager for marine applications, still at
22 Geco-Prakla, correct?

54

1   **A   Right.**
2   Q   And among other things, presumably he
3   launched lateral bird development, took over IRMA
4   acoustic positioning project, and launched Nessie-5
5   streamer system, now called Q-Marine, right?
6   **A   Right.**
7   Q   And in 1998 through '99, he continued to
8   work on, among other things, streamer control,
9   acoustic positioning systems, and other equipment,
10 right?
11   **A   Right.**
12   Q   So as of the 1998 priority date that
13 we're applying here, Dr. Bittleston had at least five
14 years of experience in working on streamer steering
15 in the marine seismic context, right?
16   **A   Correct. Actually, he had previous**
17   **experience too, but -- yeah. Okay.**
18   Q   Now, you also considered Dr. Hillesund,
19 Oyvind Hillesund's experience and education, correct?
20   **A   Yes. I don't recall the specifics now.**
21   Q   But you reviewed his deposition from the
22 ION case, correct?

55

1   **A   I remember doing it, yes.**
2   Q   Okay. And so you know that he worked on
3   bird technology for marine seismic surveying at least
4   as early as 1994. Correct?
5   **A   I don't have it in front of me, so I**
6   **presume you are reading from somewhere.**
7   Q   Does that comport with your recollection
8   having reviewed the deposition transcript of
9   Dr. Hillesund that he had at least four years of
10 experience in working on marine seismic --
11   **A   I don't remember the specifics now.**
12   Q   Well, what's your understanding of
13 Dr. Hillesund's experience in connection with
14 rendering your opinion of the definition of "person
15 of ordinary skill" in paragraph 18 of your
16 declaration?
17   **A   I don't have the specifics in front of**
18   **me. I considered it at the time. I don't remember**
19   **the specifics.**
20   Q   Okay. You asked for the declaration of
21 Dr. Evans, and let me provide that to you. It's
22 previously marked as Exhibit 1002 in the 00689 case,

56

1   which is the '520 patent case. So this is his '520
2   declaration.
3   And in particular, I would direct you to
4   paragraph 23. Are you there, Doctor?
5   **A   I am there.**
6   Q   And paragraph 23 provides Dr. Evans'
7   definition of "a person of ordinary skill," correct?
8   **A   Yes.**
9   Q   And that requires --
10   MR. KIKLIS: I'm sorry, are we on page 23
11 or paragraph 23?
12   MR. BERL: No. Paragraph 23, page 10.
13 BY MR. BERL:
14   Q   Sorry. Let me just get that clear then.
15 Paragraph 23 provides Dr. Evans' definition of "a
16 person of ordinary skill," right?
17   **A   Yes.**
18   Q   And that requires a Master's degree or
19 Ph.D. in ocean engineering, mechanical engineering,
20 geophysics, applied physics or a related area. Do
21 you see that?
22   **A   Yes.**

57

1   Q   And it identifies further some
2 coursework, correct?
3   A   Yes.
4   Q   And then it says: "Additionally, the
5 person should have at least three years of experience
6 designing and/or operating seismic surveys as well as
7 significant experience aboard marine seismic survey
8 vessels during the course of several marine seismic
9 surveys."
10   Do you see that?
11   A   Yes, I do.
12   Q   You would agree that Dr. Bittleston's
13 education and experience comports with Dr. Evans'
14 person of ordinary skill more than yours, correct?
15   MR. KIKLIS: Objection to form.
16   THE WITNESS: It's a matter of
17 interpretation.
18 BY MR. BERL:
19   Q   Well, your person of ordinary skill does
20 not require an advanced degree, and Dr. Evans does,
21 correct?
22   A   He requires a Ph.D., yes. Or a Master's

58

1 degree.
2   Q   And you only require a Bachelor's degree,
3 correct?
4   A   That's -- I tried to be as broad thinking
5 as I could for the specific person of ordinary skill.
6   Q   I understand. I'm just asking a simple
7 question.
8   Your person of ordinary skill requires a
9 Bachelor's degree, correct?
10   A   Right. And --
11   Q   And Dr. Bittleston has a Ph.D.
12   A   Okay.
13   Q   Correct?
14   A   Correct.
15   Q   Okay. And your person of ordinary skill
16 that we looked at is not required to have any work
17 experience in the area of -- in any area, correct?
18   MR. KIKLIS: Objection. Misstates.
19   THE WITNESS: It's a hypothetical person
20 we are talking about. When I said this, I didn't
21 specify without experience.
22 BY MR. BERL:

59

1   Q   Well, we talked about this a few moments
2 ago. We can review it again. I don't think it's
3 necessary. It's in paragraph 18 of your declaration.
4   Work experience is not required for your
5 person of ordinary skill. You can either have a
6 Bachelor's or work experience in ocean engineering,
7 right?
8   A   It is understood that he will have read
9 all the patents and the like. That was part of the
10 experience.
11   Q   Okay. I understand that. But with
12 regard to work experience outside of reading the
13 patents, your person of ordinary skill is not
14 required to have it.
15   A   It doesn't say that. It's understood
16 what are the essential ingredients that someone will
17 have, and you don't put someone on a job to read
18 patents and everything without some background, some
19 experience and the like. So it's understood that
20 they will have some experience in the field;
21 otherwise, he wouldn't be able to handle the patents.
22   Q   Well, but your person of ordinary skill,

60

1 as you wrote it after thinking very hard about it,
2 it's right in front of you in paragraph 18, does not
3 require work experience, right?
4   MR. KIKLIS: Objection. Argumentative.
5 BY MR. BERL:
6   Q   You can change it if you would like, but
7 it doesn't -- what you wrote in paragraph 18 does not
8 require work experience, right?
9   A   When I responded to you at the time I
10 told you that it may take years for this person to
11 work it out, what are the essential ingredients in
12 order to arrive at the solution. Okay. So in the
13 process you have to reach the level of maturity in
14 the patent field before you are able to apply it.
15   So my requirement was not, you know, a
16 turnkey type of solution. I'm saying which would be
17 the essential ingredients in order for this person to
18 function.
19 BY MR. BERL:
20   Q   And --
21   A   And in order to reach that level one
22 would have to read the patents, get the experience,

61

1 and go on board the vessels, learn the technology and
2 the like. That's understood for someone who is
3 trying to do technology development.
4   Q   That's not the definition in your
5 paragraph 18, is it, Doctor?
6   A   Let me -- let me finish. I didn't
7 complete my sentence.
8   Q   Oh, I'm sorry.
9   A   So someone who is about to do the patent
10 will have to familiarize with the technology, read
11 the patents, and get all the necessary -- so I don't
12 think that -- I didn't put this specifically because
13 it's natural that someone who is going to go into a
14 patent area as specified will have to be familiarized
15 with it, which is the equivalent of what experience
16 means.
17   Q   And when you answered my questions a
18 moment ago, you said that experience is reading the
19 patents. Correct?
20   A   Reading the patents, learning what the
21 field is about, what the requirements are, learning
22 from the user, learning from everybody else. We're

62

1 talking about common logic. We're not talking about
2 any deep thinking here.
3   Q   We're talking about common logic.
4   A   Common logic.
5   Q   Doctor, do you have your definition in
6 front of you, paragraph 18?
7   A   Yes.
8   Q   It says: "A bachelor's degree in ocean
9 engineering or control systems." Do you see that?
10   A   Yes.
11   Q   "Or five years of experience in the field
12 of ocean engineering or marine seismic surveys." Do
13 you see that?
14   A   I do.
15   Q   Okay. And your person of ordinary skill
16 does not require both a degree in ocean engineering
17 or control systems and years of experience in the
18 field of ocean engineering or marine seismic surveys,
19 right?
20   MR. KIKLIS: Objection. Form.
21   THE WITNESS: Two things. So let's take
22 one at a time. Paragraph 18 comes after

63

1 paragraph 17, which is on the previous page. Do you
2 have it in front of you?
3 BY MR. BERL:
4   Q   Yes.
5   A   And it says there: "... and is also
6 presumed to be aware of all relevant prior art,"
7 which implies the experience we're talking about.
8   Q   Okay.
9   A   Let me finish. Don't jump in. Okay.
10   And the second is the -- the requirements
11 on 18, the five years' experience is if you don't
12 have the Bachelor of Science in ocean engineering or
13 control systems. You have a Bachelor of Science --
14 obviously, as someone in the field, you have to be
15 competent to be hired. So there are implicit
16 sentences in here which include what you are talking
17 about.
18   Q   Okay. Let me make sure I understand.
19 Were you finished?
20   A   Yes, I am.
21   Q   Okay. You need five years of experience
22 if you don't have a Bachelor of Science in ocean

64

1 engineering or control systems, right?
2   A   If you have the specific Bachelor of
3 Science in ocean engineering or control systems.
4   Q   If you do not have that specific BS in
5 ocean engineering or control systems, then you need
6 five years of experience, right?
7   A   In the field, yes.
8   Q   But if you do have a Bachelor of Science
9 in ocean engineering or control systems, then what
10 you need is to be able to read the relevant prior
11 art, the patents and literature?
12   A   And to be a practitioner in the field; in
13 other words, to understand what the practice is
14 about. So all this constitutes some elementary
15 experience and level of competence.
16   Q   And you agree that both Dr. Bittleston
17 and Hillesund had at least three years of experience
18 in the field of seismic surveys, correct?
19   A   Yes.
20   Q   As Dr. Evans' person of ordinary skill
21 requires, right?
22   A   Correct.

65

1 Q Did you look at the experience of any
2 authors of the prior art references to determine
3 whether your person of ordinary skill comported with
4 their experience and education and expertise?
5 A I remember I have looked at some of the
6 people, yes. Actually, in every patent that I looked
7 at, I was trying to see what their level of
8 experience was.
9 Q How did you do that?
10 A As far as I remember, I was Googling
11 people, and whatever was available, I could make a
12 note of it.
13 Q Did you rely on any of those results of
14 your Google search in your opinion in this case?
15 A I -- that's how I formed my opinion.
16 Q So you considered the results of Google
17 searches you conducted on authors of the prior art in
18 rendering your opinions in this case?
19 A Yes.
20 Q If you look at Exhibit C which I handed
21 you earlier, which is Exhibit C to your expert
22 report, Exhibit 2042, do you see that's entitled

66

1 "Materials Considered" by you?
2 A Yes.
3 Q Can you show me on that list the results
4 of Google searches you did of the inventors or
5 authors of the prior art references?
6 A I didn't put them down.
7 Q Did you understand that you were to
8 include in this list the materials you considered in
9 rendering your opinions in this case?
10 A Yes. But this was a composite idea that
11 I was forming over a long period of time. So I made
12 an average of all these -- it was an unofficial
13 search, so to speak, so I can get an idea of what
14 they were like.
15   My opinion would not rely exclusively on
16 the level of competence of these people. My opinion
17 relied on primarily what would be required to
18 understand this, and that was one of the
19 considerations.
20 Q Okay. And so it's correct that the
21 materials you considered in rendering your
22 declaration, Exhibit 2042, are not all included in

67

1 Exhibit C that's in front of you, right?
2 A I included only the important ones, yes.
3 Q How did you decide what was important?
4 A My personal judgment.
5 Q Okay. So it was your understanding not
6 that you had to provide a list of materials that you
7 considered, but, rather, that you had to provide a
8 list of materials that you thought were important
9 among the materials you considered, correct?
10   MR. KIKLIS: Objection. Misstates.
11   THE WITNESS: When I was making Google
12 searches, they were staying in my brain. So whatever
13 I reference.
14 BY MR. BERL:
15 Q Are they still in your brain?
16 A At the time when I was writing the
17 report, yes. When I was writing this section.
18 Q Can you answer questions about the
19 results of the Google searches right now?
20 A Not right now.
21 Q Do I have any ability to look at those
22 Google searches as I ask you questions right now?

68

1 A You are making --
2   MR. KIKLIS: Objection. Argumentative.
3 BY MR. BERL:
4 Q Do you have them with you --
5 A It is a process which is --
6   MR. KIKLIS: Objection. Form.
7   THE WITNESS: It's a process which is
8 repeatable. If I do the Google search now, I will
9 come up with the same result and reasoning. So,
10 that's basically how it happened.
11 BY MR. BERL:
12 Q Let me ask you this: What authors of the
13 prior art references have a level of expertise and
14 education and experience that comport with your
15 definition of "a person of ordinary skill" in
16 paragraph 18?
17 A Can you repeat the question?
18 Q Yeah. What authors of prior art
19 references have a level of education and experience
20 that comports with your definition of "a person of
21 ordinary skill" in paragraph 18, that is, a
22 Bachelor's in ocean engineering or control systems,

69

1   or five years of experience in the field of ocean
2   engineering or marine seismic surveys?
3   A   It is a hypothetical person. It's a
4   composite of many people and many backgrounds, the
5   person of ordinary skill in the art. So the question
6   is a hypothetical person.
7   Q   That's not my question. My question is
8   not about hypotheticals. I'm asking you to identify
9   what authors of prior art references, since you've
10 Googled all these people and put it into your head,
11 but not Exhibit C, have the level of experience and
12 education that is reflected in your person of
13 ordinary skill. Just give me their names.
14   MR. KIKLIS: Objection. Argumentative.
15   THE WITNESS: You know what the average
16 of many numbers is, right? If I take three, five,
17 six, seven and the like, and I find the average, I
18 find the numbers. None of the numbers corresponds to
19 this average. When you take a hypothetical of many
20 people doing a search, that person doesn't respond to
21 anyone. It's like the average, it can be anywhere
22 else.

70

1   And what I understood from paragraph 17
2   is that multiple factors are relevant in determining,
3   so that was one of many other factors that I
4   considered. So I blended all these factors and I
5   have them in. So I didn't reference this because
6   it's exactly an averaging process type to arrive at
7   this.
8   BY MR. BERL:
9   Q   Let me ask you this: What authors of
10 prior art references did not have at least five years
11 of experience in the field of ocean engineering or
12 marine seismic surveys?
13   A   This was not how I arrive at the five
14 years or how I considered it. This is a factor in
15 determining it. The five years came from another
16 consideration.
17   Q   I understand that. My question is, can
18 you identify for me, based on all your Google
19 searching and everything else you did, any authors of
20 prior art references that are relevant to this case
21 that had less than five years of experience in the
22 field of ocean engineering or marine seismic surveys?

71

1   A   This hypothetical person does not have to
2   be any of the previous authors.
3   Q   That may or may not be, but that's not my
4   question, Doctor. If you can identify such an author
5   of a prior art reference for me, please tell me. If
6   you can't, just tell me you can't.
7   A   I cannot do it right now --
8   MR. KIKLIS: Objection. Form,
9   argumentative.
10   Dr. Triantafyllou, please let me
11 interject with my objections.
12 BY MR. BERL:
13   Q   Other than conduct Google searches, did
14 you do anything else to determine the experience of
15 the authors of the prior art?
16   A   Are you talking specifically about the
17 qualifications of the people who wrote the prior art?
18   Q   Yes.
19   A   It depends. For some, like Bittleston, I
20 knew more about it because I've heard him in person.
21 For others, like Hillesund, I remember we had a
22 conversation from the previous case. So it was a

72

1   very -- very varying level of how much I spent for
2   each person. But I considered one of multiple
3   factors.
4   (Exhibit No. 1077 was marked for
5   identification.)
6   BY MR. BERL:
7   Q   Doctor, I'm handing you what has been
8   marked as Exhibit 1077. That number will be used for
9   all of the proceedings.
10   Do you see it's an SEG application for
11 active membership?
12   MR. KIKLIS: I'm sorry. You say this is
13 marked?
14   MR. BERL: I just marked it. 1077.
15   MR. KIKLIS: Oh.
16 BY MR. BERL:
17   Q   Do you see that, Doctor?
18   A   Yes.
19   Q   SEG is the society that we were
20 discussing earlier?
21   A   (The witness nods.)
22   Q   That you're now a little more familiar

73

1   with, right?
2   A   You mean the acronyms. I can throw you a
3   few acronyms later on so we can have a competition in
4   acronyms.
5   Q   I -- I'm sure you can.
6   Do you see where it says "Eligibility
7   Requirements"?
8   A   Eligibility requirements?
9   Q   On the left side of the page.
10   A   Yes.
11   Q   Okay. And do you see it says:
12 "Applicant's educational and/or full-time
13 professional work experience must total at least
14 eight years."
15   Do you see that?
16   A   No.
17   Q   It's in the middle of the page on the
18 left under "Eligibility Requirements," the second
19 paragraph.
20   A   Okay. Yes, I see that.
21   Q   You see that, right? And then it says:
22 "Educational credit for the highest degree earned

74

1   is..." Do you see that?
2   A   Yes.
3   Q   And then it says: "Bachelor's degree,
4   four years; Master's degree, five years; Doctoral
5   degree, seven years," right?
6   A   Yes.
7   Q   And so in order to be eligible for
8   admission into the SEG, the Society of Exploration
9   Geophysicists, someone with a Bachelor's degree must
10 have four years of full-time professional work
11 experience. Do you see that?
12   A   Yes.
13   Q   Someone who had a Bachelor's degree
14 without four years of professional experience would
15 not even be eligible to be a member of SEG, correct?
16   A   That's what it states on the application.
17   MR. KIKLIS: Objection. Scope.
18 BY MR. BERL:
19   Q   Okay. Now, you have Dr. Evans' report in
20 front of you, I believe, the '520 report,
21 Exhibit 1002. You looked at this report in
22 connection with your work in this case, correct?

75

1   A   Correct.
2   Q   If you could turn to paragraphs 32
3   through 34 of that report. Do you see that Dr. Evans
4   in those paragraphs is discussing the planning of
5   marine seismic surveys?
6   A   Yes.
7   Q   Including the use of preplots. Is that
8   right?
9   A   Yes.
10   Q   You agree that marine seismic surveys are
11 planned in advance, correct?
12   A   They are planned in advance.
13   Q   And they use preplots that are created
14 with bins along the lines illustrated above
15 paragraph 34 of Dr. Evans' report, Exhibit 1002,
16 right?
17   A   Yes.
18   Q   And you agree with Dr. Evans that the
19 goal in the survey is for the vessel and towed
20 streamers to be maintained along the preplanned
21 designated course, right?
22   A   That's the plan.

76

1   Q   That was understood to be important for
2   data quality and efficiency of the survey, right?
3   A   Yes.
4   Q   You don't take issue with the statements
5   that Dr. Evans made in paragraphs 32 through 34 of
6   his declaration, right?
7   MR. KIKLIS: Objection. Form.
8   THE WITNESS: I cannot give you an
9   opinion right now. I never looked at it under that
10 scope.
11 BY MR. BERL:
12   Q   What do you mean you never looked at them
13 under that scope?
14   A   Of objection to any specific -- I read
15 the -- nothing jumped on me, but I didn't do the
16 critical screening that I did for other attachments.
17   Q   Okay. Let me ask it this way: In your
18 declaration, which is Exhibit 2042, you don't take
19 issue with him or disagree with any statement that
20 Dr. Evans makes in paragraphs 32 through 34 of his
21 report, right?
22   A   I didn't express any disagreement.

77

1   Q   Okay. And Dr. Evans, in paragraphs 36
2 through 38, addresses the issue of irregular spatial
3 sampling. Do you see that?
4   A   Yes. Let me take a -- go to there. Yes.
5   Q   And you didn't express any disagreement
6 with his statements about irregular spatial sampling,
7 did you?
8   MR. KIKLIS: Objection to form.
9   THE WITNESS: I was not asked to do such
10 a thing.
11 BY MR. BERL:
12   Q   Whether you were asked or not, you didn't
13 take issue with any of his statements regarding
14 irregular spatial sampling, did you?
15   A   I was not asked to do this, so I didn't
16 do it.
17   Q   So as you sit here today, you don't have
18 any disagreement with what Dr. Evans --
19   A   If I didn't --
20   Q   -- writes about irregular spatial
21 sampling.
22   A   If I read it again carefully, I'm not

78

1 sure. But I was looking at it, skimming through,
2 because this is not of vital importance to the
3 patents.
4   Q   Okay. You don't disagree, Doctor, that a
5 person of ordinary skill in the art would have
6 understood that a straight and parallel configuration
7 of streamers best facilitates accurate correlation
8 and interpretation of seismic data.
9   A   You are talking about the desire of
10 someone to do something?
11   Q   Yes.
12   A   A desire existed.
13   Q   A desire existed to have a straight and
14 parallel configuration of streamers, right?
15   A   Which is exactly what brings the issue of
16 control because you can never achieve it.
17   Q   I promise we'll get there. I know you
18 want to talk about it, and I will keep my promise to
19 you, but right now I'm asking a separate question.
20   Which is you agree that a person of
21 ordinary skill at the priority date would have
22 understood that the desired configuration was a

79

1 straight and parallel configuration of streamers?
2   A   Yes. That's what the antenna concept of
3 a streamer dictates.
4   Q   Okay. And a person of ordinary skill
5 would have understood that that straight and parallel
6 configuration best facilitates accurate correlation
7 and interpretation of seismic data.
8   A   Are we talking about the person of
9 ordinary skill in my definition or Dr. Evans'
10 definition?
11   Q   The conclusions differ, right?
12   A   No, they don't.
13   Q   Okay. Well, let's -- so why did you ask
14 me?
15   A   I asked you just to be sure that we're on
16 the same page. I will be asking you for
17 clarifications.
18   Q   I'm happy to clarify, but if the
19 conclusions don't differ, it doesn't seem to matter
20 for this question.
21   A   Maybe -- yeah.
22   MR. KIKLIS: Let him finish.

80

1 BY MR. BERL:
2   Q   I want you to apply your definition of
3 "the person of ordinary skill" as you did in your
4 report. And my question is, that person of ordinary
5 skill would have understood that the straight and
6 parallel configuration best facilitates accurate
7 correlation and interpretation of seismic data.
8   A   That's the desire, exactly.
9   Q   And the person of ordinary skill also
10 would have understood that the straight and parallel
11 configuration would facilitate the desire to have a
12 similar number of records in each bin, correct?
13   A   To the extent possible.
14   Q   And you provide what you called "an
15 idealized seismic streamer array in a 3D survey" in
16 your report on page 17; is that right?
17   A   Yes.
18   Q   That's Figure 3, right?
19   A   Yes.
20   Q   And just so we're on the same page, the
21 vessels and streamers in a 3D survey are preplotted
22 to traverse the survey area in straight lines, as

81

1   shown in Dr. Evans's report on page 16, using your
2   idealized streamer array shown on page 17 of your
3   declaration, right?
4   A   Yes.
5   Q   And the preplot calls for streamers to be
6   in a straight and parallel configuration, right?
7   A   To the extent possible.
8   Q   And generally, directly behind the vessel
9   along the tow line as shown in your Figure 3.
10   A   Can you be more specific?
11   Q   Sure. The preplot generally in a 3D
12   survey calls for the streamers not only to be
13   straight and parallel but generally directly behind
14   the vessel, as you show in Figure 3 on page 17 of
15   your report.
16   A   Yes. There are considerations of the
17   weight of the ship and the like. This is an
18   idealized configuration.
19   Q   And it's the idealized configuration
20   that's generally used in the preplot, correct?
21   A   Yes.
22   Q   And the idealized configuration has all

82

1   of the streamers straight and parallel and without
2   any feather angle to the towing line, correct?
3   A   You are talking about which year now?
4   Q   Well, this is 1998. That's when you're
5   analyzing this, right, in your report?
6   A   Right.
7   Q   So in your Figure 3 is the idealized
8   seismic streamer array in a 3D survey; that shows all
9   of the streamers in a straight and parallel
10   configuration with zero feather angle, correct?
11   A   Yes. Because it's an idealized. Then
12   comes the reality.
13   Q   And the reality is that sometimes when
14   streamers are towed in the ocean, currents and waves
15   cause them to move away from their ideal
16   configuration, right?
17   A   Correct.
18   Q   And that's known as "feathering."
19   A   No, feathering is a very specific item.
20   Feathering is like a feather aligns with the wind.
21   So, it starts with a single streamer when there is a
22   side current and it veers off, so you think it will

83

1   go straight and instead it comes at an angle because
2   there is a side force pushing the waves. Now, if you
3   have waves, if you have irregular currents, then
4   other things may happen much worse than feathering.
5   Q   Feathering is one example of a phenomenon
6   that causes streamers to move away from their
7   idealized configuration that's shown in Figure 3,
8   right?
9   A   One of many, yes.
10   Q   And it's one that was known and
11   recognized as of October 1998, right?
12   A   They were recognized as many problems,
13   yes.
14   Q   And feathering was one of the problems
15   that was recognized.
16   A   Feathering was a problem.
17   Q   Was?
18   A   It was a recognized problem, yes.
19   Q   Okay. Now, I would like to ask you about
20   some questions about array geometry as it was
21   understood at the priority date in 1998.
22   By that time surveys were being conducted

84

1   with multiple streamers in the array, correct?
2   A   There were attempts to make, yes, and
3   sometimes when --
4   THE REPORTER: I'm sorry?
5   THE WITNESS: There were attempts, there
6   were efforts to do this, and sometimes they were
7   successful, sometimes they were not.
8   BY MR. BERL:
9   Q   But there were arrays that had multiple
10   streamers as of 1998.
11   A   There were some. I don't -- I can't give
12   you a specific number right now because it's many
13   years ago.
14   Q   And typically, how many streamers would a
15   multi-streamer array have in October 1998?
16   A   I don't remember off the top of my head,
17   but I remember up to several, I mentioned.
18   Q   And what do you mean by "several"?
19   A   Five, six.
20   Q   And it was understood that in such a
21   multi-streamer array the closer together the
22   streamers are, the higher the data resolution in the

85

1   survey, correct?
2   A   Correct.
3   Q   And it was not atypical at the time of
4   the priority date for the streamers at the front
5   at the end closest to the vessel to be less than
6   100 meters apart, correct?
7   A   **Or even more than that, yes.**
8   Q   Or sometimes even less, correct?
9   A   **Less than 100 meters on the -- I don't**
10   **remember now the exact numbers off the top of my**
11   **head, but I remember those numbers were considered to**
12   **be very, very dicey in real environments.**
13   Q   In real environments, you said?
14   A   **In actual practice.**
15   Q   But you don't remember the exact number,
16   but you wouldn't have a basis to dispute that in fact
17   the distance between the streamers in a
18   multi-streamer array at the time of the priority date
19   could be less than a hundred meters, right?
20   MR. KIKLIS: Objection. Form.
21   THE WITNESS: I cannot provide you a
22   reliable answer right now.

86

1   BY MR. BERL:
2   Q   You can't provide a reliable answer
3   about --
4   A   **Because I don't remember off the top of**
5   **my head.**
6   Q   Okay. And as of 1998, how long were the
7   streamers typically?
8   A   **Again, a rough number, on the order of**
9   **kilometers.**
10   Q   You show streamers of six miles in your
11   expert report; is that right?
12   A   **It can go up to six miles.**
13   Q   And sometimes it's substantially less,
14   correct?
15   A   **And sometimes it is, yes.**
16   Q   It could be, for example, a 3-kilometer
17   streamer as of 1998?
18   A   **It could be 1 kilometer.**
19   Q   It could be 1 kilometer?
20   A   **It depends on what you are looking for.**
21   Q   Okay.
22   MR. KIKLIS: How about if we take a

87

1   break. We've been going about an hour and a half.
2   MR. BERL: Okay. Sure.
3   (Recess.)
4   (Ms. Trisha Jhunjhnuwala left the
5   deposition proceedings.)
6   BY MR. BERL:
7   Q   If we can look at page 27 of your
8   declaration, Doctor. You show there a representation
9   of a cable from Q-Marine; is that right -- or cables
10   from Q-Marine?
11   A   **That's correct.**
12   Q   And that's a 4.5-mile streamer from
13   Q-Marine?
14   A   **Yes.**
15   Q   Do you know which version of Q-Marine
16   that is?
17   A   **Not off the top of my head. We did it --**
18   **I did this sketch in -- sometime back.**
19   Q   Do you know whether this was from the
20   version that launched in 1998 or a later one?
21   A   **Probably a later one.**
22   Q   How many versions of Q-Marine are there?

88

1   A   **I don't recall right now.**
2   Q   Do you know how the various versions of
3   Q-Marine differ?
4   A   **I used to remember them very well but not**
5   **today. I haven't looked in some time.**
6   Q   Okay. So you don't remember them today.
7   There is no discussion of that in your report, is
8   there?
9   A   **No.**
10   Q   Sorry. Let me ask --
11   A   **No, they are not in my report, from what**
12   **I recall also. I may have thrown a phrase in**
13   **or anything, but not that I remember right now.**
14   Q   When you use the phrase "array geometry,"
15   that includes the geometry of the streamers; is that
16   right?
17   A   **The targeted geometry, yes.**
18   Q   The geometry of the array includes the
19   streamers, correct?
20   A   **Yes.**
21   Q   And the vessel itself, correct?
22   A   **Yes.**

89

1   Q   Does it include the sources too?
2   A   In more detail, yes.
3   Q   What do you mean "in more detail"?
4   A   When you do sketches that are more
5 detailed, you include also the source.
6   Q   Right. Yeah, I don't mean to ask what is
7 shown in this cartoon with a mountain. When someone
8 in the field is actually discussing array geometry,
9 they include the geometry of the sources, correct?
10   MR. KIKLIS: Objection. Scope.
11   THE WITNESS: In the sketch you would say
12 where your sources are, where your targeted sources
13 are.
14 BY MR. BERL:
15   Q   I'm not asking about a sketch anymore.
16 You can put the picture away if that's distracting
17 you.
18   When the term "array geometry" is used by
19 persons in the field, that includes the positions and
20 geometry of the sources, correct?
21   MR. KIKLIS: Objection. Scope.
22   THE WITNESS: It's a general statement.

90

1 And I have to think because array in terms of this
2 application means several streamers. In other
3 applications array means the array of hydrophones,
4 which also is used. So it depends on what you want
5 to depict.
6 BY MR. BERL:
7   Q   But the array not only includes the
8 streamers, it includes the vessel too. The --
9 correct?
10   A   The configuration -- then we use -- we
11 will use a name, you know, the configuration of the
12 system. We can say the array -- array usually will
13 be reserved for the streamers. As the name "array"
14 means a matrix of.
15   Q   So the configuration then includes the
16 streamers and the location of the vessel and the
17 location of the sources.
18   A   You mean in the definition of the word --
19 of the word "streamer array"?
20   Q   Or as you put it, configuration.
21   A   Configuration usually targets the array
22 itself. But when you say the "array system" -- it

91

1 depends on the expression.
2   Q   Okay. Let me hand you the '967 patent.
3 It's Exhibit 1001 in the '967 case which is the 00687
4 case.
5   You have the '967 patent, Doctor?
6   A   Yes, I do.
7   Q   And that's one of the three patents
8 that's at issue in this case, correct?
9   A   Correct.
10   Q   And you reviewed this patent, of course,
11 correct?
12   A   I did review this patent.
13   Q   And rendered opinions about the patent,
14 correct?
15   A   And I did render opinions.
16   Q   And the first page after the cover of the
17 '967 patent, Exhibit 1, is Figure 1. Do you see
18 that?
19   A   Yes.
20   Q   It says "Figure 1" at the top, and then
21 underneath it says "Prior Art," right?
22   A   It's an inelegant way of marking

92

1 Figure 1, to put it mildly, because he describes what
2 he is going to patent. So what he means by "prior
3 art" whether he accidentally put it there or -- he
4 meant something like a configuration like the prior
5 art.
6   Q   So you think that the inclusion of the
7 label "Prior Art" under Figure 1 in the '967 patent
8 was accidental?
9   A   I cannot say why they put it there. I
10 have no idea. I'm just stating the fact that someone
11 reading it, it includes all the things -- some things
12 which were prior art and some things which were new.
13   Q   You think it's a mistake to label it as
14 "Prior Art"?
15   A   Someone who reads it doesn't agree with
16 the prior art.
17   Q   So your testimony is that it's labeled
18 "Prior Art," but a person who reads it, who has --
19 who is your person of ordinary skill, would recognize
20 that it's a mistake and discard the fact that
21 Figure 1 is labeled "Prior Art"?
22   A   Right. It would contradict the fact that

93

1   there is a patent developed.
2   Q   Would contradict?
3   A   Contradict the fact that someone wants to
4   patent this. I mean that it has been patented.
5   Q   Okay. And I think you answered this. I
6   just want to make sure I understand your testimony,
7   which is that a person reading this would reject the
8   statement below Figure 1 that Figure 1 is showing
9   prior art, right?
10   MR. KIKLIS: Objection to form.
11   THE WITNESS: It shows prior art and new
12   items. Novel items.
13   BY MR. BERL:
14   Q   So they would recognize that the label is
15   not correct and reject the label?
16   A   Correct.
17   Q   Now, you said that some of the items, you
18   agree, in Figure 1 are in fact in a prior art, right?
19   A   Yes.
20   Q   For example, 20 -- the item labeled 20 at
21   the back of the streamers --
22   A   Yes, I have to look at -- it's probably

94

1   the tail buoy, but I have to remind myself.
2   Q   Okay. Sure. And you can go ahead and do
3   that, and it is in fact labeled the "Tail Buoy."
4   That's prior art, correct?
5   A   Let me find it. Figure 1. 20 is showing
6   the tail buoy, yes.
7   Q   So I'm correct, 20, the tail buoy, is
8   prior art?
9   A   It is prior art. Yes, it is.
10   Q   And number 16, do you see number 16 at
11   the front of the streamer, that's the deflector?
12   A   Yes. It's likely to be the deflector.
13   Now, generically a deflector was known because that's
14   what they use. It could have been something which is
15   old art or new art that -- but, in principle, it
16   could be something from prior art, yes.
17   Q   So it's disclosed in Figure 1 that 16 is
18   in the prior art, right?
19   A   It could be. I mean you have to
20   afterwards read the entire patent and see whether
21   they're talking about the new kind of deflector, for
22   example.

95

1   Q   So is it your opinion that in fact
2   consistent with Figure 1, 16, the deflector, is in
3   the prior art?
4   A   As a concept it exists as prior art, a
5   deflector, yes.
6   Q   I'm not asking as a concept. This
7   deflector shown here as 16 in Figure 1, is it your
8   opinion that it is prior art or that it is not prior
9   art?
10   A   This is a cartoon, so it's hard to tell.
11   It's a little factor, it's a little segment labeled
12   as 16, a deflector. So, generically.
13   Q   And so --
14   A   It could be a prior art or it could be a
15   new deflector, whatever it is, but it could be prior
16   art.
17   Q   But the '967 patent is not claiming a new
18   deflector, is it?
19   A   I know, but I'm explaining to you. You
20   are asking me is it prior art. Well, I'm looking at
21   the little dot there and says a deflector. It could
22   be prior art.

96

1   Q   And the person of ordinary skill would
2   understand that the deflector, number 16, is not part
3   of the new invention but rather part of the prior
4   art.
5   MR. KIKLIS: Objection.
6   THE WITNESS: It's possible. It depends
7   on -- I mean, are you talking about someone reading
8   it for the first time, someone who is reading it for
9   the hundredth time?
10   BY MR. BERL:
11   Q   Does it change if you read it 99 more
12   times?
13   A   Well, if someone opens up and gives me
14   this figure, and I look at it and I say, What does it
15   say here, 16? I go back and I say, 16, deflector.
16   Okay. It could be a deflector that I know or it
17   could be a new deflector, but that's the first time I
18   read it. The second time I read it carefully, and I
19   say, Does it say about the new deflector?
20   Q   So how many times have you read it?
21   A   Countless. Too many.
22   Q   The '967 you've read too many times to

97

1 count?
2   A   Right.
3   Q   Okay. So after reading it too many times
4 to count, what is your opinion about whether the
5 deflector, 16, is in the prior art?
6   A   It remains unspecified, so it could very
7 well be prior art.
8   Q   It could very well be prior art, but you
9 don't know in fact whether it's prior art in spite of
10 you read it --
11   A   I don't know what Bittleston had in mind
12 at the time, but it very well could be prior art.
13 Isn't that an answer to your question?
14   Q   No, it's really not. I'm not asking
15 about what Dr. Bittleston had in mind at all.
16   I'm asking you, based on having read it
17 too many times to count, whether you have an opinion
18 about whether 16 is in the prior art, yes or no?
19   MR. KIKLIS: Objection. Form.
20   THE WITNESS: It could be one of the
21 deflectors in the prior art.
22 BY MR. BERL:

98

1   Q   Or you could use a deflector that is not
2 in the prior art.
3   A   Exactly.
4   Q   But the use of a deflector as shown in 16
5 certainly is presented in the '967 patent as prior
6 art, correct?
7   MR. KIKLIS: Objection. Form.
8   THE WITNESS: It's not clear from the
9 figure.
10 BY MR. BERL:
11   Q   You can't even determine whether the
12 deflector is prior art in Figure 1, having read the
13 '967 patent too many times to count?
14   MR. KIKLIS: Objection. Form.
15   THE WITNESS: If I had a picture of the
16 deflector, I will tell you, yes, this deflector is
17 prior art. Now, it's a symbol. It's like reading
18 the word "the deflector," and you're telling me is
19 the deflector a prior art.
20 BY MR. BERL:
21   Q   I'm not asking you about any particular
22 deflector. I'm asking you about 16, what is shown

99

1 and labeled as 16 in Figure 1.
2   A   And I'm --
3   Q   And my question is simple. Let me ask it
4 first so that the court reporter is not going to kill
5 both of us.
6   16 in Figure 1 would be understood to be
7 prior art, correct?
8   MR. KIKLIS: Objection. Form.
9   THE WITNESS: It could be understood as
10 prior art, yes.
11 BY MR. BERL:
12   Q   Could it be understood as not being prior
13 art?
14   A   It says a deflector. It doesn't specify
15 what kind of deflector.
16   Q   So you can't sit here and tell me, having
17 read the point countless number of times, whether in
18 fact 16 in Figure 1, the deflector, is in the prior
19 art?
20   MR. KIKLIS: Objection. Form.
21   THE WITNESS: You are asking me to
22 speculate. You know, if it said a car, you tell me,

100

1 is it a prior art? It could be. It could be the car
2 of 2050, not yet invented. I don't know what he had
3 in mind, okay? But he leaves it very vague. So it
4 could be prior art. We're going to argue whether it
5 was not prior art. Maybe it was, maybe it was not.
6 But the same applies to everything.
7 BY MR. BERL:
8   Q   Okay. So let's see then, the same
9 applies to everything. So 10, based on your review,
10 thorough review, of the '967 patent, 10 is the
11 vessel, right?
12   A   Yes.
13   Q   That may or may not be prior art?
14   A   When we're talking about a ship, a ship
15 existed, they are standard, they haven't changed. In
16 this case we can say, yes, it was prior art. It's a
17 ship that we use for such array. But not the entire
18 ship because it may have equipment on the ship which
19 may be new, software on the ship. So we cannot say
20 blanket statement, yes, it was prior art.
21 BY MR. BERL:
22   Q   So you can't say then that 10, the

101

1 vessel, is prior art?
2   **A   Well, if you are talking about the hull,**
3 **yes, the hull was prior art. What is in there could**
4 **be the new software.**
5   Q   And you can't determine -- well, would a
6 person of ordinary skill reading the '967 patent
7 understand that the ship is part of the prior art or
8 part of the invention, or could they not tell?
9   MR. KIKLIS: Objection to form.
10   THE WITNESS: If we're talking about the
11 ship as a system, it may have on it new things which
12 are not prior art.
13 BY MR. BERL:
14   Q   But they're not disclosed in the patent,
15 right?
16   **A   Well, I can see the 22, if I remember, is**
17 **the control, right?**
18   Q   No, I'm talking about 10 right now.
19   **A   But 22 is inside of that.**
20   Q   Okay. I'm asking before the vessel, what
21 is labeled 10. Is there any new vessel that a person
22 of ordinary skill would understand to have been

102

1 invented in the '967 patent?
2   MR. KIKLIS: Objection to form.
3   THE WITNESS: Okay. If we say if the
4 hull of the ship is meant by 22 -- by 10, the shell
5 outside, and the equipment -- the ship needs to run
6 as a ship, yes, this is prior art with a provision
7 that -- it's just a label. A ship.
8 BY MR. BERL:
9   Q   What about 14? That's disclosed as prior
10 art, correct?
11   **A   14 must be the gun, right?**
12   Q   It says "seismic source" --
13   **A   Yeah.**
14   Q   -- in column 3. That's prior art?
15   **A   It probably is prior art because it**
16 **doesn't claim any new.**
17   Q   When you say "probably prior art," your
18 testimony is that one cannot determine whether 14 is
19 prior art based on Figure 1?
20   **A   Since the patent does not claim any new**
21 **gun, any new seismic source, it's -- it probably**
22 **presumes prior art.**

103

1   Q   It's labeled as "Prior Art, Figure 1,"
2 isn't it?
3   MR. KIKLIS: Objection. Form.
4   THE WITNESS: We just argued about that.
5 BY MR. BERL:
6   Q   What was the answer again, that it is
7 labeled as "Prior Art," right?
8   MR. KIKLIS: Objection. Form.
9   THE WITNESS: It's mislabeled "Prior
10 Art."
11 BY MR. BERL:
12   Q   Okay. Fine.
13   18 are the birds, correct?
14   **A   The birds.**
15   Q   That's prior art as well, correct?
16   **A   Again, it depends which part of the birds**
17 **we're talking about. If we are talking about the**
18 **fins, yes. If he's -- it could be the specific**
19 **patent that he has himself. But if we're talking**
20 **about some control skims inside the fin, they may not**
21 **be. So, generically, we cannot say it is prior art**
22 **because they may have elements that are new.**

104

1   Q   So would you say that 18 is mislabeled as
2 "Prior Art" in Figure 1 or is it labeled correctly?
3   **A   Viewing it as developed, it has elements**
4 **of new art too.**
5   Q   So it's mislabeled.
6   **A   Yes.**
7   Q   And 12 are the streamers, correct?
8   **A   Yes.**
9   Q   And those are prior art or not prior art,
10 or can you not tell?
11   **A   Probably prior art.**
12   Q   What does "probably prior art" mean? I'm
13 trying to understand this. You've read this
14 countless number of times, and you can't tell me
15 whether, 12, the streamers, are prior art?
16   MR. KIKLIS: Objection. Form.
17 Argumentative.
18   THE WITNESS: This is such an
19 encompassing question that I have to think. So I say
20 "probably" because I'm planning in my mind that in
21 other cases it's not exhaustive. Maybe there is a
22 communication cable that goes through to carry the

105

1 commands. The streamer is a streamer, but a streamer
2 with software is a different streamer than an
3 existing streamer.
4 BY MR. BERL:
5   Q   So I think what you're saying is that,
6 correct me if I'm wrong, someone who just looks at
7 this without analyzing it countless times as you did
8 would look at this figure and say, 12, the streamer,
9 is part of the prior art.
10   But you, having read it countless number
11 of times now, bring a more subtle interpretation to
12 the document and recognize that in fact it may not
13 actually be prior art; is that right?
14   MR. KIKLIS: Objection. Misstates.
15   THE WITNESS: No, the contrary. The
16 first reading, you read this and you say, This is so
17 general everything could be new art, so I don't know
18 what the prior art refers to. You have to -- it's
19 the opposite of what you're saying. After you read
20 it many times, you say, Okay, this is probably prior
21 art. Initially -- I'm sorry. Go ahead.
22 BY MR. BERL:

106

1   Q   Initially -- sorry, you can continue. I
2 didn't mean to interrupt.
3   A   Initially when you first read it, just
4 reading this description without anything -- I'm
5 reading Figure 1, you leave it open that maybe it's a
6 new streamer; maybe it's a new bird.
7   Q   Or maybe it's prior art as it's labeled
8 and the label is correct?
9   A   It could be, but initially when you're
10 reading a new patent, you say, Hey, it could be
11 anything, but it's new and patentable.
12   Q   When it's discussing birds in column 3,
13 it says: "They may be located at regular intervals
14 along the streamer." Do you see that, every 200 to
15 400 meters?
16   A   Where are you referring to?
17   Q   I'm on line 57.
18   A   57. Yes.
19   Q   "The birds are located at regular
20 intervals along the streamer, such as every 200 to
21 400 meters," right?
22   A   Yes.

107

1   Q   And that was known, correct?
2   A   It depends because --
3   MR. KIKLIS: Objection to form.
4   THE WITNESS: It's a presumption, what
5 was known. Because at the time there were desires to
6 do things, but it was not known that you have to put
7 this birds there because there was no -- no streamer
8 array to control -- there were no control systems
9 to -- available at the time. So this was the first
10 time. So to be known, maybe the desire was there,
11 but the system was not around.
12 BY MR. BERL:
13   Q   You mean the system was not commercially
14 available, correct?
15   A   Yeah, there was no available system to do
16 such things, so what was known.
17   Q   Okay.
18   A   There was no such system.
19   Q   Okay. 200 to 400 -- every 200 to 400
20 meters -- well, let me ask you this: Birds that were
21 not horizontally steerable were known and used as of
22 this time, correct?

108

1   MR. KIKLIS: Objection to form.
2   THE WITNESS: They were used for
3 controlling depth only.
4 BY MR. BERL:
5   Q   And they were used in a way that had
6 multiple birds on the streamer, correct?
7   MR. KIKLIS: Objection to form.
8   THE WITNESS: Sometimes they were used,
9 and the -- they serve a completely different purpose.
10 BY MR. BERL:
11   Q   I didn't ask about their purpose.
12   A   So as a result, they were -- this would
13 not apply even to such birds. I mean it's not coming
14 as something known from vertical birds.
15   Q   Well, let me ask you this: Was it known
16 to have multiple depth-only birds on a streamer as of
17 the priority date?
18   A   They have been -- I have to think about
19 that. I don't remember what exactly there was
20 available at the time. Okay?
21   Q   You don't know.
22   A   I don't recall right now.

109

1   Q   Okay. Going back to Figure 1, we've
2   looked at everything but 22; is that right?
3   A   Yes.
4   Q   And your testimony as it relates to
5   number 22 -- well, let me ask you this: 22 is a
6   global control system, correct?
7   A   Well, if I go back to Figure 1, in the
8   last paragraph in the preferred embodiment, it says:
9   "Distributed global control system, 22."
10   Q   So the global control system is 22?
11   A   The global control system is depicted as
12 22 here.
13   Q   And that's the global control system
14 that's recited in the claims of the '967 patent,
15 right?
16   A   The global control systems consists of
17 also its communications and things and anything else.
18 So, again, it's a dot on a ship to denote that
19 somewhere there is certain central processing data.
20   Q   And that 22, the dot denoted as the
21 global control system, is the global control system
22 of the claims of the '967 patent.

110

1   A   That and its other components. Not just
2   the dot.
3   Q   But, in other words, when it uses the
4   term "global control system, 22," in column 3, you
5   just read from there, right?
6   A   Yes.
7   Q   And then when it says in the claim "a
8   global control system," that's the same global
9   control system, right?
10   A   Yeah, but the system is connected and
11 everything. It sends information to -- so all I'm
12 trying to say is that it's a network. It's not just
13 one box.
14   Q   Okay. But it's the same global control
15 system we're talking about in column 3 and Figure 1
16 as shows up again in the claims.
17   A   It is the control -- the global control,
18 yes.
19   Q   And your testimony is that number 22, the
20 global control system in Figure 1, Prior Art, is not
21 in fact prior art, right?
22   A   Can you restate this?

111

1   Q   Your testimony is that number 22, the
2   global control system in Figure 1, Prior Art, is not
3   in fact prior art?
4   MR. KIKLIS: Objection. Form.
5   THE WITNESS: 22 is a novel system.
6   BY MR. BERL:
7   Q   It's not prior art?
8   A   It's not prior art.
9   Q   It doesn't say anything in Figure 1 to
10 indicate that 22 is not prior art, right?
11   A   As we said, it's a mislabel.
12   Q   Okay. And you mentioned in your
13 declaration that there are other aspects of the
14 invention that are not prior art in your declaration,
15 right?
16   A   Can you point me to where exactly --
17   Q   Sure. It's paragraph 67 of your
18 declaration. That might be a good place to look.
19   A   Say it again. 67?
20   Q   Yes, paragraph 67 on page 35 of your
21 declaration.
22   A   Yes.

112

1   Q   Said that: "Although Figure 1 is labeled
2   as 'Prior Art,' there are many components and thus
3   functions of the system in that figure that are
4   described only in the detailed description of the
5   section of the patents."
6   Do you see that?
7   A   Yes.
8   Q   And what you identify there is the global
9   control system, which we just discussed. The
10 functionality of this system as well as the
11 distributed processing control architecture. Do you
12 see that?
13   A   Yes.
14   Q   And by "functionality of the system," in
15 parentheses, you mean behavior predictive control and
16 the various control modes, right?
17   A   Yes.
18   Q   The behavior predictive control is not
19 identified in Figure 1, is it?
20   A   It is identified as part of the global
21 control.
22   Q   Is there any number that is identified in

113

1 Figure 1 as behavior predictive control?
2 **A   It is understood as part of the global**
3 **control.**
4   Q   I understand that you think that a global
5 control system has to have behavior predictive
6 control. I promise we'll ask many questions about
7 that.
8   But my question here is a different one,
9 which is, is there anything in Figure 1, any number
10 that I've maybe missed, that is identified and
11 labeled as "Behavior predictive control"?
12   MR. KIKLIS: Objection. Form.
13   THE WITNESS: If it said "car" there, to
14 bring in the previous example, you would ask me, Is
15 there a number there that says it has tires? The
16 global control has functions. So to someone who is a
17 person skilled in the art, global control has certain
18 attributes, which I list there.
19 BY MR. BERL:
20   Q   But those attributes are not called out
21 in Figure 1. It just says, "22, global control
22 system," right?

114

1   **A   The tires are part of the car, as is the**
2 **steering wheel, as is the battery, as is the engine,**
3 **as are the seats.**
4   Q   That may be, and those may be labeled in
5 some picture that doesn't exist that we're not
6 talking about, or they may not be.
7   But my question is about Figure 1. There
8 is nothing in figure that is labeled "behavior
9 predictive control," right?
10   MR. KIKLIS: Objection to form.
11   THE WITNESS: Words have different
12 meaning for a layperson and for a control engineer or
13 an naval architect. So someone who is reading
14 "global control," it is not an empty word.
15 BY MR. BERL:
16   Q   I understand you have a view about what
17 it means. So, is your view -- let me just ask it
18 this way: Is your way that in fact Figure 1
19 identifies and labels "behavior predictive control"
20 as one of the items?
21   **A   It is an irrelevant question, if I may**
22 **say, because I answered that it is part of the global**

115

1 **control. I'm sorry, let me -- to a person of**
2 **ordinary skill, the global control would include**
3 **these items without a number.**
4   Q   The various control modes that you
5 identified in paragraph 67, those aren't labeled in
6 Figure 1, right?
7   **A   Not specifically, yes.**
8   Q   Then it says: "The distributed
9 processing control architecture." Do you see that?
10   **A   Yes, I do see that.**
11   Q   And by "distributed processing control
12 architecture," you mean the architecture of which
13 parts of the functionality are carried out by the
14 local control versus the global control, right?
15   **A   And the communication.**
16   Q   And that is not identified in Figure 1
17 either, is it?
18   **A   Global without distribution to the parts**
19 **is not -- cannot exist.**
20   Q   I understand that. But the question of
21 what parts of the control system discharge which
22 tasks is not anywhere labeled or identified in

116

1 Figure 1, right?
2   **A   These functionalities have to be**
3 **described, but the functionalities themselves are**
4 **part of the word "global." The specifics are**
5 **specified. But --**
6   Q   Are specified -- not in Figure 1.
7   **A   In the patent, but the -- the**
8 **functionalities themselves generically are part of**
9 **the global control.**
10   Q   But are not specifically identified in
11 Figure 1.
12   **A   The functionalities are because they're**
13 **part of the global control.**
14   Q   So a person of ordinary skill, in your
15 view, looking at Figure 1 would understand that it
16 includes a description of the control modes or of the
17 distributed processing control architecture?
18   **A   A global control means a control which**
19 **controls many components and coordinates them. Thus,**
20 **the word "global." Therefore, it is part of the word**
21 **"global" that there are subcomponents, that there is**
22 **coordination software, there are communication skims,**

117

1   and also in order to be global, there have to be some
2   patents to be specified. Those are part of the
3   invention, but the fact is that there will have to be
4   some patents. Okay.
5   So let's say we're designing an exhibit
6   with airplanes which are manually controlled. We're
7   going to do the maneuvers. Those require a global
8   control because, otherwise, they will crash one
9   against the other. So immediately it means there is
10 a local control on the planes, there is
11 communication. But then the specifics, which
12 patents? What are they going to do? What is
13 feasible? Okay?
14   Q   Let me ask you a simpler question maybe.
15 Would a person of ordinary skill reading Figure 1
16 understand that it is disclosing behavior predictive
17 control?
18   A   It -- it's disclosing global control.
19 That's what we understand.
20   Q   Which includes behavior predictive
21 control?
22   A   It does not include behavior predictive

118

1   control. It includes some control to be specified.
2   It includes some communication to be specified. It
3   includes some local control -- and distributed
4   architecture, but to be specified. Those are the
5   inventive parts.
6   Q   But those things, like what kind of
7   control and the precise distributed control, are not
8   specified in Figure 1?
9   A   They have to be read because there are
10 details. Like when it says "array," it doesn't say
11 array one foot in diameter, so many pounds per square
12 or per cubic inch, and so on and so forth.
13   Q   So they have to be specified somewhere,
14 but it's not in Figure 1, right?
15   A   Figure 1 is a depiction of the overall
16 system.
17   Q   Okay. Now, I would like to discuss with
18 you the meaning of "global control system." You
19 addressed this in your expert report.
20   In your view, "Global control system is a
21 control system configured to coordinate all streamer
22 positioning devices in the array," right?

119

1   A   Where are you reading?
2   Q   93.
3   A   Yes.
4   Q   So your interpretation is given in
5   paragraph 93 that: "A global control system is a
6   control system configured to coordinate all streamer
7   positioning devices in the array," right?
8   A   Correct.
9   Q   This is the construction that you applied
10 in assessing the validity of the '967 patent claims
11 at issue in this case, right?
12   A   This is the interpretation.
13   Q   That you applied, correct?
14   A   Correct.
15   Q   You did not provide any assertion in this
16 case that the '967 claims are valid under any
17 construction of global control system other than the
18 one that you advanced here in paragraph 93.
19   A   I did not consider a variety of things,
20 so I cannot say -- you know, I may have considered
21 some alternatives or we will have discussions about
22 it. But I don't recall of any definition that I

120

1   applied that it seemed not to be valid under those.
2   But this is the one I used for my opinion.
3   Q   Okay. And just to be clear, I'm not
4   asking about what discussions you had. I'm asking
5   about what you actually provided.
6   A   Yes.
7   Q   So I wasn't privy to those discussions.
8   So just to be clear, you did not provide in your
9   declaration here any opinion that the claims of the
10 '967 patent are valid using any definition of "global
11 control system" other than the one that is in
12 paragraph 93.
13   A   I considered the validity under this
14 definition here.
15   Q   Only under this definition here in
16 paragraph 93.
17   MR. KIKLIS: Objection. Form.
18   THE WITNESS: For the controlled array,
19 this is the definition, yes, in terms of the
20 controlled array.
21 BY MR. BERL:
22   Q   Okay. Doctor, it's your interpretation

121

1 of the global control system that it oversees the
2 entire array.
3   A   The entire controlled array.
4   Q   Well, if we look at paragraph 72 of your
5 declaration, the last sentence says: "Although the
6 claims require that the global control system only
7 send commands to at least one local control system at
8 a given instant, the specification and claim language
9 specify clearly that the global control system
10 oversees the entire array."
11   Do you see that?
12   A   Yes. So --
13   Q   That's your testimony, right?
14   A   Yes.
15   Q   And what that means is that under your
16 construction, the global control system monitors the
17 actual positions of each of the birds.
18   A   Yes. What I'm trying to say is the
19 controlled part of the array. If someone decides to
20 have a sacrificial line, so be it. But the
21 controlled array in order to have global control has
22 to control all the -- all the -- all the birds.

122

1   Q   A sacrificial what?
2   A   If for any reason someone doesn't care
3 about one specific line, all I'm saying is the
4 seismic streamers that you want to control, they have
5 to be controlled by the global control system.
6   Q   So all of the SPDs on the streamers that
7 are being controlled need to be controlled by the
8 global control system.
9   A   The ones that you want to control, yes.
10   Q   The streamers that you want to control.
11   A   The streamers you want to control.
12   Q   Okay. And in your view then, the term
13 "global control system" identifies and imposes a
14 limitation on the recipients of its commands. It
15 must be the streamer positioning devices in the
16 array, right?
17   A   What do you mean "recipients"?
18   Q   Well, the global control system has to
19 provide commands to certain recipients; that is, all
20 of the streamer positioning devices in the array.
21   A   It has to send commands to the -- to the
22 streamer positioning devices.

123

1   Q   And in your view, this definition that
2 you've provided of a "global control system" as a
3 control system configured to coordinate all SPDs in
4 the array, that's the only reasonable way to construe
5 a global control system, right?
6   MR. KIKLIS: Objection to form.
7   THE WITNESS: This is the way to arrive
8 at reading the patent.
9 BY MR. BERL:
10   Q   There is no -- that's the only reasonable
11 interpretation to arrive at after reading the patent,
12 right?
13   A   That's my personal view.
14   Q   Okay. What about a definition of "global
15 control system" as a control system that sends
16 commands to other devices in a system? That's not a
17 reasonable interpretation of the term "global control
18 system" in the '967 patent, is it?
19   A   Well, I --
20   MR. KIKLIS: Objection. Form.
21   THE WITNESS: Are you -- can I read this?
22 I mean, are you talking about -- are you asking a

124

1 hypothetical question?
2 BY MR. BERL:
3   Q   It's a definition of a "global control
4 system" as a control system that sends commands to
5 other devices in the system.
6   A   It's a partial definition.
7   Q   It's a broader definition than the one
8 you've applied, correct?
9   A   It's a partial. It's not a broader.
10   Q   Well, your definition requires that all
11 of the SPDs in the arrays -- in the array must be
12 coordinated. This definition of a control system
13 that sends commands to other devices in the system
14 doesn't require all devices in the system. Right?
15   MR. KIKLIS: Objection. Form.
16   THE WITNESS: It is the coordination that
17 is crucial here.
18 BY MR. BERL:
19   Q   I understand that. But the construction
20 of a control system that sends commands to other
21 devices in a system is a broader construction than
22 the one you've applied that requires coordinating all

125

1   SPDs in the array, correct?
2   MR. KIKLIS: Objection. Form.
3   THE WITNESS: It's not in the spirit of
4   the patent.
5   BY MR. BERL:
6   Q   What is not in the spirit of the patent?
7   A   The definition that you mentioned.
8   Q   The definition of the "global control
9   system" as a control system that sends commands to
10 other devices in a system is not a reasonable
11 definition in view of the '967 patent, right?
12   A   It is incomplete.
13   Q   It's incorrect.
14   A   It's incomplete.
15   MR. KIKLIS: Objection. Form.
16   THE WITNESS: It is incomplete.
17 BY MR. BERL:
18   Q   It's not in the spirit of the patent.
19   MR. KIKLIS: Objection. Form.
20   THE WITNESS: It is incomplete in my
21 view.
22 BY MR. BERL:

126

1   Q   And it's wrong.
2   MR. KIKLIS: Objection. Form.
3   THE WITNESS: It is incomplete.
4   BY MR. BERL:
5   Q   Well, would it be incorrect to analyze
6   the validity of the '967 patent based on a
7   construction of a global control system as a control
8   system that sends commands to other devices in a
9   system?
10   A   Only -- sometimes we will say a broader
11 definition where it is implied that other conditions
12 which are present in the patent are there. For
13 example, the patent says specifically that the system
14 has to keep a record of individual lines and
15 everything.
16   All this brings the issue of
17 coordination. So it is understood that they will be
18 coordinated control. If you want to tag under your
19 definition the implicit assumption that there will be
20 coordinated control, then it can be applied. But
21 then why not spell it out like I do?
22 BY MR. BERL:

127

1   Q   Well, what about the issue of whether all
2   of the SPDs in the array need to be controlled by the
3   global control system? That's an issue you address
4   in your declaration, and you conclude that the global
5   control system must control all of the SPDs as we
6   just looked at, right?
7   A   It has to control all of the SPDs in
8   order to be controlled so there can be coordinated
9   control.
10   Q   And a definition that does not require
11 that, such as the definition I'm proposing here, a
12 control system that sends commands to other devices
13 in the system, is incorrect in your view.
14   A   It is incomplete. It has to have the
15 implicit assumption of coordinated control.
16   Q   But coordinated control in your view must
17 be of all of the SPDs on the array or, as you put it
18 a moment ago, all of the SPDs on the streamers that
19 one wants to control, right?
20   MR. KIKLIS: Objection. Form.
21   THE WITNESS: You're talking generically
22 about an issue. Maybe some of those will have broken

128

1   down. There may be situations where you cannot
2   control all of it. But the generic meaning of
3   "global control system" is to coordinate all the
4   actuators.
5   BY MR. BERL:
6   Q   All of the SPDs?
7   A   The streamer positioning devices, yes.
8   Q   Did you look at WesternGeco's responses
9   that they provided in this case that cited to your
10 declaration?
11   A   I have looked at them. I have to -- you
12 have to point me to specifics.
13   Q   But you did review them.
14   A   Yes, I have looked.
15   Q   Okay. And have you looked at their
16 preliminary responses that were provided before your
17 declaration?
18   A   I have a vague recollection right now,
19 but I don't think they had at the time my definitions
20 of the control -- of the -- the claim constructions
21 that they had made.
22   Q   But this case is not the first time that

129

1   you've worked with WesternGeco in relation to the
2   '967 patent, right?
3   A   No, it's the second time.
4   Q   Let me give you what is labeled as
5   "Patent Owner Preliminary Response" in the 00687 case
6   which corresponds to the '967 patent.
7   Is this a document you've seen before,
8   Doctor?
9   A   I have to go through it.
10   Q   Do you recall looking at this before or
11   not?
12   A   I have a vague recollection right now
13   because I think it was a long time ago.
14   Q   Okay. Well, it wasn't too long ago. It
15   was September 2014. But you don't know whether you
16   saw it?
17   MR. KIKLIS: Objection. Form.
18   THE WITNESS: I don't recall right now.
19   BY MR. BERL:
20   Q   Okay. Do you see that this is Patent
21   Owner WesternGeco's Preliminary Response to the
22   petition for review of the '967 patent?

130

1   A   Let me read it because the legalese is a
2   little slow for me.
3   Q   Sure.
4   A   Yes. I can see it on the first page.
5   Q   Okay. And if you could go to page 26.
6   Do you see it says: "B. Global Control System"?
7   A   Yes.
8   Q   And then it talks about the fact that
9   Claim 1 and Claim 15 recite global control system.
10   Do you see that?
11   A   Yes.
12   Q   And then on the next page, the first full
13   sentence says: "Patent owner agrees with petitioner
14   that the term 'global control system' should be
15   interpreted as: 'A control system that sends
16   commands to other devices in a system; e.g., local
17   control systems.'"
18   Do you see that?
19   A   Yes.
20   Q   You disagree with that construction,
21   right?
22   A   Yes, because it's missing the element of

131

1   coordination.
2   Q   And it's missing coordination of all the
3   SPDs, correct?
4   A   All the ones that you need to control.
5   So that is not a strong statement. You can choose to
6   ignore some, but the ones that you want to control,
7   you have to send signals. But the more important
8   word is "coordinated."
9   Q   This notion that you can ignore some of
10   the SPDs, can you point me anywhere in your
11   declaration to where you suggested that?
12   A   Practical aspects. One of the control
13   devices has broken down. You are not going to say,
14   This ends the global control system.
15   Q   Other than an instance where one of the
16   birds is broken down. By the way, you don't discuss
17   that issue in your declaration, do you?
18   MR. KIKLIS: Objection. Form.
19   THE WITNESS: It is something that a
20   reasonable person would think of immediately.
21   BY MR. BERL:
22   Q   Well, that may be. Is it anywhere in

132

1   your declaration?
2   MR. KIKLIS: Objection. Argumentative.
3   THE WITNESS: A lot of things are not in
4   my declaration.
5   BY MR. BERL:
6   Q   Okay. And one of the things that's not
7   in your declaration is any opinion that the global
8   control system can control fewer than all of the SPDs
9   in the array, right?
10   A   We're talking about the desire to control
11   all of them, if they break down, and this is what
12   comes to mind right now. I can find other reasons if
13   I sit down and think.
14   Q   Right. But I'm not talking about desire.
15   I'm talking about practicing the claims of the '967
16   patent. Is there any place in your expert report
17   that you can point me to which provides the view that
18   one can practice the claims of the '967 patent
19   without the global control system coordinating all of
20   the SPDs in the array?
21   A   It is understood that to the extent
22   possible, that's the desire.

133

1   Q   And we just looked at paragraph 74 of
2   your expert report, Doctor, which you confirmed for
3   me is in fact your testimony still, that plainly says
4   that all of the SPDs in the array have to be
5   controlled, right?
6   **A   The arrays that you want to control**
7   **tightly and everything in accordance with the patent,**
8   **yes, you have to coordinate them all in order to**
9   **achieve the tight control that the patent promises.**
10 **If other reasons preclude you from that, you are not**
11 **going to do the impossible or you are not going to**
12 **abandon the search.**
13   Q   And for the record, it's paragraph 72
14 that we looked at before which ends with your view
15 that: "The specification and claim language clearly
16 specified that the global control system oversees the
17 entire array."
18   Do you see that?
19   **A   72. Too many documents in front of me.**
20   Q   Okay. We will withdraw that question.
21 You've already confirmed that's your testimony.
22   Doctor, the definition that we looked at

134

1   from the Preliminary Patent Owner Response that
2   WesternGeco agreed to --
3   **A   Can we go back to 72 before we abandon**
4   **this?**
5   Q   Well, there is no question. I'm on to a
6   new question.
7   **A   Clarification.**
8   Q   Well, your --
9   **A   You just read it, that's why. The global**
10 **control system --**
11   Q   Doctor, there is no question pending.
12 Your lawyer will have a chance at the end to ask you
13 questions.
14   **A   No. No.**
15   Q   I'm asking you questions.
16   **A   Because you read it, you said "oversees**
17 **the entire array." This is different, oversees, than**
18 **sends signals.**
19   Q   Well, I appreciate that clarification,
20 though you say at other places in fact that the
21 global control system has to send signals to the --
22 all the SPDs in the array, correct?

135

1   **A   If you point me to the --**
2   Q   Well, we already looked at it. Do you
3   dispute that that's your view?
4   **A   I'm not disputing it. I'm asking you**
5   **to --**
6   MR. KIKLIS: Objection. Argumentative.
7   THE WITNESS: -- the same way as you read
8   72, which it says something different.
9   BY MR. BERL:
10   Q   Okay. Well, if you look at 91, for
11 example. Well, we will get to 91 later. We'll do
12 this in a moment.
13   Doctor, going back to the Preliminary
14 Patent Owner Response, the definition that you
15 believe is not correct, you were aware of this
16 construction of the claim in your --
17   **A   We're talking about the '967 patent?**
18   Q   Yes, the '967 Preliminary Patent Owner
19 Response that we looked at, page 27.
20   **A   Oh, I'm sorry. I was looking at the**
21 **patent. So we're talking about the response now.**
22 **Okay.**

136

1   Q   And we just looked at this definition
2   that you told me is not right, on page 27, of "global
3   control system." And my question is, you were aware
4   of that definition of "global control system" when
5   you prepared your declaration in this case, right?
6   **A   Yes.**
7   Q   That -- you understood that was the
8   declaration proposed by PGS in this case, right?
9   **A   Yes.**
10   MR. KIKLIS: Objection. Form.
11 BY MR. BERL:
12   Q   And that was --
13   **A   At the time that's what this document**
14 **claims.**
15   Q   And you understood that Dr. Evans was
16 applying that declaration, right?
17   MR. KIKLIS: Objection. Form.
18   THE WITNESS: I have to look at the
19 Evans' declaration right now.
20 BY MR. BERL:
21   Q   You responded to Dr. Evans' report,
22 correct?

137

1   A   Still I have to look at it.
2   Q   I have a new question. You responded to
3 Dr. Evans' report, correct?
4   A   I included a response in my -- in my own
5 declaration.
6   Q   Right. And you reviewed Dr. Evans'
7 report, correct?
8   A   I did.
9   Q   And you understood his opinions about why
10 he thought the '967 patent was invalid, right?
11   A   Understood.
12   Q   And you responded, correct?
13   A   I responded to certain aspects of it,
14 yes.
15   Q   Certain aspects that you thought were not
16 correct?
17   A   Correct.
18   Q   Now, you said you participated in a prior
19 case with WesternGeco. That was the ION case,
20 correct?
21   A   Yes. When ION was found to be
22 infringing.

138

1   Q   And you provided testimony in that case,
2 correct?
3   A   Correct.
4   Q   And you're aware of the claim
5 constructions that were provided in that case,
6 correct?
7   A   Correct.
8   (Exhibit No. 1078 was marked for
9   identification.)
10 BY MR. BERL:
11   Q   Let's take a look at Exhibit 1078, and
12 just to be clear for the record, that will be 1078 in
13 all of the cases.
14   Doctor, this Exhibit 1078 is entitled
15 "WesternGeco's Opening Claim Construction Brief." Do
16 you see that?
17   A   Yes.
18   Q   And this was in the case of WesternGeco
19 versus ION, correct?
20   A   Correct.
21   Q   Sorry?
22   A   Correct.

139

1   Q   Okay. And if you look at page 12 of
2 Exhibit 1078, do you see "Global Control System"?
3   A   Yes.
4   Q   And it has a table, right?
5   A   (The witness nods.) Yes, I do.
6   MR. KIKLIS: Dave, this is marked
7 "Confidential Information Filed Under Seal." I'm not
8 sure whose confidential information is in here. It
9 could be ION's. I'm just flagging that for you.
10   MR. BERL: I can't imagine -- do you
11 really --
12   MR. KIKLIS: I'm not -- I don't represent
13 ION. I just -- you know --
14   MR. BERL: Okay. That's fine. ION had
15 notice of this deposition, I assume, but they're not
16 here. So, that's fine. We will continue.
17 BY MR. BERL:
18   Q   Do you see there is a table under "Global
19 Control System," Doctor?
20   A   Yes.
21   Q   And the term at issue is "global control
22 system," right?

140

1   A   Yes.
2   Q   And then it provides WesternGeco's
3 proposed construction and ION's proposed
4 construction. Do you see that?
5   A   Yes.
6   Q   And WesternGeco's proposed construction
7 is: "A control system that sends commands to other
8 devices in a system; e.g., global control system."
9   Do you see that?
10   A   I do.
11   Q   That's the same definition that
12 WesternGeco agreed to in this case, right?
13   MR. KIKLIS: Objection. Form.
14   THE WITNESS: I have to look and compare
15 the two, but it sounds the same.
16 BY MR. BERL:
17   Q   It sounds the same as the definition they
18 thought was right until they talked to you, and then
19 it all changed, right?
20   MR. KIKLIS: Objection. Form.
21   THE WITNESS: It didn't change. It
22 became more consistent with the spirit of the patent.

141

1   BY MR. BERL:
2   Q   Okay. So this definition that was
3   proposed by WesternGeco in the ION case says nothing
4   about a behavior-based predictive model, correct?
5   MR. KIKLIS: Objection. Form.
6   THE WITNESS: The global control system
7   is one that coordinates. The behavior-based is the
8   specification of what type of control system has to
9   apply within the global control system.
10 BY MR. BERL:
11   Q   So there is no requirement in this
12 definition that's provided by WesternGeco -- on
13 page 12 in the ION case, as well as the one they
14 agreed to in this case, there is no requirement that
15 a behavior-based predictive model is used by the
16 global control system, right?
17   **A   This is not what we were discussing**
18 **earlier, right? We were talking about coordination.**
19   Q   I understand that.
20   **A   It's a new question.**
21   Q   Yeah, it's a new question.
22   And my question is, just so you

142

1   understand it, that the definition that is on page 12
2   here that's proposed by WesternGeco in the ION case,
3   which is the same one that they agreed to in this
4   case, does not require use of the behavior-based
5   predictive model, right?
6   **A   This definition does not contain, as you**
7   **say, but within the spirit of the patent, this comes**
8   **with the paper.**
9   Q   You think it should be required that a
10 global control system in the context of this patent
11 use a behavior-based predictive model?
12   **A   No, a global control system doesn't have**
13 **to be behavior-based. Behavior-based is something**
14 **that is in addition part of the patent. Global**
15 **control is the shell.**
16   Q   So let me make sure I understand your
17 testimony.
18   Can one in your view have a global
19 control system in the context of the '967 patent that
20 does not use behavior-based predictive modeling?
21   **A   Not in the sense of the '967 patent. But**
22 **it doesn't have to be an explicit part of the global**

143

1   **control, because it's a second layer of specification**
2   **where it says behavior predictive.**
3   Q   So does the use of the term "global
4   control system" in the claims of the '967 patent
5   require the use of a behavior-based predictive model,
6   yes or no?
7   MR. KIKLIS: Objection. Form.
8   THE WITNESS: If I read the patent, yes.
9   BY MR. BERL:
10   Q   Well, you did read the patent, right?
11   **A   When I read the patent, I meant.**
12   Q   Okay. This definition that was agreed to
13 by WesternGeco in this case and advanced by
14 WesternGeco in the ION case of "global control
15 system" says nothing about a dynamic model of each
16 streamer, right?
17   **A   That's part of the behavior-based**
18 **specification.**
19   Q   Which is not included in this definition,
20 but you think should be required.
21   **A   It comes with the territory, meaning we**
22 **define what "global control system," then we define**

144

1   **what behavior-based prediction means.**
2   Q   But the global control system requires
3   behavior-based prediction in the '967 patent, and
4   then one has to specify further about what the
5   behavior-based predictive model must have, right?
6   **A   Right.**
7   MR. KIKLIS: Objection to form.
8   BY MR. BERL:
9   Q   And in this definition here that is in
10 Exhibit 1078, the claim construction briefing in the
11 ION case, WesternGeco is advancing a definition that
12 does not require taking into account the behavior of
13 the complete array, right?
14   **A   Where are you showing me now?**
15   Q   Same definition that we've been looking
16 at.
17   **A   So is your question not reading from**
18 **anywhere?**
19   Q   No, the definition that WesternGeco
20 advanced in the ION case and agreed to in this case
21 does not require taking into account the behavior of
22 the complete steamer array.

145

1   A   You are talking about the ION-proposed
2   construction?
3   Q   Yes -- no. No. WesternGeco's proposed
4   construction in the ION case.
5   A   WesternGeco's proposed construction. But
6   it's understood as the second step.
7   Q   What is understood as the second step?
8   A   You are asking me where the -- a dynamic
9   model of the array and the like.
10   Q   No, that wasn't my question. I didn't
11   say anything about a dynamic model.
12   This definition, WesternGeco's
13   definition, says nothing about taking into account
14   the behavior of the complete streamer array, correct?
15   A   As expressed at the time, it was
16   understood that it will come with a second statement
17   from the patent, and I tried to make it or elaborate
18   it. So looking at it now, it doesn't exclude it. It
19   just doesn't spell it out.
20   Q   But you think that's required of a global
21   control system, in the context of the '967 patent,
22   that it take into account the behavior of the

146

1   complete streamer array, right?
2   MR. KIKLIS: Objection. Form.
3   THE WITNESS: It's better to be included.
4   It will not invalidate anything, because always when
5   you make such definitions you have to say them in the
6   spirit of the patent.
7   So when we're saying the broader
8   definition, the broader definition which makes
9   comfortable someone reading what it is about. Taking
10   this out, this will not invalidate my conclusions
11   because everything else is included in the items of
12   the patent.
13   BY MR. BERL:
14   Q   In other words, your interpretation of
15   global control system requires all of these things
16   that we've been discussing, like the behavior-based
17   predictive model, whether they are spelled out or
18   not, correct?
19   A   The reading of the patent requires that.
20   Q   And in your view the reading of the
21   patent requires also that the global control system
22   maintain the geometry of the array, correct?

147

1   A   We have to read the specification of the
2   patent.
3   Q   But the geometry of the array is
4   maintained in the '967 patent, correct?
5   A   It's attempted to be maintained.
6   Q   The '967 discloses attempting to maintain
7   the geometry of the array.
8   A   Yes. It discloses the geometry, the
9   desired configuration.
10   Q   So I think you agree, but I just want to
11   make clear, the '967 patent discloses attempting to
12   maintain the geometry of the array, correct?
13   A   Well, we have to go into the specifics
14   since you are asking specific questions, so --
15   Q   Well, I'm basing this on everything
16   you've been saying of the global control system and
17   what it does. And I think you answered my question
18   before quite clearly, but I just wanted to make sure.
19   You trailed off and I couldn't quite hear you at the
20   end, that the '967 patent you're saying attempts to
21   maintain the geometry of the array.
22   A   The control system of the '967 patent

148

1   will attempt to maintain a certain configuration.
2   Q   The configuration is the array's
3   geometry?
4   A   One part is the geometry.
5   Q   Of the array?
6   A   Of the array.
7   Q   Now, you would agree that the ordinary
8   meaning of a global control system is a control
9   system that sends commands to other devices in a
10   system, right?
11   MR. KIKLIS: Objection. Form.
12   THE WITNESS: We're talking about in the
13   context of a patent, but in general, when we are
14   talking about global control, it has the meaning of
15   controlling everything. Global.
16   BY MR. BERL:
17   Q   And that's the position that you provide
18   in this case, that it's the entire array of streamers
19   that are being controlled, right?
20   A   That you want to control.
21   Q   You say in paragraph 91 that your
22   understanding of a global control system stems from

149

1 the use of the word "global." This term is specific.
2 To a POSA, it means that the control system oversees
3 and affects the entire system.
4   That's your interpretation, right?
5 **A   That's my interpretation.**
6   Q   And a definition that does not require
7 that the global control system oversee and affect the
8 entire system is incorrect in your view.
9 **A   It's not. It's incomplete, and it**
10 **requires the implicit assumption, so that's why I**
11 **tried to make it expressedly so.**
12   Q   The implicit assumption that is not in
13 that definition of overseeing the entire system is
14 what makes it correct, adding that explicit --
15 **A   Making it complete.**
16   Q   It's narrowing it -- to be clear, that
17 it's not just sending signals to other devices, but,
18 rather, overseeing and affecting the entire array.
19   MR. KIKLIS: Objection. Form.
20   THE WITNESS: The -- you have to talk
21 about the specifics of the control system. There are
22 devices which take control action and they will

150

1 attempt to set, to the extent possible, to the extent
2 that you want to do this, but it provides you the
3 opportunity for this.
4 BY MR. BERL:
5   Q   And what it tries to do is control and
6 oversee and affect the entire system, right?
7 **A   That's the capability that it gives you,**
8 **yes.**
9   Q   And a definition, as you put it, that
10 does not require that is incomplete.
11 **A   Without the implicit assumption.**
12   Q   You see in that same claim construction
13 brief that we've been looking at, which I think was
14 marked as 1078, the WesternGeco's claim construction
15 brief in the ION case, we looked at page 12 which had
16 the proposed definitions of "global control system."
17   If you -- are you there?
18 **A   Page 12?**
19   Q   No, I think you're in the wrong document,
20 Doctor. It's the ION claim -- the brief in the ION
21 case. That one.
22 **A   This one?**

151

1   Q   Yes. We looked at page 12 of that a
2 moment ago.
3   Do you see on page 13, when it's
4 explaining why the global control system should be
5 construed as suggested by WesternGeco, it says:
6 "Consistent with its ordinary meaning, the 'global'
7 control system," with global in quotes, "oversees and
8 sends commands to other devices."
9   Do you see that?
10 **A   No. Where are you --**
11   Q   It's the first full sentence on page 13
12 at the top.
13 **A   Between the global control system, 22?**
14   Q   Yeah, the first full sentence says:
15 "Consistent with its ordinary meaning, the global
16 control system oversees and sends commands to other
17 devices."
18   Do you see that?
19 **A   Yes.**
20   Q   And it has a citation to an exhibit, and
21 paragraph 39 of the exhibit. Do you see that?
22 **A   Yes.**

152

1   Q   Did you ever read the expert reports or
2 declarations of any other WesternGeco experts in the
3 ION case?
4 **A   I recall vaguely that I did.**
5   Q   Whose expert report do you recall vaguely
6 reading?
7 **A   I don't remember even the names now. The**
8 **people that -- I remember their faces, I'm very good**
9 **at that. But at least one person I read his report**
10 **in detail.**
11   Q   Was it Peter Canter?
12 **A   I remember another name. It could have**
13 **been Canter too.**
14   **(Exhibit No. 1079 was marked for**
15   **identification.)**
16 BY MR. BERL:
17   Q   Let's take a look at what we will mark as
18 Exhibit 1079, which is identified as "Claim
19 Construction Expert Report of Peter H. Canter" in
20 WesternGeco versus ION. Do you have Exhibit 1079?
21 **A   Yes.**
22   Q   All right. Do you believe that you

153

1   looked at this expert report of Peter Canter?
2   A   **Right now I cannot state one way or**
3   **another.**
4   Q   Are you familiar with Peter Canter?
5   A   **I recall the name but nothing right now**
6   **else.**
7   Q   You don't recall anything about him?
8   A   **No, because in my deposition at the time,**
9   **it was the only other guy present.**
10   Q   Okay. And if you look at his
11 declaration, for example, in paragraphs 3, 4 and 5,
12 it provides some of his educational background and
13 work experience. Do you see that?
14   A   **Yes.**
15   Q   And he has significant experience in the
16 field of marine seismic surveying, right?
17   A   **Correct.**
18   Q   Including at Schlumberger, which is the
19 parent of WesternGeco?
20   A   **Yes.**
21   Q   And if you look at paragraph 39, which is
22 the paragraph cited in 1078 that we looked at. Do

154

1   you see paragraph 39 on page 15?
2   A   **"Around October."**
3   Q   Yes. Do you see it is addressing the
4   interpretation of "global control system"?
5   A   **Yes.**
6   Q   And it says: "Around October 1, 1998,
7   one of ordinary skill in the art would interpret
8   'global control system' to mean a control system that
9   sends commands to other devices in the system; e.g.,
10 local control systems."
11   Do you see that?
12   A   **I see that.**
13   Q   And you disagree with the statement of
14 WesternGeco's other expert, right?
15   A   **Well, in the document we just read,**
16 **meaning "the global control system oversees and sends**
17 **commands to other devices," you can see that the**
18 **"oversees" is an implicit assumption.**
19   **So when he says, "Global control system**
20 **sends commands," it doesn't send commands to these**
21 **other devices for fun. It's to coordinate them. And**
22 **the -- so it was only implicit all along that "global**

155

1   **control" means coordinate. It means put -- put a**
2   **number of control devices to work towards a purpose.**
3   **It was a goal. And that's what I wanted to make**
4   **explicit in my new definition.**
5   Q   But then what you also made explicit in
6   your new definition is that it's a global control --
7   "a control system configured to coordinate all
8   streamer positioning devices in the array." We
9   looked at that earlier.
10   That's not present in the construction
11 advanced by Dr. Canter, by WesternGeco in the ION
12 case or by WesternGeco initially in this case, right?
13   MR. KIKLIS: Objection. Form.
14   THE WITNESS: All is meant only in the
15 sense of the ones that you want to control.
16 BY MR. BERL:
17   Q   Even with that proviso, which is, as we
18 agreed, nowhere in your expert report, that's still
19 not required by the construction advanced by
20 WesternGeco in the ION case, initially in this case
21 and by Peter Canter, correct?
22   MR. KIKLIS: Objection. Form and

156

1   argumentative.
2   THE WITNESS: We are arguing about
3   something which has been implicit all along. In all
4   of the testimonies and the like, it was explicit that
5   global control tries to coordinate.
6   BY MR. BERL:
7   Q   But it doesn't say anywhere in Peter
8   Canter's declaration or in the claim construction
9   brief we just discussed from the ION case or in the
10 agreement of WesternGeco in this case to the
11 definition of PGS that it has to coordinate all of
12 the SPDs in the array, right?
13   MR. KIKLIS: Objection. Form.
14   THE WITNESS: It is implicit from reading
15 the patent.
16 BY MR. BERL:
17   Q   In your view it's required by the patent.
18   A   **It is a result of the patent, which will**
19 **come out when you read the patent.**
20   Q   Okay. Even though you actually now say
21 that it doesn't have to be all the devices in the
22 array.

157

```
 1            MR. KIKLIS:  Objection.
 2   BY MR. BERL:
 3       Q    Today.
 4            MR. KIKLIS:  Objection.  Argumentative.
 5            THE WITNESS:  I never said that.
 6   BY MR. BERL:
 7       Q    So I don't mean to mischaracterize your
 8   deposition testimony at all, Doctor.  Do you still
 9   believe that global control system requires a control
10   system configured to coordinate all SPDs in the
11   array?
12       A    Yes, with the provisos that I put down.
13   To the extent possible and to the extent of wanting
14   to control those specific arrays, this is what the
15   patent offers you.
16       Q    Those specific streamers.
17       A    Those specific streamers that you want to
18   control.  Everything that it -- it offers you this.
19       Q    Those provisos, have you ever written
20   them down anywhere?
21            MR. KIKLIS:  Objection.  Argumentative.
22            THE WITNESS:  The provisos are something
```

158

```
 1   that a reasonable person would sit down and
 2   understand.
 3   BY MR. BERL:
 4       Q    Let me ask it this way:  Have you ever
 5   seen it written down anywhere, those provisos, about
 6   the interpretation of global control system in the
 7   '967 patent by you or anyone else?
 8            MR. KIKLIS:  Objection.  Argumentative.
 9            THE WITNESS:  We can argue right now, but
10   on the -- as a matter of having working global
11   control, there can be no discussion.
12   BY MR. BERL:
13       Q    But you've never seen them written down
14   by anyone until this court reporter is writing them
15   down today?
16       A    They may have been --
17            MR. KIKLIS:  Objection -- hold on a
18   minute.  Objection.  Form.  Argumentative.
19            THE REPORTER:  And your answer?
20            THE WITNESS:  My throat needs to respond.
21            They may have been put down.  They may be
22   part of the every day.  Right now you are asking me,
```

159

```
 1   I cannot think.
 2   BY MR. BERL:
 3       Q    So, Doctor, it's correct in your view
 4   that the global control system has to calculate the
 5   desired vertical and horizontal forces based upon the
 6   behavior of each streamer and also take into account
 7   the behavior of the complete streamer array, right?
 8       A    Can you point me to the specific --
 9       Q    This is actually part of the response,
10   but you -- WesternGeco's response.
11            Do you agree that the global control
12   system must calculate the desired vertical and
13   horizontal forces based on the behavior of each
14   streamer and also taking into account the behavior of
15   the complete streamer array?
16       A    That's a big sentence.  Can you point me
17   where in the document?
18       Q    Sure.  I guess you can do 69.  Well,
19   yeah, let's do this.
20       A    69 of my report?
21       Q    Let me just give you a new document,
22   which is the patent owner response from WesternGeco.
```

160

```
 1   Not their preliminary response but the later one.
 2            MR. KIKLIS:  Which is called the mac
 3   daddy response.
 4   BY MR. BERL:
 5       Q    Do you have WesternGeco's patent owner
 6   response, Doctor?
 7       A    I do.
 8       Q    And --
 9       A    This is also underlined.  Do you want me
10   to take a look at it?
11       Q    No.  Are yours underlined too?
12       A    It was underlined in the original and
13   photocopied.
14       Q    Oh, yeah.  That's fine.  As long as it's
15   the original underlined, that's fine.
16       A    I'm not sure.  I'm just saying.
17            MR. KIKLIS:  We see your secret strategy
18   in here.
19            MR. BERL:  Too late to do much about it.
20   BY MR. BERL:
21       Q    Okay.  If you go, Doctor, to, for
22   example, page 6, you see that it says:  "The global
```

161

1   control system of the '967 patent" -- last

2   sentence -- "takes into account the status and

3   relative positioning of all of the birds in the

4   array"?

5   Do you see that?

6   **A   Where exactly?**

7   Q   Last sentence of page 6.

8   **A   "The global control system" -- okay.**

9 **Good.**

10   Q   Do you agree with WesternGeco?

11   A   Yes.

12   Q   And you and WesternGeco rely on a

13 statement from column 4 of the '967 patent. It's

14 shown here, if you want to look at it, in the middle,

15 the one that starts "the global control system." If

16 you would like to look at the patent --

17   **A   Yeah, let's see that.**

18   Q   -- that's perfectly fine as well. It's

19 in column 4, line 54 through 57.

20   A   Yes.

21   Q   And you actually address that yourself,

22 if you want to look at it, Doctor, in paragraph 69 of

162

1 your declaration. So you can have what you --

2   **A   Yes. Okay.**

3   Q   Do you have that?

4   So the language that begins: "The global

5 control system 22," on lines 54 through 57 of

6 column 4, are reproduced in your expert report in

7 paragraph 69, right?

8   **A   Yes.**

9   Q   And what you say about it in paragraph 69

10 is that: "The global control system's continuous

11 coordination of every streamer positioning device

12 involves taking into account the forces and dynamics

13 affecting each streamer."

14   Do you see that?

15   A   Yes.

16   Q   And then you reproduce the language from

17 column 4, correct?

18   **A   Correct.**

19   Q   But you actually embolden and italicize

20 some of the language from column 4, right?

21   A   Yes.

22   Q   Well, let me make sure I understand what

163

1 your testimony is. In your view, the global control

2 system must take into account the behavior of the

3 entire array, right?

4   A   Yes.

5   Q   This sentence, however, makes it clear

6 that the global control system need not calculate the

7 desired vertical and horizontal forces based on the

8 behavior of each streamer and the behavior of the

9 complete array, right?

10   **A   Well, in view of the rest of the patent,**

11 **although here it says "preferably," in view of other**

12 **parts of the patent where there it says explicitly**

13 **not preferably, it becomes obligatory to do it.**

14   Q   So that this sentence conveys that

15 behavior of the entire streamer array need not be

16 taken into account, but other passages in the patent

17 make it clear that it's required, not just

18 preferable.

19   **A   It's -- it makes -- yes, in combination**

20 **of other sentences, it makes it necessary.**

21   Q   Because other sentences make it clear

22 that taking into account the behavior of the complete

164

1 array is a requirement rather than just being

2 preferable.

3   **A   Right.**

4   Q   And I notice you didn't italicize or

5 embolden "preferably." You emboldened and italicized

6 all sorts of other things. Why is it that you never

7 italicize "preferably"?

8   **A   Because of the effect of other sentences**

9 **in the patent.**

10   Q   Let me ask you this: Would your opinion

11 be any different in this case if the word

12 "preferably" were not included in that sentence from

13 lines 54 to 57 of column 4 of the '967 patent?

14   **A   No, because of the other sentence which**

15 **is very restrictive.**

16   Q   Which other sentence are you talking

17 about, Doctor?

18   **A   I will have to look for it, okay? Bear**

19 **with me.**

20   **(Perusing document.) Okay. If you go to**

21 **Section 4 --**

22   Q   Column 4?

165

1   A   Column 4. I'm sorry.
2   -- the patent says -- that's one of the
3   locations which I found now, okay? "The inventive
4   control system utilizes a distributive processing
5   control architecture and behavior predictive
6   model-based control logic to properly control the
7   streamer positioning devices."
8   So because there is no "preferably" in
9   that sentence, it means it has to be behavior
10   predictive model-based. "Model-based" means you have
11   to keep a model of the system. To a control person
12   "model-based" means model-based. No way around it.
13   You have to make a model of the system and build it.
14   Q   So let's discuss that sentence for a
15   moment. That sentence says nothing about the
16   behavior of the complete streamer array, does it?
17   A   It says: "The inventive control system
18   utilizes a distributive process" -- "and behavior
19   predictive model-based distributed positioning
20   devices" (reading to self).
21   So when I read this sentence, as a
22   control engineer now, exclusively, so nothing to do

166

1   with anything, I look at it and say, What is the
2   system? The streamer positioning devices are the
3   actuators. The system is the streamers. I have to
4   control them through a distributed process control,
5   number one. And, two, behavior predictive
6   model-based. Model-based on whose model? Of the
7   streamers.
8   Q   What is the answer to that question?
9   A   The streamers, the model of the
10   streamers.
11   Q   Whose model of the streamers?
12   A   Model has a specific meaning. You write
13   down the equations of motion.
14   Q   Equations of motion? What do the
15   equations of motion give you?
16   A   Okay. So the equations of motion, you
17   write down how the streamers behave in the fluid. So
18   the streamers have a structural part. They are made
19   out of bendable material, they have tension, they
20   have attachments to them. They have a mass
21   distributed along the length. They have a bending
22   stiffness distributed along the length. They have a

167

1   tension applied to them.
2   On top of that, at every location there
3   will be the streamer devices, which have their own
4   mass, the fins and the like. So you have to write
5   what are called equations of motion of the cables,
6   which come from Newton's law.
7   So when Bittleston gave his testimony, he
8   explained that that's how he derived it too. So I'm
9   just giving you an example of how someone would do
10   it. So he did it.
11   And then you have to take into account
12   the forces from the fluid. Very important.
13   Extremely important why? Because there are so-called
14   added mass forces. Added like add, and mass as in
15   mass forces. When you turn something and you move,
16   you displace the fluid particles. You move the fluid
17   around and that kicks back. That's Newton's law.
18   But because you move at the same time, the kick you
19   give now, okay, those free particles move to another
20   location.
21   So these are the so-called convective
22   terms, which cause -- convective as in convection.

168

1   And when the towed array starts bending, it generates
2   centrifugal and Coriolis forces. Coriolis is
3   C-O-R-I-O-L-I-S. This causes these arrays to behave
4   in a very complex way. The most significant effect
5   of it is that if you shake one part of the array
6   here, it will create a wave which will travel down.
7   These are the dynamics. These are the equations
8   we're talking about. Okay.
9   How you model this? So this wave -- so
10   let's say I ordered bird number 10 to move, shakes up
11   and down, to correct the array. It will create a
12   wave, which 10 minutes down the road it will be felt
13   near the end of the array. So, bird number 65, it's
14   about to do a correction when it's feeling a jolt
15   from the -- something that happened 10 minutes ago.
16   These are the dynamics and the model base that need
17   to be implemented. That's exactly what Bittleston
18   had in mind. That's exactly what he said here.
19   That's what behavior means.
20   Q   That's what's required by what is called
21   here a "behavior predictive model-based control
22   logic"?

169

1   A   It's to understand these equations and
2   make appropriate models.
3   Q   That account for all of the forces that
4   you just described.
5   A   That account for the essence of the
6   forces I'm talking about.
7   Q   And when you say "the essence of the
8   forces," those are all of the forces including the
9   traveling waves and the Coriolis forces and the
10 centrifugal forces, correct?
11   A   There are more, but I just mentioned the
12 first sort of layer.
13   Q   The most essential ones.
14   A   Yeah, and then there are drag forces,
15 which are huge.
16   Q   So they have to account then for all the
17 forces that you've described plus the drag forces.
18   A   Yes.
19   Q   And --
20   A   And other forces.
21   Q   And other forces too. And that's what
22 Dr. Bittleston did, correct?

170

1   A   Yes. And in my view, that's why he was
2   successful.
3   Q   Okay. And those equations that provide
4   the model, were those available in the art as of
5   October 1, 1998?
6   A   They had been worked, believe it or not,
7   in the '80s and the '90s. So in the review paper
8   that I gave in '91, the one that I mentioned in the
9   beginning of our talk, number 2 of the review papers,
10 I reviewed specifically for the towed arrays, the
11 equations, because they were big unknowns at the
12 time. In fact, some people who had made publications
13 in respectable journals had made errors, so I had to
14 identify those errors.
15   So there was still -- it looks
16 deceptively simple, but it's not. Okay. By the fact
17 that the premier Journal of Fluid Mechanics was
18 publishing -- it's still publishing papers on this.
19 But at the time there was raging discussion on such
20 issues. So it was coming to fruition in the '90s.
21   Q   But Dr. Bittleston didn't simply use your
22 equations, right?

171

1   A   He was aware of the literature. So it
2   was not myself. There were four or five people doing
3   that.
4   Q   And he built on that literature, he
5   changed the equations, right?
6   A   It took him years to do that, yes.
7   Q   And as a result of his work for years on
8   that project, he was able to obtain the equations
9   that provided the behavior predictive model-based
10 control of the patent, correct?
11   MR. KIKLIS: Objection. Scope.
12   THE WITNESS: We don't know how exactly
13 it happened. But it's an assumption to say maybe it
14 happened that way.
15 BY MR. BERL:
16   Q   Well, but Dr. Bittleston, based on all
17 the work, and you said he worked for years on this,
18 was able to obtain equations that constitute the
19 behavior predictive model-based control logic that is
20 identified in column 4 of the patent, right?
21   A   He was -- he arrived at his equations,
22 and then he put it down -- he recognized the

172

1   importance of this, and then he put it down in the
2   patent so people would know what it is. It would
3   depend, sometimes there would be differences in the
4   systems.
5   Q   When you say he put it down in the
6   patent, he put down that you use behavior predictive
7   model-based control logic, right?
8   A   So the -- so the words that he put down
9   is "behavior," which means the behavior of the
10 models, because the computer doesn't know anything
11 about behaviors. It knows about equations. So there
12 have to be some equations.
13   "Predictive" is another magic word in
14 that. Predictive comes with the territory of delay.
15 Okay. So, again, it's within the control realm that
16 this will immediately signal certain things to the
17 person of the art.
18   Q   So as I understand it, your testimony is
19 that Dr. Bittleston worked on all these equations for
20 years and took into account all of these forces, and
21 as a result of that work, obtained equations that
22 constitute the behavior predictive model-based

173

1 control logic that is identified in column 4 of the
2 '967 patent, right?
3   A   I would say it gave him the incentive to
4 put them down because that gave him the solution. So
5 now it becomes something that a person can read and
6 reproduce without having to reinvent everything.
7   Q   What gave him the solutions? The
8 equations gave him the solutions?
9   MR. KIKLIS: Objection. Scope.
10   THE WITNESS: No, the specification here.
11 The specifications in the patent.
12 BY MR. BERL:
13   Q   Gave the solutions that Dr. Bittleston
14 obtained from his years of work?
15   A   Gave the essence of what he wants to do
16 with his control system.
17   Q   Okay. It provides information about what
18 he wants to do with his control system, not the
19 equations, right?
20   A   No. The equations is something that you
21 have to do because the computer control will require
22 them.

174

1   Q   Someone in order to implement and
2 practice this invention has to obtain the equations
3 themselves.
4   A   Derive based on -- he has to seek them
5 out. I mean --
6   Q   Like Dr. Bittleston did in his years of
7 work.
8   A   Right. But at the time there was
9 uncertainty what exactly was needed, because there
10 was no successful system. And these equations are
11 complicated. Do we need to go through this effort,
12 and Bittleston says, yes, you have to.
13   Q   You have to go through this years' long
14 effort of obtaining complicated equations?
15   A   For him it was in order to check out what
16 exactly was going, and he was experimenting and
17 doing -- I presume now, okay? Maybe he did it
18 overnight. I have no idea. But there is some time
19 that he did it.
20   Q   And you looked at --
21   A   So now he teaches it through the patent.
22   MR. KIKLIS: How about if we take a break

175

1 for lunch. It's noontime.
2   MR. BERL: Sure. That's fine.
3   (Lunch from 11:58 a.m. to 12:55 p.m.)
4 BY MR. BERL:
5   Q   All right. Are you ready, Doctor?
6   A   Yes.
7   Q   Okay. You have before you the patent
8 owner response on the '967 patent, right?
9   A   Yes, I do.
10   Q   On page 14.
11   A   Yes, I am there.
12   Q   And the sentence near the top is what I
13 want to direct you to. It says: "A construction of
14 global control system that does not require control
15 of all streamer positioning devices would not be
16 supported by, and in fact would be contradicted by,
17 its three optional modes described in the
18 specification."
19   Do you see that?
20   A   Yes.
21   Q   Do you agree with that sentence of
22 WesternGeco's?

176

1   A   I agree in the following sense, that if
2 you want to control tightly, which is what the patent
3 was derived by, you need to control all the
4 positioning devices.
5   Q   And that the three modes that are
6 discussed in this sentence, the three operational
7 modes, those are streamer separation mode, feather
8 angle mode and turn control mode, right?
9   A   Right.
10   Q   And the point that WesternGeco is making
11 here is that these three control modes require the
12 global control system to control every SPD in the
13 array, right?
14   A   That's the -- the capability -- that's
15 when you get the most capability.
16   Q   That's what WesternGeco is saying here,
17 that the use of these three modes, feather angle,
18 streamer separation and turn control, requires the
19 global control system to control all the SPDs, right?
20   A   Yes. It's a desire more than an absolute
21 requirement in the sense that that's when you get the
22 full specification of the patent. If the few birds

177

1 have failed and you cannot control them, you have to
2 live with that.
3 Q   And if the global control system is not
4 configured to coordinate all of the SPDs in the
5 array, even -- other than the ones that have failed,
6 one cannot operate in steamer separation mode.
7 A   You cannot operate in the optimal sense
8 that this -- with the guarantees that the patent
9 brings, you can still do it. You can still -- you
10 may see some benefit. But it's dubious. It's case
11 by case. It depends.
12 Q   Well, it says that a construction of
13 global control system that does not require all the
14 SPDs to be controlled would not be supported by and
15 would be contradicted by the three operational modes,
16 so what that means is that streamer separation mode
17 is contradicted by any notion of a global control
18 system that does not require control of all SPDs,
19 right?
20 MR. KIKLIS: Objection. Form.
21 THE WITNESS: I haven't thought about
22 this specific way that you're putting it. But the

178

1 way I view it is I see it with a different twist.
2 This is the case where Bittleston and company try to
3 create a new system, and they say if you are to
4 choose a hundred birds and put them on your streamer,
5 you will choose them so you can control all of them.
6 In other words, that's what will give you this
7 benefit.
8 Now, if you happen to have an existing
9 system today which has 5,000 birds, and you say, Hey,
10 for this operation I'm going to operate only half of
11 them, because there are so many, it so happens that
12 someone gives you a system that for some reason is
13 many, you may get away with fewer birds.
14 BY MR. BERL:
15 Q   But would that be a global control system
16 that is controlling half of the birds?
17 A   It would be in the following sense, that
18 if you have to do it that way -- that's what I'm
19 saying, I'm trying to say where the exclusiveness
20 comes up. The patent tells you if you want to see
21 the good things, you have to control everything.
22 Q   That's what you say is required of a

179

1 global control system in the definition that you've
2 applied in this case.
3 A   This is what is required by the patent
4 out of the system in order to operate in full
5 capability.
6 Q   But that's what's required by the
7 patent's claiming of a global control system as you
8 have defined it in your own declaration, right?
9 A   That's what is envisioned, yes.
10 Q   That's what's claimed. You were
11 construing or providing a definition for "global
12 control system."
13 A   Subject to the provisos that we mentioned
14 before.
15 Q   Which were not in your definition or
16 anywhere in your declaration.
17 A   Because there are practical provisos that
18 they will be in this case. If you are asking me, I
19 have a system with a thousand birds and 999 of them
20 operate and one does not operate because, whatever,
21 Hey, this is not the system, this is not the patent,
22 there is no way.

180

1 So we have to -- it means if you want
2 good control, you have to control them all. That's
3 what implies global control system. You wouldn't
4 choose a system. Okay. If it so happens someone
5 gives you a predetermined system that has too many
6 for whatever reason, it allows -- this is the
7 provisos I can think of right now, okay? But you
8 wouldn't design a system to have inoperable birds.
9 Q   I'm not talking about what you would do
10 in designing. I'm asking when you are practicing the
11 patent and when you are not practicing the patent.
12 And when the patent calls for a global control
13 system, the patent is reciting a system that controls
14 all of the birds.
15 A   The patent is at the junction when there
16 are no working control systems to do this kind of
17 successful operation. And it says if you want to
18 design a new system, put the birds, and make sure you
19 coordinate them all.
20 Q   Okay.
21 A   That's what it means.
22 Q   Okay. The --

181

1   A   Now, you want to go in the other
2 direction. If not all, then the patent is violated.
3 No, it's not. Okay. The patent recommends the best
4 control, you have to have all of them.
5   Q   So now it's just a recommendation even
6 though you said --
7   A   It's a practice of the patent. It says
8 if you --
9   Q   Well, let me ask you this: The last
10 sentence of this same page, paragraph -- or page 14
11 in WesternGeco's --
12   A   Yes.
13   Q   -- patent owner response. It says:
14 "Thus, the only reasonable way to construe the term
15 'global control system' while considering the global
16 limitations contained in Claims 1 and 15 and the
17 disclosure contained in the specification is as,
18 quote: "A control system configured to coordinate
19 all streamer positioning devices in the array."
20   I have a very simple question. Do you
21 agree or disagree with that?
22   A   I agree that a person who would get this

182

1 patent in -- when it was issued will have to design
2 the birds so they can all be coordinated.
3   Q   I'm not asking about a person who is
4 getting the patent and designing a system. I'm
5 asking about the construction of the term "global
6 control system."
7   A   And I'm telling --
8   Q   Do you agree that the only reasonable way
9 to construe that term in Claims 1 and 15 in view of
10 the specification is as, quote: A control system
11 configured to coordinate all streamer positioning
12 devices in the array?
13   A   And my answer again is, I agree that this
14 is the definition, having read the patent, subject to
15 certain provisos, which I elaborated on previously.
16   Q   About, for example, the birds being
17 broken?
18   A   For example.
19   Q   Okay.
20   A   One of them, yeah.
21   Q   Okay. Now, you said that arrays you had
22 seen at the time, that there was as many as six -- or

183

1 five or six streamers in the array. There were also
2 multi-streamer arrays that had two streamers, right?
3   A   There could be only with two.
4   Q   And you said that the length differed,
5 but one could have a length in the streamer of a
6 kilometer, for example.
7   A   I'm not sure that there -- that was
8 practiced at the time. You could do it, depending on
9 the application.
10   Q   Okay. But one application would be two
11 streamers, one kilometer each, right?
12   A   This is a hypothetical?
13   Q   I'm asking you what was sort of -- what
14 was possible at the time of the priority date.
15   A   You could choose the length that would
16 fit the antenna requirement, how long you wanted it
17 to be depending on the depth and the location and the
18 like.
19   Q   And that one could, according to the
20 patent, put birds positioned along the streamer in
21 the patented invention, right?
22   A   Right.

184

1   MR. KIKLIS: Objection. Form.
2 BY MR. BERL:
3   Q   And the birds could, for example, be
4 every 400 meters on the streamer?
5   A   There were no birds to put for lateral
6 position at the time, right? I mean ...
7   Q   There were birds described by the PCT
8 '636, right?
9   A   You could put such birds, yes.
10   Q   Every 400 meters.
11   A   You wouldn't know why you were doing it,
12 but yes.
13   Q   And in such a configuration where you had
14 two streamers and two -- and 1 kilometer length of
15 each streamer, and birds placed approximately every
16 400 meters, there would be fewer than a half dozen
17 birds in the array, right?
18   A   In fact, far, far fewer than that, yes.
19   Q   When you say "far fewer than that,"
20 you're saying two or four?
21   A   400 meters gives you two per streamer.
22   Q   Which gives you four total.

185

1   A   Four total.
2   Q   And that's within the scope of the claims
3 of the '967, '607, and '520 patents that you have
4 been rendering an opinion about to have --
5   MR. KIKLIS: Objection.
6 BY MR. BERL:
7   Q   -- a two-streamer array as you just
8 described?
9   MR. KIKLIS: Objection to form.
10   THE WITNESS: I have to look at the
11 details. I can't tell you off -- I have to check.
12 BY MR. BERL:
13   Q   Well, there are no length requirements,
14 are there?
15   A   It presumes the operating length at the
16 time. When I said 1 kilometer, it might have been a
17 very super special case --
18   Q   You didn't say that.
19   A   -- in shallow water.
20   Q   But that's within the claim to have a
21 1 kilometer long streamer, right?
22   A   If it required to have such a length.

186

1   Q   There is nothing in the claim that limits
2 it to a particular length of a streamer, right?
3   A   Well, usually you will put it in the
4 length range that the industry would require, which
5 is a few kilometers, okay.
6   Q   And even if it's a few kilometers, if you
7 have two streamers every 400 meters, you're talking
8 about a half dozen streamers, right?
9   A   Okay. In the hypothetical.
10   Q   Yes. And that hypothetical configuration
11 that we've now described is within the scope of the
12 three patents that you have been testifying about?
13   A   Provided it satisfies all the other
14 requirements.
15   Q   Right.
16   A   The global control, the distributed, all
17 the items that are in the patent.
18   Q   Right. But with respect to the number of
19 birds or SPDs, that's within the scope of the patent.
20   A   The patent doesn't require a number, but
21 it alerts you to the fact that there are delays and
22 the like, which to a reasonable engineer would put

187

1 some practical limitations.
2   Q   In terms of how many there could be.
3   A   In terms of how many.
4   Q   In terms of the ceiling but not the
5 floor.
6   A   What do you mean by ceiling and floor?
7   Q   It would provide practical implications
8 about how many -- about the maximum number of birds
9 but not the minimum number.
10   A   No, on the contrary, the minimum.
11   Q   So what's the minimum number of birds
12 that can be used in a streamer array consistent with
13 the claims of the '520, '967, '607 patents?
14   A   It depends on the application.
15   Q   But in some applications, at least the
16 configuration we've described with a half dozen birds
17 or fewer, would be within the scope of the claims.
18   A   You want me to hypothesize an ideal
19 situation? If someone decides that the conditions
20 would be ideal, they could choose fewer birds.
21   Q   And still practice the claims of the
22 '520, '607 and '967?

188

1   A   Provided it satisfied all of the
2 limitations of the patent, yes.
3   Q   Okay. Now, let's go back to the '967
4 patent. In particular, I wanted to ask you some
5 questions about column 2. Do you have column 2 in
6 front of you?
7   A   I do.
8   Q   Okay. And in particular, let's start
9 right now at line 38 of column 2 where it says
10 "Another system." Do you see that sentence?
11   A   I do.
12   Q   And that says: "Another system for
13 controlling a horizontally steerable bird is
14 disclosed in our published PCT International
15 Application No. W098/28636."
16   Do you see that?
17   A   Yes.
18   Q   The system that is being referred to in
19 that sentence is the '636 system, correct?
20   MR. KIKLIS: Objection. Form.
21   THE WITNESS: He refers here to the bird.
22 BY MR. BERL:

189

1   Q   It says "another system." Do you see
2 that?
3   A   Yes. But the '636 patent is about the
4 birds. Whatever "system" means in his mind is
5 unknown, but --
6   Q   And, again, I'm not asking what was in
7 Dr. Bittleston's mind. He is not here; you are. And
8 so I'm asking about the understanding of a person of
9 ordinary skill reading the '967 patent. Do you
10 understand that?
11   A   I do. And I'm answering in that spirit.
12   Q   Okay. So a person reading the '967
13 patent would understand that the term "system" used
14 in the sentence I just read at line 38 of column 4
15 refers to the '636 system, correct?
16   MR. KIKLIS: Objection to form.
17   THE WITNESS: It refers to what is
18 patent -- patented in '636. It's not a control
19 system in '636. It's a bird that can be used to
20 produce forces.
21 BY MR. BERL:
22   Q   Okay. Let me ask it this way: When it

190

1 says "another system" on line 38 of column 4, what
2 system would a person of ordinary skill understand
3 that phrase to refer to?
4   A   The bird.
5   Q   The bird of the '636?
6   A   Yes.
7   Q   And that is a system for controlling a
8 horizontally steerable bird.
9   A   He means the bird with its local control
10 system.
11   Q   So the system that is being referred to
12 for controlling a horizontally steerable bird is the
13 system of the PCT '636?
14   MR. KIKLIS: Objection. Form.
15   THE WITNESS: Look, in the same way we
16 refer to bird as the wings, because they look like a
17 bird, or the bird plus the motor or the bird plus the
18 attachments. That's what he refers to here.
19 BY MR. BERL:
20   Q   I'm just asking you about when it says:
21 "Another system for controlling a horizontally
22 steerable bird," a person of skill would understand

191

1 that he is referring to the system disclosed in the
2 '636. That's what it says, right?
3   MR. KIKLIS: Objection to form.
4   THE WITNESS: But he refers to the
5 apparatus in '636, which can be used for his
6 purposes, not for --
7 BY MR. BERL:
8   Q   But he refers to a system for controlling
9 a horizontally steerable bird, and he says that's
10 disclosed in the '636. Doesn't it say that?
11   MR. KIKLIS: Objection. Form.
12   THE WITNESS: That's what you presume it
13 says.
14 BY MR. BERL:
15   Q   I'm not asking what you presume.
16 Wouldn't a person of ordinary skill understand the
17 '967 in column 4 to be stating that the '636
18 discloses a system for controlling a horizontally
19 steerable bird?
20   MR. KIKLIS: Objection. Form.
21   THE WITNESS: A system which can be used
22 for controlling. For -- within the control system.

192

1 It's not the control system, per se, because it
2 doesn't have a global control system. So you
3 cannot -- so you cannot control an array with this
4 patent, which is very clear when you read the '636.
5 BY MR. BERL:
6   Q   I think -- well, is what you're saying
7 that this sentence in fact does say that a system for
8 controlling a horizontally steerable bird is
9 disclosed in the '636, but you think that's wrong?
10   MR. KIKLIS: Objection. Form.
11   THE WITNESS: I didn't say ever that.
12 BY MR. BERL:
13   Q   So let me ask it this way: Is it correct
14 that the '636 discloses a system for controlling a
15 horizontally steerable bird?
16   MR. KIKLIS: Objection. Form.
17   THE WITNESS: You -- you don't define
18 what "control" means. And the person who would have
19 read '636 would understand that this is not the
20 control of the array he's interested in. This is to
21 provide control forces.
22 BY MR. BERL:

193

1   Q   For controlling a horizontally steerable
2   bird.
3   A   **Within a scheme which is to be disclosed**
4   **in the sequence of the patent.**
5   Q   Okay. But the system for controlling a
6   horizontally steerable bird is disclosed in the '636.
7   A   **By "system," he means an apparatus, he**
8   **means a motor, a correction. He doesn't mean a**
9   **controlled overall system to control an array.**
10   Q   So when he says "a system for
11   controlling," that's not a control system that he is
12   talking about here.
13   A   **It's not a control system for a towed**
14   **array.**
15   Q   Is it a control system for controlling a
16   horizontally steerable bird?
17   A   **It's an apparatus which provides forces**
18   **which can be used within a control system.**
19   Q   So is it a control system for controlling
20   a horizontally steerable bird?
21   MR. KIKLIS: Objection. Form.
22   THE WITNESS: It's a system to provide

194

1   forces through a steerable bird.
2   BY MR. BERL:
3   Q   Okay. Let's go to the next sentence.
4   It says: "Using this type of control
5   system, the desired horizontal positions and the
6   actual horizontal positions are received from a
7   remote control system and are then used by the local
8   control system within the birds to adjust the wing
9   angles."
10   Do you see that?
11   A   **Yes, I do.**
12   Q   And "this type of control system," do you
13   see that phrase?
14   A   **I do.**
15   Q   That's referring to the system of
16   PCT '636, right?
17   A   **No. Where does it say that?**
18   Q   I'm asking you.
19   A   **No, it's not. I didn't construe it to**
20   **mean that at all.**
21   Q   Okay. So this type of control system
22   then refers to what?

195

1   A   **It's hard to conclude. He is talking**
2   **about a system from the beginning, a control system**
3   **for positioning a marine seismic streamer. So using**
4   **this type of control system, I presume it will mean**
5   **something generally within the control system you**
6   **have in mind.**
7   Q   Rather than the system that is the
8   subject of the immediately preceding sentence?
9   A   **What I mean by this is this: Using this**
10   **type of control system, in other words, having this**
11   **component of the '636 as a component, what I meant is**
12   **he doesn't mean that I'm going to use this for**
13   **controlling the array. This will be the components**
14   **of my control system. That's what I mean.**
15   Q   "This type of control system" is
16   referring to the '636 control system, right?
17   A   **Yes, but as an incorporated item, not as**
18   **using a control system to control the array. That's**
19   **what I'm trying to make a distinction.**
20   Q   Well, when it says: "Using this type of
21   control system, the desired horizontal positions and
22   the actual horizontal positions are received from a

196

1   remote control system" -- do you see that?
2   A   **I do.**
3   Q   Okay. So "this type of control system in
4   which the desired horizontal positions and the actual
5   horizontal positions are received from a remote
6   control system" is referring to the '636 system,
7   right?
8   A   **No.**
9   MR. KIKLIS: Objection to form.
10   THE WITNESS: No. I'm trying to make a
11   distinction, and I made it too sharp perhaps in the
12   beginning. "Using this type of control system," in
13   other words, the '636 gives you a bird. Taking this
14   bird into account.
15   Second part, he is teaching and he says:
16   "The desired horizontal positions and the actual
17   horizontal positions are received from a remote
18   control system," meaning in the thing that I'm doing
19   now. That's how I interpret it.
20   BY MR. BERL:
21   Q   You mean the patent's system, '967
22   patent's system?

197

1   A   He's starting now to talk about his own
2 system. That's how I interpret it. And he says,
3 Take this apparatus that I have there, which cannot
4 do control of the overall line. Okay?
5   Q   He doesn't call it an apparatus. He
6 calls it a control system. You keep saying
7 "apparatus" or "bird." It says: "Using this type of
8 control system," right?
9   A   You can call it a bird, you can call it a
10 control system, you can call it an apparatus.
11   Q   Those are three different things, aren't
12 they?
13   A   No, they can be synonymous. Control
14 system is apparatus. The bird has a controller in
15 it. Sometimes we use them interchangeably. That's
16 why -- I'm not trying to wordsmith a sentence, but
17 I'm trying to understand from the context. Because
18 it says: "The actual horizontal positions are
19 received from a remote control system," right?
20   Q   Yes, that's what it says.
21   A   Yeah. And then I look back in the '636
22 patent, and I don't see anywhere any remote control.

198

1   Q   Well, let me ask you this: You think
2 then that this system that is being discussed where
3 you have the desired horizontal positions and the
4 actual horizontal positions being received from a
5 remote control system is then talking about the
6 invention of the '967 patent.
7   A   That's how I interpret it.
8   Q   Okay. Then let's talk about the next
9 sentence. It says: "The actual horizontal positions
10 of the birds may be determined every five to ten
11 seconds, and there may be a five-second delay between
12 the taking of measurements and the determination of
13 actual streamer positions."
14   Do you see that?
15   A   Right.
16   Q   Is he talking about the '967 system?
17   A   No. He's talking about a control system
18 that he's trying to implement, so he is arguing with
19 himself. If I do this now, this is what is going to
20 happen. So he's working his way through the system
21 that he's going to propose at the end.
22   Q   Yes, but when you say he's doing this, he

199

1 is implementing the control system from the previous
2 sentence, right?
3   A   Let's put it from the beginning. There
4 is a sentence about the '636. He says -- the way I
5 interpret it -- and I may have to read once more the
6 paragraph. So let me read the whole paragraph once
7 more so I can give it to you.
8   (Perusing document.) Okay. So, I will
9 put my recollections. He refers to the '636 patent
10 where he has described the bird.
11   Q   Except he refers to it as a system for
12 controlling a bird, rather than a bird, right?
13   A   The system that can change the angle of
14 the fins of the bird. That's what he means by
15 control in my view.
16   And then he says using this type of
17 control system, this bird that we put in there. Then
18 I can take it, and using a remote control system, I
19 can adjust the wing angles and everything else.
20   And then he says, If I do that, given the
21 delays, given all the reasons that he elaborates in
22 the last sentences, there will be some problem. So

200

1 I'm going to do something even more than that, and
2 more of a deterministic system for control of this
3 type is therefore desired.
4   Q   So let's go to the next sentence then.
5 It says: "While this type of system allows for more
6 automatic adjustment of the bird wing angles," do you
7 see that?
8   A   Yes.
9   Q   What is "this type of system" now?
10   A   Can you point me there again?
11   Q   Yes, it's right after the last sentence.
12   A   It is therefore --
13   Q   "While this type of system allows for
14 more automatic adjustment of the bird wing angles."
15   A   Wait a minute. I'm not there.
16   Q   Line 48.
17   A   Okay. "While this type of system allows
18 for more automatic adjustment of the bird wing
19 angles," meaning by putting a remote control.
20   Q   What is "this type of system" referring
21 to? The patented system? The '636 system?
22   MR. KIKLIS: Objection. Form.

201

1   THE WITNESS: My interpretation is that
2   he's working through his patent logic.
3   BY MR. BERL:
4   Q   But what is "this type of system"?
5   MR. KIKLIS: Objection. Form.
6   THE WITNESS: I wouldn't know what
7   exactly Bittleston said. How I interpret it is a
8   system which takes every five to ten seconds
9   measurement and applies this new remote control
10   system that he is talking about.
11   BY MR. BERL:
12   Q   It's the same system as the last
13   sentence. Right?
14   A   **The system from the previous sentence,**
15   **taking the measurements every five to ten seconds.**
16   Q   Yes. Right?
17   A   **Right.**
18   Q   So this system in line 48 is referring
19   to the same system as the sentence that begins on
20   line 45, right?
21   A   **Yes, it's reasonable to assume that.**
22   Q   Okay. And the system that's described in

202

1   the sentence beginning at line 45 is the same system
2   that's referred to in the prior sentence beginning on
3   line 41?
4   A   **No. Because we said the bird is part of**
5   **a new system, now that we're going to use a remote**
6   **control system. My interpretation of this is he's**
7   **arguing why he has to not only put the remote control**
8   **system and everything else, but he has to put also a**
9   **behavior-based control. So he has to give a**
10   **justification for that.**
11   Q   But he's referring to a system here in a
12   paragraph that begins: "Another system for
13   controlling a horizontally steerable bird is
14   disclosed in our published PCT International
15   Application '636," right?
16   A   **Yes. Don't corner the word "system."**
17   **It's used generically for anything. "System" in the**
18   **strict definition of the system is any collection of**
19   **mechanical, electrical devices, which for reasons of**
20   **your own use, you identify as an entity with inputs**
21   **and outputs. So a system can be a motor. A system**
22   **can be a bird. Okay?**

203

1   **So I'm not going to speculate. I'm just**
2   **reading it, and it reads to me reasonable that the**
3   **'636 patent which discloses a bird will be**
4   **incorporated in a new system. But then he says if we**
5   **just use a remote control system, then the five to**
6   **ten seconds and all these other things, because of**
7   **some problems, so I need to go one more step.**
8   Q   The '636 also teaches having desired
9   horizontal positions and actual positions being
10   received. Correct?
11   A   **In the hypothetical. It doesn't say how,**
12   **what, who --**
13   Q   It has arrows with "desired horizontal
14   positions" and "actual horizontal positions," right?
15   MR. KIKLIS: Objection to form.
16   Speculation. Foundation.
17   THE WITNESS: A motor has inputs for
18   controlling a motor. Now, how this motor is going to
19   be controlled depends on the application. So just to
20   have two cables and saying input comes in, without
21   specifying remote control, global control, who gives
22   on what basis, how often, the '636 would not give

204

1   anybody any idea.
2   BY MR. BERL:
3   Q   I'm not asking about that right now. I'm
4   simply asking the system that is being described here
5   in the sentence beginning at column 4, line 41, where
6   it's a control system with desired horizontal
7   positions and actual horizontal positions being
8   received, that is consistent with the '636, correct?
9   A   **The '636 describes a bird. So system is**
10   **the bird and its controller. It's a local**
11   **controller.**
12   Q   The sentence we were looking at before
13   that says: "While this type of system allows for
14   more automatic adjustment of the bird wing angles,"
15   do you see that?
16   A   **Yes.**
17   Q   It then says: "The delay period and
18   relatively long cycle time between position
19   measurements prevents this type of control system
20   from rapidly and efficiently controlling the
21   horizontal position of the bird."
22   Do you see that?

205

1   A   Yes.
2   Q   And so "this system," again you are
3 saying is not the '636 nor is it the patented system,
4 right?
5   A   It's going towards the patent.
6   Q   But it's not an actual system that is
7 described anywhere, right?
8   A   It is a system, again with a generic
9 form, where he's taking the birds from '636, and he
10 says if I apply and all this stuff, then I will
11 have -- not have good control because an element is
12 missing, which he's about to describe it in the next
13 paragraph.
14   Q   Whatever "this type of system" refers to,
15 and I understand your answer of what it refers to,
16 that type of system does provide for automatic
17 adjustment of bird wing angles, right?
18   MR. KIKLIS: Objection to form.
19   THE WITNESS: It doesn't specify this.
20 BY MR. BERL:
21   Q   It says: "This type of system allows for
22 automatic adjustment of the bird wing angles."

206

1   A   If a system is behind it, which he hasn't
2 described it, potentially.
3   Q   Well, whatever system he's referring to
4 here, it's one that's being disclosed to allow for
5 automatic adjustment of the bird wing angles, right?
6   MR. KIKLIS: Objection. Form.
7   THE WITNESS: "Allows" means someone
8 could configure something to make it do this. Okay.
9 He doesn't elaborate because he is going to discount
10 it and go on to describe the good way.
11 BY MR. BERL:
12   Q   He says: "A more deterministic system
13 for controlling this type of streamer positioning
14 device is therefore desired." Do you see that?
15   A   Yes.
16   Q   Then he says: "It is therefore an object
17 of the present invention to provide for an improved
18 method and apparatus for controlling a streamer
19 positioning device."
20   Do you see that?
21   A   Yes.
22   Q   And that is an improved method and

207

1 apparatus compared to the '636, correct?
2   A   Compared to anything. I don't think he
3 specifically is talking about the '636 in this
4 aspect.
5   Q   Let's go further up the column. It says,
6 line 26: "One system for controlling a horizontally
7 steerable bird, as disclosed in UK Patent No. ending
8 '610, is to utilize a manually operated central
9 control system."
10   Do you see that?
11   A   Yes.
12   Q   And that paragraph is referring to the
13 system for controlling a horizontally steerable bird
14 disclosed in the UK '610 patent, right?
15   A   Right.
16   Q   Right?
17   A   (The witness nods.)
18   Q   You have to answer audibly.
19   A   It refers to the system of the UK patent.
20   Q   And the next paragraph then refers to the
21 system for controlling a horizontally steerable bird
22 from the PCT '636, right?

208

1   A   It starts --
2   MR. KIKLIS: Objection. Form.
3   THE WITNESS: It starts with the
4 sentence, but you see the difference. He is talking
5 about the UK patent, and then he says: "Which is to
6 utilize a manually operated central control system."
7   The '636, he doesn't say what system to
8 use. And the '636 doesn't say what system to use.
9 So there's a difference between those patents.
10 That's why I interpret it differently than you
11 suggest the subsequent sentence says.
12 BY MR. BERL:
13   Q   On line 30 of column 2, it says: "While
14 this method greatly simplifies the circuitry" -- do
15 you see that?
16   A   Yes.
17   Q   "This method" is referring to the method
18 of the '610?
19   A   The UK patent.
20   Q   Yes. Right?
21   A   Yes.
22   Q   But when it says: "Using this type of

209

1 control system," on line 41 of column 2, it's not
2 referring in your view to the control system of the
3 '636.
4   A   It's not clear that it says that. Okay?
5   Q   It's not clear what?
6   A   It's not clear what it says.
7   Q   So your view is that column 2 --
8   A   And the six -- if I can finish. And the
9 '636 does not specify a remote control system.
10 That's why I concluded that it's not referring to the
11 '636.
12   Q   So in your view, column 2, line 41, is
13 not clear that it's referring to the control system
14 of the '636.
15   A   And then in view of the next sentence,
16 it's clear that it's not referring to this. In other
17 words, the expression using this type of control
18 system is not clear what exactly he means. But then
19 reading the positions received from a remote control
20 system, these are new things that he's saying there.
21 So it cannot be referring to '636.
22   Q   And the new things that it's referring to

210

1 are, you say, his idea?
2   A   That's how I interpret it, and then he
3 goes on to elaborate every five to ten seconds and
4 five-second delay and so on and so forth. So it gets
5 into the middle of things.
6   Q   So his idea is to have a remote control
7 system.
8   A   That's how he starts. If we do a remote
9 control system, we -- in general.
10   Q   And the remote control system is his
11 global control system.
12   A   No, it's not. Let's give an example here
13 so we can be clear.
14   Let's say we have five kids playing with
15 airplanes, toy airplanes.
16   Whenever you are ready. So, can I
17 continue?
18   Q   No, I -- I understand. I understand your
19 answer, which is the remote control system is not the
20 same thing as the global control system.
21   A   Yeah, but let me give -- let me finish
22 the sentence so that may help understand where we're

211

1 going with this.
2   We have five kids playing with airplanes
3 in the sky. They use a remote control. Each one of
4 them uses a remote control sending devices, but those
5 planes crash against each other because there is no
6 coordination. If now instead of that we put a
7 computer, which uses a remote control within a global
8 control system that's inside the computer, the planes
9 stop crashing with each other.
10   So the global control may employ a remote
11 control to do its job. But someone may say "must
12 employ," but we need to think about that -- whereas
13 the remote control can cause crashings because there
14 is no coordination.
15   Q   The system that's being described on
16 line 41 that says: "Using this type of control
17 system, the desired horizontal positions and the
18 actual horizontal positions are received from a
19 remote control system."
20   Do you see that?
21   A   Yes.
22   Q   And so what that is teaching is that this

212

1 remote control system is providing positions, plural,
2 to the birds, correct?
3   A   Provides in the parlance here the
4 horizontal positions.
5   Q   So it's controlling more than one bird.
6   MR. KIKLIS: Objection. Form.
7   THE WITNESS: It could be one. It could
8 be two. It's not clear what -- where he leads to
9 this. It's until he gets into the middle of that
10 sentence later that it becomes more clear. At the
11 time he is just using hypotheticals.
12 BY MR. BERL:
13   Q   Well, it says one remote control system
14 is providing the desired horizontal positions and the
15 actual horizontal positions, right?
16   MR. KIKLIS: Objection. Form.
17 Misstates.
18   THE WITNESS: It can be several more
19 control systems. At this point it's not clear
20 what -- he's not talking about the global control
21 system.
22 BY MR. BERL:

213

1   Q   But he is talking about one remote
2 control system, right?
3   A   From a remote control system.
4   MR. KIKLIS: Objection to form.
5   THE WITNESS: It's "a." "A" may mean
6 anything.
7 BY MR. BERL:
8   Q   So you don't know whether it means one or
9 multiple remote control systems?
10   A   It's not clear. I mean it's from "a
11 remote control system."
12   Q   It doesn't say there is more than one,
13 does it?
14   MR. KIKLIS: Objection. Form.
15   THE WITNESS: He doesn't say centralized
16 control. That's what I'm looking for.
17 BY MR. BERL:
18   Q   That's not what I'm asking you. I'm
19 asking you, doesn't it say that one remote control
20 system controls multiple birds?
21   MR. KIKLIS: Objection. Form.
22   THE WITNESS: He says "from a remote

214

1 control system." Is it the same for all of them? Is
2 it different?
3 BY MR. BERL:
4   Q   You can't tell? No?
5   A   "A remote control system," what can you
6 construe from this? He doesn't say anything about
7 it.
8   Q   You can't construe whether it's more than
9 one?
10   A   It could be.
11   Q   "A" usually means one, right?
12   MR. KIKLIS: Objection. Form.
13   THE WITNESS: "A" means some.
14 BY MR. BERL:
15   Q   Some remote control systems?
16   A   If you wanted to say one, you would say
17 one.
18   Q   It says: "The positions received from a
19 remote control system are then used by a local
20 control system within the birds."
21   Is that right?
22   A   "By a local control system within the

215

1 birds."
2   Q   So the remote control system provides
3 information that's used by multiple birds to adjust
4 wing angles, right?
5   A   We don't know. He doesn't go into the
6 architecture of the thing. It could be humans doing
7 the remote control.
8   Q   Well, first of all, it's multiple birds,
9 correct?
10   MR. KIKLIS: Objection. Form.
11   THE WITNESS: He's talking -- he's
12 talking about the birds. Now, whether each bird
13 receives individual attention or coordinated or -- he
14 doesn't specify. We don't have any specifics.
15 BY MR. BERL:
16   Q   Other than by saying a local control --
17 "a remote control system," right?
18   A   "From a remote control system."
19   Q   And whatever system he is referring to,
20 again, is not a manual system. "This type of system
21 allows for automatic adjustment of the wing angles,"
22 correct?

216

1   MR. KIKLIS: Objection. Form.
2 Misstates.
3   THE WITNESS: Allows.
4 BY MR. BERL:
5   Q   So --
6   A   Allows for.
7   Q   -- whatever is provided there, allows is
8 the same as permits manual -- automatic adjustment,
9 right?
10   MR. KIKLIS: Objection to form.
11   THE WITNESS: Could be. Possible.
12 Allows for.
13 BY MR. BERL:
14   Q   And the last sentence says: "A more
15 deterministic system for controlling this type of
16 streamer positioning device" -- "this type of
17 streamer positioning device" is referring to what?
18   A   He is making arguments about the system,
19 whether it will have five to ten seconds and the
20 like.
21   Q   I'm on the last sentence: "A more
22 deterministic system for controlling this type of

217

1 streamer positioning device," what is "this type of
2 streamer positioning device" referring to?
3   A   I'm clear what I interpret it to say is
4 that a system with a local control system receiving
5 some from a remote control system in there would
6 suffer necessarily from the five to ten seconds and
7 the like, so something better is needed.
8   Q   "This type of streamer positioning
9 device" is referring to the streamer positioning
10 device in the '636, is it not?
11   A   No, because that's not a streamer
12 positioning device, per se. It's a device to produce
13 forces.
14   Q   The '636 does not disclose a streamer
15 positioning device?
16   A   It's describing a -- what it describes is
17 a bird that can produce forces, which you can use it
18 to position.
19   Q   And a bird is a streamer positioning
20 device.
21   A   Yes. But I think here when he is talking
22 about "a more deterministic system," he is referring

218

1 to what he has argued above, which is not the '636
2 system. It's more than that.
3   Q   But when he says "this type of streamer
4 positioning device," he's referring to the streamer
5 positioning device of the '636.
6   A   No.
7   Q   The birds. No?
8   A   No.
9   Q   What other bird is he referring to then?
10   A   He's referring to -- he's referring
11 that -- this is not the bird that he's talking about.
12 He's talking about the marine seismic streamers
13 control system.
14   Q   When it says "this type of streamer
15 positioning device" --
16   A   He described above a system where the
17 actual position of the birds may be determined and
18 everything else. That is not part of the '636. He
19 is saying every five to ten seconds and everything
20 else, such a system would suffer from delays.
21   Q   I'm not asking about the system right
22 now. I'm asking about the SPD. When he says "this

219

1 type of streamer positioning device," that's
2 referring to the '636 bird, is it not?
3   MR. KIKLIS: Objection. Form.
4   THE WITNESS: It is -- it could be.
5 BY MR. BERL:
6   Q   Okay. So you agree -- and in fact, the
7 '636 bird is the only bird that's referenced in this
8 paragraph, right?
9   A   It is, but it's unknown whether it is in
10 the context of discussing this or the previous one.
11 You want to make it very narrow.
12   Q   So if you -- so you agree that the last
13 sentence in referring to "this type of streamer
14 positioning device" may be referring to the '636
15 bird, but when it is discussing the system that it
16 wants to make more deterministic, that's not
17 referring to the '636, right?
18   MR. KIKLIS: Objection. Form.
19   THE WITNESS: It is unclear what he means
20 given the intervening sentences. He jumps from one
21 system to the other.
22 BY MR. BERL:

220

1   Q   When you say the "other," there is a
2 system -- there's -- that he says is present for
3 controlling a horizontally steerable bird that's
4 disclosed in the '636, and then he has the present
5 invention, which he talks about in the next paragraph
6 starting on line 55. There is no other system being
7 disclosed here, is there?
8   MR. KIKLIS: Objection. Form.
9   THE WITNESS: It's -- I can argue that
10 he's talking about a hypothetical system which he
11 finds that doesn't work and he introduces the next
12 system, which will be good.
13 BY MR. BERL:
14   Q   Where does he ever say he is talking
15 about a hypothetical system?
16   A   Well --
17   MR. KIKLIS: Objection. Form.
18   THE WITNESS: -- the whole sentence is a
19 conjecture. Let's assume that I'm taking this, and
20 then let's say I'm using a local control system
21 that's driven by a remote control -- all these are
22 not in the '636 patent.

221

1   BY MR. BERL:
2   Q   Would you have reached the same
3   conclusions, Doctor, if you had read this paragraph
4   without looking at the '636 patent about what this
5   paragraph means, starting on line 38 and ending on
6   line 55 of column 2 of the '967 patent?
7   A   This is a hypothesis that I can't -- if
8   you put this sentence in front of me, I would say,
9   Let me see the '636. There is no way I can -- I
10   can't do it otherwise.
11   Q   Okay. So your opinions that you're
12   rendering are the result of your consideration of the
13   language we've been looking at in column 2 in
14   conjunction with your analysis of the '636.
15   A   They helped. It's not the exclusive
16   reason. But the language speaks also for itself.
17   Q   Okay. Let me hand you what's been marked
18   as Exhibit 1004. So you have it. It's the '967
19   petition. That's the '636 PCT. And then we'll also
20   give you what has been marked as 1019 in the '967
21   proceeding, the Langland '990.
22   Do you have the '636, Doctor?

222

1   A   Yes, I do.
2   Q   And if you go to page 5 of the '636.
3   Do you see there is a sentence that says:
4   "The lateral position signals are typically derived
5   from a position determining system" --
6   A   Whereabouts?
7   Q   Two-thirds of the way down.
8   "The lateral position signals are
9   typically derived from a position determining system
10   of the kind described in our U.S. Patent 4,992,990 or
11   our International Patent Application W096/21163."
12   Do you see that?
13   A   Yes.
14   Q   And the '636 there is identifying the
15   '990 patent as being used for its position
16   determining system to derive lateral position
17   signals, right?
18   A   It states that "typically derived." It
19   doesn't say how or what.
20   Q   But it's clear what the '990 patent is
21   being used for here in the '636. It's to derive
22   lateral position signals from a positioning

223

1   determining system of the kind used in the '990
2   patent.
3   A   Right. But he provides no details
4   whatsoever, and that's why it was not successful as a
5   patent, right?
6   Q   When you say "it was not successful as a
7   patent," you're saying the '636?
8   A   The '636.
9   Q   In your view, with the '636 in hand, a
10   person of ordinary skill in the art could not
11   laterally steer streamers.
12   A   Right.
13   Q   So that the lateral steering of streamers
14   that WesternGeco ultimately was able to obtain and
15   commercialize was not the result of the '636 PCT
16   disclosure but, rather, due to its later patents.
17   A   It was contributing to that, but what you
18   asked me is just with the '636.
19   Q   Just with the '636, one could not
20   laterally steer streamers.
21   A   Successfully, yes.
22   Q   Okay. And so that the most important

224

1   contributing factor to the ability to laterally steer
2   streamers are the later patents, such as the
3   Hillesund patents that we're discussing here.
4   A   Right.
5   Q   You don't address the question of
6   incorporation by reference in your declaration, do
7   you?
8   A   Can you be more specific?
9   Q   Yes, there is a doctrine called
10   "incorporation by reference." Do you address in your
11   declaration the question of whether Langland, the
12   '990 patent, is incorporated by reference into the
13   PCT '636?
14   A   I would have to be reminded in my report
15   how I did it.
16   Q   I didn't see it.
17   A   I'm not recalling right now.
18   Q   You address Langland in paragraph 184 of
19   your declaration. I didn't see any opinion there
20   about incorporation by reference. I just want to
21   confirm that that's not something that you
22   considered.

225

1   A   Okay. Since I'm not -- if you will
2   remind me exactly what it is so I can refresh my
3   memory.
4   Q   Well, do you see paragraph 184?
5   A   Yes.
6   Q   And there you discuss Langland, correct?
7   A   Yes.
8   Q   And you agree that Langland describes
9   using acoustics to determine the position of two or
10 more seismic streamers, right?
11   A   Yes.
12   Q   And then you distinguish it on the basis
13 that it does not, for example, describe a system for
14 steering streamers laterally, right?
15   A   Correct.
16   Q   But that sentence does not -- or that
17 paragraph does not address the issue of incorporation
18 by reference.
19   A   Okay. So you can read me what
20 "incorporation by reference" is.
21   Q   Well, I'm not going to sort of get into
22 the meaning of the doctrine. Let me just ask you

226

1   whether you address incorporation by reference.
2   A   I do not recall offhand. I don't see it
3   in front of me whether I did or not.
4   Q   Okay. The '636, as you said earlier,
5   discloses horizontally steerable birds, right?
6   A   Yes.
7   Q   And the purpose -- one purpose of the
8   horizontally steerable birds of the '636 are to avoid
9   streamer tangling, correct?
10   A   It was one of the concepts, yes. One of
11 the goals.
12   Q   And that is in your airplane example, the
13 analogy of the planes crashing into each other when
14 the kids are all playing with them, right?
15   A   The analogy, yes.
16   Q   And if one wants to avoid the crashing of
17 the airplanes in your analogy, one would want a
18 single system to control all of the airplanes, right?
19   A   Correct.
20   Q   And likewise, if one wanted to avoid the
21 streamer steering -- or the streamer tangling problem
22 in the '636, what one would do is have a system that

227

1   controls all of the birds, correct?
2   MR. KIKLIS: Objection to form.
3   THE WITNESS: But it's not just that, and
4   that's why he realizes it in his later patent after
5   he has the time to think about it.
6   But it's not just the coordination.
7   Remember in the beginning we spoke about the hated
8   mass forces, the Coriolis, the centrifugal, and the
9   like?
10 BY MR. BERL:
11   Q   Yes.
12   A   And the traveling waves, the delays. So
13 imagine you have hundreds of these and you start now
14 having one after the other. Not only you have to
15 coordinate them, you have to remember what you did
16 the last 10 minutes, because what you did 10 minutes
17 at the beginning of the array will reach the end of
18 the array. So all of a sudden, it's not only the
19 coordination, it's to remember everything else.
20   That's what precludes human control.
21 Humans are extremely good at controlling things, but
22 they have to be within certain time constants.

228

1   Something less than a second is difficult to control.
2   Something that is more than a few minutes, it's very
3   difficult to remember. So these have several
4   minutes.
5   So the issue here is with control. You
6   can do -- with bad control, you can do worse than
7   uncontrolled. You can tangle really bad because you
8   put energy into the system. If you put it in the
9   wrong place, it will lose stability.
10   So he is going through this chain of
11 thinking, and now he has reached the point where he
12 says, Aha, we need to coordinate, but coordination is
13 not enough. It's not only the delay in getting the
14 signal. It's the delay of the response of these
15 things, which are very complicated.
16   Q   So I think what you mean is that a person
17 of skill looking at the '636 would want to have a
18 system that coordinates all of the birds, but because
19 they have to account for all of these forces, the
20 traveling waves, the Coriolis forces, the centrifugal
21 forces, that they wouldn't be able to.
22   A   There was a desire in the industry to

229

1 have such a system, but it was not at the point
2 where, Hey, we have his system, now let's do a global
3 control, because there were other considerations.
4 People doing the towing didn't want any noise.
5   So it was a question mark whether
6 closed-loop control was even feasible before it was
7 done. There was a question whether it would ever be
8 done.
9   Q   These phenomena that you're describing,
10 the traveling waves, the Coriolis forces, centrifugal
11 forces, these were all known phenomena, correct?
12   A   They've been studied in the '90s still as
13 a phenomena. And going from there to actually
14 building a patent, it requires sort of imagination
15 and synthesis.
16   Q   So I just want to make sure I understand
17 this.
18   A person of skill would have wanted a
19 global control system that coordinated all of the
20 birds and would have known that there are all these
21 phenomena and forces, like the Coriolis forces and
22 the traveling waves, but wouldn't have been able to

230

1 provide a model of a system that successfully modeled
2 all of those forces in a streamer, right?
3   MR. KIKLIS: Objection. Form.
4   THE WITNESS: No, it's not that. It
5 requires an inventiveness, which requires someone to
6 sit down and do it.
7 BY MR. BERL:
8   Q   To actually model it.
9   A   Or to say, Hey, we will bite the bullet
10 and do it.
11   Q   When you say "do it," you mean model the
12 forces on the streamer?
13   A   No. Do control. Bittleston was heading
14 this effort, and I'm sure there were doubters, people
15 who would say they will never accept these devices
16 because they're noisy.
17   So, perhaps, we will have a chance to
18 revisit this. But if I can be in his shoes, you
19 know, what he is talking about hydrodynamics now and
20 everything else, this cannot be done. These things
21 are noisy. These things are huge. Why do you
22 bother?

231

1   Q   And what you're saying then is inventive
2 is -- well, let me ask it this way: The goal to have
3 a global control system to coordinate all of these
4 things were known and the forces that acted on the
5 streamers were known. The inventive aspect you're
6 saying is to decide to go forward and actually build
7 a model of the forces on the streamer, this behavior
8 predictive model, and then implement it to steer
9 streamers effectively. Right?
10   A   It's the other way around. Once you
11 decide to go for it, then you find the global control
12 among other choices. Someone would say, The captain
13 will never let you do that. He will want to have
14 global control -- human control, sorry.
15   So, no, it was not an obvious choice, the
16 global control. And the predictive model sounded too
17 difficult for some people. The model-based control,
18 and he did it. So that's the invention, inventive
19 part.
20   Q   To actually do a model?
21   A   To sit down and do it.
22   Q   To sit down and account for all these

232

1 forces that you've described.
2   A   And have the skills and the like. It's
3 not automatic.
4   MR. KIKLIS: Objection. Form.
5   THE WITNESS: Nothing is automatic.
6   MR. KIKLIS: Let me get my objections in,
7 Dr. T.
8   THE WITNESS: Okay.
9   MR. KIKLIS: I did.
10   THE WITNESS: I'm -- I have to get a
11 bottle of water.
12   MR. BERL: You want to take a quick
13 break?
14   THE WITNESS: We can continue a little
15 more. What time is it?
16   MR. KIKLIS: It's almost 2:00.
17   MR. BERL: Have we been going an hour?
18   MR. KIKLIS: We've been going for about
19 an hour.
20   MR. BERL: We can take a quick break.
21   (Recess.)
22 BY MR. BERL:

233

1   Q   All right. Doctor, you have your
2 declaration in front of you. Could you turn to
3 paragraph 38 and 39. That's on page 20.
4   A   Yes.
5   Q   And there you discuss some of the
6 mechanics of cables in the ocean, right?
7   A   Yes.
8   Q   And some of the forces that act upon
9 streamers, correct?
10   A   Correct.
11   Q   And it includes some of the things that
12 you testified about this morning, like tension,
13 right?
14   A   Yes.
15   Q   And also you talk about complex phenomena
16 such as the worm-in-hole effect; is that right?
17   A   Correct.
18   Q   And is that an important effect on
19 streamers?
20   A   It can have an effect, yes.
21   Q   And then in paragraph 39, you say: "The
22 dynamics of the streamer that I describe in the

234

1 previous paragraphs must be counted for fully within
2 the control system design."
3   Do you see that?
4   A   Which number --
5   Q   Paragraph 39.
6   A   Yes.
7   Q   And you say: "If the dynamics are
8 omitted, then the closed-loop system will perform
9 poorly or become unstable." Right?
10   A   Yes.
11   Q   That's your opinion. Right?
12   A   It is my opinion based on fact.
13   Q   And your opinion is that, unless one
14 accounts for the various forces that you describe in
15 paragraph 38 and before paragraph 38, as you see on
16 the previous page about the traveling waves, then the
17 system will perform poorly or be unstable.
18   A   It could be.
19   Q   You say "will perform poorly."
20   A   There will be circumstances where it will
21 behave poorly.
22   Q   And that's why one needs a behavior-based

235

1 predictive model, right?
2   A   Right.
3   Q   And the behavior of a -- well, new
4 question.
5   The use of a behavior-based model is
6 different from simply accounting for positions on a
7 streamer and the velocity of the towed streamer or
8 vessel, right?
9   A   It depends whether you have included the
10 model or not.
11   Q   Including the model is different from
12 simply relying on position and velocity, right?
13   A   Right.
14   Q   Relying simply on position and velocity
15 is not a behavior predictive model.
16   A   It could be if you have some elementary
17 system, an elementary transfer function there between
18 relating the two. If the two are completely
19 unrelated, if you don't know what kind of system
20 you're talking about, then it's not a model-based.
21   Q   When you say "an elementary transfer
22 function there relating the two," what do you mean a

236

1 transfer function relating the two?
2   A   Relating the velocity and position to the
3 forces that you are applying.
4   Q   But if you're just accounting for
5 velocity and position, then that's not a behavior
6 predictive model.
7   A   Right. It's blank.
8   Q   Yes. And in your view the claims of the
9 Hillesund patent require the use of a behavior
10 prediction model?
11   A   Because they state so.
12   Q   The claims of the '967, '607 and '520.
13   A   The specifications.
14   Q   And the claims require that.
15   A   The claims state certain conditions,
16 which are conditional on what the specifications say.
17   Q   Right. And in order to practice these
18 claims -- as you already testified, I just want to
19 make sure you haven't changed your view -- the
20 behavior prediction model has to be used.
21   A   A prediction model, yes.
22   Q   A behavior prediction model.

237

1   A   Behavior-based.

2   Q   Yes, I'm right?

3   A   Yes.

4   Q   Now, I want to discuss with you your

5   interpretation of the claim term "predicting

6   positions" that appears in the '607 patent.

7   Do you recall your analysis of that claim

8   term?

9   A   Yes. Can you point me to a specific

10   place so I can have some reference?

11   Q   Sure. You conclude on paragraph 88 of

12   page 42, do you see the section called "Predicting

13   Positions"?

14   A   Yes.

15   Q   And that claim term appears in the claims

16   at issue in the '607 patent, right?

17   A   Correct.

18   Q   And it says: "The broadest reasonable

19   interpretation of 'predicting positions,' based on

20   the specifications of the patent at issue from the

21   standpoint of one having ordinary skill in the

22   relevant art as of the priority date of the patent at

238

1   issue, is," quote, "determining positions using a

2   behavior predictive model."

3   Do you see that?

4   A   Yes.

5   Q   And so that is the broadest reasonable

6   interpretation of predicting positions as used in the

7   '607 claims, right?

8   A   This is how I view it. Yes. This is

9   my --

10   Q   Any other construction that did not

11   require using a behavior predictive model would be

12   unreasonable.

13   A   It will be incomplete again, and it would

14   put this as an underlying assumption. So I might as

15   well spit it out.

16   Q   Well, if a construction of predicting

17   positions did not require using a behavior predictive

18   model, then it would be broader than the construction

19   that you have advanced here in paragraph 88, which

20   does require using a behavior predictive model.

21   A   To be included in the phrase, it is

22   narrowing it down according to the patent.

239

1   Q   You have narrowed down what "determining

2   positions" to mean and you've narrowed it by

3   requiring using a behavior predictive model.

4   A   Equivalently, as I state here in the

5   footnote, it could be estimating the actual locations

6   with the underlying assumption of predict -- behavior

7   predictive model.

8   Q   In other words, you could alternatively

9   construe predicting positions as estimating the

10   actual locations using a behavior predictive model.

11   A   Which springs from the -- from the

12   patents.

13   Q   So, but what you mean in footnote 5 that

14   you just referred to on page 43 of your declaration

15   is that if you're applying any other interpretation

16   of predicting positions, such as estimating the

17   actual locations, that would be done in conjunction

18   with the required use of a behavior predictive model.

19   A   Yes.

20   Q   Okay. But you did not apply any

21   construction that does not require use of a behavior

22   predictive model.

240

1   A   It will depend on the -- on the

2   conditions under which I would apply such a thing. I

3   would have to consider it, but --

4   Q   In your analysis of the '607 patent,

5   though, in this case, you did not apply any

6   interpretation of predicted positions that did not

7   require using a behavior predictive model.

8   A   Well, as I say in my footnote, I used the

9   -- estimating the actual locations.

10   Q   But then you added to that, that it would

11   be estimating the actual locations using a behavior

12   predictive model.

13   A   Because, as I state, the prediction

14   platform would not come from thin air, and,

15   therefore, we have to turn immediately to the patent.

16   Q   And, therefore, it would require use of a

17   behavior predictive model in your analysis.

18   A   According to the patent.

19   Q   Yes, under the patent, was that answer?

20   A   According to the patent.

21   Q   So, yes, you agree with me?

22   A   Yes.

241

1   Q   But to the extent that one interpreted
2   the term "predicting positions" from the '607 patent
3   without requiring use of a behavior predictive model,
4   you think that would be an incorrect interpretation
5   of the claim.
6   **A   It would be incomplete.**
7   Q   And incorrect?
8   **A   Incomplete. You need to complete it with**
9   **behavior-based.**
10   Q   And if you don't complete it with
11 behavior-based, it's --
12   **A   It would be incomplete.**
13   Q   And wrong.
14   MR. KIKLIS: Objection to form.
15   THE WITNESS: Incomplete.
16 BY MR. BERL:
17   Q   I guess I don't understand the
18 distinction you're making between "incomplete" and
19 "wrong."
20   Is it a correct interpretation of the
21 claims of the '607 to apply them to the prior art,
22 for example, without requiring use of a behavior

242

1   predictive model?
2   MR. KIKLIS: Objection. Form.
3   THE WITNESS: The patent states certain
4   things, so we have to follow them.
5   BY MR. BERL:
6   Q   And so in your view, it would be
7   incorrect to apply the claims of the '607 patent to
8   the prior art for validity analysis without requiring
9   use of a behavior predictive model, right?
10   MR. KIKLIS: Objection. Form.
11   THE WITNESS: It would be incomplete,
12 because then you would need to add one component. So
13 it's not incorrect, it's incomplete.
14 BY MR. BERL:
15   Q   What is there is correct potentially, but
16 because you have to do something else in order to
17 complete it, it's not correct?
18   MR. KIKLIS: Objection. Form.
19   THE WITNESS: It's not complete.
20 BY MR. BERL:
21   Q   The analysis that would be conducted to
22 compare the '607 claims, for example, to the prior

243

1   art in a validity analysis, if it did not include a
2   requirement to use a behavior predictive model would
3   not be a proper analysis because it would be missing
4   a requirement of the claims to use a behavior
5   predictive model, correct?
6   **A   It will depend --**
7   MR. KIKLIS: Objection. Form.
8   THE WITNESS: It will depend on the
9   conditions. There will be conditions -- cases where,
10 yes, that would be true. Other conditions -- we have
11 to look at it case by case.
12 BY MR. BERL:
13   Q   No, but my question is applying the
14 claims of the -- you understand that a validity
15 analysis involves a comparison of the claims of the
16 patent to, for example, the prior art disclosure,
17 right?
18   **A   Right.**
19   Q   And so what I'm asking is, if one
20 compared the claims of the '607 patent to the prior
21 art without applying a requirement of using a
22 behavior predictive model, that would be incorrect.

244

1   MR. KIKLIS: Objection. Form.
2   THE WITNESS: I answered this question.
3   It will be incomplete.
4   BY MR. BERL:
5   Q   Well, let me put it another way. Would
6   it be possible for a prior art reference to
7   anticipate the '607 patent -- you apply anticipation
8   in your report, correct?
9   **A   Yes.**
10   Q   And you understand that anticipation
11 requires the limitations to be disclosed in a prior
12 art reference, right?
13   **A   Every single one, yes.**
14   Q   Okay. Would it be possible in a proper
15 analysis of the '607 patent claim validity to have a
16 prior art reference that anticipates the '607 patent
17 claims that does not include a use of a behavior
18 predictive model in a prior art reference?
19   **A   You are talking about anticipation.**
20 **There are several items in the claims. I have to**
21 **look at it and decide on the -- on -- it's an**
22 **incomplete hypothetical.**

245

1   Q   I want you to assume that I am allowed to
2 ask you hypothetical questions, and you will have to
3 do your best to answer them. If you don't understand
4 my question, I will try to clarify, but I think I'm
5 being very clear.
6   If one has a prior art reference that
7 otherwise includes all the limitations of the claims
8 of the '607 patent, but does not use a behavior
9 predictive model, under a proper analysis of validity
10 in your view, can that prior art reference anticipate
11 the claims of the '607 patent?
12   MR. KIKLIS: Objection. Form.
13 Incomplete hypothetical.
14   THE WITNESS: I have not seen any such
15 patents anticipating. And it will depend on the
16 circumstances. What you are saying could be possibly
17 violating the -- not anticipating because of the lack
18 of prediction.
19 BY MR. BERL:
20   Q   Why does it depend on the circumstances?
21 If the claims require, as you say, determining
22 positions using a behavior predictive model, then how

246

1 could a prior art reference anticipate without having
2 a use of a behavior predictive model?
3   MR. KIKLIS: Objection. Form.
4   THE WITNESS: It's completely
5 hypothetical, so I have to say that it's -- looking
6 here, you are trying to tell me that there is a
7 magical patent which anticipates everything except
8 behavior-based. There is no such patent.
9 BY MR. BERL:
10   Q   But you are fighting my hypothetical,
11 Doctor. I want you to assume that's the case.
12 Whether there is a magical or actual or hypothetical
13 patent doesn't matter. I want you to assume that
14 that's the disclosure of the prior art reference, and
15 I'm trying to understand the analysis that you
16 believe is the correct analysis.
17   Can a prior art reference anticipate the
18 claims of the '607 patent if it does not use a
19 behavior predictive model, yes or no?
20   A   So I --
21   MR. KIKLIS: Objection. Form.
22   THE WITNESS: I have to understand what

247

1 you are saying here. Here is a patent that
2 anticipates the importance of dynamics. There is a
3 patent that anticipates the need for global control.
4 And then depending on which patent we refer to,
5 anticipates every other thing, but it does not point
6 to the behavior-based control.
7   So I will have to look whether it is
8 implicit in what else it recognizes. If it said, for
9 example, that the dynamics are important and someone
10 has to study them extensively, it could be
11 construed that it's including behavior prediction,
12 but it would be farfetched. So I'm speculating
13 completely now.
14 BY MR. BERL:
15   Q   I want you to assume it does not include
16 a behavior predictive model. Implicitly or
17 explicitly, it doesn't have a behavior predictive
18 model.
19   A   But it may have a dynamic model.
20   Q   It doesn't have a dynamic model either.
21 Can it anticipate the '607 claims?
22   A   If it doesn't have any dynamic model, any

248

1 prediction model, and under the proviso right now,
2 I'm thinking without the benefit of looking at the
3 '607 complete, it does not anticipate in that case.
4 But under all these conditions, it's complete
5 speculation.
6 BY MR. BERL:
7   Q   This construction that we looked at in
8 paragraph 88 of your report, you still believe that
9 to be the proper construction, right?
10   A   I do.
11   Q   And a construction of predicting
12 positions that does not include using a behavior
13 predictive model, you still believe to be incomplete,
14 right?
15   A   Can you specifically -- I can't get what
16 the question is.
17   Q   Like estimating the actual conditions.
18 Locations, for example. That's an incomplete
19 definition to the extent that it does not require
20 using a behavior predictive model, right?
21   A   Correct.
22   Q   And if you look to the patent, and we

249

1   can -- I can give you the '607 if you'd like or we
2   can keep looking at the disclosure of the '967, we've
3   discussed already the language in the specification
4   that identifies the behavior predictive model, right?
5   A   We did discuss it, yes.
6   Q   In column 4, right?
7   A   Yes.
8   Q   The patent uses the term "behavior
9   predictive model" once, right?
10   A   We identify that it does in column 4. It
11   may contain it somewhere else too, but for sure
12   there, yes.
13   Q   You are aware of nowhere other than
14   column 4 where the phrase "behavior predictive model"
15   is used in the Hillesund patents, right?
16   A   I can look at the document now. I
17   remember that this is one location. Because it so
18   happens that I've seen it in Bittleston's deposition,
19   I've seen it in his personal notes.
20   Also, you have to remember that we can
21   see it today in three different locations, because
22   the '967, the '607 and the '520 patents all contain

250

1   the same.
2   Q   Right, they all contain --
3   A   They repeat it three times.
4   Q   Well, it's repeated once in each one,
5   which makes it three times, right, because the
6   specifications of the three patents are the same?
7   A   Right. He didn't change his mind along
8   the way. It's obviously a very important topic for
9   him.
10   Q   Do you know whether he in fact wrote the
11   specification three times or whether it's just the
12   same specification that's used in all three patents?
13   MR. KIKLIS: Objection. Form.
14   THE WITNESS: What I'm saying is he gave
15   prominence to this item in his speech also, and I'm
16   pointing out that it's three times in the three -- in
17   the three patents.
18   BY MR. BERL:
19   Q   One time in the three patents.
20   A   One time that we see it explicitly, but I
21   remember that it's somewhere else. I have to look
22   where exactly.

251

1   Q   The phrase "behavior predictive model" --
2   A   Something about "behavior predictive,"
3   whether it is here or whether in his deposition, I
4   don't remember.
5   Q   Okay. You can't identify anywhere other
6   than column 4 in that one sentence we discussed
7   earlier where that phrase is used.
8   A   I didn't say that.
9   MR. KIKLIS: Objection. Form.
10   THE WITNESS: I said if you ask me to
11   read the patent now, maybe I'll be able to identify
12   where I remember related things. You want me to go
13   ahead?
14   BY MR. BERL:
15   Q   No. That's fine. I have your answer.
16   Now, you also rely on the statement that:
17   "The global control system preferably maintains a
18   dynamic model of each of the streamers."
19   A   Yes.
20   Q   Is that right?
21   A   Yes.
22   Q   And are you looking at the '967 patent?

252

1   A   Yes, that --
2   Q   Let's actually use the '607 patent just
3   so the record is a little more clear. Let me hand
4   that to you. It's Exhibit 1001 in the '607 case,
5   which is the 688 case. I just don't want the record
6   to get confused.
7   You have the '607 patent, Doctor?
8   A   I have it in front of me, yes.
9   Q   Okay. And in the '607 patent, in
10   column 4, there is a statement starting on line 28
11   that: "The global control system preferably
12   maintains a dynamic model of each of the streamers."
13   Do you see that?
14   A   Yes.
15   Q   And that sentence does not require the
16   use of a dynamic model for each of the streamers,
17   right?
18   A   We just read that it maintains a dynamic
19   model.
20   Q   It preferably maintains a dynamic model,
21   correct?
22   A   Right. But when he says it will use a

253

1   model-based control, it implies it will have to use a
2   modeled control for the system, for the entire
3   system.
4   Q   So it's your view that the global control
5   system is required to maintain a dynamic model?
6   A   My view is that's what the patent comes
7   down to it.
8   Q   And -- so the answer is "yes"?
9   A   Yes.
10   Q   And it's your view that the '607 patent
11 and its claims require the use of a behavior
12 predictive model, correct?
13   A   That's what I read from the patent.
14   Q   Okay. Now, you see that the '607 patent
15 on the first page, if you go to the front on the
16 left, it says: "Continuation of Application
17 787,723." Do you see that?
18   A   Yes.
19   Q   Which was filed on September 28, 1999,
20 which is now Patent 6,932,017, right?
21   A   I see that.
22   Q   And have you looked at that '017 patent?

254

1   A   I have in the past.
2   Q   In connection with this case?
3   A   And I may have looked at it with this
4   case. I don't remember right now how recently I
5   looked at it.
6   Q   Did you look at the file history? Do you
7   know what a file history is?
8   A   Yes, I do.
9   Q   Did you look at the file history of the
10 '017 patent?
11   A   Of course. When I look at the patent, I
12 make sure to go to that.
13   Q   Every time you look at a patent, you look
14 at the file history too?
15   A   The first time, I looked at it just out
16 of curiosity to see how -- how it developed.
17   Q   And did you do that on your own?
18   A   Oh, that was recommended to me to do.
19   Q   And so when you find a patent, for
20 example, on -- you find patents on Google?
21   A   Not when I do it for my hobby, but if I
22 do it for a case, I make sure to have a sense of the

255

1   history.
2   Q   And how do you obtain the history?
3   A   In this case, I remember clearly that it
4   was provided to me, because I asked for a number of
5   patents, and the whole -- because sometimes it's not
6   so straightforward to get the history. So it was
7   provided to me.
8   Q   So then you think you looked at the
9   history of the '017 patent.
10   A   Yes. Do I make a reference in my report
11 to the '017 patent?
12   Q   No, the WesternGeco's patent owner
13 response which we looked at earlier makes reference
14 to the '017 patent.
15   A   Okay. So that's why I don't remember it
16 very, very clearly, but I'm sure I've looked at it
17 because I remember it from the previous case.
18   (Exhibit No. 1080 was marked for
19   identification.)
20 BY MR. BERL:
21   Q   Let's give you Exhibit 1080. For the
22 record, this will be 1080 in each of the cases.

256

1   And for the record, Exhibit 1080 is
2   entitled "USPTO." It has Bates Nos. WG422, and says
3   "Application No. 09/787,223."
4   A   Where are you referring to, the second
5   page?
6   Q   The first page. I'm just identifying the
7   document. And its pages 422 through 26 for
8   identification.
9   A   Yes.
10   Q   Do you see the application number on the
11 first page, Doctor, is the same application number
12 that we looked at a moment ago that the '607 patent
13 claims priority to? 09/787 --
14   A   723, yes.
15   Q   -- 723.
16   A   Yes, I can see that.
17   Q   So this is the patent that -- this is the
18 application that the '607 patent claims priority to.
19 And if you could turn -- do you understand that
20 this -- here what we're looking at is an office
21 action; this is a rejection from the Patent Office.
22   A   Okay.

257

1   Q   Is that right?
2   **A   That's what I see here.**
3   Q   Okay. And then you see here it starts
4 "Detailed Action" on page 2?
5   **A   I do.**
6   Q   And then if you turn to the next page,
7 page 3 -- well, it says: "Claims 25 through 48 are
8 rejected under 35 USC 103(a) as being unpatentable
9 over Elholm." Do you see that?
10   **A   Yes.**
11   Q   And then it says: "Elholm discloses the
12 method and apparatus as recited in the claims, except
13 that in the claims of plurality of positioning
14 devices along the streamer is recited."
15   Do you see that?
16   **A   I see that.**
17   Q   And then it says: "The use of plurality
18 of positioning devices is well known in the art as
19 evidenced from the disclosure in Figure 1 of the
20 present application and acknowledged as prior art."
21   Do you see that?
22   **A   I see that.**

258

1   Q   So you understand that the claims of the
2 223 -- '723 application, excuse me, to which the '607
3 patent claims priority were rejected over this Elholm
4 reference, correct?
5   **A   That's what I read from this paragraph.**
6 **I don't recall what the continuation of this was,**
7 **what happened to the claims and --**
8   Q   Okay. Let's see what happened next.
9   Let me give you a response, which is
10 previously marked at least in the 688 case as
11 Exhibit 2067. Do you see this --
12   MR. KIKLIS: What is the exhibit number
13 on this?
14   MR. BERL: 2067. It's at the bottom
15 right.
16   MR. KIKLIS: Oh, okay.
17   MR. BERL: In the 688 case, the '607
18 patent case.
19   MR. KIKLIS: Okay.
20 BY MR. BERL:
21   Q   Do you see on the front of Exhibit 2067,
22 Doctor, it says: "Response to office action dated

259

1 February 26, 2003"?
2   **A   Yes.**
3   Q   And do you see the document we just
4 looked at, Exhibit 1080, on the front was the office
5 action that says "Date mailed 2/26/03"?
6   Exhibit 1080, that's the office action we
7 just looked at.
8   **A   Yes.**
9   Q   So what we're looking at, 2067, is the
10 response to the office action we just looked at,
11 1080, correct?
12   **A   Correct.**
13   Q   And at page 2, do you see that it says:
14 "Please amend the claims according to the following
15 replacement claim set," at the top?
16   **A   Yes.**
17   Q   Okay. And then certain language is
18 underlined. Do you see that?
19   **A   I can see that.**
20   Q   And the language that's underlined is the
21 language that's being added to the claims, right?
22   **A   Let me read it. (Perusing document.)**

260

1   **Okay, I see that now.**
2   Q   And the language that's been added to the
3 claims in response to the rejection over Elholm is:
4 "Obtaining a predicted position of the streamer
5 positioning devices." Is that right?
6   **A   I see the underlining. I presume that's**
7 **it.**
8   Q   And that's the same language that we've
9 been discussing here that you construed in the '607
10 patent, correct?
11   **A   It is the -- it doesn't say**
12 **"model-based," but it says "predicted position."**
13   Q   Well, just to be clear, the '607 patent
14 claims don't say "model-based" either, do they?
15   **A   The '607 patent?**
16   Q   Yeah, you construed Claims 1 and 15.
17 Those don't say "model-based," do they?
18   **A   "Behavior predictive model-based control**
19 **logic."**
20   Q   Where are you reading? Column 4, right?
21   **A   Column 4.**
22   Q   The claims themselves, Claims 1 and 15,

261

1   do not include that language of "behavior predictive
2   model," right?
3   A   But they are in the spirit of the
4   specifications.
5   Q   Okay. I understand that.
6   And likewise, the claims here that we're
7   looking at that were amended in the prosecution
8   simply add the same language that's in the claims of
9   the '607, "the predicted position of the streamer
10 positioning devices," right?
11   A   So you're saying that these are added to
12 the claims of the '017 patent?
13   Q   The language that's underlined on page 2
14 of Exhibit 2067: "Obtaining a predicted position of
15 the streamer positioning devices." Do you see that?
16   A   I see that, yes.
17   Q   That's the language that you construed in
18 the '607 patent claims too, correct?
19   A   Correct.
20   Q   Okay. And on page 7, do you see there
21 are remarks that are provided by the patent
22 applicant, WesternGeco?

262

1   A   So where do you want me to look?
2   Q   Do you see it says "Remarks" at the top?
3   A   Yes.
4   Q   Those are remarks provided in response to
5   the February 26, 2003 office action, correct?
6   A   Yes.
7   Q   And it notes that: "The claims have been
8   amended in the bottom paragraph such that both claims
9   presently recite the step/function of 'obtaining a
10 predicted position of the streamer positioning
11 devices.'" Do you see that?
12   A   Yes.
13   Q   Then the next sentence, it says: "Such
14 predicted position determination is preferably based
15 upon the behavior of the streamers." Do you see
16 that?
17   A   I see that.
18   MR. KIKLIS: One quick second. We lost
19 our feed.
20   (Pause in the proceedings.)
21 BY MR. BERL:
22   Q   So we just looked at the first sentence

263

1   of the bottom paragraph on page 7 of exhibit --
2   A   Claims 25 and 39.
3   Q   It begins Claims 25 and 39. It's
4   exhibit --
5   A   Let me make sure that -- okay. So it is
6   the same claim we looked at before.
7   Q   Of the '607, right?
8   A   I --
9   Q   The same claim language as in the '607 of
10 "predicting position" --
11   A   Of '017, right?
12   Q   Yes, this is in the file history.
13   A   Of the '017.
14   Q   Yes, which is the --
15   A   Not the '607.
16   Q   -- it's the priority document for the
17 '607, right?
18   A   Yes.
19   Q   And here we were discussing the claim
20 language of obtaining a predicted position of the
21 SPDs, right?
22   A   Yes. Streamer positioning devices.

264

1   Q   Right. And it says: "Claims 25 and 39
2   have been amended such that both claims presently
3   recite the step/function of obtaining a predicted
4   position of the streamer positioning devices," right?
5   A   I see that.
6   Q   And then it says: "Such predicted
7   position determination is preferably based upon the
8   behavior of the streamers." Do you see that?
9   A   I see that.
10   Q   In your view, the predicted position
11 determination necessarily must be based upon the
12 behavior of the streamers in the Hillesund patents,
13 right?
14   A   That's what the '607 patent says.
15   Q   And the '607 patent has the exact same
16 specification as the '017 patent, Doctor. So it's
17 your view that to interpret the Hillesund disclosure
18 simply to articulate a preference for determination
19 of predicted positions based upon the behavior of the
20 streamers is incorrect.
21   A   Again, we're going into the incomplete
22 business. It has to be considered case by case, but

265

1 when I interpret the patent, that's what I see. So I
2 have to think about specific examples. I can give
3 you specific answers.
4   Q   Well, in this specific example, this you
5 believe to be incomplete or incorrect, or choose
6 whatever synonym for "wrong" you want, you don't
7 think this is right.
8   MR. KIKLIS: Hold on. Objection. Form.
9 Argumentative.
10   THE WITNESS: He is trying to teach a
11 certain method, and he says "preferably based upon
12 the behavior of the streamers." He leaves it to the
13 chance that the model somehow will generate this
14 behavior. I can't conjecture why "preferably" when
15 the whole other language leads there.
16 BY MR. BERL:
17   Q   You don't think that it's correct to say
18 that "the position determination is preferably based
19 upon the behavior of the streamers," because your
20 view is that that term "predicting positions of the
21 streamer positioning devices" requires determination
22 based on a behavior predictive model.

266

1   A   In the general case, yes. There may be
2 particular cases we can think of. But in the general
3 case, the patent to cover everything will have to be
4 based on the -- on the behavior-based.
5   Q   What do you mean "particular cases"?
6 What we're doing here is interpreting the meaning of
7 the claim. I'm not asking about particular cases or
8 particular prior art references right now. I'm just
9 asking what the claim means.
10   You understand that that's an inquiry
11 that you undertook in this case, to interpret the
12 claims of the '607 patent, right?
13   A   Yes. And we go around the same question
14 which I answered repeatedly, so you have my answer.
15 You know what the answer is. You want to keep going?
16 I can go until the evening.
17   Q   Okay. Well, I just want it to be clear,
18 the answer is that your interpretation of the claims
19 is different than the interpretation advanced by
20 WesternGeco in Exhibit 2067.
21   A   It's not because --
22   MR. KIKLIS: Hold on. Objection. Form.

267

1   THE WITNESS: It is not, because he's
2 making the same sort of language in here. Whether it
3 was having something in their minds, we cannot guess.
4 But from the other words that come from the document,
5 it seems like in the general case this is -- now we
6 may have a particular case where for some reason this
7 behavior is not needed in that particular case. I'm
8 trying to speculate what else. Right now I cannot
9 think of why "preferably" when he has put it in so
10 many words that it is behavior-based. But we have to
11 look at specifics.
12 BY MR. BERL:
13   Q   I'm not asking for a specific case or
14 speculation. Your claim interpretation requires use
15 of a behavior predictive model. The interpretation
16 advanced by WesternGeco here simply identifies it as
17 a preference, right?
18   MR. KIKLIS: Objection. Form.
19   THE WITNESS: It says "preferably" in the
20 context of other things, so we have to analyze it on
21 case by case what he meant by "preferably," under
22 what context and everything else. When someone puts

268

1 a sentence that says "behavior-based," and then says
2 "preferably behavior of the streamers," it leaves
3 some latitude which we cannot specify right now until
4 we go to a specific system.
5 BY MR. BERL:
6   Q   "Preferably" does not mean required,
7 right?
8   A   That's what I understand.
9   Q   Okay. If you go back to the front page
10 of the '607 patent again, Doctor, do you see that
11 there is something underneath called "Foreign
12 Application Data"?
13   A   The front --
14   Q   The front page, yeah.
15   A   So the front page of the '607 patent --
16   Q   Right before where we looked at before,
17 do you see "Foreign Application Priority Data"?
18   A   Yes.
19   Q   And then it says, "October 1, 1998 GB."
20 Do you see that?
21   A   Yes.
22   Q   And then it identifies an October 1, 1998

269

1 GB Application 9821277. Do you see that?
2   A   I do.
3   Q   Let's take a look at that application.
4 Have you looked at that before?
5   A   I'm not sure. Show me.
6   Q   Okay. Let's mark it as Exhibit 1081.
7   A   I'm not sure if I saw it.
8   (Exhibit No. 1081 was marked for
9   identification.)
10 BY MR. BERL:
11   Q   Do you have Exhibit 1081, Doctor?
12   A   1081. Yes.
13   Q   And do you see on the second page of it,
14 it identifies a patent application number?
15   A   Yes. 98 and so on.
16   Q   9821277. Do you see that?
17   A   But it has a different -- ".2" versus
18 ".3."
19   Q   Okay. But before the ".2" and ".3," it's
20 the same number, correct?
21   A   Okay. Yes.
22   Q   And the filing date of this patent

270

1 application is October 1, 1998, right?
2   A   Yes.
3   Q   And if you look to page 6 of the
4 application, which is 1081, do you see at the bottom,
5 the last sentence that says: "To compensate for
6 these localized current fluctuations, the inventive
7 control system utilizes a distributed processing
8 control architecture and behavior predictive
9 model-based control logic to properly control the
10 streamer positioning devices"?
11   Do you see that?
12   A   Let me just read the sentence just to get
13 my --
14   Q   Sure.
15   A   -- bearings. (Perusing document.)
16   Yes, I can see that.
17   Q   And you are free to compare with the '607
18 patent that we looked at before on lines 10 through
19 14 of column 4, but is that the same sentence that
20 we've been discussing that you rely on for the
21 disclosure of the behavior predictive model-based
22 control logic in the '607 patent?

271

1   A   It will be nice if we could mark this so
2 we can go back and find it.
3   Q   If we could what?
4   A   If we can mark this so we can go back.
5   Q   Sure. I will give you a flag, or my
6 colleague will.
7   Here you go, Doctor. Do you know how to
8 use those?
9   A   No. Ah, yes, yes. I thought it was
10 something more complex. This is wonderful.
11   MR. KIKLIS: Okay. I won't say anything.
12   THE WITNESS: It sounds like a similar
13 language.
14 BY MR. BERL:
15   Q   So you've looked at Exhibit 1081, the
16 priority document, and you have confirmed that the
17 language at the bottom of page 6, that last sentence,
18 is the same as the language in column 4, lines 10
19 through 14, of the '607 patent that discloses the
20 behavior predictive model-based control logic, right?
21   A   It appears to be the same language.
22   Q   And if you go to the next page, page 7 of

272

1 the application, Exhibit 1081, do you see in the
2 middle, there is the paragraph that begins "The
3 global control system, 22, preferably maintains..."
4   A   I can see.
5   Q   And that language there is the same as
6 the language on which you rely starting at column 4,
7 line 28, of the '607 patent, right?
8   A   I read the first three paragraphs. It is
9 the lines and it looks similar.
10   Q   Okay. Let's take a look at the next
11 document then. This is going to be Exhibit 1082 in
12 all of the cases.
13   (Exhibit No. 1082 was marked for
14   identification.)
15   THE WITNESS: This is a recent one.
16 BY MR. BERL:
17   Q   You see this is dated actually the 9th of
18 April, 2014. Right?
19   A   Yes.
20   Q   And this is a recent statement by the
21 European Patent Office; is that right?
22   A   Yes, London.

273

1   Q   And if you look to what at the top is
2 labeled page 1 on the 9th of April, 2014, it's a few
3 pages after the first page, page 1, it says "Facts
4 and Submissions." Do you see that?
5   A   Yes.
6   Q   And it discusses European Patent
7 No. 1850151, which is based on another patent filed
8 28th of September 1999, and claiming priority to
9 Great Britain 9821277 filed on October 1st, 1998,
10 right?
11   A   I'm -- I see a lot of numbers. What
12 exactly do you want me to --
13   Q   Okay. But the application it's
14 discussing is one that claims priority to this
15 GB9821277 from October 1st, 1998, which is what we
16 just looked at as 1081, right?
17   MR. KIKLIS: I'm going to object to this
18 line of questioning as beyond the scope.
19   MR. BERL: Okay.
20 BY MR. BERL:
21   Q   Is that correct, Doctor?
22   A   Let me understand, because you are

274

1 presenting me with new material which I'm not sure I
2 have seen this. I probably have not seen. So this
3 is a document from some European Patent Office.
4   Q   Right.
5   A   Is it the European Patent Office or some
6 European patent office?
7   Q   The European Patent Office.
8   A   Which is in Germany. And it issues a
9 summons to attend oral proceedings. Because if you
10 can explain to me what the facts and submissions say
11 with all these numbers. But this patent that we were
12 talking -- this application for a patent we talked
13 about, which has a 21 October 1999.
14   Q   Which if you go to the next page
15 identifies October 1st, 1998, and the number of the
16 patent application of 9821277. Do you see that?
17   A   Right. And that patent --
18   MR. KIKLIS: Objection. Scope.
19 BY MR. BERL:
20   Q   And this patent that is being discussed
21 claims priority to that Great Britain application?
22   A   Which patent? Claims priority over

275

1 which?
2   Q   The patent that is the subject of this
3 submission here, which I will give you in a moment if
4 you'd like, Exhibit 1081, claims priority to the
5 October 1st, 1998, Great Britain '277 application
6 that we just looked at. Do you see that?
7   MR. KIKLIS: Objection. Form, beyond the
8 scope.
9   THE WITNESS: I -- I never made any
10 analysis of priority or anything. I'm missing so
11 many data that right now you are asking me to do the
12 impossible. You present me a brand-new document from
13 some agency in Europe, which claims priority of this
14 over that. I don't know what to say. I'm here for a
15 technical report, and you're asking me priority
16 dates.
17 BY MR. BERL:
18   Q   I'm not asking you about the priority
19 dates, Doctor. This is -- this GB '277 application
20 that's identified here is the same one we just looked
21 at, 1081. Correct?
22   MR. KIKLIS: Objection. Form, scope.

276

1 BY MR. BERL:
2   Q   You just looked at that and read a couple
3 of paragraphs that you identified as being the same
4 as those that you relied on in '607, correct?
5   MR. KIKLIS: Objection. Scope.
6 BY MR. BERL:
7   Q   Correct?
8   MR. KIKLIS: Objection. Scope.
9   THE WITNESS: That's exactly what we did
10 before, but --
11 BY MR. BERL:
12   Q   Okay.
13   A   -- again, we are going down a road of
14 priorities and the language. I will need much more
15 time to consider. And even the opinions that I gave
16 you of this looking the same as that, I didn't have
17 time to review this in that scope.
18   Q   You looked at those four lines and said
19 they were the same, right?
20   A   I looked at four lines. We're talking
21 about patents with pages.
22   Q   I'm just asking you right now about what

277

1   we've discussed. Let's see what was said by the
2   European Patent Office. If you go to page 4.
3   MR. KIKLIS: Objection. Form, scope.
4   BY MR. BERL:
5   Q   Do you see actually on page 3, it has a
6   section labeled "3"? Do you see that?
7   **A   This is a preliminary nonbinding opinion.**
8   Q   Yes.
9   **A   And you want me to discuss in a technical**
10 **deposition a nonbinding opinion of a court in Europe?**
11   Q   Let's take a look.
12   **A   How much sense does that make?**
13   Q   We'll ask that question at the end of how
14 much sense it makes. We will take a look first, and
15 then we can evaluate how much sense it made.
16   MR. KIKLIS: Objection. Scope.
17   THE WITNESS: You don't bring me a fact.
18 You bring me a nonbinding opinion.
19 BY MR. BERL:
20   Q   Do you see where it says "Preliminary and
21 Nonbinding Opinion of the Opposition Division" on
22 page 3?

278

1   MR. KIKLIS: Objection. Scope.
2   THE WITNESS: Yes.
3   BY MR. BERL:
4   Q   And do you see on the next page, it says
5   "3.2.1.5"?
6   MR. KIKLIS: Objection. Scope.
7   THE WITNESS: Yes.
8   BY MR. BERL:
9   Q   And there it says: "The generalized
10 feature transmitting from a global control system
11 seems to introduce subject matter that extends beyond
12 the originally disclosed subject matter of the parent
13 application. The feature global control system seems
14 to be disclosed only in combination with the feature,
15 quote, "a distributed processing control architecture
16 and behavior predictive model-based control logic to
17 properly control the streamer positioning devices,"
18 page 6, last paragraph.
19   Do you see that?
20   MR. KIKLIS: Objection. Scope.
21   THE WITNESS: The answer --
22   MR. KIKLIS: Dr. T, let me get my

279

1   objections in.
2   Objection. Form, scope, foundation.
3   BY MR. BERL:
4   Q   Do you see that?
5   **A   It is very hard for people to grasp what**
6   **"global control system" means. Predictive behavior.**
7   **You bring me someone from Europe who does not**
8   **understand perhaps the concepts and expresses some**
9   **opinions. What do you want me to say? To say an**
10 **opinion about this opinions here, I can do it. I can**
11 **cream them if you want to.**
12   Q   You can what?
13   **A   I can cream the various expressions here**
14 **because they are written by a non-specialist.**
15   Q   You can what them?
16   **A   He is talking about the feature global**
17 **control system. I can refute. Refute.**
18   Q   He is agreeing with what you have said,
19 Doctor.
20   **A   The way he speaks, "the feature global**
21 **control system," and the like is -- it's language**
22 **which does not show someone who appreciates, and I**

280

1   **don't know whether he agrees with me accidentally or**
2   **disagrees with me for any other reason.**
3   Q   Well, whether it's accidental or not, you
4   agree that the distributed processing control
5   architecture and behavior predictive model-based
6   control logic is necessary to properly control the
7   streamer positioning devices. You agree, correct?
8   **A   I have to read it carefully. Let me read**
9   **it.**
10   Q   Okay. Go ahead.
11   **A   (Perusing document.) This is -- you are**
12 **identifying a small piece out of a big sentence. It**
13 **says: "The feature" -- feature, what does "feature"**
14 **mean? -- "global control system" -- it's not a**
15 **feature -- seems to be disclosed only in combination**
16 **with the feature, a distributed processing control**
17 **architecture and behavior predictive -- you want me**
18 **to agree with a quote within a sentence where he**
19 **tries to say something else?**
20   Q   So let's take out the word "feature"
21 since you seem to be having problems with it.
22   Do you agree that "the global control

281

1 system is disclosed only in combination with a
2 distributed processing control architecture and
3 behavior predictive model-based control logic to
4 properly control the streamer positioning device"?
5   **A   As we said, the global control system**
6 **sits on top and there is also a behavior predictive**
7 **model underneath it.**
8   Q   And --
9   **A   Now, I'm not going to be trapped into**
10 **phrases which are out of context, and they are trying**
11 **to convey something else, without arguing about**
12 **validity of patents or anything else. I don't**
13 **know where everything is, and you asked me -- you**
14 **didn't ask me to read the document. You asked me to**
15 **read one line.**
16   Q   That's the only -- this paragraph is the
17 only part of this document that I'm going to ask you
18 about. You can read whatever you'd like.
19   I understood this to be taking the
20 position you're advancing here, which is that the
21 distributive processing and control architecture and
22 behavior predictive model-based control logic is

282

1 essential for properly -- for the global control
2 system.
3   **A   It's essential for the patent, not for**
4 **the global control system. This is an erroneous**
5 **statement the way you put it.**
6   Q   It's -- is it essential for the claimed
7 global control system to have behavior predictive
8 model-based control logic?
9   MR. KIKLIS: Objection. Form.
10   THE WITNESS: This is --
11   MR. KIKLIS: Scope.
12   THE WITNESS: This is within the patent.
13 Not generically.
14 BY MR. BERL:
15   Q   But -- and he's citing page 6, last
16 paragraph. We've already looked at that.
17   It's your view that in the context of the
18 Hillesund patent disclosure, the behavior predictive
19 model-based control logic is essential for the
20 properly transmitting global control system?
21   MR. KIKLIS: Objection.
22   THE WITNESS: No.

283

1   MR. KIKLIS: Doctor, Doctor, please.
2 Objection. Form. Misstates.
3   THE WITNESS: You have to rephrase it
4 slowly.
5 BY MR. BERL:
6   Q   Okay. Do you agree -- you've already
7 answered this several times in the affirmative, but
8 we will do it a fourth time.
9   Do you agree that the behavior predictive
10 model-based control is essential for the proper
11 transmission from a global control system?
12   MR. KIKLIS: Objection. Form.
13   THE WITNESS: Not the way you put it.
14 BY MR. BERL:
15   Q   How would you put it?
16   **A   It needs a lot more to explain. There is**
17 **a global control system which coordinates, period.**
18 **And there is a behavior predictive model --**
19 **behavior-based predictive model which keeps dynamic**
20 **models of the system and everything else. And there**
21 **is a distributed control algorithm to convey the**
22 **information to the systems. So these are three. It**

284

1 **shows one.**
2   Q   I understand that. And it's your view
3 that in the context of the Hillesund patents, the
4 behavior predictive model must be used for the global
5 control system to operate properly.
6   MR. KIKLIS: Objection. Form.
7   THE WITNESS: It is essential for the
8 patent. The global control can work in many ways.
9 BY MR. BERL:
10   Q   For the patent's global control system
11 that is disclosed in the Hillesund patents, that
12 global control system must use a behavior predictive
13 model.
14   MR. KIKLIS: Objection. Form.
15 Argumentative. Lower your voice.
16   THE WITNESS: I mentioned it in -- there
17 are several layers here. You try to contaminate them
18 in a way that it creates confusion. So I will not
19 agree with this statement.
20 BY MR. BERL:
21   Q   So you don't agree that the global
22 control system in the context of the '967 patent must

285

1 use behavior predictive model?
2   A   I never said anything quite like that.
3   Q   So, well, let me just ask you. I'm not
4 trying to put words in your mouth. Does the global
5 control system claimed in the '967 patent require the
6 use of a behavior predictive model?
7   MR. KIKLIS: Objection. Form.
8   THE WITNESS: They are systems which work
9 together. And one works, the other is there, the
10 other is there. So we have layers of working. The
11 way of needs and everything puts a different context
12 in the application.
13   So I'm answering to you there are these
14 layers of requirements from the patent. You cannot
15 straitjacket them into one phrase like you try to do.
16 So I'm not objecting to the need for behavior
17 predictive model-based and so on and so forth. I'm
18 objecting to the way you put the sentences. And also
19 the way you are extracting.
20   Why don't you ask me, not from a random
21 document out of nowhere I've never seen before, out
22 of the patents, out of somewhere where we have

286

1 access? Here they are quotes. I don't know where
2 they took these quotes and how.
3 BY MR. BERL:
4   Q   Doctor, it is your view that the phrase
5 "predicted positions" is properly interpreted to mean
6 "determining positions using a behavior predictive
7 model," correct?
8   A   Can we point to a document where it says
9 that?
10   Q   We've already done this. It's page --
11 it's paragraph 88 of your expert report.
12   A   Well, let's go --
13   MR. KIKLIS: Objection. Form.
14   THE WITNESS: Let's go to paragraph 88 of
15 my report. So you are talking about my broadest
16 definition in paragraph 88 "determining positions
17 using the behavior predictive model."
18 BY MR. BERL:
19   Q   That's what predicting positions
20 requires, right?
21   A   A predictive model, yes.
22   Q   And in your view, as you testified this

287

1 morning, the term "global control system" likewise
2 requires the use of a behavior predictive model,
3 correct, in the context of the '967 patent?
4   MR. KIKLIS: Objection. Form.
5   THE WITNESS: There is a behavior
6 predictive model and there is a global controller.
7 Okay. Two shells, separate, which work together.
8 BY MR. BERL:
9   Q   And the global control system uses a
10 behavior predictive model, correct?
11   A   Works with the behavior predictive model.
12   Q   And there -- can the global control
13 system in the context of the '967 patent work without
14 using a behavior predictive model?
15   MR. KIKLIS: Objection. Form.
16   THE WITNESS: Again, it's a hypothetical.
17 The patent puts in the requirements. If you switch
18 off the behavior predictive model, the global
19 controller will continue working.
20 BY MR. BERL:
21   Q   It will continue working, but it won't
22 properly steer the streamers, correct?

288

1   MR. KIKLIS: Objection. Form.
2   THE WITNESS: You are not going to get
3 the benefit of the patent.
4 BY MR. BERL:
5   Q   Because the disclosure of the patent is
6 to use the global control system with a distributive
7 processing control architecture and behavior
8 predictive model, correct, to control the SPDs?
9   MR. KIKLIS: Objection. Form. Asked and
10 answered.
11   THE WITNESS: In three different shells
12 which coordinate the function of the system.
13 BY MR. BERL:
14   Q   Does the Hillesund patent disclose the
15 use of a global control system that does not use a
16 behavior predictive model?
17   MR. KIKLIS: Objection. Form.
18   THE WITNESS: Which patent?
19   MR. KIKLIS: Asked and answered.
20 BY MR. BERL:
21   Q   The Hillesund patent specification.
22   A   Which one?

289

1   Q   They are all the same. The '967.
2   **A   Let's be specific, '967?**
3   Q   Sure.
4   **A   It specifies a global control system, and**
5   **then specifies a model predictive -- a behavior-based**
6   **predictive model.**
7   Q   Right. And the global control system --
8   well, does it disclose the use of a global control
9   system that does not use a behavior predictive model?
10   MR. KIKLIS: Objection. Form.
11   THE WITNESS: The inference from the
12   patents is that they collaborate.
13   BY MR. BERL:
14   Q   The inference of the patents is that the
15   use of the behavior predictive model is essential for
16   the global control system to function.
17   MR. KIKLIS: Objection. Asked and
18   answered.
19   THE WITNESS: It is required for
20   achieving good performance by the system.
21   BY MR. BERL:
22   Q   In your view, is it possible to properly

290

1   control the streamer positioning devices without a
2   behavior predictive model?
3   **A   This is a general statement.**
4   MR. KIKLIS: Objection. Form. Asked and
5   answered.
6   BY MR. BERL:
7   Q   In the context of the Hillesund patent
8   disclosures, is it possible to properly control the
9   streamer positioning devices without a behavior
10   predictive model?
11   MR. KIKLIS: Objection. Form. Asked and
12   answered.
13   THE WITNESS: It's completely
14   hypothetical. If I have two streamers a thousand
15   miles apart, I can control them very well without any
16   predictive model. They will not tangle. But if you
17   want to do a tight control, it's another story.
18   BY MR. BERL:
19   Q   So then one can practice then the claims
20   of the '967 patent, for example, without using a
21   behavior predictive model. Is that your testimony?
22   MR. KIKLIS: Objection. Asked and

291

1   answered.
2   THE WITNESS: Not at all. Not at all.
3   BY MR. BERL:
4   Q   Not at all.
5   **A   You asked me if there are cases where you**
6   **can do something without the predictive model.**
7   Q   And that something is properly control
8   the SPDs. Can one properly control the SPDs without
9   a behavior predictive model?
10   MR. KIKLIS: Objection. Form. Asked and
11   answered.
12   THE WITNESS: Again, we are talking about
13   realistic situations with hundreds of such devices.
14   That's where Bittleston's patents are, and then you
15   need the predictive model.
16   BY MR. BERL:
17   Q   Okay. The language that we looked at in
18   column 4 of the '607 patent, lines 28 through 34.
19   **A   The global control system.**
20   Q   Yes. Where it speaks to the dynamic
21   model.
22   **A   Yes.**

292

1   Q   That sentence provides a disclosure that
2   the dynamic model, whether behavior predictive or
3   otherwise, is not essential, right?
4   MR. KIKLIS: Objection.
5   THE WITNESS: Can you repeat the
6   question?
7   MR. KIKLIS: Asked and answered.
8   BY MR. BERL:
9   Q   Yeah. That sentence that begins on
10   line 28 of column 4 of the '607 patent is a positive
11   disclosure that a dynamic model, whether behavior
12   predictive or otherwise, is not essential, right?
13   MR. KIKLIS: Objection. Form. Asked and
14   answered.
15   THE WITNESS: Where does it say that?
16   BY MR. BERL:
17   Q   That's how someone would interpret it,
18   correct?
19   MR. KIKLIS: Objection. Asked and
20   answered.
21   THE WITNESS: Not after coming from
22   reading the -- the paragraph -- two paragraphs above.

293

1 BY MR. BERL:
2   Q   So when it says: "The global control
3 system preferably maintains a dynamic model of each
4 of the seismic streamers," you disagree that that's a
5 disclosure that the dynamic model is not essential?
6   MR. KIKLIS: Objection. Asked and
7 answered.
8   THE WITNESS: You are focusing on the
9 "preferably."
10 BY MR. BERL:
11   Q   Yes.
12   A   **And we discussed this before, we went**
13 **over it, that what he had in mind putting**
14 **"preferably" is unknown, but he had put the other**
15 **sentence above, which makes it required.**
16   Q   And so in your view, the language from
17 lines 10 through 14 of column 4 provides a disclosure
18 that behavior predictive model-based control logic is
19 essential, right?
20   MR. KIKLIS: Objection. Asked and
21 answered.
22   THE WITNESS: It says: "The inventive

294

1 control system utilizes behavior predictive
2 model-based control logic."
3 BY MR. BERL:
4   Q   So that's essential?
5   A   **It's an essential part of the disclosure.**
6   Q   And you don't agree, I take it, that that
7 sentence in column 4, lines 10 through 14, presents
8 one way in which the streamer positioning devices may
9 be properly controlled, but that there are other ways
10 that are possible?
11   MR. KIKLIS: Objection. Asked and
12 answered.
13   THE WITNESS: It's speculation. But the
14 only interpretation is that there are localized
15 current fluctuations which really wreak havoc with
16 streamers. So he makes it stronger because that's
17 the usual case, and then he makes it a little more
18 general on keeping the dynamic proper. But I put a
19 lot of emphasis on line 10.
20 BY MR. BERL:
21   Q   Mm-hmm.
22   A   **Because the localized current**

295

1 **fluctuation, as we know, is one of the strongest**
2 **components of malfunction of streamer arrays.**
3   Q   So it would be incorrect to interpret
4 that sentence to provide a suggestion of one way in
5 which the SPDs may be properly controlled, right?
6   MR. KIKLIS: Objection. Form. Asked and
7 answered.
8   THE WITNESS: You can -- you can deduce
9 this from the line before -- the sentence before 10,
10 where he says: "Localized current fluctuations can
11 dramatically influence the magnitude of the site
12 control required to properly position the streamers."
13   And if there is one thing that is really
14 difficult in there are those "current fluctuations."
15 If the waves are too -- if the water waves, the ocean
16 waves are too strong, we just suspend operations.
17 But "current," you have to do it. So that's why I
18 think it's an essential part.
19 BY MR. BERL:
20   Q   It's not just -- and "it" in your answer
21 was the behavior control model, right?
22   MR. KIKLIS: Objection to form.

296

1   THE WITNESS: Say it again.
2 BY MR. BERL:
3   Q   When you say "it is essential," "it" is
4 the behavior control model --
5   MR. KIKLIS: Objection.
6 BY MR. BERL:
7   Q   -- behavior predictive model, right?
8   MR. KIKLIS: Objection. Form.
9   THE WITNESS: It is, as it says here:
10 "The inventive control system utilizes a distributed
11 processing control architecture and behavior
12 predictive model-based logic."
13 BY MR. BERL:
14   Q   Okay. So the behavior predictive model
15 is not just one way of properly controlling the
16 streamers, it's the essential way in the '967 and
17 '607 and '520 patents --
18   A   **It's --**
19   MR. KIKLIS: Let him finish his question
20 first, and then let me object.
21   Objection. Form. Asked and answered.
22   THE WITNESS: I read the patent.

297

1 BY MR. BERL:
2   Q   And the patent tells you that the use of
3 a behavior predictive model-based control is not just
4 one way of properly controlling the streamers but, in
5 the context of this patent, is the only way to do it
6 properly, right?
7   MR. KIKLIS: Objection. Form. Asked and
8 answered.
9   THE WITNESS: It says "utilizes."
10 BY MR. BERL:
11   Q   So the answer is "yes"?
12   A   **Utilizes.**
13   Q   I can read "utilizes" too. I'm trying to
14 get an answer to my question, which I think you're
15 answering "yes." If that's right, we can move on.
16 If not, I'm going to keep asking until I get an
17 answer, which is this sentence that you have
18 identified, lines 10 through 14 on column 4, is
19 disclosing that the use of a behavior predictive
20 model is essential for properly controlling the
21 streamer positioning devices in the Hillesund patent,
22 it's not just one way of doing so.

298

1   MR. KIKLIS: Objection. Asked and
2 answered. Argumentative.
3   THE WITNESS: As I answered before, for
4 the localized current fluctuations, as he puts it,
5 which is the majority of the cases, he says it
6 utilizes. Then he makes a statement that preferably,
7 if there is another case where there are no current
8 fluctuations, only one can think of various. But
9 it's all hypothetical. So -- there is a reason for
10 putting one and there is a reason for putting the
11 other.
12 BY MR. BERL:
13   Q   But the way you read column 4, lines 10
14 through 14, and correct me if I'm wrong, is that the
15 behavior predictive model is required in practicing
16 the '607 patent claims, right?
17   A   **In localized current fluctuations, as the**
18 **patent states, yes. And then he makes maybe a more**
19 **general statement where he says "preferably."**
20   Q   So it's now your testimony that the
21 behavior predictive model is not a requirement of
22 predicting positions depending on the localized

299

1 currents?
2   MR. KIKLIS: Objection.
3   THE WITNESS: I didn't say that.
4   MR. KIKLIS: Form. Asked and answered.
5 Misstates.
6   THE WITNESS: The majority of the cases
7 is with current fluctuations. So reading the patent,
8 knowing the field, you know that you need to have the
9 behavior predictive model-based logic.
10 BY MR. BERL:
11   Q   So it's essential.
12   A   **One --**
13   MR. KIKLIS: Objection. Form. Asked and
14 answered.
15   THE WITNESS: It can be answered that
16 maybe one day where the sun is bright and everything
17 is nice and there are no currents, then you switch it
18 off.
19 BY MR. BERL:
20   Q   In which case it's not required. It's
21 only required when it's not a sunny day.
22   MR. KIKLIS: Objection. Form. Asked and

300

1 answered.
2   THE WITNESS: We are speculating.
3 BY MR. BERL:
4   Q   And I -- you understand we're doing claim
5 construction here, so this is to determine what the
6 scope of the claim is. And I think I'm entitled to a
7 clear answer to the question of whether in practicing
8 the '607 patent the use of a behavior predictive
9 model is required, irrespective of whether the sun is
10 shining or what the local currents are.
11   A   **It's not as speculative as --**
12   MR. KIKLIS: Objection. Asked and
13 answered. Argumentative.
14   THE WITNESS: I think I answered. So we
15 will go back again to the same.
16 BY MR. BERL:
17   Q   What's the answer?
18   A   **The answer is, under localized current**
19 **fluctuations, to compensate the inventive control**
20 **system utilizes the behavior predictive model.**
21 **That's the majority of the cases. So, yes, from that**
22 **point of view, it is required to have the behavior**

301

1   **predictive model-based control.**
2   **Then he makes it more general. There may**
3   **be other cases, very rare. We cannot speculate which**
4   **cases and where. I cannot think of them right now.**
5   Q   But there are some cases in which the
6   claim does not require the use of a behavior
7   predictive model.
8   MR. KIKLIS: Objection. Misstates.
9   Asked and answered.
10   THE WITNESS: That was not the question.
11   The question was what the patent says. The patent
12   says that under the localized current fluctuations,
13   which is the majority of the cases.
14   BY MR. BERL:
15   Q   I know what the patent says, Doctor. I'm
16   asking about your construction.
17   Does the scope of the claim change
18   depending on whether there are localized current
19   fluctuations or is the claim always the same scope?
20   MR. KIKLIS: Objection. Asked and
21   answered.
22   THE WITNESS: I think I answered more

302

1   than once that the distributed and behavior
2   predictive are part of the patent. That's how you
3   read it. And then there are other cases which you
4   may think where you may have special cases of this or
5   that, but the majority of the patent focuses on
6   behavior predictive model-based.
7   BY MR. BERL:
8   Q   So am I understanding your testimony
9   correctly that in the majority of cases, one needs a
10   behavior predictive model in the context of the '607
11   patent but not always?
12   MR. KIKLIS: Objection. Form. Asked and
13   answered.
14   THE WITNESS: I answered. Reading the
15   patent, yes, behavior predictive model-based control
16   and everything is part of the patent. Why the
17   "preferably," I'm trying to explain to you that there
18   may be cases where -- but designing a new system,
19   yes, you are going to put the behavior predictive
20   model in your system.
21   MR. KIKLIS: So I got to take a break.
22   MR. BERL: Okay. Let's take a break.

303

1   MR. KIKLIS: We've been going about an
2   hour and 20 minutes.
3   (Recess.)
4   BY MR. BERL:
5   Q   I just want to make sure I understand
6   your testimony clearly so that there is no confusion
7   about what you understand.
8   A   Sure.
9   Q   You were asked to construe or interpret
10   the claims of the '607 patent in this case, right?
11   A   Yes.
12   Q   Including the term "predictive
13   positions," so that's PDs, correct?
14   A   Say that again.
15   Q   Including the claim term "predicting
16   positions" of at least some of the streamer
17   positioning devices.
18   A   Yes, that was part of it.
19   Q   And you relied in large measure on
20   column 4 of the patent in construing the term
21   "predicting positions," right?
22   A   In -- yes, as far as the patent is

304

1   concerned. It was reinforced by other secondary
2   statements, as we said, Bittleston's declaration and
3   the like. But the statement came out of here, yes.
4   Q   Okay. And "here" being the patent?
5   A   The patent.
6   Q   Okay. And on lines 10 through 14 is a
7   statement that you relied on, and in fact the only
8   statement you've identified that uses the term
9   "behavior predictive model-based control." Do you
10   see that?
11   A   That's what we identified here. If you
12   want me to read the patent, I can go through that.
13   Q   And you pointed out that the beginning of
14   that sentence says: "To compensate for these
15   localized current fluctuations." Right?
16   A   Yes.
17   Q   And my question is very simple. If there
18   are no localized current fluctuations, do the claims
19   of the '607 patent require the use of the behavior
20   predictive model-based control?
21   MR. KIKLIS: Objection. Asked and
22   answered.

305

1   THE WITNESS: It -- the patent satisfies
2   a need, and the need was to be able to go in all
3   conditions, and primarily when there were currents.
4   So to take out this ingredient is like negating the
5   patent.
6   BY MR. BERL:
7   Q   So that even if one encounters a
8   circumstance due to the weather or other conditions
9   where there are no localized current fluctuations,
10 the claims of the '607 patent still require the use
11 of a behavior predictive model-based control.
12   MR. KIKLIS: Objection. Asked and
13 answered.
14   THE WITNESS: As we answered, yes, when
15 encountering the currents, as it states, the system
16 utilizes the predictive behavior.
17 BY MR. BERL:
18   Q   And that's required even if there are no
19 localized current fluctuations, right?
20   MR. KIKLIS: Objection. Asked and
21 answered.
22   THE WITNESS: The predictive behavior

306

1   would be there whether switched on or off.
2   BY MR. BERL:
3   Q   It's required as part of the claim
4   whether you have current fluctuations or not.
5   MR. KIKLIS: Objection. Asked and
6   answered.
7   THE WITNESS: As we said, you can switch
8   it on and off, but in order to gain the benefits of
9   the patent, you have it.
10 BY MR. BERL:
11   Q   If it's off, can one predict positions of
12 at least some of the SPDs?
13   A   Not when there are disturbances. That's
14 the majority of the cases. All I'm trying to say is
15 you are getting the benefit of the patent by having
16 the predictive control.
17   Q   But in some circumstances, one can
18 predict positions without using --
19   A   I didn't say that. I said the -- one can
20 cook up cases where you switch it off because the sun
21 is bright and there are no currents.
22   Q   Okay. But if --

307

1   A   But that is not going to make the patent,
2   you know, require the captain to have the system on.
3   Q   Let me ask you very simply, "predicting
4   positions," which is a claim term that you
5   interpreted, can one predict positions, as that term
6   is used in the claims of the '607 patent, without
7   using a behavior predictive model?
8   MR. KIKLIS: Objection. Asked and
9   answered.
10   THE WITNESS: As I answered, it is based
11 on behavior predictive control, behavior-based
12 predictive control.
13 BY MR. BERL:
14   Q   Predictive positions is based on that.
15 Yes?
16   A   Yes.
17   Q   The predicting positions language of the
18 claim, therefore, requires compensating for the speed
19 and heading of marine currents acting on the streamer
20 positioning devices, right?
21   A   Yes. We're going now to the more
22 technical details.

308

1   Q   And so when the claim talks about
2   predicting positions, it is compensating for the
3   speed and heading of marine currents that are acting
4   on the SPDs, right?
5   A   Right.
6   Q   And if you look at Claim 2 of the '607
7   patent, you see that that depends on Claim 1. Do you
8   see that?
9   A   We were not analyzing Claim 2, right, but
10 you want me to look at it?
11   Q   Yes. And Claim 2 is: "The method, as
12 claimed in Claim 1, compromising estimating velocity
13 of at least some of the streamer positioning
14 devices," and then it has "wherein" language. Do you
15 see that?
16   A   I see that.
17   Q   Okay. And then do you see Claim 5?
18   A   Yes.
19   Q   And Claim 5 is: "A method, as claimed in
20 Claim 2, in which the step of using the predicted
21 positions to calculate desired changes in position of
22 one or more of the streamer positioning devices

309

1 further uses an estimate of the crosscurrent velocity
2 at the respective streamer positioning devices --
3 device."
4   Do you see that?
5   A Yes.
6   Q And Claim 3 likewise depends on Claim 2,
7 right?
8   A Right.
9   Q Claim 3 says: "A method, as claimed in
10 Claim 2, in which said estimated velocity is a
11 water-referenced towing velocity that compensates for
12 the speed and heading of marine currents acting on
13 the streamer positioning devices."
14   Do you see that?
15   A Yes.
16   Q In your view, the predicted positions in
17 Claim 1 already requires compensating for the speed
18 and heading of marine currents acting on the streamer
19 positioning devices, right?
20   A It is -- the estimate of the velocity is
21 needed on two levels: On knowing the kind of forces
22 that you should expect there from the site of the

310

1 velocity; and also on possibly adjusting the gains of
2 the controller, of the predictive controller by
3 knowing where the current is coming and what exactly
4 is going.
5   Q And both of those are part of the
6 behavior predictive control model, right?
7   A Well, the estimation of the velocity can
8 be done directly from measurements or it can be
9 estimated from vessel speed. It's better to do it
10 locally, or even by watching the behavior of the
11 arrays, you can get an estimate of what the velocity
12 is like.
13   Q So that the estimated velocity is not
14 part of the calculation done by the behavior
15 predicted control model.
16   A It's not part of the prediction, but it's
17 used in the prediction.
18   Q Is it part of the behavior predictive
19 control model?
20   A It is used by the behavior predictive
21 model. Again, preferably, if you have this
22 information.

311

1   Q And so, just so I understand, the
2 Limitation B, "predicting positions of at least some
3 of the streamer positioning devices," as you've
4 interpreted it to include the behavior prediction
5 model, includes accounting for the estimated velocity
6 as part of the behavior prediction control, right?
7   A It is a component of it.
8   Q And so that Claim 3, which recites:
9 "Compensating for the speed and heading of marine
10 currents acting on the streamer positioning devices
11 when estimating velocity" already is included in your
12 interpretation of Claim 1?
13   A Because the predictions will be improved
14 by knowing what the current velocities are.
15   Q And that's already done in Claim 1,
16 correct?
17   MR. KIKLIS: Objection. Form.
18   THE WITNESS: In part 1, it's talking
19 about the prediction. In the second, it puts a
20 second step, which is important also, but the
21 essential part is the prediction of the positions.
22 And then the second reinforces sort of the -- the

312

1 methodology.
2 BY MR. BERL:
3   Q Right. But my question is, the
4 compensation for the speed and heading of marine
5 currents acting on the SPDs, that's already done
6 under your interpretation of Claim 1 of predicting
7 positions using a behavior control model.
8   MR. KIKLIS: Objection. Misstates.
9 Form.
10   THE WITNESS: That depends. That's why
11 the claims are -- are made this way, that it's coming
12 on Claim No. 2. Even if you don't have a velocity or
13 you have poor estimates or the like, still the system
14 will do a good job by predicting positions. But if
15 you have these estimates of the velocity, then you
16 improve the performance.
17 BY MR. BERL:
18   Q What does Claim 3 require that Claim 2
19 does not require, if the speed and heading of marine
20 currents, as you've testified, are already accounted
21 for as part of the predicting of positions in 1(b)?
22   A So if we read 2, it says that the method

313

1   comprises estimating the velocity; said estimated
2   velocity calculated using the vessel speed and the
3   like.
4   "3. In which the estimated velocity is a
5   water reference, towing velocity, that compensates
6   for the speed and heading of marine currents acting
7   on such positioning devices."
8   So in 2, you get an estimate of the
9   velocity that will be useful in calculating the gains
10 of the system. And 3, you can even use it to provide
11 some forces based on these velocities. So I have to
12 read it very careful to see whether it's No. 3 or 4.
13   Q   Okay.
14   A   No, I think it's 3. And so the -- like
15 we said, there is a predictive control. There is
16 also what's called "fit forward control."
17   Q   And what is that?
18   A   Fit forward control is something that
19 also improves the performance of systems. For
20 example, if the wind blows, and it's going to apply a
21 force, the control system works reactively. It blows
22 away your system, moves it, and as the -- you go away

314

1   from where you are, the control kicks in. And that's
2   the automatic control action. So it waits for
3   something to happen before it does.
4   Fit forward is when you have -- when you
5   can measure that wind velocity, you can apply the
6   force before the system starts moving. So you can
7   prevent the onset.
8   So he's talking about this in the main
9   specifications, that you can start by applying some
10 force to oppose some of the side current forces
11 before they act on the vessel to help the overall
12 system.
13   Q   That's what Claim 3 requires?
14   A   So I will have to remind myself because I
15 looked only at 1 and 5, but that's my interpretation
16 now. I can look at it -- the letters are too small
17 for my eyes.
18   Q   Okay. I would like to ask you about
19 something else, which is Limitation C of Claim 1,
20 "Using the predicted positions to calculate desired
21 changes in one or more -- of one or more of the
22 streamer positioning devices." Do you see that?

315

1   A   Yes.
2   Q   And the construction of that term -- I
3   will give you the WesternGeco patent owner response
4   in the '607 case. That's the 688 case.
5   If you go to page 13 of the WesternGeco
6   patent owner response --
7   A   Which page?
8   Q   13. Do you see near the top that it
9   refers to Element C?
10   A   Correct.
11   Q   It says: "Element C considers both the
12 streamer behavior as well as the behavior of the
13 complete streamer array. The '607 patent plainly
14 states this requirement that global control system 22
15 preferably calculates the desired vertical and
16 horizontal forces based on the behavior of each
17 streamer and also takes into account the behavior of
18 the complete streamer array."
19   Do you see that?
20   A   Yes.
21   Q   Is that, in your view, the correct
22 interpretation of Element C of the claims of the '607

316

1   patent?
2   A   On the basis of the reading of the
3   patent, it is correct.
4   Q   Okay. And now there is a statement that
5   the -- that Element C, the calculation considers both
6   the streamer behavior as well as the behavior of the
7   complete streamer array. What does "considers" mean
8   in the context of a calculation?
9   A   The algorithm by which you can -- you can
10 decide on controlling distributed systems has a
11 logic. For example, you want to act on a streamer
12 taking into account the prior history of what you
13 have applied. So "considers" means the algorithm
14 through which you will decide how to do correction
15 given the current status of the arrays.
16   Q   And then based on what is written here,
17 that algorithm for determining a calculation of how
18 far to move the streamer in the arrays has to have as
19 an input to it the behavior of each of the streamers
20 as well as the behavior of the complete streamer
21 array?
22   A   That's correct. Because especially if

317

1 **you do non-simple maneuvers, like feathering mode or**
2 **control mode, then for sure you need to take into**
3 **account the entire array.**
4 Q In order to maintain the array in those
5 modes like feathering.
6 A **To maintain the array in a configuration.**
7 Q And that's what's disclosed in the
8 Hillesund patents.
9 A **And that's what's disclosed in the**
10 **Hillesund patents.**
11 Q Okay. And turning to your declaration,
12 you comment on this in paragraph 57 of your
13 declaration.
14 And are you at paragraph 57, Doctor?
15 A **Yes, I am.**
16 Q And in paragraph 57, near the bottom, you
17 say: "Precise knowledge of array behavior is needed
18 for regular operations; i.e., during towing for data
19 acquisition, performing normal maneuvers, and other
20 normal operations other than emergency maneuvers."
21 Do you see that?
22 A **Yes.**

318

1 Q What does "knowledge of array behavior"
2 mean?
3 A **Knowledge of array behavior has two**
4 **components. One is to -- for the designer to**
5 **understand how these arrays move and behave. But in**
6 **terms of the patent implementation is to have a model**
7 **of these array behaviors.**
8 Q And that's separate from the model of the
9 streamers?
10 A **It is the model of the streamers.**
11 Q It is the same thing as the model of the
12 streamers or it's separate from the model of the
13 streamers?
14 A **It is the model of the streamers all put**
15 **together. So when you have them all together, you**
16 **have the entire array.**
17 **What this -- can I complete? What this**
18 **refers to is when you decide for each of the**
19 **streamers, you take into account where the other**
20 **streamers are and what they're going to do next.**
21 Q So in this sentence where you discuss
22 regular operations, that includes, for example, being

319

1 in feather angle mode, correct?
2 A **Where exactly are you talking about?**
3 Q The line we just read from, paragraph 57
4 of your declaration where you refer to "regular
5 operations."
6 A **"During towing for data acquisition,**
7 **performing normal maneuvers and other normal**
8 **operations other than emergency maneuvers."**
9 Q Right. Regular operations includes
10 feathering mode, right?
11 A **Yes, it does.**
12 Q And streamer separation mode?
13 A **And streamer separation mode.**
14 Q And turn control mode.
15 A **And turning.**
16 Q What you are saying is that the
17 calculation of changes must account for the behavior
18 of the complete streamer array in all of those modes,
19 correct?
20 A **Yes. To a variable degree in each case.**
21 Q Well, it says: "Precise knowledge of the
22 array behavior." So in each of those cases, the

320

1 precise knowledge of the array behavior must be
2 accounted for in calculating changes to the streamer
3 positions, correct?
4 A **Correct.**
5 Q And in support of this construction that
6 Element C here, the calculation, requires considering
7 the behavior of the complete array, you rely on
8 column 4, lines 48 through 51, correct?
9 A **Yes.**
10 Q And, in fact, you discuss that language
11 in your own declaration in paragraph 63, right?
12 A **Yes.**
13 Q And, again, you embolden many words in
14 that paragraph when you reproduce it in paragraph 63,
15 but the word "preferably" is not emboldened or
16 italicized in the sentence: "The global control
17 system 22 preferably calculates the desired vertical
18 and horizontal forces based on the behavior of each
19 streamer and also takes into account the behavior of
20 the complete streamer array."
21 Is that right?
22 A **That's correct. Given the lines at the**

321

1   **top of column 4.**
2   Q   Those same lines, 10 through 14?
3   A   **Lines 10 to 14.**
4   Q   Lines 10 through 14 don't recite taking
5   into account the behavior of the complete streamer
6   array, do they?
7   A   **Line 10 to 14 recites the behavior**
8   **predictive model-based control logic.**
9   Q   Correct. And it says nothing in lines 10
10   through 14 about being based on the behavior of each
11   streamer and also taking into account the behavior of
12   the complete streamer array. That only comes in
13   lines 48 through 51, right?
14   A   **Here it makes it plain. But model-based**
15   **means certainly a model of the system. The system is**
16   **the array.**
17   Q   And so that is the behavior of each
18   streamer, correct?
19   A   **All together, the array.**
20   Q   And taking into account the behavior of
21   the complete streamer array, right?
22   A   **Yes. The model is the model of the**

322

1   **array. The fact that the interaction between the**
2   **streamers, the dynamic reaction is not very strong,**
3   **can allow you perhaps to model them individually, but**
4   **then you have to consider all of them together.**
5   Q   And that requirement comes from lines 11
6   through 14, not from lines 48 through 51, which just
7   use the term "preferably" with respect to calculating
8   the forces based on the behavior of each streamer
9   taking into account the behavior of the complete
10   streamer array, right?
11   A   **It reinforces.**
12   Q   48 through 51 reinforces?
13   A   **No. That 10 to -- lines 10 to 14**
14   **reinforce the statement of "preferably."**
15   Q   Which part of the specification gives
16   rise to a requirement that the system calculate the
17   desired forces based on the behavior of each streamer
18   taking into account the behavior of the complete
19   streamer array?
20   A   **Well, "model-based" means you have a**
21   **model of the system. The system is the array. So**
22   **that's where it's coming from.**

323

1   Q   So the requirement is coming from lines
2   11 through 14 where it says "a behavior predictive
3   model-based control," right?
4   A   **Correct.**
5   Q   And that behavior model-based control may
6   or may not calculate the desired vertical and
7   horizontal forces based upon the behavior of each
8   streamer and also taking into account the behavior of
9   the complete streamer array, right?
10   MR. KIKLIS: Objection to form.
11   THE WITNESS: "Model-based" means you
12   calculate the forces based on the behavior of the
13   system.
14   BY MR. BERL:
15   Q   But it says it's only preferable that you
16   take into account each streamer and also the behavior
17   of the complete streamer array, right?
18   A   **But the overriding sentence is up above.**
19   **It says "model-based."**
20   Q   Let me ask you this: If in lines 48
21   through 51 the word "preferably" were absent, would
22   that change your interpretation of the patent at all?

324

1   A   **I don't think it would -- it would affect**
2   **my statement.**
3   Q   It wouldn't affect your interpretation.
4   A   **My interpretation.**
5   Q   And because you already have the
6   requirement in lines 11 through 14 that in your
7   statement, I'm reading from paragraph 62 now:
8   "Recognizes that proper lateral control calls for the
9   use of a behavior predictive model in the control
10   system." Right?
11   A   **Correct.**
12   Q   And that in your view, that requires not
13   only accounting for all of the forces that you
14   discussed this morning, but also accounting for each
15   streamer in the array and the behavior of the entire
16   streamer array.
17   A   **The model-based covers the entire array.**
18   **I think it's repeating it so things can be more**
19   **clear.**
20   Q   Okay. Now, if you look at the claim for
21   a moment, in Element B it requires predicting
22   positions of at least some of the streamer

325

1 positioning devices, correct?
2   A   Correct.
3   Q   And Element C requires using those
4 predicted positions to calculate desired changes in
5 one or more of the streamer positioning devices,
6 right?
7   A   Correct.
8   Q   But in your view, Element C, "using the
9 predicted positions to calculate desired changes in
10 positions of one or more of the streamer positioning
11 devices," must take into account the predicted
12 positions of the entire array, right?
13   A   The interpretation is within the context
14 of having a working system. But what made the
15 Bittleston patents be successful, and it was the
16 global overall control of all the -- of the -- so
17 looking at what he specified in column 4, line 10,
18 the -- he claims for the invention of this, but
19 really he means the entire array, not that he
20 means -- that's when the full benefit of the patent
21 is there.
22   Q   I'm not sure I understood that answer.

326

1   You mean that in column 4, he provides
2 for the full benefit of the invention of using all of
3 the streamer arrays in calculating desired changes,
4 but in the claim one need not use all of the
5 predicted positions in order to calculate desired
6 changes.
7   A   And I interpreted that based on his claim
8 of using the model-based compensator, he has to use
9 all of them.
10   Q   But in the claim it's clear that he is
11 using the predicted positions which can be, per
12 Element B, as few as two of the predicted positions
13 to calculate desired changes of one or more of the
14 streamer positioning devices, right?
15   A   The way I interpret it, I interpret this
16 is he takes the claim and he says, You want good
17 steering control, you need model-based compensation.
18   Then if you deactivate some of the -- of
19 the birds or apply control to only a few of them,
20 you're going to get some change but not -- but not
21 much. So from that point of view, I interpret the
22 patent as saying model-based control and allows some

327

1 latitude for -- I don't know what cases. I cannot
2 speculate now.
3   Q   So Claim 1 includes deactivating some of
4 the birds or applying control to fewer of them.
5   A   I'm speculating why he put down this only
6 at least some of the streamer positioning devices.
7   Q   Because notwithstanding what you believe
8 is disclosed in column 4 of the patent, the claim
9 language and structure itself suggests that not all
10 of the streamers need to be used in calculating the
11 desired changes in positions in Element C, right?
12   A   I interpreted -- in writing my own
13 patents, the patent lawyers advise you to put it as
14 general as it can be. So I presume here they told
15 him if someone has done your system and switches on
16 one of the birds can claim, Hey, I'm not interpreting
17 your patent if all are not working -- I'm not
18 infringing. Put some. But he puts the claim up
19 there at the top, and anybody who can read
20 understands.
21   That's my interpretation of why he puts
22 "some" and "at least some" and preferably this and

328

1 preferably that. I think it's general language of
2 patent lawyers. You know better. I know less.
3   Q   And I'm not asking why he did it. Again,
4 he is not here to answer questions, but you are. And
5 I'm asking you how a person of ordinary skill would
6 understand this claim, and a person of ordinary skill
7 would understand, whatever Dr. Bittleston and his
8 lawyer's reason for doing so, that what he's done
9 here is claim in Element C calculating changes in
10 position using the predicted positions of fewer than
11 all of the streamers. Correct?
12   A   I would say that the -- the statement in
13 the specifications alerts someone to the fact that
14 this localized current fluctuations can dramatically
15 influence the behavior. People in the field know
16 that these currents vary along the -- along the
17 arrays. Even along the arrays, the current is not
18 constant.
19   And, therefore, looking at this, they
20 would say, Yeah, sure, I could get away in some
21 unusual cases with towing an array with fewer. But
22 really what he says up there is, if I want to take

329

1 **advantage of the device -- that's my interpretation.**
2 **That's why I put down all the birds, because knowing**
3 **the dynamics of the system, it would be very**
4 **difficult or impossible to generally have a reliable**
5 **system if only a few or some were used.**
6 Q   But if you are, as you put it, getting
7 away with it by using fewer of the birds in
8 predicting positions and calculating the desired
9 changes, you may not get the full benefit of the
10 invention as disclosed in column 4, but you would be
11 practicing Claim 1.
12 **A   Yes. I see this a protection that**
13 **someone switches off one or two of the birds, and if**
14 **he puts everybody has to be using everything, and**
15 **they would say, I'm not using one and two, so I'm off**
16 **the hook.**
17 Q   But this claim is satisfied then as long
18 as the predicted positions of two or more streamer
19 positioning devices are used in the calculation of
20 desired changes in position, right?
21 **A   We're in speculation. I presume you know**
22 **the patent a little better than me.**

330

1 Q   I'm asking for your interpretation of the
2 claim through the lens of a person of ordinary skill,
3 and that interpretation is that as long as at least
4 two or more of the streamer positioning device
5 predicted positions are used in the calculation of
6 desired changes, one is within the scope of Claim 15
7 as you've interpreted it or Claim 1 as you've
8 interpreted it?
9 MR. KIKLIS: Objection. Misstates.
10 THE WITNESS: I didn't say that. I said
11 you had the system if you switch some of them off;
12 how you design it. So my interpretation is based on
13 how the person of the art would interpret this by
14 reading the document.
15 BY MR. BERL:
16 Q   But it's not just switching one of them
17 off. All that's required is predicting positions of
18 at least some of the streamer positioning devices.
19 At least some is two or more, correct?
20 **A   Correct.**
21 Q   And when it says "using the predicted
22 positions in Element C," those are the predicted

331

1 positions from Element B, correct?
2 **A   Yes.**
3 Q   Which are --
4 **A   He is trying to protect his patent.**
5 Q   Which are the predicted positions of two
6 or more SPDs.
7 **A   So he is trying to protect his patent.**
8 **But if we interpret the patent as it was implemented**
9 **and as it came about, reading it, you have to**
10 **interpret it in this way. You cannot design a**
11 **successful system just by having a few of them.**
12 **That's my --**
13 Q   That's your interpretation based on
14 column 4, rather than the language of the patent.
15 **A   That's right.**
16 Q   Rather than language of the claim.
17 **A   Correct.**
18 Q   It says -- why don't you go back to the
19 WesternGeco response again. And, in particular,
20 page 7 of the response.
21 **A   So here we're talking about document at**
22 **the top "435221 US"?**

332

1 Q   Yes.
2 **A   Yes. Okay. Where do I go now?**
3 Q   Page 7. Do you see in the bottom
4 paragraph, there is a sentence that begins with the
5 word "Trying"?
6 **A   Whereabouts?**
7 Q   Near the bottom of page 7 --
8 **A   Bottom.**
9 Q   -- there is a sentence that starts with
10 the word "Trying."
11 **A   Are we in the same document?**
12 Q   Yes. Yes, this sentence right here
13 (indicating).
14 **A   Ah, up there.**
15 Q   Do you see the sentence that begins with
16 the word "Trying," Doctor?
17 **A   Okay. "Trying to steer streamers with**
18 **simple position and estimates, rather than**
19 **time-adjusted positional data considering the**
20 **behavior of the system as a whole proved more**
21 **dangerous than towing with" -- yes.**
22 Q   Do you agree with that sentence of

PGS Exhibit 1103, pg. 84
PGS v. WesternGeco (IPR2014-01477)

333

1   WesternGeco's?
2   A   Yes, because that's the essence of the
3   patent. It says that with positional estimates in
4   the sense of known behavior-based predictions
5   will ignore all the dynamics that we talked about.
6   Q   Well, what would be an example of a
7   positional estimate that does not use the behavior of
8   the system as a whole?
9   A   Positional estimate is to take the
10 measurements that were fed from the sensors and pass
11 a curve through it, make a curve fitting through what
12 you saw, and say that's the estimate of where they
13 are, and let's apply control based on that.
14   Q   And that kind of positional estimate that
15 does not account for the forces on the streamer is
16 what could prove dangerous.
17   A   Right.
18   Q   And when you say "put a curve through
19 it," how do you put a curve through it?
20   A   You can put it through a least squares
21 method. Others have put -- I don't remember what
22 kind of curves they were suggesting to use. There

334

1   are ways of interpolating. And other ways to do
2   Kalman filtering is to least square fit it. So there
3   are ways to least square fit existing data.
4   Q   There are also ways to time adjust the
5   positional data using velocity to update it, correct?
6   A   Correct.
7   Q   Without accounting for the forces on the
8   streamers, right?
9   A   True.
10   Q   How do you describe that approach?
11   A   That's also sort of a filtering type of
12 procedure.
13   Q   And the filtering procedure would take
14 the data of positions and then use the velocity of
15 the system to update it in time, correct?
16   A   Correct.
17   Q   And such a system would not be a behavior
18 predictive model, correct?
19   A   Correct. Let me give you an example of
20 this. Let's say you are the parent of a one-year-old
21 who just manages to crawl on the floor. And you are
22 watching him or her. They are very slow. Okay. So

335

1   the -- looking at them at one point, you can read
2   your paper, and then a second later they will maybe
3   have their foot next to you or something, so you can
4   read the paper more or less comfortably.
5   If you have a two-year-old, if you look
6   for one minute at the newspaper, the next minute
7   they're at the end of the room trying to jump the
8   balcony. So in that case, the -- it's not a matter
9   so much of velocity and position right now, because
10 they can spurt. So it's the dynamics of the system
11 that counts. The two-year-old has such dynamics, the
12 actuators are so strong and fast, and no brain to
13 control them, that they will disappear.
14   So that's the difference between in one
15 case you extrapolate where it is now, okay, and you
16 say, Now where it's going to be next? If you don't
17 know the dynamics, it can be catastrophic. So the
18 system dynamics, and this is a very simple example
19 that I'm bringing, but the system dynamics give you
20 this insight. Is this a one-year-old I'm watching or
21 a two-year-old? If you don't tell your filter that
22 you have a two-year-old, then it's going to give you

336

1   a real different answer. That's what model-based
2   means. It doesn't mean that it gives you something
3   convoluted or difficult.
4   Q   And so I think that was a helpful analogy
5   to understand what your position is.
6   And as I understand it, correct me if I'm
7   wrong, what you're saying is that it's not enough to
8   predict position using estimated velocity and
9   carrying it forward to the next point in time by
10 simply applying the velocity times the time to get
11 the updated position, right?
12   A   Yes. And to make it more concrete for
13 the towed arrays, because you will say, Wait a
14 minute, you know, velocity. If I measure the
15 velocity of my daughter at all the times, maybe I can
16 do it.
17   The difference with towed arrays is you
18 have the velocity and the position at this point here
19 now. In the future what you did in the upstream buoy
20 will reach this, it's going to come now as a
21 traveling wave to hit it, and it's going to hit it
22 ten seconds later when you're about to do your

337

1 **correction and impart it to the data, and where you**
2 **have predicted it's going to go there, it's going to**
3 **go there because it's going to whiplash on the other**
4 **end. It's going to whip all the way to the other.**
5   Q   And so grounding this analysis in the
6 work you've done in this case in the claims of the
7 '607, if one is predicting position using estimated
8 velocity and carrying it forward to the next point in
9 time simply applying the velocity times the time to
10 get the updated position, you're not practicing the
11 claims of the '607 patent, right?
12   **A   Correct.**
13   Q   You mentioned that you have worked on
14 these patents before, right?
15   **A   Yes.**
16   Q   In the ION case, right?
17   **A   Correct.**
18   Q   And in connection with the ION case, you
19 were asked to compare the claims of these patents,
20 including Claims 1 and 15 of the '607 patent to ION's
21 accused device, right?
22   **A   Yes. At that time, that's right.**

338

1   Q   In order to render a conclusion about
2 whether ION infringed the claims of the '607 patent,
3 right?
4   **A   Yes. That was some time ago, yeah?**
5   Q   Yes, it was. And you submitted a report
6 in that case, correct?
7   **A   Correct.**
8   Q   And in submitting a report in that case,
9 you did your best to properly apply the claims of the
10 '607 patent to ION's accused device to render an
11 opinion about whether ION infringed the claims of the
12 '607 patent.
13   **A   Correct.**
14   Q   And you believe you did so properly.
15   **A   I believe so.**
16   Q   Let's take a look at the infringement
17 report you submitted in that case, which has been
18 marked as Exhibit 1083 in all of these cases now.
19   (Exhibit No. 1083 was marked for
20   identification.)
21 BY MR. BERL:
22   Q   And that is entitled "Opening Expert

339

1 Report of Michael S. Triantafyllou."
2   MR. KIKLIS: I want to point out that
3 this is marked "Highly Confidential" subject to the
4 District Court protective order, and, therefore, we
5 would ask that this be restricted to outside counsel
6 eyes only.
7   MR. BERL: Okay. I'm not sure you have
8 standing to do that given that he is analyzing ION's
9 infringement.
10 BY MR. BERL:
11   Q   Do you have a basis to believe that this
12 includes your confidential information? Or are you
13 acting in concert with ION?
14   **A   You have marked here a couple of places.**
15 **It doesn't matter?**
16   Q   Can I see it? What page?
17   MR. KIKLIS: We're going to take a look
18 through this, and we'll --
19   THE WITNESS: Well, 85, 87.
20   MR. KIKLIS: You have some checkmarks in
21 here or something.
22   MR. BERL: Yeah, this was marked at a

340

1 prior deposition. So --
2   THE WITNESS: Okay.
3   MR. BERL: -- I think it comes from
4 there. Well, so as I understand it, then --
5   MR. KIKLIS: So, Dave, just to be clear,
6 we're going to check to see whether there is any
7 confidential information of my clients.
8   MR. BERL: Okay.
9   MR. KIKLIS: That's what we're looking
10 for and that's what our concern was.
11   MR. BERL: Okay. I take it you're not
12 representing ION in this case.
13   Okay. In the interim, for the avoidance
14 of doubt, are you then requesting Mr. Hart to leave?
15   MR. KIKLIS: Just for the moment while we
16 go through this, okay?
17   MR. BERL: Why don't we do that off the
18 record for a moment.
19   MR. KIKLIS: Sure.
20   MR. BERL: Let's go off the record.
21   (Mr. Hart exits the conference room.)
22 BY MR. BERL:

341

1   Q   Is this the expert report that you
2 prepared and submitted in the ION case, Doctor?
3   **A   Going through it, it looks like it.**
4   Q   And in fact, on page 88, do you see your
5 signature there?
6   **A   Yes, I do.**
7   Q   And you signed this on or about
8 February 21st, 2012?
9   **A   Yes.**
10   Q   And you believed it to be true when you
11 signed the report?
12   **A   Correct.**
13   Q   And you believe it to be true today?
14   **A   I have no reasons otherwise.**
15   Q   And if you look at the first page of the
16 report, page 1, it says in the first paragraph: "I
17 offer the following report regarding the infringement
18 of," and then it gives U.S. patents that includes
19 7,080,607. Do you see that?
20   **A   Yes.**
21   Q   That's the '607 patent that we've been
22 discussing today, correct?

342

1   **A   Okay.**
2   Q   Right?
3   **A   Yes.**
4   Q   And if we turn to page 59, do you see a
5 Roman numeral IV?
6   **A   Okay. I'm 59, IV, '607 patent.**
7   Q   This is where you begin to analyze the
8 '607 patent infringement, correct?
9   **A   Right.**
10   Q   And if you look at little (b) on the
11 bottom of page 59, it says: "A prediction unit
12 adapted to predict positions of at least some of the
13 streamer positioning devices." Do you see that?
14   **A   Yes.**
15   Q   And that's one of the limitations we've
16 been discussing here today, correct?
17   **A   Correct.**
18   Q   And in paragraph 145, you begin by
19 saying: "There are several modules within Orca
20 and/or Spectra that are adapted to predict positions
21 of the DigiFIN devices." Do you see that?
22   **A   I do.**

343

1   Q   And then it says: "The network
2 calculation node of Orca and/or Spectra is a
3 prediction unit that predicts positions of the nodes
4 in the system including the DigiFINs."
5   Do you see that?
6   **A   Yes, I do.**
7   Q   And the network calculation node of Orca
8 and/or Spectra, that refers to part of the ION
9 system, correct?
10   **A   Correct.**
11   Q   Orca is the ION system; is that right?
12   **A   Right.**
13   Q   And the DigiFINs are the ION birds,
14 correct?
15   **A   Yes.**
16   Q   And you rely on testimony from
17 Mr. Macnab. He is an ION witness; is that right?
18   **A   Yes, as I recall.**
19   Q   And you say he testified:
20   "Q. So the Kalman filter is predicting
21 the positions of the DigiFIN node?
22   "A.   It's predicting the position of all

344

1 nodes.
2   "Q. And among the nodes are the Kalman
3 filter is predicting the position of the DigiFIN
4 devices?
5   "A. Yes."
6   And you rely on that testimony from
7 Mr. Macnab's deposition in your conclusion regarding
8 a prediction unit adapted to predict positions of at
9 least some of the streamer positioning devices; is
10 that right?
11   **A   That is right.**
12   Q   Okay. And then you continue, and you
13 say: "Mr. Macnab further testified:
14   "Q. And does the NCN --
15   NCN is network calculation node, right?
16   **A   Yes.**
17   Q   Network calculation node.
18   "Q. Does the NCN essentially predict
19 position using that estimated velocity carrying it
20 forward to the next point in time by simply applying
21 the velocity times the time to get an updated
22 position?

345

1   "A. In simple terms, yes."
2   Do you see that?
3   **A   I do.**
4   Q   And that is the end of your analysis as
5   to whether the network calculation node of ION's
6   system satisfies Limitation B of the '607 claims, "a
7   prediction unit adapted to predict positions of at
8   least some of the streamer positioning devices,"
9   right?
10   MR. KIKLIS: Hold on one second.
11   Objection. Form.
12   THE WITNESS: This is one testimony, and
13   you have to see the following. It says here:
14   "Essentially predict positioning using that estimated
15   velocity carrying forward" -- "in simple terms, yes."
16   Now, "simple terms" means that's how
17   he -- he perceived it. That's how he understood it.
18   So in the example of the girl we spoke of earlier
19   that you supervise, the one-year-old versus a
20   two-year-old, it makes a difference if you take the
21   velocity and you integrate it to find position or you
22   use Newton's law, mass times acceleration equals

346

1   force, to find what the next step is based on. You
2   know, there is a scheme.
3   So at the time we had a specialist from
4   my department, Professor John Leonard, who looked
5   into the workings of the Kalman filter of the ION
6   product. I went into the ION manuals. And in the
7   manuals of the ION -- I remember it very well because
8   we prepared slides for this -- and they contained
9   the -- among the other things that they contained in
10   their coverage is that the prediction can be done, we
11   can do it, and they included the Smith predictor.
12   That's a control mode, Smith predictor.
13   So on the basis of this analysis, we can
14   -- this is one -- you identify one of the issues
15   where someone is talking about the Kalman filter, and
16   I mentioned it because in his own words that's how he
17   interpreted the propagation. But there was more
18   intelligence behind the propagation mode of the ION
19   at the time, as we concluded from the documents and
20   looking at the software.
21   BY MR. BERL:
22   Q   The analysis performed by Dr. Leonard, is

347

1   it?
2   **A   Professor Leonard, yes.**
3   Q   Professor Leonard in your department at
4   MIT?
5   **A   Right.**
6   Q   Referenced in the infringement report,
7   Exhibit 1083?
8   **A   It is -- I think I mentioned somewhere**
9   **here in my own declaration -- in the current**
10   **declaration, his testimony, so you can find it as an**
11   **exhibit, yes.**
12   Q   I'm asking about this exhibit where you
13   concluded that ION infringes the claims of the '607
14   patent, is Professor Leonard's analysis disclosed as
15   a basis for your opinion?
16   **A   At the time we were -- I was relying on a**
17   **number of such items. Not just the -- this**
18   **particular code that you have here.**
19   MR. KIKLIS: Hey, Dave, you can call
20   Mr. Hart back. We're fine.
21   MR. BERL: Okay. We will get to the
22   other things.

348

1   (Mr. Hart returns to the deposition
2   proceedings.)
3   BY MR. BERL:
4   Q   My question is, this analysis that
5   Professor Leonard did, did you rely on it in your
6   infringement report that concludes that ION infringes
7   the claims of the '607 patent, Exhibit 1083?
8   **A   I have to review it and see how I -- I**
9   **constructed the interpretations. But we started,**
10   **first of all, by the fact that -- so it was -- it was**
11   **all this evidence put together that put it into -- it**
12   **was not that single statement that you have there.**
13   Q   Except the entirety of the analysis that
14   you provide, in order to conclude that ION infringes
15   Limitation B of the '607 patent claims, "a prediction
16   unit adapted to predict positions of at least some of
17   the streamer positioning devices," is in that
18   subsection (b), paragraphs 145 and 146, correct?
19   MR. KIKLIS: Objection. Misstates.
20   THE WITNESS: And -- I'm answering that
21   we had looked at the manuals of ION to conclude about
22   this. The fact that he's understanding it in a

349

1 certain way doesn't mean that that's how it was done.
2 BY MR. BERL:
3   Q   Do you rely on the manuals in the section
4 of your expert report where you conclude that ION
5 infringes Limitation B, "a prediction unit adapted to
6 predict positions of at least some of the streamer
7 positioning devices"?
8   MR. KIKLIS: Objection. Form.
9   THE WITNESS: It was in -- the decision
10 was made in combination with what we had read of the
11 ION manuals and his statements.
12 BY MR. BERL:
13   Q   Let me ask you again. Do you cite the
14 ION manuals anywhere in Section (b) -- well, frankly
15 anywhere in the section regarding the '607 patent in
16 Exhibit 1083, your infringement report in the ION
17 case?
18   MR. KIKLIS: Objection. Form.
19   THE WITNESS: I have to read the --
20   MR. KIKLIS: Scope.
21   THE WITNESS: I have to read my report to
22 see exactly where I phrase it and everything, but the

350

1 manuals were part of the analysis, because I quote
2 them in here in the -- in this report.
3 BY MR. BERL:
4   Q   Whether you quote the materials somewhere
5 in your report, Doctor, when you provide your opinion
6 that ION satisfies the limitation of "a prediction
7 unit adapted to predict positions of at least some of
8 the streamer positioning devices," you don't cite the
9 ION manuals, you don't cite Dr. Leonard's analysis,
10 you don't cite the Smith predictor, correct?
11   MR. KIKLIS: Objection. Form, scope.
12   THE WITNESS: The -- the entire manual, I
13 had read it, and that's where I based my opinion.
14 BY MR. BERL:
15   Q   But the opinion that you provide here,
16 Doctor, relies on Mr. Macnab's testimony rather than
17 the manual or Dr. Leonard's analysis or some analysis
18 you purport to have conducted using a Smith
19 predictor, right?
20   MR. KIKLIS: Objection. Form, scope,
21 asked and answered.
22   THE WITNESS: No. I answered to you that

351

1 this was one of the statements that I put in to
2 corroborate that they were having a Kalman filter
3 working. What his interpretation was was different
4 than the ION manuals, and that came about in the
5 trial too.
6 BY MR. BERL:
7   Q   But his interpretation that you cite here
8 was sufficient for you to conclude in this
9 infringement report that ION satisfies Limitation B?
10   A   It was --
11   MR. KIKLIS: Hold on a minute.
12 Objection. Form, scope, misstates.
13   THE WITNESS: I'm quoting this -- I had
14 quoted that quote only to show that the Kalman filter
15 was part of the overall scheme. I didn't use it for
16 -- until I finish. I didn't use it to make this
17 specific -- it was everything all put together. So
18 I'm quoting in order to explain there are many other
19 statements I have made in my report that support this
20 infringement.
21 BY MR. BERL:
22   Q   But the testimony that you relied on here

352

1 to support infringement of Limitation B, the
2 limitation of "a prediction unit adapted to predict
3 positions of at least some of the streamer
4 positioning devices," is Mr. Macnab's testimony that
5 the network calculation node of the ION system
6 essentially predicts position using estimated
7 velocity, carrying it forward to the next point in
8 time by simply applying the velocity times the time
9 to get the updated position, correct?
10   MR. KIKLIS: Objection.
11   THE WITNESS: No --
12   MR. KIKLIS: Objection. Asked and
13 answered, scope.
14   THE WITNESS: My analysis relied on the
15 ION manual.
16 BY MR. BERL:
17   Q   Which isn't cited in this section, right?
18   A   Because --
19   MR. KIKLIS: Objection. Scope.
20   THE WITNESS: -- I explained that I read
21 the entire manual, and then I wanted someone to say
22 that indeed the Kalman filter was part of it. So

353

1   that's why I put that statement here.
2   BY MR. BERL:
3   Q   But they're using the Kalman filter here
4   in this testimony simply to predict position using
5   the estimated velocity carrying it forward to the
6   next point in time by applying the velocity times the
7   time to get an updated position, right?
8   MR. KIKLIS: Objection. Scope.
9   THE WITNESS: He says: "In simple terms,
10   yes." No, he does not say that.
11   BY MR. BERL:
12   Q   Because he says "in simple terms"?
13   A   Yes.
14   MR. KIKLIS: Objection. Scope.
15   BY MR. BERL:
16   Q   You believe when you submitted this
17   report, Doctor, that the testimony you cited in
18   paragraph 145 was supportive of your conclusion that
19   ION infringes Limitation B of the '607 patent, right?
20   MR. KIKLIS: Objection. Asked and
21   answered, scope.
22   THE WITNESS: It was part of my

354

1   conclusion that it was infringing.
2   BY MR. BERL:
3   Q   The testimony that the NCN of the ION
4   system "essentially predicts position using the
5   estimated velocity carrying it forward to the next
6   point in time by simply applying the velocity times
7   the time to get an updated position" was considered
8   by you to be supportive of the conclusion that ION
9   meets Limitation B of a prediction unit adapted to
10   predict positions of at least some of the streamer
11   positioning devices, right?
12   A   No.
13   MR. KIKLIS: Objection. Asked and
14   answered, scope.
15   BY MR. BERL:
16   Q   It was not supportive?
17   MR. KIKLIS: Objection.
18   BY MR. BERL:
19   Q   It was not supportive and yet you cited
20   it?
21   MR. KIKLIS: Objection. Scope.
22   Hold on. You've got to let me object.

355

1   BY MR. BERL:
2   Q   Is your testimony that that testimony you
3   relied on from Mr. Macnab in paragraph 145 was not
4   supportive of your infringement conclusion, yet
5   Mr. Macnab's testimony is the only thing you cite?
6   MR. KIKLIS: Objection. Asked and
7   answered, scope, argumentative.
8   THE WITNESS: You twisted my answer
9   completely. I used this to explain that there is a
10   Kalman filter, and he admitted it. The way he
11   explains it is different than what the manual is
12   explaining.
13   BY MR. BERL:
14   Q   Where do you say that in your expert
15   report where you conclude that ION infringes the
16   claims of the '607 patent?
17   MR. KIKLIS: Objection. Scope.
18   THE WITNESS: I will have to read the
19   report and tell you exactly where and how we --
20   BY MR. BERL:
21   Q   Well, it's certainly not in the section
22   of the report about infringement of the '607 patent.

356

1   Would you agree with that?
2   MR. KIKLIS: Watch the tone, Counsel.
3   Objection. Scope.
4   MR. BERL: My tone is perfectly
5   appropriate.
6   MR. KIKLIS: Lower your voice.
7   MR. BERL: I haven't raised my voice a
8   single time today.
9   MR. KIKLIS: You are starting to.
10   THE WITNESS: Again, this was -- this --
11   the simple admission that there was a Kalman filter
12   came out of the ION manual. So we needed to have it
13   on the record that they recognized that this was the
14   case, because initially they were talking about not
15   having a working manual -- I don't remember the
16   details now. So that's why I put this quote in
17   there.
18   BY MR. BERL:
19   Q   But your testimony now, as I understand
20   it, Doctor, is that the explanation provided by
21   Mr. Macnab that you rely on to assert that ION
22   infringed the claims of the '607 patent is in fact

357

1 not supportive of the view that ION infringes the
2 '607 patent, but that the documents that do support
3 that view, such as the manual and Dr. Leonard's
4 analysis, were not cited in the section of the report
5 about ION's infringement of the '607 patent; is that
6 right?
7   MR. KIKLIS: Objection. Scope,
8 misstates, argumentative.
9   THE WITNESS: You're misstating my
10 answers. I had read the entire report of the ION at
11 the time, and, therefore, all I needed is the fact to
12 show that there was a Kalman filter. How he --
13 Macnab explained the Kalman filter is another story.
14 BY MR. BERL:
15   Q   But it's a story that you relied on in
16 support of your infringement conclusion.
17   MR. KIKLIS: Objection. Scope.
18 Misstates.
19 BY MR. BERL:
20   Q   So your testimony here today, Doctor, is
21 that you did not rely on Mr. Macnab's testimony in
22 concluding that ION infringed the '607 patent?

358

1   MR. KIKLIS: Objection. Misstates, asked
2 and answered, scope.
3   THE WITNESS: I answered that I relied on
4 Macnab's to show that there is a Kalman filter there,
5 and then it was up to us to decide what the Kalman
6 filter is doing.
7 BY MR. BERL:
8   Q   But you cited his testimony that explains
9 his understanding of what the Kalman filter does in
10 support of your conclusion that ION infringes.
11   MR. KIKLIS: Objection. Badgering,
12 scope, asked and answered many times.
13 BY MR. BERL:
14   Q   Why did you do that?
15   MR. KIKLIS: Objection. Scope.
16 BY MR. BERL:
17   Q   If it wasn't supported?
18   MR. KIKLIS: Objection. Scope.
19   THE WITNESS: I never said it was not
20 supported.
21 BY MR. BERL:
22   Q   Okay. So the testimony that you cite in

359

1 paragraph 145 where Mr. Macnab testifies that the NCN
2 essentially predicts position using the estimated
3 velocity carrying it forward to the next point in
4 time by simply applying the velocity times the time
5 to get an updated position, that is supportive of the
6 infringement conclusion, correct?
7   A   No.
8   MR. KIKLIS: Objection. Scope. Asked
9 and answered.
10   THE WITNESS: In simple terms, yes.
11 Afterwards it requires interpretation, what is the
12 meaning of "simple terms"?
13 BY MR. BERL:
14   Q   You don't elucidate the meaning of
15 "simple terms" in your expert report, but you rely on
16 his statement to conclude that ION infringes, right?
17   MR. KIKLIS: Objection. Scope.
18   THE WITNESS: I didn't say that.
19 BY MR. BERL:
20   Q   That's what you've done here, isn't it,
21 Doctor?
22   MR. KIKLIS: Objection. Argumentative,

360

1 scope.
2 BY MR. BERL:
3   Q   Did you get it wrong in the ION case?
4   MR. KIKLIS: Objection. Scope.
5 Argumentative.
6   THE WITNESS: No, I have not.
7 BY MR. BERL:
8   Q   If you think that you did it wrong in the
9 ION case and you shouldn't have reached a conclusion
10 of infringement on the bases that you did here in the
11 report, you can just say so. Did you get it wrong?
12   MR. KIKLIS: Objection. Argumentative,
13 scope.
14   THE WITNESS: I did not.
15 BY MR. BERL:
16   Q   What you did hear in analyzing the ION
17 system and concluding that ION infringed Limitation B
18 of the claims of the '607 patent was correct.
19   MR. KIKLIS: Objection. Scope, asked and
20 answered, badgering.
21   THE WITNESS: I answered.
22 BY MR. BERL:

361

1   Q   It's correct, right?
2   A   I answered.
3   MR. KIKLIS: Objection. Scope. Asked
4 and answered. Badgering.
5 BY MR. BERL:
6   Q   You have not answered that question. If
7 it's correct, just tell me, and we will move on to
8 another question.
9   MR. KIKLIS: Objection. Asked and
10 answered, scope, badgering.
11   THE WITNESS: I answered the question.
12 BY MR. BERL:
13   Q   Is the answer yes, Doctor?
14   MR. KIKLIS: Objection. Scope, asked and
15 answered, badgering.
16 BY MR. BERL:
17   Q   I'm not badgering. If the answer is
18 "yes," I might have missed it, for which I apologize.
19 But if the answer to the question is "yes," just tell
20 me.
21   MR. KIKLIS: Objection. Scope, asked and
22 answered, badgering.

362

1 BY MR. BERL:
2   Q   Is the answer "yes"?
3   MR. KIKLIS: Objection. Scope, asked and
4 answered, badgering.
5 BY MR. BERL:
6   Q   You're declining to answer my question as
7 to whether the answer is "yes" that you --
8   A   I answered --
9   MR. KIKLIS: Object.
10 BY MR. BERL:
11   Q   -- correctly analyzed the infringement
12 case in the ION expert report?
13   MR. KIKLIS: Objection. Scope, asked and
14 answered, badgering.
15   THE WITNESS: I answered. We can read it
16 off the record.
17 BY MR. BERL:
18   Q   I'd like you to answer the question. The
19 analysis that you conducted here in Exhibit 1083,
20 concluding that ION infringed the claims of the '607
21 patent, including Limitation B, correct?
22   MR. KIKLIS: Objection. Scope, asked and

363

1 answered, badgering.
2   THE WITNESS: I answered where I -- where
3 I based my conclusion. The conclusion is that there
4 is a Kalman filter, and the Kalman filter is doing
5 what the manual says where the words were such as to
6 conclude that there was prediction based on modeling.
7 BY MR. BERL:
8   Q   Let me ask you this: You referred to
9 Professor Leonard. Is he more familiar with the
10 workings of the ION Kalman filter than you are?
11   MR. KIKLIS: Objection. Scope.
12   THE WITNESS: You want the details of the
13 analysis of --
14 BY MR. BERL:
15   Q   No, my question didn't ask for the
16 details of the analysis.
17   My question is, is Dr. Leonard more
18 familiar with the workings of the ION Kalman filter
19 than you are?
20   A   He was --
21   MR. KIKLIS: Objection. Scope.
22   THE WITNESS: He was asked at the time to

364

1 analyze the Kalman filters.
2 BY MR. BERL:
3   Q   And he did that.
4   A   He did that.
5   MR. KIKLIS: Objection. Scope.
6 BY MR. BERL:
7   Q   Yes, he did?
8   MR. KIKLIS: Objection. Scope.
9 BY MR. BERL:
10   Q   I missed the answer. He did that? Okay.
11 You got that.
12   And you relied on his analysis of ION's
13 Kalman filter?
14   MR. KIKLIS: Objection. Scope.
15   THE WITNESS: I relied also on his
16 analysis, but I relied primarily on my analysis of
17 the manual.
18 BY MR. BERL:
19   Q   But the analysis of the Kalman filter was
20 done by Dr. Leonard.
21   MR. KIKLIS: Objection. Scope.
22   THE WITNESS: Of the implementation of

PGS Exhibit 1103, pg. 92
PGS v. WesternGeco (IPR2014-01477)

365

1   the Kalman filter.
2   BY MR. BERL:
3   Q   And so you didn't analyze that yourself.
4   Dr. Leonard did and you relied on him.
5   MR. KIKLIS: Objection. Scope.
6   THE WITNESS: We are talking about
7   different phases and different points in this whole
8   thing.
9   BY MR. BERL:
10   Q   That may be, but you didn't analyze that
11 yourself. Dr. Leonard did and you relied on him.
12   A   I analyzed --
13   MR. KIKLIS: Objection. Scope.
14   THE WITNESS: -- the manuals of ION.
15 BY MR. BERL:
16   Q   I understand you analyzed the manuals.
17 Dr. Leonard analyzed the implementation of the Kalman
18 filter, you did not, and you relied on Dr. Leonard's
19 analysis of the implementation of the Kalman filter.
20 Do I have it right?
21   MR. KIKLIS: Objection. Scope.
22   THE WITNESS: He analyzed the computer

366

1   code of ION. I analyzed the manuals of ION.
2   BY MR. BERL:
3   Q   And so with respect to the computer code
4   and the implementation of the Kalman filter,
5   Dr. Leonard is more knowledgeable than you?
6   MR. KIKLIS: Objection.
7   THE WITNESS: I didn't say that.
8   MR. KIKLIS: Scope, argumentative.
9   BY MR. BERL:
10   Q   It's a question. Am I right or wrong?
11   MR. KIKLIS: Objection. Scope.
12   THE WITNESS: We both arrived at our
13 conclusions.
14 BY MR. BERL:
15   Q   You based on the manual; Dr. Leonard
16 based on his analysis of ION's code.
17   MR. KIKLIS: Objection. Scope.
18 BY MR. BERL:
19   Q   Right?
20   A   Correct.
21   Q   And you based on deposition testimony
22 from ION witness Mr. Macnab, right?

367

1   MR. KIKLIS: Objection. Scope.
2   THE WITNESS: I answered that part.
3   BY MR. BERL:
4   Q   In your paragraph 145 -- and we can
5   expand if you would like to the whole section where
6   you conclude that ION infringes the '607 patent --
7   you mention nothing about behavior prediction, do
8   you?
9   MR. KIKLIS: Objection. Argumentative,
10 scope.
11   MR. BERL: It's not argumentative.
12   MR. KIKLIS: Sure, it is.
13   MR. BERL: It's a complete question.
14   MR. KIKLIS: Are you asking for an
15 explanation?
16   MR. BERL: Nope.
17   MR. KIKLIS: You're raising your voice.
18   MR. BERL: I'm not raising my voice.
19 You've raised your voice more than I have today.
20   MR. KIKLIS: You are badgering the
21 witness. You've asked the same question a million
22 times. I ask you to move on.

368

1   THE WITNESS: The question at the time
2   was whether there was a Kalman filter predicting, and
3   the Kalman filter had to predict in a certain way.
4   So I first had to establish that there was such, so
5   I'm quoting all the evidence as it was coming at the
6   time.
7   BY MR. BERL:
8   Q   And the evidence you had at the time was
9   that ION had a Kalman filter, and that was sufficient
10 for you to conclude that they infringed Limitation B
11 of the '607 patent.
12   A   No.
13   MR. KIKLIS: Objection. Asked and
14 answered, scope, badgering.
15 BY MR. BERL:
16   Q   Not true?
17   MR. KIKLIS: Objection. Asked and
18 answered, scope, badgering.
19   THE WITNESS: I looked at the manual
20 which described all the intent and function of the
21 ION system. So on the basis of that, I concluded
22 that the Kalman filter is infringing because the

369

1   Kalman filter may or may not infringe.
2   BY MR. BERL:
3   Q   Why didn't you cite the ION manual then
4   if that was your basis for concluding that ION
5   infringes?
6   MR. KIKLIS: Objection. Scope, asked and
7   answered, badgering.
8   THE WITNESS: I answered that question.
9   BY MR. BERL:
10   Q   I don't think you did. Why didn't you
11 cite the ION manual?
12   MR. KIKLIS: Objection. Scope, asked and
13 answered, badgering.
14   THE WITNESS: The ION manual is
15 referenced in several locations by photocopying here.
16 So I based my opinion on that.
17 BY MR. BERL:
18   Q   Let's go back to my prior question which
19 was not answered. In this section where you analyzed
20 the infringement by ION of the claims of the '607
21 patent, do you say anything about behavior
22 prediction?

370

1   MR. KIKLIS: Objection. Scope.
2   THE WITNESS: I had concluded that the
3   Kalman filter was infringing. That's why I'm
4   concentrating on establishing there is a Kalman
5   filter. That is what this part of the report is
6   saying.
7   BY MR. BERL:
8   Q   So the answer is, no, that there is no
9   mention in this section of behavior predictive model?
10   MR. KIKLIS: Objection. Scope.
11   THE WITNESS: It's not as you stated.
12 BY MR. BERL:
13   Q   And same with accounting for all of the
14 forces on the streamer positioning devices, not
15 addressed in this section where you conclude that ION
16 infringes the '607 patent, right?
17   MR. KIKLIS: Objection. Scope.
18   THE WITNESS: Which paragraph are you
19 talking about now?
20 BY MR. BERL:
21   Q   The entire section that begins "'607
22 patent" on page 59.

371

1   A   I'm --
2   MR. KIKLIS: Objection.
3   THE WITNESS: I read the report. I
4   discovered in it the prediction and the Kalman filter
5   and everything else. That brought these questions
6   and this testimony about.
7   I was convinced from the reading the
8   manual that they were using prediction in their
9   Kalman filter. That's how I structured the report at
10 the time. It was more the importance of having this
11 item in the overall scheme of things, and the ION
12 manual explained the rest.
13 BY MR. BERL:
14   Q   And when you say "prediction" -- well,
15 let me just make sure I have the testimony clearly.
16   There is nothing in this section about
17 accounting for all the forces on the streamer
18 positioning devices, right?
19   MR. KIKLIS: Objection. Form, scope.
20   THE WITNESS: What exactly are you asking
21 now?
22 BY MR. BERL:

372

1   Q   In this section of the report --
2   A   145?
3   Q   No. The entire section that begins with
4   the "'607 patent" at the top of page 59, you say
5   nothing about accounting for all of the forces on the
6   streamer positioning devices.
7   A   Accounting for all the --
8   MR. KIKLIS: Objection. Form and scope.
9   THE WITNESS: What do you mean by
10 "accounting for all the forces"?
11 BY MR. BERL:
12   Q   Accounting for all of the forces on the
13 streamer positioning devices.
14   A   What do you mean by that?
15   MR. KIKLIS: Objection. Form, scope.
16 BY MR. BERL:
17   Q   What you testified about this morning,
18 that the behavior predictive model has to account for
19 the forces on the streamer positioning devices, and
20 you set forth many of them for me this morning. Do
21 you remember that? The traveling waves.
22   A   You mean the behavior of the system?

373

1   Q   Yes. Anything about that in this section
2 of the report where you conclude that ION infringes?
3   MR. KIKLIS: Objection. Form, scope.
4   THE WITNESS: The ION system was very
5 complex. It had several nodes. They were carrying
6 them around. So we have to read all in perspective
7 of the report. You are asking a very vague question.
8 You're --
9 BY MR. BERL:
10   Q   You have interpreted the claims of the
11 '607 patent to require accounting for all of the
12 forces on the streamer positioning devices.
13   And my question is quite simply, in the
14 section where you conclude that ION infringes the
15 '607 patent, can you point me to any place where you
16 address whether ION in fact does so?
17   MR. KIKLIS: Objection. Misstates,
18 scope, form.
19   THE WITNESS: Okay. So what I explained
20 this morning was that you have to account for the
21 forces and produce appropriate models of the behavior
22 of the system. And one of them was the delay, the

374

1 traveling wave and the like.
2   You can do all sorts of models for this,
3 complex or simple. Okay. So even if you make a
4 simple model such as mass times acceleration equals
5 the force delayed by a certain amount of time, that's
6 a model of the system. You may be smart enough to
7 capture some essential dynamics of the delay. Okay.
8 So it doesn't have to be all the forces that you're
9 talking about. It can be a very simple model with a
10 delay in it.
11 BY MR. BERL:
12   Q   Any analysis of that here in concluding
13 that ION infringes?
14   MR. KIKLIS: Objection. Form, scope.
15   THE WITNESS: We -- when you infringe,
16 you infringe even when you use a simplified model.
17 In other words, if it contains the essence of the
18 model, which is delay, then you are using the
19 methodology that Bittleston came up with.
20 BY MR. BERL:
21   Q   And when you say "delay," you are saying
22 accounting for the traveling wave, for example.

375

1   A   For example. So it can be a simpler way
2 to practice the model.
3   Q   You don't address any such model in
4 concluding that ION infringes, do you?
5   MR. KIKLIS: Objection. Form, scope,
6 asked and answered.
7 BY MR. BERL:
8   Q   I'm not trying to make this hard. If you
9 addressed it, maybe I missed it or I'm not
10 understanding your analysis, and you can point me to
11 it. If you didn't address it, you can just tell me
12 you didn't address that.
13   MR. KIKLIS: Objection. Form, scope,
14 asked and answered.
15   THE WITNESS: In this report I put down
16 the information as best I -- I thought at the time.
17 Later on at the trial, all these questions came up --
18 about, and then I presented the entire, you know,
19 case with the manuals and supporting pages, with the
20 Smith predictor and the like.
21 BY MR. BERL:
22   Q   And the source code.

376

1   MR. KIKLIS: Objection. Form.
2   THE WITNESS: That was someone else's --
3 someone else's testimony.
4 BY MR. BERL:
5   Q   So you did not rely on the source code.
6   A   I read the report of --
7   MR. KIKLIS: Objection. Scope.
8   THE WITNESS: -- Dr. Leonard, but at the
9 time we decided to act in parallel rather than one
10 relying on the other.
11   So I have to remember some of those
12 things, and because now you're putting me, you know,
13 three years back and with this report.
14 BY MR. BERL:
15   Q   And so --
16   A   I read the -- let me put it straight.
17 Don't interrupt me here.
18   I read the ION manual, and that's where
19 we discovered the infringement.
20   Q   And --
21   A   And the -- the -- we discovered that they
22 were practicing some of the claims of the Bittleston

377

1 patents. So I put it down with all the evidence that
2 we had at the time.
3   And then later on at the trial, we made
4 it -- so I remember things from the trial which I'm
5 telling you now, but you want to concentrate on the
6 sentences here. But I'm telling you at the time I
7 relied on the ION manual.
8   MR. KIKLIS: We've been going for almost
9 an hour and a half. Why don't we take a break.
10   MR. BERL: Okay.
11   (Recess.)
12 BY MR. BERL:
13   Q   Doctor, do you still have Exhibit 1083 in
14 front of you, your infringement report from the ION
15 case?
16   A   Yes.
17   Q   And I just wanted to ask you a few more
18 questions about what is or is not in the section
19 about infringement of the '607 patent.
20   Nothing there about accounting for
21 traveling waves or disturbances, right?
22   MR. KIKLIS: Objection. Scope.

378

1   THE WITNESS: That is in the model that
2 is used in the Kalman filter.
3 BY MR. BERL:
4   Q   In the source code?
5   A   In -- what the ION manuals claimed.
6   MR. KIKLIS: Objection. Scope.
7 BY MR. BERL:
8   Q   The analysis that you undertook in the
9 infringement report in front of you, 1083, of the
10 '607 patent, does not include any discussion of
11 accounting for traveling waves or disturbances,
12 right?
13   MR. KIKLIS: Objection. Scope,
14 misstates.
15   THE WITNESS: A traveling wave manifests
16 itself as a delay. So modeling something with a
17 delay is a way of accounting for the traveling waves.
18 BY MR. BERL:
19   Q   But what you've relied on was
20 Mr. Macnab's testimony of predicting position using
21 estimated velocity in carrying it forward. That's
22 not accounting for traveling waves, is it?

379

1   A   And the ION manuals which explained the
2 issue about delay and the Smith predictor.
3   Q   And so let me -- I'm asking you about
4 this report. I'm not asking you about some other
5 testimony you may have given.
6   In this report, there is nothing in the
7 section where you conclude that ION infringes the
8 '607 patent about accounting for traveling
9 disturbances, right?
10   MR. KIKLIS: Objection. Scope, asked and
11 answered.
12   THE WITNESS: It was after I read the ION
13 manual.
14 BY MR. BERL:
15   Q   Not in this section.
16   MR. KIKLIS: Objection.
17   THE WITNESS: Yes.
18   MR. KIKLIS: Asked and answered, scope.
19   THE WITNESS: The manual was read in the
20 beginning before I read the -- because -- before I
21 wrote this.
22 BY MR. BERL:

380

1   Q   I'm not sure why you are having troubling
2 answering my questions. I'm just asking whether this
3 section where you conclude that ION infringes the
4 '607 patent has any discussion of traveling waves or
5 disturbances.
6   A   And I explained to you --
7   MR. KIKLIS: Objection. Scope.
8   THE WITNESS: -- that I arrived at it
9 after reading the ION manual.
10 BY MR. BERL:
11   Q   So the answer is, no, there is no
12 discussion of traveling waves or disturbances in this
13 section of the ION report about infringing the '607
14 patent.
15   MR. KIKLIS: Objection. Misstates,
16 scope.
17   THE WITNESS: It was after I read the ION
18 manual where it states explicitly about delay.
19 BY MR. BERL:
20   Q   That's an answer to a different question,
21 Doctor.
22   Will you answer "yes" or "no" as to

381

1   whether in this section of the report where you
2   conclude that ION infringes the '607 patent you
3   discuss traveling waves or disturbances?
4   MR. KIKLIS: Objection. Scope, form.
5   THE WITNESS: I will go over the report
6   and read where exactly I mentioned the ION manual,
7   but it was the background, and in this particular
8   case we wanted to put forward the fact that there was
9   a part which was doing this prediction, and that in
10   the ION -- based on the ION manual, that meant that
11   they were accounting for the delays.
12   BY MR. BERL:
13   Q   That's not what this section says. The
14   section doesn't even refer or cite the ION manual,
15   right?
16   MR. KIKLIS: Objection. Misstates, asked
17   and answered, scope.
18   BY MR. BERL:
19   Q   Right?
20   **A   I answered the question.**
21   Q   You can't identify for me any place in
22   this declaration where you discuss traveling waves or

382

1   disturbances?
2   MR. KIKLIS: Objection. Scope.
3   BY MR. BERL:
4   Q   Right?
5   **A   You recognize that the ION manual was**
6   **read by me throughout the report. Whether I mention**
7   **it here or not, that's what weighted in my opinion.**
8   Q   Same answer if I ask about the use of the
9   dynamic model?
10   **A   The dynamics is --**
11   MR. KIKLIS: Objection. Scope.
12   THE WITNESS: -- part of the model.
13   BY MR. BERL:
14   Q   But the same answer to the question of
15   whether you discuss the use of a dynamic model in the
16   section of the report where you conclude that ION
17   infringes the '607 patent?
18   MR. KIKLIS: Objection. Scope.
19   THE WITNESS: As I explained to you, I
20   read the manual. It was explicit there that there
21   was a delay, and then I pointed out where exactly
22   this function happens.

383

1   BY MR. BERL:
2   Q   So it's your testimony that in this
3   expert report, you rely on the manual's disclosure of
4   accounting for the delay and it's on that basis that
5   you concluded that ION infringes the '607 patent?
6   **A   Yes. And any model that includes a pure**
7   **delay is a model of the waves arriving late.**
8   Q   Except the one that simply uses position
9   and velocity.
10   MR. KIKLIS: Objection. Scope.
11   THE WITNESS: That's not what I said.
12   BY MR. BERL:
13   Q   Well, we'll look at that later.
14   Doctor, let's take a look at the Workman
15   patent. You reviewed that in connection with this
16   case, correct?
17   **A   Correct.**
18   Q   And the Workman patent is Exhibit 1004.
19   MR. KIKLIS: Are you okay?
20   THE WITNESS: I have to check.
21   MR. KIKLIS: Are you having an allergic
22   reaction?

384

1   THE WITNESS: Not yet, but --
2   MR. BERL: Are you okay? Need to take a
3   break?
4   THE WITNESS: I will let you know if it
5   is, but thanks.
6   BY MR. BERL:
7   Q   Okay. You have Exhibit 1004, Workman, in
8   front of you?
9   **A   Yes.**
10   Q   And you've reviewed Workman, correct?
11   **A   I reviewed Workman.**
12   Q   And if we take a look at the abstract of
13   Workman, it says: "A method for controlling the
14   position and shape of marine seismic streamer cables
15   whereby a plurality of realtime signals from a marine
16   seismic data acquisition system and a plurality of
17   threshold parameters from an input device are
18   received. The realtime signals are compared to the
19   threshold parameters to determine if the streamer
20   cables should be repositioned. The streamer cables
21   are repositioned when realtime signals exceed the
22   threshold parameters."

385

1   Is that the abstract?
2   A   That is the abstract.
3   Q   And that states the purpose of the
4 Workman patent, correct?
5   A   The intent.
6   Q   It states the intent of the Workman
7 abstract -- of the Workman patent, right?
8   A   Yes. What it discloses is a different
9 story.
10   Q   But the intent is to control the position
11 and shape of marine seismic streamer cables.
12   A   So let's go to it. That's what you read.
13   Q   And --
14   A   Which is what the patent states.
15   Q   And that's what the intent is, to control
16 the position of and shape of marine seismic streamer
17 cables, right?
18   A   Correct.
19   Q   And you discuss the concept of noise in
20 connection with Workman in your report, right?
21   A   That's his predominant concern.
22   MR. KIKLIS: I want to step out and

386

1 discuss his -- whether he's okay to continue,
2 frankly. He is having -- obviously having a reaction
3 of some sort.
4   Can we just step out and talk for a
5 second?
6   THE WITNESS: Sure.
7   But just the beginning of it, it may not
8 have been --
9   MR. BERL: Okay. Let's go off the
10 record.
11   (Pause in the proceedings.)
12   THE WITNESS: So, yes, it's true we have
13 interpreted the noise concern.
14 BY MR. BERL:
15   Q   And every time a streamer positioning
16 device is controlled, it produces noise, correct?
17   A   Not necessarily. It depends on what kind
18 of device you have, but, in principle, you can say
19 that any device that acts with a large force will
20 produce some noise.
21   Q   Including a streamer positioning device.
22   A   Including the positioning device.

387

1   Q   So that if one were primarily concerned
2 with avoiding the creation of noise, one would not
3 use streamer positioning devices, correct?
4   A   No. The -- what we're talking about in
5 this patent, they had not had any successful working
6 system. So the way I interpret Workman is to try to
7 dissuade those who thought it would never be able to
8 happen.
9   Q   What is --
10   A   Because of the noise. Putting a
11 positioning device would create so much noise that it
12 would make it impossible to operate the system.
13   Q   And that's what some people thought, and
14 Workman is trying to dissuade those who had that
15 view.
16   A   That's why he puts all the concern on the
17 noise.
18   Q   And he is trying to dissuade people and
19 say that one can have streamer steering without
20 having unacceptable noise.
21   A   I wouldn't say that. He says, I'm going
22 to take care first of noise and then of anything

388

1 else, so don't worry about it. If it's too noisy,
2 I'm just going to let it go.
3   Q   But streamer steering creates more noise
4 than the absence of streamer steering, correct?
5   A   It depends. If there are -- if there are
6 variable currents, the streamers may get weird
7 shapes, and then they start producing noise
8 themselves. So it depends.
9   Q   Do you disagree that every time an SPD is
10 controlled, it produces noise?
11   A   It will produce some noise. The question
12 is whether it's something -- a small amount of noise
13 or a lot of noise.
14   Q   And if you look at Figure 3, I think you
15 were referring to this in one of your previous
16 answers.
17   The noise is a -- maximum allowable noise
18 is a threshold parameter in Workman's system, right?
19   A   That's how he -- that's how he puts it.
20   Q   So that Workman, when seismic data is
21 being recorded, checks against a threshold parameter
22 of maximum allowable noise, correct?

389

1   A   That's how he puts it in the patent.
2   Q   And if the noise threshold is -- or let
3   me put it a different way.
4   If the noise will be too great, it
5   exceeds the maximum allowable hydrophone noise, then
6   Workman does not send a correction to the device
7   controller, correct?
8   A   Not only then. It depends on whether the
9   streamers violate his minimum -- his maximum
10 allowed -- his separation.
11   Q   His minimum allowable separation between
12 streamers?
13   A   Right.
14   Q   But with respect to noise, Workman, when
15 seismic data is being recorded, checks against a
16 threshold parameter of maximum allowable hydrophone
17 noise; is that right?
18   A   That's right.
19   Q   And when the hydrophone noise exceeds the
20 maximum allowable noise threshold, no correction is
21 sent to the device controller, right?
22   A   Right. It's switched off.

390

1   Q   And when the hydrophone noise does not
2   exceed the maximum allowable noise threshold, then
3   the correction is sent, right?
4   A   It depends. If the minimum distance is
5   exceeded, then he sends a correction; otherwise, he
6   does nothing.
7   Q   And if the minimum separation between
8   streamers is exceeded and the comparison to the noise
9   threshold shows that the noise will not be too great,
10 then the correction sent to the streamer device
11 controller is the same correction that would be sent
12 in the absence of checking whether the correction
13 exceeds the maximum allowable hydrophone noise,
14 correct?
15   A   The algorithm shows this. It's not
16 certain, but that's what it shows.
17   Q   Okay. So essentially the noise acts as a
18 check. If the Workman system wants to create a
19 correction in order to move the streamers farther
20 apart, for example, then as long as the noise is not
21 too high, it proceeds with that correction without
22 regard to noise, correct?

391

1   A   And -- but with regard to the other
2   threshold parameters.
3   Q   And --
4   A   So it may never work if the distance is
5   of a certain -- if the distances are kept, if the
6   streamers are kept away from each other, then it lets
7   them do whatever they please.
8   Q   We will discuss that in a moment, but
9   right now I want to ask you about the at-risk
10 position correction. Do you see that?
11   A   Yes.
12   Q   And that sends the correction to the
13 streamer device controller irrespective of noise,
14 correct?
15   A   "At risk," he means something like an
16 obstacle in the water, another platform or something
17 really dangerous.
18   Q   And in that event, that's an emergent
19 situation; is that right?
20   A   That's an emergency situation.
21   Q   And in that case Workman sends a
22 correction irrespective of noise, correct?

392

1   A   Then he sends a correction.
2   Q   Irrespective of noise.
3   A   In that emergency situation, like a fire
4   alarm.
5   Q   Okay. But it's inaccurate to say that
6   Workman discloses that streamer positioning should be
7   limited to emergent situations, right?
8   A   No. He applies it also to the case where
9   he operates, but intermittently or whenever the need
10 arises.
11   Q   So I just want to be clear. To say that
12 Workman discloses that streamer positioning should be
13 limited to emergent situations is an incorrect
14 statement.
15   A   It depends how you phrase it, because the
16 violation of the threshold parameters may be
17 considered to be a -- not a risk but an emergency.
18 So let's stick to the labels in the patent where it
19 says "at-risk position correction."
20   Q   Which you identified as an emergent
21 situation, right?
22   A   I did.

393

1   Q   Correct?
2   A   **Correct.**
3   Q   Okay. And per Figure 3, Workman's
4 position correction and streamer positioning is not
5 limited to emergent situations.
6   A   **Right.**
7   Q   One of the key goals of Workman is to
8 avoid streamer entanglement, right?
9   A   **That is what he claims. Yes, that's**
10 **correct.**
11   Q   And one of the goals of the Hillesund
12 patent is to avoid streamer entanglement, correct?
13   A   **Yes.**
14   Q   And referring you again to Figure 3, it's
15 likewise incorrect to say that Workman tries at all
16 costs to not control the streamer positioning
17 devices, right?
18   A   **Say that again.**
19   Q   It's incorrect to say that Workman tries
20 at all costs to not control the streamer positioning
21 devices.
22   A   **He doesn't make it a priority for sure.**

394

1   Q   Well, it's not correct to say that he
2 tries at all costs to not control the SPDs, right?
3   A   **He certainly tries to minimize how much**
4 **he's going to control them.**
5   Q   Well, he uses a threshold parameter of
6 maximum allowable hydrophone noise as a check on the
7 transmission of the correction to the streamer device
8 controller when seismic data is being recorded.
9 That's the accurate analysis of Figure 3, correct?
10   A   **The analysis is that he is more concerned**
11 **about noise than about controlling it.**
12   Q   Well, if he were more concerned about
13 noise than controlling the streamer, then he wouldn't
14 ever steer the streamers, right?
15   A   **No, that's not true. He says, If I have**
16 **the chance, I will control them a little. But if**
17 **noise gets above a certain level, then I will stop**
18 **controlling.**
19   **Then there is another issue. The kind of**
20 **devices that he's disclosing to use, the kind of**
21 **devices that he has in mind, are so massive that they**
22 **are going to produce so much noise that his system**

395

1 **would never work.**
2   Q   Well, we'll deal with that in due course.
3   Doctor, I just want to be clear. If I'm
4 wrong, then I'm wrong. But it's incorrect to say
5 that Workman tries at all costs not to control the
6 SPDs, right?
7   MR. KIKLIS: Objection. Asked and
8 answered.
9   THE WITNESS: I answered. He doesn't
10 make it a priority for sure.
11 BY MR. BERL:
12   Q   But it's not correct to say that he tries
13 at all costs to not control the SPDs.
14   MR. KIKLIS: Objection. Asked and
15 answered.
16   THE WITNESS: He is trying to minimize
17 it, so he puts a priority not to control them.
18 That's why he uses the threshold parameters.
19 BY MR. BERL:
20   Q   Well, in some instances he doesn't use
21 the threshold parameter in an at-risk position
22 correction, right?

396

1   A   **That happens once every 10 years.**
2   Q   How do you know that happens once every
3 10 years?
4   A   **When you plan a seismic survey, you try**
5 **to avoid structures. Not once in 10 years, but**
6 **rarely. So we're not talking about control in the**
7 **sense of being a routine control.**
8   Q   And again, as long as the threshold
9 parameter of maximum allowable hydrophone noise is
10 not exceeded, then Workman senses position correction
11 if the streamers get too close, correct?
12   A   **If the streamers get too close.**
13   Q   And so if Workman wanted to not control
14 the streamer positioning devices at all costs, he
15 would simply not control the streamer positioning
16 devices, right?
17   A   **He's doing a halfway job because he wants**
18 **to, as we said in the beginning, to appease those who**
19 **are afraid that this will be a very noisy operation,**
20 **so as a result, he goes overboard. He says, I'm not**
21 **going to do it unless there is an absolute need. So,**
22 **otherwise, I will avoid it.**

397

1   Q   Well, he doesn't actually say that, does
2 he?
3   **A   Well, that's what "threshold parameter"**
4 **means.**
5   Q   You don't know how high that threshold
6 parameter is set, correct?
7   **A   No. But when you set a threshold**
8 **parameter, it means nothing unless I exceed this**
9 **level. And usually when you do control, even if you**
10 **don't want to do something, you have a graduated**
11 **level, like if it's that small, I will have small**
12 **gauge, I will do smaller control, and then I will**
13 **gradually go up and do it. He says nothing, zilch,**
14 **unless the threshold parameter.**
15   Q   So I think what you are saying, I may be
16 misunderstanding it, is that the way this would be
17 implemented is that in order to avoid creating too
18 much noise, Workman would -- or one practicing,
19 Workman would want to move the streamers less to
20 modulate the interests in moving the streamers and
21 not creating too much noise, right?
22   **A   Or none at all. I mean if he could. So**

398

1 **he would allow the streamers to snake, to do all**
2 **sorts -- provided they don't go over a certain**
3 **parameter. So if that's control...**
4   Q   And my question, just so it's clear, is
5 one way to address the concern about the noise would
6 be not to correct the position completely but only
7 correct it partially so that too much noise is not
8 created by the movement of the SPD, right?
9   **A   Say that again.**
10   Q   One of the ways to apply Workman would be
11 that when the minimum allowable separation is
12 exceeded, in order not to create too much noise, one
13 would move the streamers less than the full position
14 correction.
15   **A   Or none at all, as he suggests, unless**
16 **there is a threshold.**
17   Q   Those would be two options of
18 implementing the Workman system.
19   MR. KIKLIS: Objection. Form.
20   THE WITNESS: The Workman system has a
21 specific form that he is saying here, minimum
22 thresholds, and it works through those.

399

1 BY MR. BERL:
2   Q   The noise that is created by the SPD is
3 proportional to the force; is that right?
4   **A   It doesn't work that way. The -- good**
5 **positioning devices, which have fins such as the**
6 **birds that ION and Q-Marine use, produce force with**
7 **very little noise up to the stalling angle, and then**
8 **they produce a lot of noise if you exceed the**
9 **stalling angle. But they have a regime where they**
10 **operate with very little noise, so they are good**
11 **devices.**
12   **Now, the power veins and things like**
13 **that, which are massive, or things that go through**
14 **the surface or any of this, those for sure create a**
15 **tremendous amount of noise.**
16   Q   And the birds of the Q-Marine are the
17 birds of the '636, correct?
18   **A   The birds could be taken from '636.**
19   Q   Those are the birds of the Q-Marine.
20   MR. KIKLIS: Objection. Scope.
21   THE WITNESS: The '636 suggests that
22 that's one way of getting these fins, yes.

400

1 BY MR. BERL:
2   Q   So the low noise birds --
3   **A   Yeah, I'm not sure they're exactly what**
4 **he describes in '636. I'd have to check it back.**
5 **But they look like them.**
6   Q   Those would be among the low noise birds
7 that you described.
8   **A   Right. Same with the DigiFIN.**
9   Q   The incidents of streamer tangling are
10 serious problems in the context of marine seismic
11 surveys, right?
12   **A   Especially as you go to tighter arrays**
13 **and 4-D and the like.**
14   Q   And when streamers tangle, it results in
15 prolonged vessel downtime; is that right?
16   **A   Right.**
17   Q   And in order to avoid streamer tangling,
18 one doesn't want the streamers to get very close,
19 right?
20   **A   If you can do it, why not? If you can**
21 **have good control, you can let them be designed to be**
22 **close together.**

401

1   Q   The better control you have, the closer
2 you can put the streamers together.
3   A   Correct. It will allow you to get
4 closer.
5   Q   And that, as you've said before, is
6 advantageous.
7   A   Same with turning mode, you would like to
8 have that facility too. It's not only the -- it's
9 not only the case of -- of nice straight line, or
10 when you have a feathering mode.
11   Q   So in connection with the use of
12 streamers close together in order to produce higher
13 quality data, it's useful to have a greater level of
14 control of the streamers so that the streamers won't
15 tangle, right?
16   A   After a certain level, where, you know,
17 if you apply too much force, then you start getting
18 other problems.
19   Q   And in ensuring in this context that the
20 streamers don't tangle, obtaining predicted positions
21 rather than time-lagged positions is useful to avoid
22 streamer tangling, correct?

402

1   A   It is important to account for the delay
2 of action of all the streamers.
3   Q   In order to avoid tangling.
4   A   Yes.
5   Q   Now, you have analyzed, among other
6 modes, feather angle mode, correct?
7   A   Correct.
8   Q   And in the feather angle mode what
9 happens is that each of the streamers is attempted to
10 be set at the same feather angle, correct?
11   A   Correct. And -- yes, set and maintained.
12   Q   In order to have straight and parallel
13 streamers, which as we discussed this morning, is the
14 desired configuration, right?
15   A   Correct.
16   Q   And in some instances the streamers when
17 initially set at feather angle mode will stay at
18 feather angle mode from one point in time to the
19 next, correct?
20   A   What do you mean they will stay?
21   Q   That even without being steered, they
22 will in some instances remain in feather angle --

403

1 remain having the same feather angle.
2   A   You mean they will feather?
3   Q   They will feather and they will have a
4 constant feather angle in some instances.
5   A   Constant feather angle requires that the
6 current is constant. So you want an accidental case
7 where the current happens to be uniform, and that's
8 rarely the case.
9   So feather has to be -- feathering has to
10 be clearly distinguished from feather mode.
11 Feathering was considered to be a curse, that you
12 would have the streamers moving in any direction they
13 would like, aligning themselves with the current, and
14 then you have no control over them.
15   And Bittleston, in my view, was the first
16 to reverse the problem, and say, Hey, if there is a
17 slight current, although it is variable, why don't we
18 try to make a feather mode where we'll make them
19 straight. So instead of fighting the current all the
20 way, we will fight it a little, try to make it
21 straight. So feather the lines but following the
22 current make them straight. So you are going to put

404

1 some energy doing that. Some of the -- you have to
2 apply force to keep it in a straight line, but don't
3 do the uncontrolled feathering.
4   Q   There was a lot there. I want to unpack
5 that a little. You said it's rarely the case that
6 all of the streamers are at the same feather angle
7 when one is not steering them.
8   A   Currents and everything will interfere.
9   Q   But it sometimes can be the case,
10 correct?
11   A   It's hard to think that it may be, and --
12 and --
13   Q   And in those situations in the context of
14 the Hillesund patent, if one is in feather angle mode
15 it's possible that no correction would be sent to the
16 streamer positioning devices because they're already
17 at a constant feather angle in a straight and
18 parallel configuration, correct?
19   A   That's a hypothetical. We take the case
20 where there is a very uniform current, and it so
21 happens in that case. Usually it doesn't happen.
22 They balloon out. They have -- you know, you have to

405

1 synchronize it accidentally, which I don't see how
2 you're going to do that.
3   Q But when it happens, the streamer
4 positioning devices don't have to be moved, right?
5   A There may be a very lucky situation where
6 it so happens that some of the streamers -- but all
7 of them? It's -- the joint probability of having all
8 of them aligned to the same line is very small.
9   Q Let me ask you this: What would happen
10 in the feather angle mode is that the positions of
11 the streamer positioning devices would be determined
12 in order to ascertain whether the desired feather
13 angle has been achieved, correct?
14   A Ascertained by whom?
15   Q By the system.
16   A But you set the feathering angle not at
17 whim but you have calculated the current, an estimate
18 of the current. And so you say with such a current
19 and with this speed of them having -- and needing to
20 go this way, and the current is coming that way or
21 that way, I have to set my angle, my feather angle to
22 four degrees. So you don't choose any specific one.

406

1   Where the thrusters come in -- I'm sorry,
2 where the fins come in is to provide the force so
3 this can be straight lines and also one parallel to
4 the other. It's a very difficult job to do.
5   Q And let me just ask it this way: Does
6 the Hillesund patent require in its system that each
7 bird is moved every time?
8   MR. KIKLIS: Objection. Form.
9   THE WITNESS: In a control scheme, an
10 automatic control scheme such as the one that the
11 Bittleston patent teaches, the action, the force is
12 proportional to the error. In other words, the
13 distance between what you would want to do and what
14 your estimate of it is.
15   So for practical purposes, there is
16 always noise. There is always disturbances. So you
17 will never find a control system that stops working
18 because it responds, albeit a little, to any kind of
19 noise. So they're continuously working, sometimes
20 not for good purpose.
21 BY MR. BERL:
22   Q When you say "continuously," do you mean

407

1 actually continuously or is it an iterative process
2 in which the positions are evaluated and then the
3 global control system determines how much force to
4 impart to a bird?
5   A Yes. At every time step or update, there
6 will be a correction, whether it is for the good or
7 the bad. Usually it's for the good. But there will
8 be a little -- some small reaction to noise, so they
9 would be working all the time.
10   Q When you say "working all the time," it's
11 an iterative process at each step update it evaluates
12 whether and how much to move each bird, right?
13   A Right. And it depends on how fast you
14 update the things. I mean, if you do it fast, you
15 will be continuously hearing the thing -- things
16 moving.
17   Q Is there any limitation in the claims of
18 the '607 patent or '967 patent or '520 patent about
19 how fast that update has to occur?
20   MR. KIKLIS: Objection. Form.
21   THE WITNESS: That depends on the system
22 you have.

408

1 BY MR. BERL:
2   Q So the update can be fast or slow and
3 still be within the scope of the claim.
4   A It will be -- in the control systems,
5 it's what is called the time skills of the system.
6 In other words, what is fast is something that
7 happens within the dynamic constants of the system.
8   So a satellite which moves around the
9 earth, okay, changes one every half revolution, the
10 altitude adjusts to -- that's fast for them. A robot
11 with eyes will blink in milliseconds. It's all in --
12 so there are sometimes constants which are suggestive
13 for such systems, but that's why you don't need to
14 put them down. It always conforms to the system.
15   Q So the global control system sends an
16 update in the form of, for example, force information
17 to the birds, and then that is transmitted, and then
18 it waits until the next update time in order to
19 determine the next piece of information to be
20 transmitted, correct?
21   A And in the meanwhile, the local control
22 system is fighting to do what it's told to do.

409

1   Q   And then the system waits until the
2 updated information, at which point another
3 calculation occurs and information is sent to the
4 birds directing them to move, correct?
5   **A   But the local control system keeps moving**
6 **because that's the nature of the control.**
7   Q   The bird keeps moving, but the global
8 control system is not sending additional information.
9 It has to wait for new information to come in and
10 calculations to be made in order to send information
11 again.
12   **A   It depends on the configuration of the**
13 **system. The -- it can do it at 100 hertz if you want**
14 **because with the predictions you make up for lack**
15 **of -- for lack of measurements. So it could be very,**
16 **very fast updating of the global control system.**
17 **There is no requirement for this.**
18   Q   Or it could be slower, right?
19   **A   Or you can make it slower, but you will**
20 **do as the technology will allow you.**
21   Q   Does the '607 patent require the minimum
22 interval between control updates to be shorter than

410

1 ten seconds?
2   **A   It would be -- it would be unwise to wait**
3 **for the ten seconds. That's why the predictive**
4 **control is there. So it is understood that it will**
5 **update much faster than that.**
6   Q   So it requires minimum interval
7 updates -- minimum intervals between control updates
8 to be shorter than ten seconds?
9   **A   There is not a requirement, per se, but**
10 **that's a gift that this patent gives, that you can**
11 **rely on the prediction in order to continuously**
12 **update what is happening.**
13   Q   And if you -- when you say "continuously
14 update," you mean update it more than every ten
15 seconds?
16   **A   Right.**
17   Q   And so if you are updating it less than
18 once every ten seconds, you're not working
19 continuously, as you put it, correct?
20   **A   No. That's also the fast and the slow**
21 **compared to the dynamics of the arrays. The arrays**
22 **have dynamics in the minutes. So you really need to**

411

1 **make an assessment of what the constants of the**
2 **system is that you want to control. How tight you**
3 **want your controller to be. Okay?**
4   **So if you have a very widely spaced**
5 **array, then you can wait the ten seconds. If you**
6 **want to go closer, do it at a much better job, then**
7 **you will start running it faster and faster.**
8   Q   So the claims of the '607 patent and '520
9 patent do not require continuous updating.
10   **A   They do continuous, but continuous means**
11 **from step to step. That's the nature of the digital**
12 **control.**
13   Q   Then it goes from one update to the next.
14   **A   Right. So it has a clock and it goes**
15 **from one time to the next.**
16   Q   And it sends a correction to a bird, if
17 necessary, and then it waits a certain amount of time
18 before sending another correction or sending zero
19 correction, correct?
20   **A   Which is impossible because there will be**
21 **always noise, so it will always update.**
22   Q   Every bird?

412

1   **A   Every bird when you have it fully**
2 **operating. For practical purposes, not that's -- but**
3 **that's the practice.**
4   Q   But it would make no sense in your view
5 to have control updates that are longer than ten
6 seconds. That's not taking advantage of what you
7 call the gift of the '607 patent, right?
8   **A   There would be cases where you don't want**
9 **to run it with high cost. The currents are mild and**
10 **you may want to go a little slower.**
11   Q   But, generally speaking, one would want
12 to have intervals shorter than ten seconds in order
13 to realize the advantages of the system?
14   **A   Ten seconds is kind of an arbitrary**
15 **constant because the -- so we shouldn't be stuck by**
16 **it. The purpose of the arrays is to collect**
17 **hydrodynamic data. So when you try to get data on**
18 **the arrays, it's an essential step, but it's not what**
19 **you are out there for. So you have to make up dates**
20 **within a reasonable time so you don't create other**
21 **kinds of noise. So that's where this five, ten**
22 **seconds comes from, and we don't want to be stuck by**

413

1   it. Certainly you can circumvent the ten seconds.
2   Q   Okay. Figure 2 of the Workman patent,
3   you didn't address Figure 2 in your declaration, did
4   you?
5   A   You mean I didn't include this figure.
6   Q   You didn't discuss it in your
7   declaration, did you?
8   A   I do not recall specifically whether I
9   addressed it or not, but --
10   Q   Figure 2 shows the streamer positioning
11   devices, correct?
12   A   It shows a -- it shows one of the lines.
13   Or a cartoon of the lines.
14   Q   With streamer positioning devices, 15,
15   correct?
16   A   With this humongous positioning devices.
17   Q   Excuse me. Sorry, 14 are the streamer
18   positioning devices, correct?
19   A   Right.
20   Q   And 15 are the location sensing devices,
21   correct?
22   A   Yes.

414

1   Q   And the -- did you -- well, let's ask
2   this instead: The location sensing devices, 15 in
3   Figure 2, are associated with the streamer
4   positioning devices, 14, right?
5   A   I have to remember the definitions, so --
6   so location sensing devices, 15, may be used for
7   observing the position of the streamer.
8   Q   And 14 are the streamer positioning
9   devices, right?
10   A   Correct.
11   Q   So that the location sensors, 15, are
12   associated with the streamer positioning devices, 14?
13   A   That's how it's shown.
14   Q   You testified earlier about Kalman
15   filters. Do you recall that?
16   A   Yes.
17   Q   And you address Kalman filters in your
18   declaration, right?
19   A   Yes.
20   Q   And the different possible functions of
21   Kalman filters, right?
22   A   Yes.

415

1   Q   For example, you have paragraph 137 of
2   your declaration which addresses the use of Kalman
3   filters; is that right?
4   A   Correct. Yes.
5   Q   And in paragraph 137, where you discuss
6   Kalman filters, you provide various uses of Kalman
7   filters that you label A, B and C, right?
8   A   Yes.
9   Q   And use A of the Kalman filters is to
10   remove noise from measurements in which case even a
11   rough and simplistic model can be effective. Do you
12   see that?
13   A   Yes.
14   Q   And B is in conjunction with the
15   controller as part of an overall scheme. Do you see
16   that?
17   A   Yes.
18   Q   And C is to actually predict the behavior
19   of the system in the future. Do you see that?
20   A   Yes.
21   Q   Okay. Now, B is not a use of the Kalman
22   filter. That's just saying that the Kalman filter is

416

1   being used in conjunction with the controller as part
2   of an overall scheme, right?
3   A   But within a specific form of the Kalman
4   filter, which is model-based.
5   Q   So B is a model-based filter?
6   A   Yes.
7   Q   And is that a behavior predictive
8   model-based filter?
9   A   Yes.
10   Q   And C says to actually predict the
11   behavior of the system in the future. Do you see
12   that?
13   A   Yes.
14   Q   Is that a model-based use of the Kalman
15   filter?
16   A   Yes.
17   Q   That's a behavior model base?
18   A   Yes.
19   MR. KIKLIS: Dave, we're going to have to
20   wrap up. A couple of questions and call it a day.
21   We've gone about eight hours.
22   MR. BERL: Why don't we just finish this

417

1 paragraph, and then we can call it a day, if that's
2 okay with you to do.
3   MR. KIKLIS: Are you okay with that,
4 Dr. T?
5   THE WITNESS: Yeah, I'm okay.
6 BY MR. BERL:
7   Q   So B and C are behavior model-based. A,
8 I take it, is not behavior model-based.
9   A   **Right.**
10   Q   And A has an element of prediction; is
11 that right?
12   A   **A, it does not have an element of**
13 **prediction. It's simply a filter.**
14   Q   Okay. One can use a Kalman filter to, as
15 we discussed earlier this afternoon, to move a
16 measurement forward in time without behavior
17 predictive modeling, right?
18   A   **It can be used to filter.**
19   Q   But your use of the term "filter" in that
20 answer, is that moving the measurement forward in
21 time?
22   A   **It's used to estimate something out of a**

418

1 **noisy measurement. It's not -- it's not per se a**
2 **prediction.**
3   Q   But when you were discussing the ION
4 system and said that the NCN, the -- excuse me, the
5 ION device, the network calculation node essentially
6 predicts position using that estimated velocity
7 carrying it forward to the next point in time by
8 simply applying the velocity times to get an updated
9 position, that is a prediction, right?
10   MR. KIKLIS: Objection. Scope.
11   THE WITNESS: No, it's -- it depends on
12 how it is formulated. So if it's using a model to do
13 this, then it's a model-based. But if it's simply to
14 filter what are noisy measurements, then it's a
15 filter.
16 BY MR. BERL:
17   Q   But when it says you use -- you predict
18 position using an estimated velocity carrying it
19 forward to the next point in time, is that -- that
20 "carrying it forward to the next point in time" is a
21 prediction. Not a modeling prediction but a
22 prediction, right?

419

1   A   **It's using internally the filter. A**
2 **comparison between what you predict with your model**
3 **and what the measurements say.**
4   Q   And then in order to do that, you carry
5 forward to the next point in time by applying the
6 velocity times the time to get an updated position,
7 right?
8   MR. KIKLIS: Objection. Scope.
9   THE WITNESS: You have to -- to -- there
10 is -- there are several ways you can state that. So
11 the easiest way to say this is to say, I'm giving you
12 something that has noise. Okay. And then you use
13 a -- the predictive part of the Kalman filter in
14 order to remove very high frequency noise.
15 BY MR. BERL:
16   Q   And to carry forward the position to the
17 next point in time by applying the velocity to get an
18 updated position, updated compared to the time that
19 the measurement was taken.
20   A   **Yeah. Now we're entering into -- into**
21 **shaky on how you are going to model this and what**
22 **exactly it is. Okay. So we have to look at the**

420

1 **application.**
2   **What I'm trying to draw your attention to**
3 **here is that the Kalman filter is a filter, and it's**
4 **using what is called the predictive part simply as a**
5 **means by which it can distinguish reality from very**
6 **high frequency noise.**
7   Q   And also to provide in this case, for
8 example, that you identified here, an updated
9 position based on velocity.
10   A   **It doesn't have to be an updated**
11 **position.**
12   MR. KIKLIS: Objection. Scope.
13 BY MR. BERL:
14   Q   But it can be an updated position.
15   MR. KIKLIS: Objection. Scope.
16   THE WITNESS: Once we start talking about
17 updated position is something different.
18   MR. KIKLIS: Okay. Let's call it a
19 night. It's eight hours. It's 6:40. Okay?
20   MR. BERL: All right.
21   MR. KIKLIS: We're off the record.
22   (Off the record at 6:40 p.m.)

421

1   CERTIFICATE OF NOTARY PUBLIC

2   I, LESLIE A. TODD, Court Reporter and

3   Notary Public within and for the Commonwealth of

4   Virginia do hereby certify:

5   That MICHAEL S. TRIANTAFYLLOU, Sc.D, the

6   witness whose deposition is hereinbefore set forth,

7   was duly sworn by me before the commencement of such

8   deposition and that such deposition was taken before

9   me and is a true record of the testimony given by such

10 witness.

11 I further certify that the adverse party, was

12 represented by counsel at the deposition.

13 I further certify that the deposition of

14 MICHAEL S. TRIANTAFYLLOU, Sc.D, occurred at the offices

15 of OBLON, SPIVAK, McCLELLAND, MAIER & NEUSTADT, LLP,

16 1940 Duke Street, Sixth Floor, Alexandria, Virginia

17 22314 on Friday, May 22, 2015, commencing at 8:35 a.m.

18 to 6:40 p.m.

19 I further certify that I am not related to

20 any of the parties to this action by blood or

21 marriage, I am not employed by or an attorney to any

22 of the parties to this action, and that I am in no way

422

1   interested, financially or otherwise, in the outcome

2   of this matter.

3   IN WITNESS WHEREOF, I have hereunto set my

4   hand this 27th day of May, 2015.

5

6

7   _____

8   LESLIE A. TODD

9   Notary Public in and for the

10 Commonwealth of Virginia

11

12 My commission expires:

13 September 30, 2017

14 Notary Registration No.: 311305

15

16

17

18

19

20

21

22

A

abandon
133:12 134:3
ability
67:21 224:1
able
47:3 59:21 60:14
64:10 171:8,18
223:14 228:21
229:22 251:11
305:2 387:7
aboard
57:7
absence
388:4 390:12
absent
323:21
absolute
176:20 396:21
abstract
384:12 385:1,2,7
abstracts
34:11
acceleration
345:22 374:4
accept
230:15
access
286:1
accidental
92:8 280:3 403:6
accidentally
92:3 280:1 405:1
account
144:12,21 145:13
145:22 159:6,14
161:2 162:12
163:2,16,22
167:11 169:3,5
169:16 172:20
196:14 228:19
231:22 315:17
316:12 317:3
318:19 319:17
320:19 321:5,11
321:20 322:9,18
323:8,16 325:11

333:15 372:18
373:20 402:1
accounted
312:20 320:2
accounting
235:6 236:4
311:5 324:13,14
334:7 370:13
371:17 372:5,7
372:10,12
373:11 374:22
377:20 378:11
378:17,22 379:8
381:11 383:4
accounts
234:14
accurate
47:20,22 78:7
79:6 80:6 394:9
accused
337:21 338:10
achieve
11:12 78:16
133:9
achieved
405:13
achieving
289:20
acknowledged
257:20
acoustic
54:4,9
acousticians
25:15
acoustics
22:19 36:1 225:9
acquisition
317:19 319:6
384:16
acronyms
73:2,3,4
act
233:8 314:11
316:11 376:9
acted
231:4
acting

307:19 308:3
309:12,18
311:10 312:5
313:6 339:13
action
5:17 149:22
256:21 257:4
258:22 259:5,6
259:10 262:5
314:2 402:2
406:11 421:20
421:22
active
5:11 72:11
acts
386:19 390:17
actual
85:14 121:17
194:6 195:22
196:4,16 197:18
198:4,9,13
203:9,14 204:7
205:6 211:18
212:15 218:17
239:5,10,17
240:9,11 246:12
248:17
actuators
128:4 166:3
335:12
adapted
342:12,20 344:8
345:7 348:16
349:5 350:7
352:2 354:9
add
167:14 242:12
261:8
added
167:14,14 240:10
259:21 260:2
261:11
adding
149:14
addition
142:14
additional

21:20 22:1 409:8
Additionally
57:4
address
14:15 127:3
161:21 224:5,10
224:18 225:17
226:1 373:16
375:3,11,12
398:5 413:3
414:17
addressed
118:19 370:15
375:9 413:9
addresses
77:2 415:2
addressing
25:22 49:19
154:3
adjust
194:8 199:19
215:3 334:4
adjusting
310:1
adjustment
200:6,14,18
204:14 205:17
205:22 206:5
215:21 216:8
adjusts
408:10
administering
2:18
admission
74:8 356:11
admitted
355:10
advance
75:11,12
advanced
14:7 23:20 57:20
119:18 143:13
144:20 155:11
155:19 238:19
266:19 267:16
advancing
144:11 281:20

advantage
329:1 412:6
advantageous
401:6
advantages
412:13
adverse
421:11
advertise
12:9
advice
28:9
advise
327:13
affect
149:7 150:6
324:1,3
Affiliations
52:5
affirmative
283:7
afraid
396:19
afternoon
417:15
agency
275:13
agility
11:5
ago
50:21 52:1 59:2
61:18 84:13
127:18 129:13
129:14 151:2
168:15 256:12
338:4
agree
21:5,16 22:14
44:3 57:12
64:16 75:10,18
78:20 92:15
93:18 147:10
148:7 159:11
161:10 175:21
176:1 181:21,22
182:8,13 219:6
219:12 225:8

240:21 280:4,7
280:18,22 283:6
283:9 284:19,21
294:6 332:22
356:1
agreed
134:2 140:12
141:14 142:3
143:12 144:20
155:18
agreeing
279:18
agreement
156:10
agrees
130:13 280:1
Ah
48:6 271:9
332:14
Aha
228:12
ahead
20:21 94:2
105:21 251:13
280:10
air
240:14
airplane
226:12
airplanes
117:6 210:15,15
211:2 226:17,18
alarm
392:4
albeit
406:18
ALEC
3:6
alerts
186:21 328:13
Alexandria
1:14 2:9 3:19
421:16
algorithm
283:21 316:9,13
316:17 390:15
aligned

405:8
aligning
403:13
aligns
82:20
allergic
383:21
allow
206:4 322:3
398:1 401:3
409:20
allowable
388:17,22 389:5
389:11,16,20
390:2,13 394:6
396:9 398:11
allowed
245:1 389:10
allows
180:6 200:5,13,17
204:13 205:21
206:7 215:21
216:3,6,7,12
326:22
alternatively
239:8
alternatives
119:21
altitude
408:10
amend
259:14
amended
261:7 262:8
264:2
American
48:9
amount
374:5 388:12
399:15 411:17
analogy
226:13,15,17
336:4
analysis
43:5,6 221:14
237:7 240:4,17
242:8,21 243:1

243:3,15 244:15
245:9 246:15,16
275:10 337:5
345:4 346:13,22
347:14 348:4,13
350:1,9,17,17
352:14 357:4
362:19 363:13
363:16 364:12
364:16,16,19
365:19 366:16
374:12 375:10
378:8 394:9,10
analyze
126:5 267:20
342:7 364:1
365:3,10
analyzed
40:1 53:6 362:11
365:12,16,17,22
366:1 369:19
402:5
analyzing
39:18 43:9 82:5
105:7 308:9
339:8 360:16
and/or
57:6 73:12
342:20 343:2,8
angle
82:2,10 83:1
176:8,17 199:13
319:1 399:7,9
402:6,8,10,17
402:18,22 403:1
403:4,5 404:6
404:14,17
405:10,13,16,21
405:21
angles
194:9 199:19
200:6,14,19
204:14 205:17
205:22 206:5
215:4,21
Anne
2:15

answer
16:7,9 17:1,6,7,8
17:9,19 18:1
20:18 27:4,17
28:5 29:6 30:1
31:3,19,21,21
34:17 41:14
42:4 44:8 48:21
67:18 85:22
86:2 97:13
103:6 158:19
166:8 182:13
205:15 207:18
210:19 240:19
245:3 251:15
253:8 266:14,15
266:18 278:21
295:20 297:11
297:14,17 300:7
300:17,18
325:22 328:4
336:1 355:8
361:13,17,19
362:2,6,7,18
364:10 370:8
380:11,20,22
382:8,14 417:20
answered
16:2,5 17:10
29:16 61:17
93:5 114:22
147:17 244:2
266:14 283:7
288:10,19
289:18 290:5,12
291:1,11 292:7
292:14,20 293:7
293:21 294:12
295:7 296:21
297:8 298:2,3
299:4,14,15
300:1,13,14
301:9,21,22
302:13,14
304:22 305:13
305:14,21 306:6
307:9,10 350:21

350:22 352:13
353:21 354:14
355:7 358:2,3
358:12 359:9
360:20,21 361:2
361:4,6,10,11
361:15,22 362:4
362:8,14,15
363:1,2 367:2
368:14,18 369:7
369:8,13,19
375:6,14 379:11
379:18 381:17
381:20 395:8,9
395:15
answering
189:11 285:13
297:15 348:20
380:2
answers
8:3 265:3 357:10
388:16
antenna
79:2 183:16
anticipate
244:7 245:10
246:1,17 247:21
248:3
anticipated
39:20 40:7,17
41:1,10,22
anticipates
244:16 246:7
247:2,3,5
anticipating
245:15,17
anticipation
244:7,10,19
anybody
204:1 327:19
anymore
89:15
apart
85:6 290:15
390:20
apologize
32:11 361:18

apology
21:1
apparatus
191:5 193:7,17
    197:3,5,7,10,14
    206:18 207:1
    257:12
APPEAL
1:2
appear
13:14 51:16
appearances
7:7
appears
8:19,21 45:5
    237:6,15 271:21
appease
396:18
appended
10:2
applicability
14:17 16:6
applicable
20:6
applicant
261:22
Applicant's
73:12
application
5:11,18 13:15
    14:18,18 19:15
    44:12 45:10
    72:10 74:16
    90:2 183:9,10
    187:14 188:15
    202:15 203:19
    222:11 253:16
    256:3,10,11,18
    257:20 258:2
    268:12,17 269:1
    269:3,14 270:1
    270:4 272:1
    273:13 274:12
    274:16,21 275:5
    275:19 278:13
    285:12 420:1
applications

26:21 44:18
    45:13 53:21
    90:3 187:15
applied
39:18 41:19 45:4
    56:20 119:9,13
    120:1 124:8,22
    126:20 167:1
    179:2 316:13
applies
16:18,22 17:3,5
    17:21 18:2,3,7
    31:5 34:15
    100:6,9 201:9
    392:8
apply
16:14 17:13
    20:12 26:12
    27:11 32:8 36:1
    36:1 40:21
    60:14 80:2
    108:13 141:9
    205:10 239:20
    240:2,5 241:21
    242:7 244:7
    313:20 314:5
    326:19 333:13
    338:9 398:10
    401:17 404:2
applying
27:1 41:11 42:9
    54:13 136:16
    236:3 239:15
    243:13,21 314:9
    327:4 336:10
    337:9 344:20
    352:8 353:6
    354:6 359:4
    418:8 419:5,17
appreciate
30:6 48:18
    134:19
appreciates
279:22
approach
334:10
appropriate

169:2 356:5
    373:21
approximately
184:15
approximations
47:22
April
272:18 273:2
arbitrary
412:14
architect
114:13
architecture
112:11 115:9,12
    115:12 116:17
    118:4 165:5
    215:6 270:8
    278:15 280:5,17
    281:2,21 288:7
    296:11
area
11:22 12:13 14:8
    14:9 15:3 20:11
    21:16 22:6,9
    23:13,15 25:7
    26:19 33:14,22
    37:13 56:20
    58:17,17 61:14
    80:22
areas
22:1,3,6
argue
100:4 158:9
    220:9
argued
103:4 218:1
arguing
156:2 198:18
    202:7 281:11
argumentative
28:22 31:15 60:4
    68:2 69:14 71:9
    104:17 132:2
    135:6 156:1
    157:4,21 158:8
    158:18 265:9
    284:15 298:2

300:13 355:7
    357:8 359:22
    360:5,12 366:8
    367:9,11
arguments
216:18
arises
392:10
array
27:13 33:16
    80:15 81:2 82:8
    83:20 84:1,15
    84:21 85:18
    88:14,18 89:8
    89:18 90:1,3,3,7
    90:12,12,13,19
    90:21,22 100:17
    107:8 118:10,11
    118:22 119:7
    120:18,20 121:2
    121:3,10,19,21
    122:16,20 123:4
    124:11 125:1
    127:2,17 132:9
    132:20 133:4,17
    134:17,22
    144:13,22 145:9
    145:14 146:1,22
    147:3,7,12,21
    148:5,6,18
    149:18 155:8
    156:12,22
    157:11 159:7,15
    161:4 163:3,9
    163:15 164:1
    165:16 168:1,5
    168:11,13
    176:13 177:5
    181:19 182:12
    183:1 184:17
    185:7 187:12
    192:3,20 193:9
    193:14 195:13
    195:18 227:17
    227:18 315:13
    315:18 316:7,21
    317:3,4,6,17

318:1,3,7,16
    319:18,22 320:1
    320:7,20 321:6
    321:12,16,19,21
    322:1,10,19,21
    323:9,17 324:15
    324:16,17
    325:12,19
    328:21 411:5
arrays
14:10,20 15:2,15
    15:17 16:14,19
    16:22 17:5,5,14
    18:3,13,17,22
    19:15,17,18,21
    21:9,18 22:11
    22:17 23:4,6
    27:11,12,14
    28:10 29:4,9,10
    29:13,13,15
    30:16,18,19,22
    31:4 33:17,19
    33:22 34:3,16
    35:14 84:9
    124:11 133:6
    157:14 168:3
    170:10 182:21
    183:2 295:2
    310:11 316:15
    316:18 318:5
    326:3 328:17,17
    336:13,17
    400:12 410:21
    410:21 412:16
    412:18
array's
148:2
arrive
60:12 70:6,13
    123:7,11
arrived
171:21 366:12
    380:8
arriving
383:7
arrows
203:13

art
14:7 40:2 42:20
43:9 50:13,13
63:6 64:11 65:2
65:17 66:5
68:13,18 69:5,9
70:10,20 71:5
71:15,17 78:5
91:21 92:3,5,7
92:12,14,16,18
92:21 93:9,11
93:18 94:4,8,9
94:15,15,16,18
95:3,4,8,9,14,16
95:20,22 96:4
97:5,7,8,9,12,18
97:21 98:2,6,12
98:17,19 99:7
99:10,13,19
100:1,4,5,13,16
100:20 101:1,3
101:7,12 102:6
102:10,14,15,17
102:19,22 103:1
103:7,10,15,21
104:2,4,9,9,11
104:12,15 105:9
105:13,17,18,21
106:7 110:20,21
111:2,3,7,8,10
111:14 112:2
113:17 154:7
170:4 172:17
223:10 237:22
241:21 242:8
243:1,16,21
244:6,12,16,18
245:6,10 246:1
246:14,17
257:18,20 266:8
330:13
article
14:13 18:5
articles
10:21
articulate
264:18

artificial
44:20
artisans
34:4
ascertain
405:12
Ascertained
405:14
asked
49:20 55:20 77:9
77:12,15 79:15
223:18 255:4
281:13,14 288:9
288:19 289:17
290:4,11,22
291:5,10 292:7
292:13,19 293:6
293:20 294:11
295:6 296:21
297:7 298:1
299:4,13,22
300:12 301:9,20
302:12 303:9
304:21 305:12
305:20 306:5
307:8 337:19
350:21 352:12
353:20 354:13
355:6 358:1,12
359:8 360:19
361:3,9,14,21
362:3,13,22
363:22 367:21
368:13,17 369:6
369:12 375:6,14
379:10,18
381:16 395:7,14
asking
26:18 37:16 38:1
38:13 41:16,17
41:19 58:6 69:8
78:19 79:16
89:15 95:6,20
97:14,16 98:21
98:22 99:21
101:20 120:4,4
123:22 134:15

135:4 145:8
147:14 158:22
179:18 180:10
182:3,5 183:13
189:6,8 190:20
191:15 194:18
204:3,4 213:18
213:19 218:21
218:22 243:19
266:7,9 267:13
275:11,15,18
276:22 297:16
301:16 328:3,5
330:1 347:12
367:14 371:20
373:7 379:3,4
380:2
aspect
207:4 231:5
aspects
23:17 111:13
131:12 137:13
137:15
assert
356:21
asserting
41:20
assertion
119:15
assessing
119:10
assessment
411:1
associate
7:10
associated
19:9 20:12 26:9
414:3,12
Association
36:20
assume
139:15 201:21
220:19 245:1
246:11,13
247:15
assumption
126:19 127:15

149:10,12
150:11 154:18
171:13 238:14
239:6
Attached
5:8 6:8
attachments
76:16 166:20
190:18
attempt
148:1 150:1
attempted
147:5 402:9
attempting
147:6,11
attempts
84:2,5 147:20
attend
274:9
attention
215:13 420:2
attorney
421:21
attributes
113:18,20
atypical
85:3
at-risk
391:9 392:19
395:21
audibly
207:18
author
71:4
authors
65:2,17 66:5
68:12,18 69:9
70:9,19 71:2,15
automatic
200:6,14,18
204:14 205:16
205:22 206:5
215:21 216:8
232:3,5 314:2
406:10
available
65:11 107:9,14,15

108:20 170:4
Avenue
4:5
average
66:12 69:15,17,19
69:21
averaging
70:6
avoid
226:8,16,20 393:8
393:12 396:5,22
397:17 400:17
401:21 402:3
avoidance
340:13
avoiding
387:2
aware
9:16 63:6 135:15
136:3 138:4
171:1 249:13
a.m
1:16 175:3
421:17

B

b
5:7 6:1 10:8
130:6 311:2
324:21 326:12
331:1 342:10
345:6 348:15,18
349:5,14 351:9
352:1 353:19
354:9 360:17
362:21 368:10
415:7,14,21
416:5 417:7
Bachelor
43:14 46:8,13
63:12,13,22
64:2,8
bachelor's
46:19 49:4 58:2,9
59:6 62:8 68:22
74:3,9,13
back
12:7 19:11 87:18

93:21 96:15
109:1,7 134:3
135:13 167:17
188:3 197:21
268:9 271:2,4
300:15 331:18
347:20 369:18
376:13 400:4
background
48:6 53:7 59:18
153:12 381:7
backgrounds
69:4
bad
228:6,7 407:7
badgering
358:11 360:20
361:4,10,15,17
361:22 362:4,14
363:1 367:20
368:14,18 369:7
369:13
balcony
335:8
balloon
404:22
base
15:14 46:7
168:16 416:17
based
14:10 15:2 20:5
47:19,21 70:18
97:16 100:9
102:19 126:6
159:5,13 163:7
171:16 174:4
234:12 237:19
262:14 264:7,11
264:19 265:11
265:18,22 266:4
273:7 307:10,14
313:11 315:16
316:16 320:18
321:10 322:8,17
323:7,12 326:7
330:12 331:13
333:13 346:1

350:13 363:3,6
366:15,16,21
369:16 381:10
420:9
bases
360:10
basic
11:4 29:8
basically
68:10
basics
15:1,2
basing
147:15
basis
14:19 85:16
203:22 225:12
316:2 339:11
346:13 347:15
368:21 369:4
383:4
Bates
256:2
battery
114:2
Bear
164:18
bearings
270:15
beginning
170:9 195:2
196:12 199:3
202:1,2 204:5
227:7,17 304:13
379:20 386:7
396:18
begins
162:4 201:19
202:12 263:3
272:2 292:9
332:4,15 370:21
372:3
BEHALF
3:2,12 4:2
behave
166:17 168:3
234:21 318:5

behavior
112:15,18 113:1,5
113:11 114:8,19
117:16,20,22
143:2 144:12,21
145:14,22 159:6
159:7,13,14
163:2,8,8,15,22
165:5,9,16,18
166:5 168:19,21
171:9,19 172:6
172:9,9,22
231:7 235:3,15
236:5,9,20,22
238:2,11,17,20
239:3,6,10,18
239:21 240:7,11
240:17 241:3,22
242:9 243:2,4
243:22 244:17
245:8,22 246:2
246:19 247:11
247:16,17
248:12,20 249:4
249:8,14 251:1
251:2 253:11
260:18 261:1
262:15 264:8,12
264:19 265:12
265:14,19,22
267:7,15 268:2
270:8,21 271:20
278:16 279:6
280:5,17 281:3
281:6,22 282:7
282:18 283:9,18
284:4,12 285:1
285:6,16 286:6
286:17 287:2,5
287:10,11,14,18
288:7,16 289:9
289:15 290:2,9
290:21 291:9
292:2,11 293:18
294:1 295:21
296:4,7,11,14
297:3,19 298:15

298:21 299:9
300:8,20,22
301:6 302:1,6
302:10,15,19
304:9,19 305:11
305:16,22 307:7
307:11 310:6,10
310:14,18,20
311:4,6 312:7
315:12,12,16,17
316:6,6,19,20
317:17 318:1,3
319:17,22 320:1
320:7,18,19
321:5,7,10,11
321:17,20 322:8
322:9,17,18
323:2,5,7,8,12
323:16 324:9,15
328:15 332:20
333:7 334:17
367:7 369:21
370:9 372:18,22
373:21 415:18
416:7,11,17
417:7,8,16
behaviors
172:11 318:7
behavior-based
47:17 141:4,7,15
142:4,11,13,13
142:20 143:5,17
144:1,3,5
146:16 202:9
234:22 235:5
237:1 241:9,11
246:8 247:6
266:4 267:10
268:1 283:19
289:5 307:11
333:4
believe
8:14 19:12 21:21
22:7 74:20
135:15 152:22
157:9 170:6
246:16 248:8,13

265:5 327:7
338:14,15
339:11 341:13
353:16
believed
9:9,12 341:10
bell
37:2
belong
34:2 36:5
bendable
166:19
bending
166:21 168:1
benefit
177:10 178:7
248:2 288:3
306:15 325:20
326:2 329:9
benefits
306:8
Bergen
52:15
Berl
3:3 5:3 7:6,8,17
13:3,9 14:1
15:18 16:4,15
16:20 18:15
21:1,3 24:1,9
27:16 28:12
29:20 30:14
31:12,22 32:9
33:1,9 34:10,22
38:7,21 41:15
42:7,15 44:6
45:7 46:10 49:8
49:21 51:6,12
56:12,13 57:18
58:22 60:5,19
63:3 67:14 68:3
68:11 70:8
71:12 72:6,14
72:16 74:18
76:11 77:11
80:1 84:8 86:1
87:2,6 89:14
90:6 93:13

96:10 97:22
98:10,20 99:11
100:7,21 101:13
102:8 103:5,11
105:4,22 107:12
108:4,10 111:6
113:19 114:15
120:21 123:9
124:2,18 125:5
125:17,22 126:4
126:22 128:5
129:19 131:21
132:5 135:9
136:11,20
138:10 139:10
139:14,17
140:16 141:1,10
143:9 144:8
146:13 148:16
150:4 152:16
155:16 156:6,16
157:2,6 158:3
158:12 159:2
160:4,19,20
171:15 173:12
175:2,4 178:14
184:2 185:6,12
188:22 189:21
190:19 191:7,14
192:5,12,22
194:2 196:20
201:3,11 204:2
205:20 206:11
208:12 212:12
212:22 213:7,17
214:3,14 215:15
216:4,13 219:5
219:22 220:13
221:1 227:10
230:7 232:12,17
232:20,22
241:16 242:5,14
242:20 243:12
244:4 245:19
246:9 247:14
248:6 250:18
251:14 255:20

258:14,17,20
262:21 265:16
267:12 268:5
269:10 271:14
272:16 273:19
273:20 274:19
275:17 276:1,6
276:11 277:4,19
278:3,8 279:3
282:14 283:5,14
284:9,20 286:3
286:18 287:8,20
288:4,13,20
289:13,21 290:6
290:18 291:3,16
292:8,16 293:1
293:10 294:3,20
295:19 296:2,6
296:13 297:1,10
298:12 299:10
299:19 300:3,16
301:14 302:7,22
303:4 305:6,17
306:2,10 307:13
312:2,17 323:14
330:15 338:21
339:7,10,22
340:3,8,11,17
340:20,22
346:21 347:21
348:3 349:2,12
350:3,14 351:6
351:21 352:16
353:2,11,15
354:2,15,18
355:1,13,20
356:4,7,18
357:14,19 358:7
358:13,16,21
359:13,19 360:2
360:7,15,22
361:5,12,16
362:1,5,10,17
363:7,14 364:2
364:6,9,18
365:2,9,15
366:2,9,14,18

367:3,11,13,16
367:18 368:7,15
369:2,9,17
370:7,12,20
371:13,22
372:11,16 373:9
374:11,20 375:7
375:21 376:4,14
377:10,12 378:3
378:7,18 379:14
379:22 380:10
380:19 381:12
381:18 382:3,13
383:1,12 384:2
384:6 386:9,14
395:11,19 399:1
400:1 406:21
408:1 416:22
417:6 418:16
419:15 420:13
420:20
BERNIKER
3:5
best
78:7 79:6 80:6
181:3 245:3
338:9 375:16
better
146:3 217:7
310:9 328:2
329:22 401:1
411:6
beyond
273:18 275:7
278:11
big
40:12 159:16
170:11 280:12
bin
80:12
binder
9:19,20,21
binning
21:19,22
bins
75:14
biomimetic

11:3 44:14
biomimetics
44:19,21
bird
52:22 53:13 54:3
55:3 106:6
168:10,13
188:13,21
189:19 190:4,5
190:8,9,12,16
190:17,17,17,22
191:9,19 192:8
192:15 193:2,6
193:16,20 194:1
196:13,14 197:7
197:9,14 199:10
199:12,12,14,17
200:6,14,18
202:4,13,22
203:3 204:9,10
204:14,21
205:17,22 206:5
207:7,13,21
212:5 215:12
217:17,19 218:9
218:11 219:2,7
219:7,15 220:3
406:7 407:4,12
409:7 411:16,22
412:1
birds
103:13,14,16
106:12,19 107:7
107:20 108:6,13
108:14,16
121:17,22
131:16 161:3
176:22 178:4,9
178:13,16
179:19 180:8,14
180:18 182:2,16
183:20 184:3,5
184:7,9,15,17
186:19 187:8,11
187:16,20 189:4
194:8 198:10
205:9 212:2

213:20 214:20
215:1,3,8,12
218:7,17 226:5
226:8 227:1
228:18 229:20
326:19 327:4,16
329:2,7,13
343:13 399:6,16
399:17,18,19
400:2,6 408:17
409:4
bite
230:9
Bittleston
5:10 47:12,14,15
48:14,18 51:1
54:13 58:11
64:16 71:19
97:11,15 167:7
168:17 169:22
170:21 171:16
172:19 173:13
174:6,12 178:2
201:7 230:13
325:15 328:7
374:19 376:22
403:15 406:11
Bittleston's
51:5,17 53:6
57:12 189:7
249:18 291:14
304:2
blank
38:1 236:7
blanket
35:6 40:14
100:20
blended
70:4
blink
408:11
blood
421:20
blows
313:20,21
board
1:2 61:1

boats
24:3
book
25:19,22 26:3,5,8
bother
230:22
bottle
232:11
bottom
258:14 262:8
  263:1 270:4
  271:17 317:16
  332:3,7,8
  342:11
box
110:13
brain
67:12,15 335:12
brains
44:20
brand-new
275:12
bread
12:15
break
87:1 132:11
  174:22 232:13
  232:20 302:21
  302:22 377:9
  384:3
Brian
6:12
brief
5:14 138:15
  150:13,15,20
  156:9
briefing
144:10
bright
299:16 306:21
bring
105:11 113:14
  277:17,18 279:7
bringing
335:19
brings
78:15 126:16

177:9
Britain
5:18 273:9
  274:21 275:5
broad
43:22 44:3 58:4
broader
124:7,9,21 126:10
  146:7,8 238:18
broadest
237:18 238:5
  286:15
broken
127:22 131:13,16
  182:17
brought
9:19 371:5
BS
64:4
build
165:13 231:6
building
229:14
built
171:4
bullet
230:9
buoy
94:1,3,6,7 336:19
business
23:10 264:22
butter
12:15

_____
C
_____
C
3:1 4:1,1 5:1 6:1
  7:1 10:9 65:20
  65:21 67:1
  69:11 314:19
  315:9,11,22
  316:5 320:6
  325:3,8 327:11
  328:9 330:22
  415:7,18 416:10
  417:7
cable
12:14 87:9

104:22
cables
12:2,2 13:17 14:3
  14:4 19:7,8
  26:19 87:9
  167:5 203:20
  233:6 384:14,20
  384:20 385:11
  385:17
calculate
36:16 159:4,12
  163:6 308:21
  314:20 322:16
  323:6,12 325:4
  325:9 326:5,13
calculated
313:2 405:17
calculates
315:15 320:17
calculating
313:9 320:2
  322:7 326:3
  327:10 328:9
  329:8
calculation
310:14 316:5,8,17
  319:17 320:6
  329:19 330:5
  343:2,7 344:15
  344:17 345:5
  352:5 409:3
  418:5
calculations
409:10
call
197:5,9,9,10
  347:19 412:7
  416:20 417:1
  420:18
called
54:5 80:14
  113:20 160:2
  167:5 168:20
  224:9 237:12
  268:11 313:16
  408:5 420:4
calling

47:14
calls
23:19 81:5,12
  180:12 197:6
  324:8
Canter
5:16 152:11,13,19
  153:1,4 155:11
  155:21
Canter's
156:8
capability
150:7 176:14,15
  179:5
captain
231:12 307:2
caption
12:10
capture
374:7
car
99:22 100:1
  113:13 114:1
care
28:16 122:2
  387:22
career
27:20
careful
313:12
carefully
77:22 96:18
  280:8
carried
115:13
carries
27:1
carry
104:22 419:4,16
carrying
336:9 337:8
  344:19 345:15
  352:7 353:5
  354:5 359:3
  373:5 378:21
  418:7,18,20
cartoon

89:7 95:10
  413:13
case
6:3 26:16,16 27:6
  27:21,21 28:17
  28:17 31:9 40:2
  40:4 54:22
  55:22 56:1
  65:14,18 66:9
  70:20 71:22
  74:22 91:3,4,8
  100:16 119:11
  119:16 128:9,22
  129:5 136:5,8
  137:19,19 138:1
  138:5,18 140:12
  141:3,13,14
  142:2,4 143:13
  143:14 144:11
  144:20,20 145:4
  148:18 150:15
  150:21 152:3
  155:12,12,20,20
  156:9,10 164:11
  177:10,11 178:2
  179:2,18 185:17
  240:5 243:11,11
  246:11 248:3
  252:4,5 254:2,4
  254:22 255:3,17
  258:10,17,18
  264:22,22 266:1
  266:3,11 267:5
  267:6,7,13,21
  267:21 294:17
  298:7 299:20
  303:10 315:4,4
  319:20 335:8,15
  337:6,16,18
  338:6,8,17
  340:12 341:2
  349:17 356:14
  360:3,9 362:12
  375:19 377:15
  381:8 383:16
  391:21 392:8
  401:9 403:6,8

404:5,9,19,21
415:10 420:7
cases
1:4 8:13,15 51:8
104:21 138:13
243:9 255:22
266:2,5,7
272:12 291:5
298:5 299:6
300:21 301:3,4
301:5,13 302:3
302:4,9,18
306:14,20
319:22 327:1
328:21 338:18
412:8
catastrophic
335:17
cause
82:15 167:22
211:13
causes
83:6 168:3
ceiling
187:4,6
central
109:19 207:8
208:6
centralized
213:15
centrifugal
168:2 169:10
227:8 228:20
229:10
certain
22:3 45:16
109:19 113:17
122:19 137:13
137:15 148:1
172:16 182:15
227:22 236:15
242:3 259:17
265:11 349:1
368:3 374:5
390:16 391:5
394:17 398:2
401:16 411:17

certainly
20:12 39:3 98:5
321:15 355:21
394:3 413:1
CERTIFICATE
421:1
certify
421:4,11,13,19
cetaceans
11:5
cetera
24:5
chain
228:10
challenging
20:8
chance
15:9 36:17
134:12 230:17
265:13 394:16
change
17:6 60:6 96:11
140:21 199:13
250:7 301:17
323:22 326:20
changed
9:13 100:15
140:19 171:5
236:19
changes
308:21 314:21
319:17 320:2
325:4,9 326:3,6
326:13 327:11
328:9 329:9,20
330:6 408:9
changing
17:7
check
174:15 185:11
340:6 383:20
390:18 394:6
400:4
checked
36:8
checking
390:12

checkmarks
339:20
checks
388:21 389:15
chemical
46:5
choice
23:22 231:15
choices
231:12
choose
45:22 131:5
178:4,5 180:4
183:15 187:20
265:5 405:22
Chris
7:15
CHRISTOPHER
3:14
circuitry
208:14
circumstance
305:8
circumstances
234:20 245:16,20
306:17
circumvent
413:1
citation
151:20
cite
349:13 350:8,9,10
351:7 355:5
358:22 369:3,11
381:14
cited
128:9 153:22
352:17 353:17
354:19 357:4
358:8
citing
282:15
claim
5:13,15 21:10
102:16,20 110:7
121:8 128:20
130:9,9 133:15

135:16 138:4,15
144:10 150:12
150:14,20
152:18 156:8
185:20 186:1
237:5,7,15
241:5 244:15
259:15 263:6,9
263:19 266:7,9
267:14 300:4,6
301:6,17,19
303:15 306:3
307:4,18 308:1
308:6,7,9,11,12
308:17,19,20
309:6,6,9,10,17
311:8,12,15
312:6,12,18,18
314:13,19
324:20 326:4,7
326:10,16 327:3
327:8,16,18
328:6,9 329:11
329:17 330:2,6
330:7 331:16
408:3
claimed
179:10 282:6
285:5 308:12,19
309:9 378:5
claiming
95:17 179:7
273:8
claims
39:19 40:7,16
41:1,9,21
109:14,22
110:16 119:10
119:16 120:9
121:6 132:15,18
136:14 143:4
181:16 182:9
185:2 187:13,17
187:21 236:8,12
236:14,15,18
237:15 238:7
241:21 242:7,22

243:4,14,15,20
244:17,20 245:7
245:11,21
246:18 247:21
253:11 256:13
256:18 257:7,12
257:13 258:1,3
258:7 259:14,21
260:3,14,16,22
260:22 261:6,8
261:12,18 262:7
262:8 263:2,3
264:1,2 266:12
266:18 273:14
274:21,22 275:4
275:13 290:19
298:16 303:10
304:18 305:10
307:6 312:11
315:22 325:18
337:6,11,19,20
338:2,9,11
345:6 347:13
348:7,15 355:16
356:22 360:18
362:20 369:20
373:10 376:22
393:9 407:17
411:8
clarification
134:7,19
clarifications
79:17
clarify
79:18 245:4
class
32:10
clear
46:11 56:14 98:8
120:3,8 138:12
147:11 149:16
163:5,17,21
192:4 209:4,5,6
209:13,16,18
210:13 212:8,10
212:19 213:10
217:3 222:20

245:5 252:3
260:13 266:17
300:7 324:19
326:10 340:5
392:11 395:3
398:4
clearly
121:9 133:15
147:18 255:3,16
303:6 371:15
403:10
clients
340:7
clock
411:14
close
396:11,12 400:18
400:22 401:12
closed-loop
229:6 234:8
closer
84:21 401:1,4
411:6
closest
46:9 85:5
Coastal
45:15
code
347:18 366:1,3,16
375:22 376:5
378:4
collaborate
289:12
colleague
271:6
colleagues
36:4
collect
412:16
collection
202:18
column
102:14 106:12
110:4,15 161:13
161:19 162:6,17
162:20 164:13
164:22 165:1

171:20 173:1
188:5,5,9
189:14 190:1
191:17 204:5
207:5 208:13
209:1,7,12
221:6,13 249:6
249:10,14 251:6
252:10 260:20
260:21 270:19
271:18 272:6
291:18 292:10
293:17 294:7
297:18 298:13
303:20 320:8
321:1 325:17
326:1 327:8
329:10 331:14
combination
163:19 278:14
280:15 281:1
349:10
come
25:10 29:14
30:21 68:9
145:16 156:19
167:6 240:14
267:4 336:20
406:1,2 409:9
comes
13:7 29:5 62:22
82:12 83:1
132:12 142:7
143:21 172:14
178:20 203:20
253:6 321:12
322:5 340:3
412:22
comfortable
146:9
comfortably
335:4
coming
30:7 108:13
170:20 292:21
310:3 312:11
322:22 323:1

368:5 405:20
commands
105:1 121:7
122:14,19,21
123:16 124:4,13
124:20 125:9
126:8 127:12
130:16 140:7
148:9 151:8,16
154:9,17,20,20
commencement
421:7
commencing
421:17
comment
38:20 317:12
commercial
14:18 37:17 38:3
commercialize
223:15
commercialized
53:17
commercially
107:13
commission
422:12
common
62:1,3,4
Commonwealth
2:17 421:3
422:10
communication
104:22 115:15
116:22 117:11
118:2
communications
109:17
company
178:2
compare
22:5 23:1 140:14
242:22 270:17
337:19
compared
207:1,2 243:20
384:18 410:21
419:18

comparison
243:15 390:8
419:2
compensate
270:5 300:19
304:14
compensates
309:11 313:5
compensating
307:18 308:2
309:17 311:9
compensation
312:4 326:17
compensator
48:4 326:8
competence
64:15 66:16
competent
63:15
competition
73:3
complete
61:7 144:13,22
145:14 146:1
149:15 159:7,15
163:9,22 165:16
241:8,10 242:17
242:19 248:3,4
315:13,18 316:7
316:20 318:17
319:18 320:7,20
321:5,12,21
322:9,18 323:9
323:17 367:13
completed
29:11
completely
108:9 235:18
246:4 247:13
290:13 355:9
398:6
complex
168:4 233:15
271:10 373:5
374:3
complicated
174:11,14 228:15

component
195:11,11 242:12
311:7
components
110:1 112:2
116:19 195:13
295:2 318:4
comport
55:7 68:14
comported
65:3
comports
57:13 68:20
composite
46:17 66:10 69:4
comprises
313:1
compromising
308:12
computer
172:10 173:21
211:7,8 365:22
366:3
concentrate
377:5
concentrating
370:4
concept
79:2 95:4,6
385:19
concepts
23:11 226:10
279:8
concern
340:10 385:21
386:13 387:16
398:5
concerned
304:1 387:1
394:10,12
concert
339:13
conclude
127:4 195:1
237:11 348:14
348:21 349:4
351:8 355:15

359:16 363:6
367:6 368:10
370:15 373:2,14
379:7 380:3
381:2 382:16
concluded
209:10 346:19
347:13 368:21
370:2 383:5
concludes
348:6
concluding
357:22 360:17
362:20 369:4
374:12 375:4
conclusion
42:22 338:1
344:7 353:18
354:1,8 355:4
357:16 358:10
359:6 360:9
363:3,3
conclusions
79:11,19 146:10
221:3 366:13
concrete
336:12
conditional
236:16
conditions
126:11 187:19
236:15 240:2
243:9,9,10
248:4,17 305:3
305:8
conduct
71:13
conducted
23:13 65:17
83:22 242:21
350:18 362:19
conducting
21:15 28:10
conference
340:21
confidential
139:7,8 339:3,12

340:7
confidentiality
20:15
configuration
78:6,14,22 79:1,6
80:6,11 81:6,18
81:19,22 82:10
82:16 83:7
90:10,11,15,20
90:21 92:4
147:9 148:1,2
184:13 186:10
187:16 317:6
402:14 404:18
409:12
configure
206:8
configured
118:21 119:6
123:3 155:7
157:10 177:4
181:18 182:11
confirm
27:18 224:21
confirmed
133:2,21 271:16
confirms
51:22
conforms
408:14
confused
252:6
confusion
284:18 303:6
conjecture
220:19 265:14
conjunction
221:14 239:17
415:14 416:1
connected
110:10
connection
8:17 10:5 55:13
74:22 254:2
337:18 383:15
385:20 401:11
Connolly

3:7 7:8,9,11
consider
119:19 240:3
276:15 322:4
consideration
37:11 70:16
221:12
considerations
37:20 38:14 39:4
66:19 81:16
229:3
considered
40:10 42:3,6
50:16 54:18
55:18 65:16
66:1,8,21 67:7,9
70:4,14 72:2
85:11 119:20
120:13 224:22
264:22 354:7
392:17 403:11
considering
181:15 320:6
332:19
considers
315:11 316:5,7,13
consistent
95:2 140:22
151:6,15 187:12
204:8
consists
109:16
constant
328:18 403:4,5,6
404:17 412:15
constants
227:22 408:7,12
411:1
constitute
171:18 172:22
constitutes
64:14
construct
47:20
constructed
348:9
constructing

46:16
construction
5:14,15 119:9,17
121:16 124:19
124:21 126:7
130:20 135:16
138:15 140:3,4
140:6 144:10
145:2,4,5
150:12,14
152:19 155:10
155:19 156:8
175:13 177:12
182:5 238:10,16
238:18 239:21
248:7,9,11
300:5 301:16
315:2 320:5
constructions
128:20 138:5
construe
123:4 181:14
182:9 194:19
214:6,8 239:9
303:9
construed
151:5 247:11
260:9,16 261:17
construing
179:11 303:20
contain
9:13 48:2 142:6
249:11,22 250:2
contained
181:16,17 346:8,9
containing
48:1
contains
374:17
contaminate
284:17
content
26:4
contents
38:11,19,20 39:1
39:5
context

20:6 26:1 35:4
54:15 142:10,19
145:21 148:13
197:17 219:10
267:20,22
281:10 282:17
284:3,22 285:11
287:3,13 290:7
297:5 302:10
316:8 325:13
400:10 401:19
404:13
continuation
253:16 258:6
continue
106:1 139:16
210:17 232:14
287:19,21
344:12 386:1
continued
54:7
continuous
162:10 411:9,10
411:10
continuously
406:19,22 407:1
407:15 410:11
410:13,19
contradict
92:22 93:2,3
contradicted
175:16 177:15,17
contrary
105:15 187:10
contributing
223:17 224:1
control
11:4,14 22:12,18
23:6 25:11
26:12 29:10
33:22 35:7
43:15 46:13,20
47:7,16,18,19
48:4,5,15 49:4
49:19 54:8 62:9
62:17 63:13
64:1,3,5,9 68:22

PGS Exhibit 1103, pg. 117
PGS v. WesternGeco (IPR2014-01477)

78:16 101:17	150:5,16 151:4	210:10,11,19,20	314:2 315:14	206:18 207:6,13
103:20 107:8,8	151:7,13,16	211:3,4,7,8,10	317:2 319:14	207:21 212:5
109:6,9,10,11	154:4,8,8,10,16	211:11,13,16,19	320:16 321:8	216:15,22 220:3
109:13,16,21,21	154:19 155:1,2	212:1,13,19,20	323:3,5 324:8,9	227:21 296:15
110:4,8,9,14,17	155:6,7,15	213:2,3,9,11,16	325:16 326:17	297:4,20 316:10
110:17,20 111:2	156:5 157:9,9	213:19 214:1,5	326:19,22 327:4	384:13 394:11
112:9,11,15,16	157:14,18 158:6	214:15,19,20,22	333:13 335:13	394:13,18
112:18,21 113:1	158:11 159:4,11	215:2,7,16,17	346:12 385:10	**controls**
113:3,5,6,11,16	161:1,8,15	215:18 217:4,5	385:15 393:16	29:9 116:19
113:17,21 114:9	162:5,10 163:1	218:13 220:20	393:20 394:2,4	180:13 213:20
114:12,14,19	163:6 165:4,5,6	220:21 226:18	394:16 395:5,13	227:1
115:1,2,4,9,11	165:6,11,17,22	227:20 228:1,5	395:17 396:6,7	**convection**
115:14,14,21	166:4,4 168:21	228:6 229:3,6	396:13,15 397:9	167:22
116:9,13,16,17	171:10,19 172:7	229:19 230:13	397:12 398:3	**convective**
116:18,18 117:8	172:15 173:1,16	231:3,11,14,14	400:21 401:1,14	167:21,22
117:10,17,18,21	173:18,21	231:16,17 234:2	403:14 406:9,10	**conversation**
118:1,1,3,7,7,18	175:14,14 176:2	247:3,6 251:17	406:17 407:3	71:22
118:20,21 119:5	176:3,8,11,12	252:11 253:1,2	408:4,15,21	**convey**
119:6,17 120:11	176:12,18,19,19	253:4 260:18	409:5,6,8,16,22	281:11 283:21
121:1,6,7,9,16	177:1,3,13,17	270:7,8,9,9,22	410:4,7 411:2	**conveys**
121:21,22 122:4	177:18 178:5,15	271:20 272:3	411:12 412:5	163:14
122:5,8,9,10,11	178:21 179:1,7	278:10,13,15,16	**controlled**	**convinced**
122:13,18 123:2	179:12 180:2,2	278:17 279:6,17	117:6 120:18,20	371:7
123:3,5,15,15	180:3,12,16	279:21 280:4,6	121:3,19,21	**convoluted**
123:17 124:3,4	181:4,15,18	280:6,14,16,22	122:5,7,7 127:2	336:3
124:12,20 125:8	182:6,10 186:16	281:2,3,4,5,21	127:8 133:5	**cook**
125:9 126:7,7	189:18 190:9	281:22 282:1,4	148:19 177:14	306:20
126:18,20 127:3	191:22 192:1,2	282:7,8,19,20	193:9 203:19	**coordinate**
127:5,5,7,9,12	192:3,18,20,21	283:10,11,17,21	294:9 295:5	118:21 119:6
127:15,16,19	193:9,11,13,15	284:5,8,10,12	386:16 388:10	123:3 128:3
128:2,3,20	193:18,19 194:4	284:22 285:5	**controller**	133:8 154:21
130:6,9,14,15	194:7,8,12,21	287:1,9,12	197:14 204:10,11	155:1,7 156:5
130:17 131:4,6	195:2,4,5,10,14	288:6,7,8,15	287:6,19 310:2	156:11 157:10
131:12,14 132:8	195:15,16,18,18	289:4,7,8,16	310:2 389:7,21	177:4 180:19
132:8,10,19	195:21 196:1,3	290:1,8,15,17	390:11 391:13	181:18 182:11
133:6,9,16	196:6,12,18	291:7,8,19	394:8 411:3	227:15 228:12
134:10,21 136:3	197:4,6,8,10,13	293:2,18 294:1	415:15 416:1	231:3 288:12
136:4 139:2,19	197:19,22 198:5	294:2 295:12,21	**controlling**	**coordinated**
139:21 140:7,8	198:17 199:1,15	296:4,10,11	108:3 148:15	124:12 126:18,20
141:6,8,9,16	199:17,18 200:2	297:3 300:19	178:16 188:13	127:8,15,16
142:10,12,15,19	200:19 201:9	301:1 302:15	190:7,12,21	131:8 182:2
143:1,4,14,22	202:6,7,9 203:5	304:9,20 305:11	191:8,18,22	215:13 229:19
144:2 145:21	203:21,21 204:6	306:16 307:11	192:8,14 193:1	**coordinates**
146:15,21	204:19 205:11	307:12 310:6,15	193:5,11,15,19	116:19 141:7
147:16,22 148:8	207:9 208:6	310:19 311:6	195:13 199:12	228:18 283:17
148:8,14,20,22	209:1,2,9,13,17	312:7 313:15,16	202:13 203:18	**coordinating**
149:2,7,21,22	209:19 210:6,9	313:18,21 314:1	204:20 206:13	124:22 132:19

coordination
116:22 124:16
126:17 131:1,2
141:18 162:11
211:6,14 227:6
227:19 228:12
copy
9:21 10:12
Coriolis
168:2,2 169:9
227:8 228:20
229:10,21
corner
202:16
CORPORATI...
1:5
correct
8:22 9:14,15
10:19 13:11,14
14:13 16:11
17:12,17 19:6
22:11 23:7
25:20 26:2 31:9
42:19 43:3,10
44:1 45:21
48:22 52:2,16
52:20 53:4,8,13
53:22 54:16,19
54:22 55:4 56:7
57:2,14,21 58:3
58:9,13,14,17
61:19 64:18,22
66:20 67:9
74:15,22 75:1
75:11 80:12
81:20 82:2,10
82:17 84:1 85:1
85:2,6,8 86:14
87:11 88:19,21
89:9,20 90:9
91:8,9,11,14
93:15,16 94:4,7
98:6 99:7
102:10 103:13
103:15 104:7
105:6 106:8
107:1,14,22

108:6 109:6
119:8,13,14
124:8 125:1
131:3 134:22
135:15 136:22
137:3,7,12,16
137:17,20 138:2
138:3,6,7,19,20
138:22 141:4
145:14 146:18
146:22 147:4,12
149:14 153:17
155:21 159:3
162:17,18
168:11 169:10
169:22 171:10
188:19 189:15
192:13 203:10
204:8 207:1
212:2 215:9,22
225:6,15 226:9
226:19 227:1
229:11 233:9,10
233:17 237:17
241:20 242:15
242:17 243:5
244:8 246:16
248:21 252:21
253:12 258:4
259:11,12
260:10 261:18
261:19 262:5
265:17 269:20
273:21 275:21
276:4,7 280:7
286:7 287:3,10
287:22 288:8
292:18 298:14
303:13 311:16
315:10,21 316:3
316:22 319:1,19
320:3,4,8,22
321:9,18 323:4
324:11 325:1,2
325:7 328:11
330:19,20 331:1
331:17 334:5,6

334:15,16,18,19
336:6 337:12,17
338:6,7,13
341:12,22 342:8
342:16,17 343:9
343:10,14
348:18 350:10
352:9 359:6
360:18 361:1,7
362:21 366:20
383:16,17
384:10 385:4,18
386:16 387:3
388:4,22 389:7
390:14,22
391:14,22 393:1
393:2,10,12
394:1,9 395:12
396:11 397:6
398:6,7 399:17
401:3,22 402:6
402:7,10,11,15
402:19 404:10
404:18 405:13
408:20 409:4
410:19 411:19
413:11,15,18,21
414:10 415:4
correction
168:14 193:8
316:14 337:1
389:6,20 390:3
390:5,10,11,12
390:19,21
391:10,12,22
392:1,19 393:4
394:7 395:22
396:10 398:14
404:15 407:6
411:16,18,19
correctly
104:2 302:9
362:11
correlation
78:7 79:6 80:7
corresponds
69:18 129:6

corroborate
351:2
cost
412:9
costs
393:16,20 394:2
395:5,13 396:14
counsel
7:16 339:5 356:2
421:12
count
97:1,4,17 98:13
counted
234:1
countless
96:21 99:17
104:14 105:7,10
counts
335:11
couple
276:2 339:14
416:20
course
47:9 49:6 57:8
75:21 91:10
254:11 395:2
coursework
57:2
court
2:16 99:4 158:14
277:10 339:4
421:2
cover
91:16 266:3
coverage
346:10
covers
324:17
crash
117:8 211:5
crashing
211:9 226:13,16
crashings
211:13
crawl
334:21
cream

279:11,13
create
168:6,11 178:3
387:11 390:18
398:12 399:14
412:20
created
75:13 398:8
399:2
creates
284:18 388:3
creating
397:17,21
creation
387:2
credit
73:22
critical
76:16
crosscurrent
309:1
crucial
124:17
cubic
118:12
curiosity
254:16
current
10:15 82:22
270:6 294:15,22
295:10,14,17
298:4,7,17
299:7 300:18
301:12,18
304:15,18 305:9
305:19 306:4
310:3 311:14
314:10 316:15
328:14,17 347:9
403:6,7,13,17
403:19,22
404:20 405:17
405:18,18,20
currently
11:11
currents
82:14 83:3 299:1

299:17 300:10
305:3,15 306:21
307:19 308:3
309:12,18
311:10 312:5,20
313:6 328:16
388:6 404:8
412:9
curriculum
5:10 10:12,17
13:11,14 51:17
curse
403:11
curve
333:11,11,18,19
curves
333:22
cutting
12:9
CV
28:15 51:5
cycle
204:18
C-O-R-I-O-L-I-S
168:3

D

D
4:1 6:1 7:1
daddy
160:3
dangerous
332:21 333:16
391:17
data
25:6,8,10,12
33:21 36:2 76:2
78:8 79:7 80:7
84:22 109:19
268:12,17
275:11 317:18
319:6 332:19
334:3,5,14
337:1 384:16
388:20 389:15
394:8 401:13
412:17,17
date

54:12 78:21
83:21 85:4,18
108:17 183:14
237:22 259:5
269:22
dated
258:22 272:17
dates
275:16,19 412:19
daughter
336:15
Dave
139:6 340:5
347:19 416:19
David
3:3 7:8
day
158:22 299:16,21
416:20 417:1
422:4
days
8:2
deactivate
326:18
deactivating
327:3
deal
395:2
deceptively
170:16
decide
67:3 231:6,11
244:21 316:10
316:14 318:18
358:5
decided
49:2 376:9
decides
121:19 187:19
decision
349:9
declaration
6:12 8:13,16,18
9:6,17 10:1,2,6
10:8,9 15:14
37:8,10 39:8
55:16,20 56:2

59:3 66:22 76:6
76:18 81:3 87:8
111:13,14,18,21
120:9 121:5
127:4 128:10,17
131:11,17 132:1
132:4,7 136:5,8
136:16,19 137:5
153:11 156:8
162:1 179:8,16
224:6,11,19
233:2 239:14
304:2 317:11,13
319:4 320:11
347:9,10 381:22
413:3,7 414:18
415:2
declarations
152:2
declining
362:6
deduce
295:8
deep
26:6 62:2
define
45:17 143:22,22
192:17
defined
179:8
definition
39:14,17 40:9
41:4,7,20 43:12
46:11,22 50:18
55:14 56:7,15
61:4 62:5 68:15
68:20 79:9,10
80:2 90:18
119:22 120:10
120:14,15,19
123:1,14 124:3
124:6,7,10,12
125:7,8,11
126:11,19
127:10,11
133:22 135:14
136:1,4 140:11

140:17 141:2,12
142:1,6 143:12
143:19 144:9,11
144:15,19
145:12,13 146:8
146:8 149:6,13
150:9 155:4,6
156:11 179:1,11
179:15 182:14
202:18 248:19
286:16
definitions
128:19 146:5
150:16 414:5
deflector
94:11,12,13,21
95:2,5,7,12,15
95:18,21 96:2
96:15,16,17,19
97:5 98:1,4,12
98:16,16,18,19
98:22 99:14,15
99:18
deflectors
97:21
degree
46:4 51:2 56:18
57:20 58:1,2,9
62:8,16 73:22
74:3,4,5,9,13
319:20
degrees
405:22
delay
172:14 198:11
204:17 210:4
228:13,14
373:22 374:7,10
374:18,21
378:16,17 379:2
380:18 382:21
383:4,7 402:1
delayed
374:5
delays
186:21 199:21
218:20 227:12

381:11
denote
109:18
denoted
109:20
department
346:4 347:3
depend
172:3 240:1
243:6,8 245:15
245:20
depending
183:8,17 247:4
298:22 301:18
depends
21:7 71:19 86:20
90:4 91:1 96:6
103:16 107:2
177:11 187:14
203:19 235:9
308:7 309:6
312:10 386:17
388:5,8 389:8
390:4 392:15
407:13,21
409:12 418:11
depict
90:5
depicted
109:11
depiction
118:15
deposition
1:13 2:1 5:9 6:2
7:21 54:21 55:8
87:5 139:15
153:8 157:8
249:18 251:3
277:10 340:1
344:7 348:1
366:21 421:6,8
421:8,12,13
depth
108:3 183:17
depth-only
108:16
derivations

28:9
derive
48:14,19 174:4
222:16,21
derived
167:8 176:3
222:4,9,18
deriving
14:19
describe
48:10 205:12
206:10 225:13
233:22 234:14
334:10
described
40:11 112:4
116:3 169:4,17
175:17 184:7
185:8 186:11
187:16 199:10
201:22 204:4
205:7 206:2
211:15 218:16
222:10 232:1
368:20 400:7
describes
92:1 204:9
217:16 225:8
400:4
describing
217:16 229:9
description
106:4 112:4
116:16
design
22:17 23:6,9 24:2
24:14 25:2
180:8,18 182:1
234:2 330:12
331:10
designated
75:21
designed
23:2,8 400:21
designer
23:4 318:4
designing

22:13 23:12 57:6
117:5 180:10
182:4 302:18
desire
78:9,12,13 80:8
80:11 107:10
132:10,14,22
176:20 228:22
desired
78:22 147:9
159:5,12 163:7
194:5 195:21
196:4,16 198:3
200:3 203:8,13
204:6 206:14
211:17 212:14
308:21 314:20
315:15 320:17
322:17 323:6
325:4,9 326:3,5
326:13 327:11
329:8,20 330:6
402:14 405:12
desires
107:5
detail
89:2,3 152:10
detailed
89:5 112:4 257:4
details
118:10 185:11
223:3 307:22
356:16 363:12
363:16
determination
198:12 262:14
264:7,11,18
265:18,21
determine
20:4 24:3 65:2
71:14 98:11
101:5 102:18
225:9 300:5
384:19 408:19
determined
198:10 218:17
405:11

determines
407:3
determining
50:7 53:7 70:2,15
222:5,9,16
223:1 238:1
239:1 245:21
286:6,16 316:17
deterministic
200:2 206:12
216:15,22
217:22 219:16
developed
12:1 53:16 93:1
104:3 254:16
developer
23:4
development
11:3 52:20 53:12
54:3 61:3
develops
23:11
device
162:11 206:14,19
216:16,17 217:1
217:2,9,10,12
217:12,15,20
218:4,5,15
219:1,14 281:4
309:3 329:1
330:4 337:21
338:10 384:17
386:16,18,19,21
386:22 387:11
389:6,21 390:10
391:13 394:7
418:5
devices
118:22 119:7
122:15,20,22
123:16 124:5,13
124:14,21
125:10 126:8
127:12 128:7
130:16 131:13
140:8 148:9
149:17,22 151:8

151:17 154:9,17
154:21 155:2,8
156:21 165:7,20
166:2 167:3
175:15 176:4
181:19 182:12
202:19 211:4
230:15 257:14
257:18 260:5
261:10,15
262:11 263:22
264:4 265:21
270:10 278:17
280:7 290:1,9
291:13 294:8
297:21 303:17
307:20 308:14
308:22 309:2,13
309:19 311:3,10
313:7 314:22
325:1,5,11
326:14 327:6
329:19 330:18
342:13,21 344:4
344:9 345:8
348:17 349:7
350:8 352:4
354:11 370:14
371:18 372:6,13
372:19 373:12
387:3 393:17,21
394:20,21
396:14,16 399:5
399:11 404:16
405:4,11 413:11
413:14,16,18,20
414:2,4,6,9,12
diameter
118:11
dicey
85:12
dictates
79:3
differ
79:11,19 88:3
differed
183:4

difference
40:13 208:4,9
335:14 336:17
345:20
differences
172:3
different
8:7 15:20 16:8
40:8,18 41:7
105:2 108:9
113:8 114:11
134:17 135:8
164:11 178:1
197:11 214:2
235:6,11 249:21
266:19 269:17
285:11 288:11
336:1 351:3
355:11 365:7,7
380:20 385:8
389:3 414:20
420:17
differently
208:10
difficult
228:1,3 231:17
295:14 329:4
336:3 406:4
Digest
14:5
DigiFIN
342:21 343:21
344:3 400:8
DigiFINs
343:4,13
digital
411:11
direct
56:3 175:13
directed
25:22
directing
409:4
direction
181:2 403:12
directly
81:8,13 310:8

disagree
76:19 78:4
130:20 154:13
181:21 293:4
388:9
disagreement
76:22 77:5,18
disagrees
280:2
disappear
335:13
discard
92:20
discharge
115:21
disclose
217:14 288:14
289:8
disclosed
94:17 101:14
102:9 188:14
191:1,10 192:9
193:3,6 202:14
206:4 207:7,14
220:4,7 244:11
278:12,14
280:15 281:1
284:11 317:7,9
327:8 329:10
347:14
discloses
147:6,8,11 191:18
192:14 203:3
226:5 257:11
271:19 385:8
392:6,12
disclosing
117:16,18 297:19
394:20
disclosure
42:8 181:17
223:16 243:16
246:14 249:2
257:19 264:17
270:21 282:18
288:5 292:1,11
293:5,17 294:5

383:3
disclosures
290:8
discount
206:9
discovered
371:4 376:19,21
discovery
30:17
discuss
14:21 15:1,5,21
16:10,21 17:2
17:11,16,20
18:6,10 19:6
47:13 118:17
131:16 165:14
225:6 233:5
237:4 249:5
277:9 318:21
320:10 381:3,22
382:15 385:19
386:1 391:8
413:6 415:5
discussed
18:5,9 19:15 35:5
35:15 112:9
156:9 176:6
198:2 249:3
251:6 274:20
277:1 293:12
324:14 402:13
417:15
discusses
16:13 17:4,13
19:8 273:6
discussing
72:20 75:4 89:8
106:12 141:17
146:16 219:10
219:15 224:3
260:9 263:19
270:20 273:14
341:22 342:16
418:3
discussion
15:15 88:7
158:11 170:19

378:10 380:4,12
discussions
24:15 119:21
120:4,7
displace
167:16
dispute
33:13 34:4 35:1
85:16 135:3
disputing
135:4
disrespectful
29:22
dissuade
387:7,14,18
distance
85:17 390:4
391:4 406:13
distances
391:5
distinction
195:19 196:11
241:18
distinguish
225:12 420:5
distinguished
403:10
distortion
29:16
distracting
89:16
distributed
109:9 112:11
115:8,11 116:17
118:3,7 165:19
166:4,21,22
186:16 270:7
278:15 280:4,16
281:2 283:21
296:10 302:1
316:10
distribution
115:18
distributive
165:4,18 281:21
288:6
District

339:4
disturbances
306:13 377:21
378:11 379:9
380:5,12 381:3
382:1 406:16
Division
277:21
Doctor
7:18,20 8:12 21:4
26:14 38:12
39:11 51:14
56:4 61:5 62:5
71:4 72:7,17
78:4 87:8 91:5
120:22 129:8
133:2,22 134:11
135:13 138:14
139:19 150:20
157:8 159:3
160:6,21 161:22
164:17 175:5
221:3,22 233:1
246:11 252:7
256:11 258:22
264:16 268:10
269:11 271:7
273:21 275:19
279:19 283:1,1
286:4 301:15
317:14 332:16
341:2 350:5,16
353:17 356:20
357:20 359:21
361:13 377:13
380:21 383:14
395:3
doctoral
51:2 74:4
doctrine
224:9 225:22
document
6:3 31:7,13 37:14
105:12 129:7
136:13 150:19
154:15 159:17
159:21 164:20

199:8 249:16
256:7 259:3,22
263:16 267:4
270:15 271:16
272:11 274:3
275:12 280:11
281:14,17
285:21 286:8
330:14 331:21
332:11
documents
10:10 31:17
133:19 346:19
357:2
doing
23:9 25:18 29:11
30:16 42:16
44:20 48:7 55:1
69:20 171:2
174:17 184:11
196:18 198:22
215:6 229:4
266:6 297:22
300:4 328:8
358:6 363:4
381:9 396:17
404:1
dot
95:21 109:18,20
110:2
doubt
22:16 53:3
340:14
doubters
230:14
downtime
400:15
dozen
184:16 186:8
187:16
Dr
6:12 21:5,17 22:1
22:14,20 25:19
40:21 41:11
48:14,18 51:5
51:17 53:6
54:13,18 55:9

55:13,21 56:6
56:15 57:12,13
57:20 58:11
64:16,20 71:10
74:19 75:3,15
75:18 76:5,20
77:1,18 79:9
81:1 97:15
136:15,21 137:3
137:6 155:11
169:22 170:21
171:16 172:19
173:13 174:6
189:7 232:7
278:22 328:7
346:22 350:9,17
357:3 363:17
364:20 365:4,11
365:17,18 366:5
366:15 376:8
417:4
drag
169:14,17
dramatically
295:11 328:14
draw
420:2
driven
220:21
dubious
177:10
due
223:16 305:8
395:2
Duke
2:7 3:17 421:16
duly
7:4 421:7
dynamic
143:15 145:8,11
247:19,20,22
251:18 252:12
252:16,18,20
253:5 283:19
291:20 292:2,11
293:3,5 294:18
322:2 382:9,15

408:7
dynamics
13:16,17 14:3
21:8 22:10,18
23:5 26:12
162:12 168:7,16
233:22 234:7
247:2,9 329:3
333:5 335:10,11
335:17,18,19
374:7 382:10
410:21,22
D.C
3:9

E

E
3:1,1 4:1,1,1 5:1
5:7 6:1,1 7:1,1
EAGE
36:18
earlier
52:12 65:21
72:20 141:18
155:9 226:4
251:7 255:13
345:18 414:14
417:15
early
55:4
earned
73:22
earth
408:9
easiest
419:11
edge
12:9
education
50:10 51:1,20
53:9 54:19
57:13 65:4
68:14,19 69:12
educational
73:12,22 153:12
effect
164:8 168:4
233:16,18,20

effective
415:11
effectively
231:9
efficiency
76:2
efficiently
204:20
effort
174:11,14 230:14
efforts
84:6
eight
29:11 73:14
416:21 420:19
either
25:7 37:6,15 59:5
115:17 247:20
260:14
elaborate
145:17 206:9
210:3
elaborated
182:15
elaborates
199:21
electrical
47:8 202:19
element
130:22 205:11
315:9,11,22
316:5 320:6
324:21 325:3,8
326:12 327:11
328:9 330:22
331:1 417:10,12
elementary
64:14 235:16,17
235:21
elements
103:22 104:3
Elholm
257:9,11 258:3
260:3
Eligibility
73:6,8,18
eligible

74:7,15
ELLIS
4:4
else's
376:2,3
elucidate
359:14
embodiment
109:8
embolden
162:19 164:5
320:13
emboldened
164:5 320:15
emergency
317:20 319:8
391:20 392:3,17
emergent
391:18 392:7,13
392:20 393:5
emphasis
294:19
employ
211:10,12
employed
421:21
empty
114:14
encompassing
104:19
encountered
21:15 50:12
encountering
305:15
encounters
305:7
ends
131:14 133:14
energy
228:8 404:1
engine
114:2
engineer
48:8 114:12
165:22 186:22
engineering
43:15,16,22 44:15

44:18,19,22
45:1,3,8,14,17
45:19 46:4,5,5,9
46:14,21 47:9
49:5 56:19,19
59:6 62:9,12,16
62:18 63:12
64:1,3,5,9 68:22
69:2 70:11,22
engineers
36:21 45:15
47:19
ensuring
401:19
entanglement
393:8,12
entering
419:20
entire
25:19 27:20
42:13 94:20
100:17 121:2,3
121:10 133:17
134:17 148:18
149:3,8,13,18
150:6 163:3,15
253:2 317:3
318:16 324:15
324:17 325:12
325:19 350:12
352:21 357:10
370:21 372:3
375:18
entirety
348:13
entitled
6:3 16:9 65:22
138:14 256:2
300:6 338:22
entity
202:20
environments
85:12,13
envisioned
179:9
equals
345:22 374:4

equation
49:12
equations
28:9 29:8 166:13
    166:14,15,16
    167:5 168:7
    169:1 170:3,11
    170:22 171:5,8
    171:18,21
    172:11,12,19,21
    173:8,19,20
    174:2,10,14
equipment
54:9 100:18
    102:5
equivalent
27:12 46:8 61:15
Equivalently
239:4
erroneous
282:4
error
406:12
errors
9:13,13,16 170:13
    170:14
especially
316:22 400:12
ESQUIRE
3:3,4,5,6,13,14
    4:3
essence
48:3,3 169:5,7
    173:15 333:2
    374:17
essential
48:1 59:16 60:11
    60:17 169:13
    282:1,3,6,19
    283:10 284:7
    289:15 292:3,12
    293:5,19 294:4
    294:5 295:18
    296:3,16 297:20
    299:11 311:21
    374:7 412:18
essentially

344:18 345:14
    352:6 354:4
    359:2 390:17
    418:5
establish
368:4
establishing
370:4
estimate
309:1,20 310:11
    313:8 333:7,9
    333:12,14
    405:17 406:14
    417:22
estimated
309:10 310:9,13
    311:5 313:1,4
    336:8 337:7
    344:19 345:14
    352:6 353:5
    354:5 359:2
    378:21 418:6,18
estimates
312:13,15 332:18
    333:3
estimating
239:5,9,16 240:9
    240:11 248:17
    308:12 311:11
    313:1
estimation
310:7
et
24:5
Europe
275:13 277:10
    279:7
European
5:19 36:20
    272:21 273:6
    274:3,5,6,7
    277:2
evaluate
277:15
evaluated
407:2
evaluates

407:11
Evans
6:12 21:5,17 22:1
    22:14 25:19
    40:21 41:11
    42:5 55:21 56:6
    56:15 57:13,20
    64:20 74:19
    75:3,15,18 76:5
    76:20 77:1,18
    79:9 136:15,19
    136:21 137:3,6
Evans's
81:1
evening
266:16
Evens
22:20
event
391:18
everybody
61:22 329:14
evidence
348:11 368:5,8
    377:1
evidenced
257:19
exact
19:13 85:10,15
    264:15
exactly
8:4 37:20 47:5
    70:6 78:15 80:8
    98:3 108:19
    111:16 161:6
    168:17,18
    171:12 174:9,16
    201:7 209:18
    225:2 250:22
    273:12 276:9
    310:3 319:2
    349:22 355:19
    371:20 381:6
    382:21 400:3
    419:22
EXAMINATION
5:2 7:16

examined
7:4
example
13:17 19:10 20:5
    37:16 38:3 45:9
    45:12 48:13
    83:5 86:16
    93:20 94:22
    113:14 126:13
    135:11 153:11
    160:22 167:9
    182:16,18 183:6
    184:3 210:12
    225:13 226:12
    241:22 242:22
    243:16 247:9
    248:18 254:20
    265:4 290:20
    313:20 316:11
    318:22 333:6
    334:19 335:18
    345:18 374:22
    375:1 390:20
    408:16 415:1
    420:8
examples
265:2
exceed
384:21 390:2
    397:8 399:8
exceeded
390:5,8 396:10
    398:12
exceeds
389:5,19 390:13
exclude
145:18
exclusive
45:14 221:15
exclusively
66:15 165:22
exclusiveness
178:19
excuse
13:18 258:2
    413:17 418:4
exhaustive

104:21
exhibit
5:9,10,11,13,15
    5:17,18,19 6:2,3
    6:9,12 8:14 10:3
    10:8,9,12 51:7,9
    51:13 52:10
    55:22 65:20,21
    65:22 66:22
    67:1 69:11 72:4
    72:8 74:21
    75:15 76:18
    91:3,17 117:5
    138:8,11,14
    139:2 144:10
    151:20,21
    152:14,18,20
    221:18 252:4
    255:18,21 256:1
    258:11,12,21
    259:4,6 261:14
    263:1,4 266:20
    269:6,8,11
    271:15 272:1,11
    272:13 275:4
    338:18,19 347:7
    347:11,12 348:7
    349:16 362:19
    377:13 383:18
    384:7
EXHIBITS
6:8
exist
114:5 115:19
existed
78:12,13 100:15
existing
105:3 178:8
    334:3
exists
95:4
exits
340:21
expand
367:5
expect
309:22

experience
10:18 43:16
45:18 46:14,20
49:4,17,18 50:1
50:1 52:11
53:10,11 54:14
54:17,19 55:10
55:13 57:5,7,13
58:17,21 59:4,6
59:10,12,19,20
60:3,8,22 61:15
61:18 62:11,17
63:7,11,21 64:6
64:15,17 65:1,4
65:8 68:14,19
69:1,11 70:11
70:21 71:14
73:13 74:11,14
153:13,15
experiences
52:12
experimenting
174:16
expert
5:15 6:4 21:11
26:15 27:6,20
28:17 31:8
65:21 86:11
118:19 132:16
133:2 152:1,5
152:19 153:1
154:14 155:18
162:6 286:11
338:22 341:1
349:4 355:14
359:15 362:12
383:3
expertise
21:6,17,21 22:2,3
22:8,10,15 65:4
68:13
experts
152:2
expires
422:12
explain
8:6 274:10

283:16 302:17
351:18 355:9
explained
15:16 167:8
352:20 357:13
371:12 373:19
379:1 380:6
382:19
explaining
95:19 151:4
355:12
explains
355:11 358:8
explanation
47:3 356:20
367:15
explicit
142:22 149:14
155:4,5 156:4
382:20
explicitly
18:5 38:17
163:12 247:17
250:20 380:18
exploration
33:10,15 34:6,12
34:14 35:2,11
35:16 36:6,11
36:15 74:8
exploring
20:2 33:19
express
76:22 77:5
expressed
145:15
expressedly
149:11
expresses
279:8
expression
91:1 209:17
expressions
279:13
extends
278:11
extensively
247:10

extent
80:13 81:7
132:21 150:1,1
157:13,13 241:1
248:19
extracting
285:19
extrapolate
335:15
extremely
167:13 227:21
eyes
314:17 339:6
408:11
e.g
130:16 140:8
154:9

_____

F

faces
152:8
facilitate
80:11
facilitates
78:7 79:6 80:6
facility
401:8
fact
8:16 19:12 21:11
21:12 36:9
85:16 92:10,20
92:22 93:3,18
94:3 95:1 97:9
99:18 105:12
110:21 111:3
114:18 117:3
130:8 133:3
134:20 170:12
170:16 175:16
184:18 186:21
192:7 219:6
234:12 250:10
277:17 304:7
320:10 322:1
328:13 341:4
348:10,22
356:22 357:11
373:16 381:8

factor
70:14 95:11
224:1
factors
50:6,16 70:2,3,4
72:3
facts
273:3 274:10
failed
177:1,5
familiar
26:4 32:1 33:11
72:22 153:4
363:9,18
familiarize
61:10
familiarized
61:14
far
65:10 184:18,18
184:19 303:22
316:18
farfetched
247:12
farther
390:19
fast
335:12 407:13,14
407:19 408:2,6
408:10 409:16
410:20
faster
410:5 411:7,7
feasibility
53:1,13
feasible
117:13 229:6
feather
82:2,10,20 176:7
176:17 319:1
402:6,8,10,17
402:18,22 403:1
403:2,3,4,5,9,10
403:18,21 404:6
404:14,17
405:10,12,21
feathering

82:18,19,20 83:4
83:5,14,16
317:1,5 319:10
401:10 403:9,11
404:3 405:16
feature
278:10,13,14
279:16,20
280:13,13,13,15
280:16,20
features
48:1
February
259:1 262:5
341:8
fed
333:10
feed
262:19
feedback
11:14
feeling
168:14
felt
168:12
fewer
132:8 178:13
184:16,18,19
187:17,20 327:4
328:10,21 329:7
field
19:22 21:4,9,15
21:18,20 22:21
25:16 43:16
44:1,2,3,7,15
45:3,8,17,19
46:2,5,7,20 49:5
59:20 60:14
61:21 62:11,18
63:14 64:7,12
64:18 69:1
70:11,22 89:8
89:19 153:16
299:8 328:15
fields
45:5
fight

403:20
fighting
246:10 403:19
408:22
figure
80:18 81:9,14
82:7 83:7 91:17
91:20 92:1,7,21
93:8,8,18 94:5
94:17 95:2,7
96:14 98:9,12
99:1,6,18
102:19 103:1
104:2 105:8
106:5 109:1,7
110:15,20 111:2
111:9 112:1,3
112:19 113:1,9
113:21 114:7,8
114:18 115:6,16
116:1,6,11,15
117:15 118:8,14
118:15 257:19
388:14 393:3,14
394:9 413:2,3,5
413:10 414:3
file
254:6,7,9,14
263:12
filed
139:7 253:19
273:7,9
filing
269:22
filter
335:21 343:20
344:3 346:5,15
351:2,14 352:22
353:3 355:10
356:11 357:12
357:13 358:4,6
358:9 363:4,4
363:10,18
364:13,19 365:1
365:18,19 366:4
368:2,3,9,22
369:1 370:3,5

371:4,9 378:2
415:22,22 416:4
416:5,8,15
417:13,14,18,19
418:14,15 419:1
419:13 420:3,3
filtering
334:2,11,13
filters
364:1 414:15,17
414:21 415:3,6
415:7,9
fin
103:20
financially
422:1
find
12:7 14:6 15:13
37:15 48:10
69:17,18 94:5
132:12 231:11
254:19,20 271:2
345:21 346:1
347:10 406:17
finding
25:9
finds
220:11
fine
21:1 29:18
103:12 139:14
139:16 160:14
160:15 161:18
175:2 251:15
347:20
finicky
48:2
finish
20:18 24:22 61:6
63:9 79:22
209:8 210:21
296:19 351:16
416:22
finished
63:19
fins
103:18 167:4

199:14 399:5,22
406:2
fire
392:3
first
10:20 32:14
52:12 91:16
96:8,17 99:4
105:16 106:3
107:9 128:22
130:4,12 151:11
151:14 169:12
215:8 253:15
254:15 256:6,11
262:22 272:8
273:3 277:14
296:20 341:15
341:16 348:10
368:4 387:22
403:15
fish
11:5,12 12:1
44:11,21
fit
183:16 313:16,18
314:4 334:2,3
fitting
333:11
five
43:15 45:18,22
46:2,7 54:13
62:11 63:11,21
64:6 69:1,16
70:10,13,15,21
74:4 84:19
171:2 183:1
198:10 201:8,15
203:5 210:3,14
211:2 216:19
217:6 218:19
412:21
five-second
198:11 210:4
Fjord
52:15
flag
271:5

flagging
139:9
Fletcher
3:4 7:9
floor
2:8 3:18 187:5,6
334:21 421:16
flow
11:4,11,13 44:10
fluctuation
295:1
fluctuations
270:6 294:15
295:10,14 298:4
298:8,17 299:7
300:19 301:12
301:19 304:15
304:18 305:9,19
306:4 328:14
fluid
47:6,9 166:17
167:12,16,16
170:17
flying
44:20
focuses
302:5
focusing
293:8
follow
242:4
following
176:1 178:17
259:14 341:17
345:13 403:21
follows
7:5
foot
118:11 335:3
footnote
239:5,13 240:8
force
83:2 313:21
314:6,10 346:1
374:5 386:19
399:3,6 401:17
404:2 406:2,11

407:3 408:16
forces
159:5,13 162:12
163:7 167:12,14
167:15 168:2
169:3,6,8,8,9,10
169:14,17,17,20
169:21 172:20
189:20 192:21
193:17 194:1
217:13,17 227:8
228:19,20,21
229:10,11,21,21
230:2,12 231:4
231:7 232:1
233:8 234:14
236:3 309:21
313:11 314:10
315:16 320:18
322:8,17 323:7
323:12 324:13
333:15 334:7
370:14 371:17
372:5,10,12,19
373:12,21 374:8
Foreign
268:11,17
form
12:21 13:6 15:7
15:11 16:1,12
16:17 18:11
23:16 24:6 27:9
28:21 31:11,18
32:5,18 34:8
38:4,15 41:12
42:1,12 44:5,16
57:15 62:20
68:6 71:8 76:7
77:8 85:20
93:10 97:19
98:7,14 99:8,20
101:9 102:2
103:3,8 104:16
107:3 108:1,7
111:4 113:12
114:10 120:17
123:6,20 124:15

125:2,15,19
126:2 127:20
129:17 131:18
136:10,17
140:13,20 141:5
143:7 144:7
146:2 148:11
149:19 155:13
155:22 156:13
158:18 177:20
184:1 185:9
188:20 189:16
190:14 191:3,11
191:20 192:10
192:16 193:21
196:9 200:22
201:5 203:15
205:9,18 206:6
208:2 212:6,16
213:4,14,21
214:12 215:10
216:1,10 219:3
219:18 220:8,17
227:2 230:3
232:4 241:14
242:2,10,18
243:7 244:1
245:12 246:3,21
250:13 251:9
265:8 266:22
267:18 275:7,22
277:3 279:2
282:9 283:2,12
284:6,14 285:7
286:13 287:4,15
288:1,9,17
289:10 290:4,11
291:10 292:13
295:6,22 296:8
296:21 297:7
299:4,13,22
302:12 311:17
312:9 323:10
345:11 349:8,18
350:11,20
351:12 371:19
372:8,15 373:3

373:18 374:14
375:5,13 376:1
381:4 398:19,21
406:8 407:20
408:16 416:3
formed
65:15
forming
66:11
formulated
418:12
forth
118:12 210:4
285:17 372:20
421:6
forward
231:6 313:16,18
314:4 336:9
337:8 344:20
345:15 352:7
353:5 354:5
359:3 378:21
381:8 417:16,20
418:7,19,20
419:5,16
found
137:21 165:3
foundation
203:16 279:2
four
9:22 55:9 74:4,10
74:14 171:2
184:20,22 185:1
276:18,20
405:22
fourth
283:8
frankly
349:14 386:2
free
167:19 270:17
frequency
419:14 420:6
Friday
1:15 421:17
front
31:8 48:12 55:5

55:17 60:2 62:6
63:2 67:1 74:20
85:4 94:11
133:19 188:6
221:8 226:3
233:2 252:8
253:15 258:21
259:4 268:9,13
268:14,15
377:14 378:9
384:8
fruition
170:20
fulfill
47:2
full
130:12 151:11,14
176:22 179:4
325:20 326:2
329:9 398:13
fully
234:1 412:1
full-time
73:12 74:10
fun
154:21
function
60:18 235:17,22
236:1 288:12
289:16 368:20
382:22
functionalities
116:2,3,8,12
functionality
112:10,14 115:13
functions
112:3 113:16
414:20
fundamental
15:8
fundamentals
14:19 15:12 23:5
26:12
further
11:10 47:3 57:1
144:4 207:5
309:1 344:13

421:11,13,19
future
336:19 415:19
416:11

G

G
7:1
gain
306:8
gains
310:1 313:9
game
29:18
gas
20:2,9 25:9
gauge
397:12
GB
268:19 269:1
275:19
GB9821277
273:15
Geco-Prakla
52:16,17 53:22
general
19:20 38:5 89:22
105:17 148:13
210:9 266:1,2
267:5 290:3
294:18 298:19
301:2 327:14
328:1
generalized
278:9
generally
34:6 81:8,11,13
81:20 195:5
329:4 412:11
generate
265:13
generates
168:1
generic
128:2 205:8
generically
94:13 95:12
103:21 116:8

127:21 202:17
282:13
geometry
83:20 88:14,15,17
88:18 89:8,9,18
89:20 146:22
147:3,7,8,12,21
148:3,4
GEOPHYSICAL
1:5
geophysicists
33:11 34:7,13,14
35:3,11,17,22
36:2,5,6,11,15
74:9
geophysics
34:15 56:20
Geoscientists
36:21
Geo-Services
1:4 4:10 7:12
Germany
274:8
getting
29:21 30:3,4
182:4 228:13
306:15 329:6
399:22 401:17
gift
410:10 412:7
girl
345:18
give
8:9 17:18 24:19
25:3 26:7 32:7
36:17 41:14
47:3 69:13 76:8
84:11 129:4
159:21 166:15
167:19 178:6
199:7 202:9
203:22 210:12
210:21 221:20
249:1 255:21
258:9 265:2
271:5 275:3
315:3 334:19

335:19,22
given
7:21 31:19 119:4
121:8 199:20,21
219:20 316:15
320:22 339:8
379:5 421:9
gives
96:13 150:7
178:12 180:5
184:21,22
196:13 203:21
322:15 336:2
341:18 410:10
giving
167:9 419:11
global
109:6,9,10,11,13
109:16,21,21
110:4,8,8,14,17
110:20 111:2
112:8,20 113:2
113:4,16,17,21
114:14,22 115:2
115:14,18 116:4
116:9,13,18,20
116:21 117:1,7
117:18 118:18
118:20 119:5,17
120:10 121:1,6
121:9,16,21
122:5,8,13,18
123:2,5,14,17
124:3 125:8
126:7 127:3,4
128:3 130:6,9
130:14 131:14
132:7,19 133:16
134:9,21 136:2
136:4 139:2,18
139:21 140:8
141:6,9,16
142:10,12,14,18
142:22 143:3,14
143:22 144:2
145:20 146:15
146:21 147:16

148:8,14,15,22
149:1,7 150:16
151:4,6,7,13,15
154:4,8,16,19
154:22 155:6
156:5 157:9
158:6,10 159:4
159:11 160:22
161:8,15 162:4
162:10 163:1,6
175:14 176:12
176:19 177:3,13
177:17 178:15
179:1,7,11
180:3,12 181:15
181:15 182:5
186:16 192:2
203:21 210:11
210:20 211:7,10
212:20 229:2,19
231:3,11,14,16
247:3 251:17
252:11 253:4
272:3 278:10,13
279:6,16,20
280:14,22 281:5
282:1,4,7,20
283:11,17 284:4
284:8,10,12,21
285:4 287:1,6,9
287:12,18 288:6
288:15 289:4,7
289:8,16 291:19
293:2 315:14
320:16 325:16
407:3 408:15
409:7,16
go
17:18 18:13 24:4
24:5 29:18 32:2
32:20 33:16,18
34:1 35:9 36:1
48:9 61:1,13
77:4 83:1 86:12
94:2 96:15
105:21 109:7
129:9 130:5

134:3 147:13
160:21 164:20
174:11,13 181:1
188:3 194:3
200:4 203:7
206:10 207:5
215:5 222:2
231:6,11 251:12
253:15 254:12
266:13,16 268:4
268:9 271:2,4,7
271:22 274:14
277:2 280:10
286:12,14
300:15 304:12
305:2 313:22
315:5 331:18
332:2 337:2,3
340:16,20
369:18 381:5
385:12 386:9
388:2 397:13
398:2 399:13
400:12 405:20
411:6 412:10
goal
75:19 155:3
231:2
goals
226:11 393:7,11
goes
104:22 210:3
396:20 411:13
411:14
going
8:1 31:20 32:2
47:6 61:13 87:1
92:2 99:4 100:4
109:1 117:7,12
131:13 133:11
133:11 135:13
174:16 178:10
195:12 198:19
198:21 200:1
202:5 203:1,18
205:5 206:9
211:1 225:21

228:10 229:13
232:17,18
264:21 266:15
272:11 273:17
276:13 281:9,17
288:2 297:16
302:19 303:1
307:1,21 310:4
313:20 318:20
326:20 335:16
335:22 336:20
336:21 337:2,2
337:3,4 339:17
340:6 341:3
377:8 387:21
388:2 394:4,22
396:21 403:22
405:2 416:19
419:21
good
7:18,19 48:8
111:18 152:8
161:9 178:21
180:2 205:11
206:10 220:12
227:21 289:20
312:14 326:16
399:4,10 400:21
406:20 407:6,7
Google
65:14,16 66:4
67:11,19,22
68:8 70:18
71:13 254:20
Googled
69:10
Googling
65:10
gotten
30:5
grade
23:21
gradually
397:13
graduated
49:14 397:10
grasp

279:5
great
5:18 273:9
274:21 275:5
389:4 390:9
greater
401:13
greatly
208:14
grounding
337:5
guarantees
177:8
guess
159:18 241:17
267:3
Gulf
23:14
gun
102:11,21
guy
153:9

————————
H
H
5:7,16 6:1 152:19
half
87:1 178:10,16
184:16 186:8
187:16 377:9
408:9
halfway
396:17
hand
8:12 41:4 91:2
221:17 223:9
252:3 422:4
handed
9:22 65:20
handing
10:7 72:7
handle
59:21
handled
25:14
handy
41:4
happen

83:4 178:8
198:20 314:3
387:8 404:21
405:9

happened
68:10 168:15
171:13,14 258:7
258:8

happening
410:12

happens
178:11 180:4
249:18 382:22
396:1,2 402:9
403:7 404:21
405:3,6 408:7

happy
32:14 40:16
79:18

hard
42:19,21 43:1,4
47:4,10 48:16
48:22 49:1
50:17 60:1
95:10 195:1
279:5 375:8
404:11

Hart
4:10 7:11 340:14
340:21 347:20
348:1

hated
227:7

havoc
294:15

head
69:10 84:16
85:11 86:5
87:17

heading
230:13 307:19
308:3 309:12,18
311:9 312:4,19
313:6

hear
18:16 147:19
360:16

heard
17:19 33:12 37:1
71:20

hearing
407:15

heart
42:14

held
2:1

help
39:2 210:22
314:11

helped
24:14,20 25:2
221:15

helpful
336:4

hereinbefore
421:6

hereunto
422:3

hertz
409:13

Hey
106:10 178:9
179:21 229:2
230:9 327:16
347:19 403:16

high
29:12,13 390:21
397:5 412:9
419:14 420:6

higher
84:22 401:12

highest
73:22

Highly
339:3

Hillesund
54:18 55:9 64:17
71:21 224:3
236:9 249:15
264:12,17
282:18 284:3,11
288:14,21 290:7
297:21 317:8,10
393:11 404:14

406:6

Hillesund's
54:19 55:13

hired
63:15

history
254:6,7,9,14
255:1,2,6,9
263:12 316:12

hit
336:21,21

hobby
254:21

hold
158:17 265:8
266:22 345:10
351:11 354:22

hook
329:16

horizontal
159:5,13 163:7
194:5,6 195:21
195:22 196:4,5
196:16,17
197:18 198:3,4
198:9 203:9,13
203:14 204:6,7
204:21 211:17
211:18 212:4,14
212:15 315:16
320:18 323:7

horizontally
107:21 188:13
190:8,12,21
191:9,18 192:8
192:15 193:1,6
193:16,20
202:13 207:6,13
207:21 220:3
226:5,8

hour
87:1 232:17,19
303:2 377:9

hours
416:21 420:19

huge
169:15 230:21

hull
101:2,3 102:4

human
227:20 231:14

humans
215:6 227:21

humongous
413:16

hundred
85:19 178:4

hundreds
227:13 291:13

hundredth
96:9

hydrodynamic
412:17

hydrodynamics
12:1 33:21 35:8
230:19

hydrophone
389:5,16,19 390:1
390:13 394:6
396:9

hydrophones
25:10 90:3

hypothesis
221:7

hypothesize
187:18

hypothetical
46:16,17 58:19
69:3,6,19 71:1
124:1 183:12
186:9,10 203:11
220:10,15
244:22 245:2,13
246:5,10,12
287:16 290:14
298:9 404:19

hypotheticals
69:8 212:11

_____
I
_____

idea
66:10,13 92:10
174:18 204:1
210:1,6

ideal

82:15 187:18,20

idealized
80:15 81:2,18,19
81:22 82:7,11
83:7

identification
51:10 72:5 138:9
152:15 255:19
256:8 269:9
272:14 338:20

identified
14:12 17:15 19:3
112:19,20,22
113:10 115:5,16
115:22 116:10
152:18 171:20
173:1 275:20
276:3 297:18
304:8,11 392:20
420:8

identifies
57:1 114:19
122:13 249:4
267:16 268:22
269:14 274:15

identify
26:14 27:4,19
28:14,19 33:5,7
69:8 70:18 71:4
112:8 170:14
202:20 249:10
251:5,11 346:14
381:21

identifying
222:14 256:6
280:12

ignore
131:6,9 333:5

illustrated
75:14

imagination
229:14

imagine
139:10 227:13

immediately
48:10 117:9
131:20 172:16

195:8 240:15
impart
337:1 407:4
implement
174:1 198:18
231:8
implementation
318:6 364:22
365:17,19 366:4
implemented
168:17 331:8
397:17
implementing
199:1 398:18
implications
187:7
implicit
63:15 126:19
127:15 149:10
149:12 150:11
154:18,22 156:3
156:14 247:8
Implicitly
247:16
implied
11:22 12:6
126:11
implies
63:7 180:3 253:1
importance
78:2 172:1 247:2
371:10
important
43:5 67:2,3,8
76:1 131:7
167:12,13
223:22 233:18
247:9 250:8
311:20 402:1
imposes
122:13
impossible
18:21 133:11
275:12 329:4
387:12 411:20
improve
312:16

improved
206:17,22 311:13
improves
313:19
inaccurate
392:5
incentive
173:3
inch
118:12
incidents
400:9
include
63:16 66:8 89:1,5
89:9 115:2
117:22 243:1
244:17 247:15
248:12 261:1
311:4 378:10
413:5
included
66:22 67:2 137:4
143:19 146:3,11
164:12 235:9
238:21 311:11
346:11
includes
44:10 45:9 46:12
88:15,18 89:19
90:7,8,15 92:11
116:16 117:20
118:1,2,3
233:11 245:7
311:5 318:22
319:9 327:3
339:12 341:18
383:6
including
49:1 51:20 52:22
75:7 153:18
169:8 235:11
247:11 303:12
303:15 337:20
343:4 362:21
386:21,22
inclusion
92:6

incomplete
125:12,14,16,20
126:3 127:14
149:9 150:10
238:13 241:6,8
241:12,15,18
242:11,13 244:3
244:22 245:13
248:13,18
264:21 265:5
incorporated
195:17 203:4
224:12
incorporation
224:6,10,20
225:17,20 226:1
incorrect
35:6 125:13
126:5 127:13
149:8 241:4,7
242:7,13 243:22
264:20 265:5
295:3 392:13
393:15,19 395:4
indicate
111:10
indicating
332:13
individual
126:14 215:13
individually
322:3
industry
23:3,19 24:16
26:20 28:7
32:22 34:5,5
46:3,3 186:4
228:22
inelegant
91:22
inference
289:11,14
influence
295:11 328:15
information
20:4,10 110:11
139:7,8 173:17

215:3 283:22
310:22 339:12
340:7 375:16
408:16,19 409:2
409:3,8,9,10
infringe
369:1 374:15,16
infringed
338:2,11 356:22
357:22 360:17
362:20 368:10
infringement
338:16 339:9
341:17 342:8
347:6 348:6
349:16 351:9,20
352:1 355:4,22
357:5,16 359:6
360:10 362:11
369:20 376:19
377:14,19 378:9
infringes
347:13 348:6,14
349:5 353:19
355:15 357:1
358:10 359:16
367:6 369:5
370:16 373:2,14
374:13 375:4
379:7 380:3
381:2 382:17
383:5
infringing
137:22 327:18
354:1 368:22
370:3 380:13
ingredient
305:4
ingredients
59:16 60:11,17
initial
52:22
initially
105:21 106:1,3,9
155:12,20
356:14 402:17
initials

32:2,7,20 33:8
inoperable
180:8
input
203:20 316:19
384:17
inputs
202:20 203:17
inquiry
266:10
insects
44:20
inside
101:19 103:20
211:8
insight
335:20
instance
24:19 25:1,3
131:15
instances
395:20 402:16,22
403:4
instant
121:8
Instruments
52:15
integrate
345:21
intelligence
346:18
intent
368:20 385:5,6,10
385:15
interaction
322:1
interchangeably
197:15
interested
192:20 422:1
interests
10:22 11:8,17,20
12:5,19 397:20
interfere
404:8
interim
340:13

interject
71:11
intermittently
392:9
internally
419:1
International
1:6 188:14
202:14 222:11
interpolating
334:1
interpret
154:7 196:19
197:2 198:7
199:5 201:7
208:10 210:2
217:3 264:17
265:1 266:11
292:17 295:3
303:9 326:15,15
326:21 330:13
331:8,10 387:6
interpretation
57:17 78:8 79:7
80:7 105:11
119:4,12 120:22
123:11,17
146:14 149:4,5
154:4 158:6
201:1 202:6
237:5,19 238:6
239:15 240:6
241:4,20 266:18
266:19 267:14
267:15 294:14
311:12 312:6
314:15 315:22
323:22 324:3,4
325:13 327:21
329:1 330:1,3
330:12 331:13
351:3,7 359:11
interpretations
348:9
interpreted
130:15 241:1
286:5 307:5

311:4 326:7
327:12 330:7,8
346:17 373:10
386:13
interpreting
25:5,8,10,12
33:20 266:6
327:16
interrupt
106:2 376:17
interval
409:22 410:6
intervals
106:13,20 410:7
412:12
intervening
219:20
introduce
278:11
introduces
220:11
invalid
137:10
invalidate
146:4,10
invented
100:2 102:1
invention
96:3 101:8
111:14 117:3
174:2 183:21
198:6 206:17
220:5 231:18
325:18 326:2
329:10
inventive
118:5 165:3,17
231:1,5,18
270:6 293:22
296:10 300:19
inventiveness
230:5
inventor
50:11,22
inventors
50:22 66:4
involves

162:12 243:15
ION
1:5,6 6:3 26:16
27:7,21 28:17
31:9 54:22
137:19,21
138:19 139:13
139:14 141:3,13
142:2 143:14
144:11,20 145:4
150:15,20,20
152:3,20 155:11
155:20 156:9
337:16,18 338:2
338:11 339:13
340:12 341:2
343:8,11,13,17
346:5,6,7,18
347:13 348:6,14
348:21 349:4,11
349:14,16 350:6
350:9 351:4,9
352:5,15 353:19
354:3,8 355:15
356:12,21 357:1
357:10,22
358:10 359:16
360:3,9,16,17
362:12,20
363:10,18
365:14 366:1,1
366:22 367:6
368:9,21 369:3
369:4,11,14,20
370:15 371:11
373:2,4,14,16
374:13 375:4
376:18 377:7,14
378:5 379:1,7
379:12 380:3,9
380:13,17 381:2
381:6,10,10,14
382:5,16 383:5
399:6 418:3,5
ION's
139:9 140:3
337:20 338:10

339:8 345:5
357:5 364:12
366:16
ION-proposed
145:1
IPRs
8:17
IPR2014-00687
1:5
IPR2014-00688
1:7
IPR2014-00689
1:9
IRMA
54:3
irregular
77:2,6,14,20 83:3
irrelevant
114:21
irrespective
300:9 391:13,22
392:2
irritate
28:8 29:22
irritated
30:8,12
issue
31:6 41:21 49:2
76:4,19 77:2,13
78:15 91:8
119:11 126:16
127:1,3,22
131:17 139:21
225:17 228:5
237:16,20 238:1
379:2 394:19
issued
182:1
issues
26:1 44:10
170:20 274:8
346:14
italicize
162:19 164:4,7
italicized
164:5 320:16
item

82:19 93:20
195:17 250:15
371:11
items
93:12,12,17
114:20 115:3
146:11 186:17
244:20 347:17
iterative
407:1,11
IV
342:5,6
i.e
317:18

J

JESSAMYN
3:5
Jhunjhnuwala
4:11 7:10 87:4
job
1:20 59:17
211:11 312:14
396:17 406:4
411:6
John
346:4
joint
405:7
jolt
168:14
journal
10:21 14:5
170:17
journals
170:13
judgment
67:4
jump
63:9 335:7
jumped
76:15
jumps
219:20
junction
180:15
justification
202:10

K

Kalman
334:2 343:20
344:2 346:5,15
351:2,14 352:22
353:3 355:10
356:11 357:12
357:13 358:4,5
358:9 363:4,4
363:10,18 364:1
364:13,19 365:1
365:17,19 366:4
368:2,3,9,22
369:1 370:3,4
371:4,9 378:2
414:14,17,21
415:2,6,6,9,21
415:22 416:3,14
417:14 419:13
420:3
Kane
4:3 7:14
keep
10:4 29:17 31:20
78:18 126:14
165:11 197:6
249:2 266:15
297:16 404:2
keeping
294:18
keeps
283:19 409:5,7
kept
37:18,21 391:5,6
Kevin
4:10 7:11
key
393:7
kick
167:18
kicks
167:17 314:1
kids
210:14 211:2
226:14
Kiklis
3:13 7:13,13

12:21 13:6 15:7
15:9 16:1,12,17
18:11 20:17,20
23:16 24:6 27:9
28:2,21 30:11
31:10,15,18
32:5,18 33:6
34:8,18 38:4,15
41:12 42:1,12
44:5,16 49:7,10
51:11 56:10
57:15 58:18
60:4 62:20
67:10 68:2,6
69:14 71:8
72:12,15 74:17
76:7 77:8 79:22
85:20 86:22
89:10,21 93:10
96:5 97:19 98:7
98:14 99:8,20
101:9 102:2
103:3,8 104:16
105:14 107:3
108:1,7 111:4
113:12 114:10
120:17 123:6,20
124:15 125:2,15
125:19 126:2
127:20 129:17
131:18 132:2
135:6 136:10,17
139:6,12 140:13
140:20 141:5
143:7 144:7
146:2 148:11
149:19 155:13
155:22 156:13
157:1,4,21
158:8,17 160:2
160:17 171:11
173:9 174:22
177:20 184:1
185:5,9 188:20
189:16 190:14
191:3,11,20
192:10,16

193:21 196:9
200:22 201:5
203:15 205:18
206:6 208:2
212:6,16 213:4
213:14,21
214:12 215:10
216:1,10 219:3
219:18 220:8,17
227:2 230:3
232:4,6,9,16,18
241:14 242:2,10
242:18 243:7
244:1 245:12
246:3,21 250:13
251:9 258:12,16
258:19 262:18
265:8 266:22
267:18 271:11
273:17 274:18
275:7,22 276:5
276:8 277:3,16
278:1,6,20,22
282:9,11,21
283:1,12 284:6
284:14 285:7
286:13 287:4,15
288:1,9,17,19
289:10,17 290:4
290:11,22
291:10 292:4,7
292:13,19 293:6
293:20 294:11
295:6,22 296:5
296:8,19 297:7
298:1 299:2,4
299:13,22
300:12 301:8,20
302:12,21 303:1
304:21 305:12
305:20 306:5
307:8 311:17
312:8 323:10
330:9 339:2,17
339:20 340:5,9
340:15,19
345:10 347:19

348:19 349:8,18
349:20 350:11
350:20 351:11
352:10,12,19
353:8,14,20
354:13,17,21
355:6,17 356:2
356:6,9 357:7
357:17 358:1,11
358:15,18 359:8
359:17,22 360:4
360:12,19 361:3
361:9,14,21
362:3,9,13,22
363:11,21 364:5
364:8,14,21
365:5,13,21
366:6,8,11,17
367:1,9,12,14
367:17,20
368:13,17 369:6
369:12 370:1,10
370:17 371:2,19
372:8,15 373:3
373:17 374:14
375:5,13 376:1
376:7 377:8,22
378:6,13 379:10
379:16,18 380:7
380:15 381:4,16
382:2,11,18
383:10,19,21
385:22 395:7,14
398:19 399:20
406:8 407:20
416:19 417:3
418:10 419:8
420:12,15,18,21
kill
99:4
kilometer
86:18,19 183:6,11
184:14 185:16
185:21
kilometers
86:9 186:5,6
Kim

14:13
kind
94:21 99:15
118:6 180:16
222:10 223:1
235:19 309:21
333:14,22
386:17 394:19
394:20 406:18
412:14
kinds
412:21
Kirkland
4:4 7:14
knew
71:20
know
15:2,15 22:18,18
32:4,12,15,15
33:2,3,4 35:15
35:19,20,22
36:3,9,13,18,21
37:20 48:7 55:2
60:15 69:15
78:17 87:15,19
88:2 90:11
95:19 96:16
97:9,11 99:22
100:2 105:17
108:21 119:20
129:15 139:13
171:12 172:2,10
184:11 201:6
213:8 215:5
230:19 235:19
250:10 254:7
266:15 271:7
275:14 280:1
281:13 286:1
295:1 299:8
301:15 307:2
327:1 328:2,2
328:15 329:21
335:17 336:14
346:2 375:18
376:12 384:4
396:2 397:5

401:16 404:22
knowing
299:8 309:21
310:3 311:14
329:2
knowledge
317:17 318:1,3
319:21 320:1
knowledgeable
366:5
known
36:3 82:18 83:10
94:13 107:1,5,6
107:10,16,21
108:14,15
229:11,20 231:4
231:5 257:18
333:4
knows
172:11

L

L
3:13
label
92:7,13 93:14,15
102:7 106:8
415:7
labeled
92:17,21 93:20
94:3 95:11 99:1
101:21 103:1,7
104:2 106:7
112:1 113:11
114:4,8 115:5
115:22 129:4
273:2 277:6
labels
114:19 392:18
lack
245:17 409:14,15
Langland
221:21 224:11,18
225:6,8
language
121:8 133:15
162:4,16,20
221:13,16 249:3

259:17,20,21
260:2,8 261:1,8
261:13,17 263:9
263:20 265:15
267:2 271:13,17
271:18,21 272:5
272:6 276:14
279:21 291:17
293:16 307:17
308:14 320:10
327:9 328:1
331:14,16
large
303:19 386:19
late
160:19 383:7
lateral
52:22 53:13 54:3
184:5 222:4,8
222:16,22
223:13 324:8
laterally
223:11,20 224:1
225:14
latitude
268:3 327:1
launched
54:3,4 87:20
law
43:11 167:6,17
345:22
lawyer
134:12
lawyers
327:13 328:2
lawyer's
328:8
layer
143:1 169:12
layers
284:17 285:10,14
layperson
12:22 29:2
114:12
lead
11:4
leads

212:8 265:15
learn
48:12 61:1
learning
61:20,21,22
leave
106:5 340:14
leaves
100:3 265:12
268:2
left
73:9,18 87:4
253:16
legalese
130:1
lends
44:22
length
166:21,22 183:4,5
183:15 184:14
185:13,15,22
186:2,4
lens
330:2
Leonard
346:4,22 347:2,3
348:5 363:9,17
364:20 365:4,11
365:17 366:5,15
376:8
Leonard's
347:14 350:9,17
357:3 365:18
Leslie
1:22 2:15 421:2
422:8
letters
314:16
let's
7:6 10:4 13:10
14:11 19:2
23:14 37:8 39:7
46:4 47:8 51:5
62:21 79:13
100:8 117:5
138:11 152:17
159:19 161:17

165:14 168:10
188:3,8 194:3
198:8 199:3
200:4 207:5
210:12,14
220:19,20 229:2
252:2 255:21
258:8 269:3,6
272:10 277:1,11
280:20 286:12
286:14 289:2
302:22 333:13
334:20 338:16
340:20 369:18
383:14 385:12
386:9 392:18
414:1 420:18
level
21:13 50:7,11
53:9 60:13,21
64:15 65:7
66:16 68:13,19
69:11 72:1
394:17 397:9,11
401:13,16
levels
309:21
Lexington
4:5
life
30:16
lightly
48:17
likewise
17:16 19:5
226:20 261:6
287:1 309:6
393:15
limitation
122:14 311:2
314:19 345:6
348:15 349:5
350:6 351:9
352:1,2 353:19
354:9 360:17
362:21 368:10
407:17

limitations
181:16 187:1
188:2 244:11
245:7 342:15
limited
392:7,13 393:5
limits
186:1
line
45:19 53:15 81:9
82:2 106:17
121:20 122:3
161:19 188:9
189:14 190:1
197:4 200:16
201:18,20 202:1
202:3 204:5
207:6 208:13
209:1,12 211:16
220:6 221:5,6
252:10 272:7
273:18 281:15
292:10 294:19
295:9 319:3
321:7 325:17
401:9 404:2
405:8
lines
21:20 22:1 75:14
80:22 126:14
162:5 164:13
270:18 271:18
272:9 276:18,20
291:18 293:17
294:7 297:18
298:13 304:6
320:8,22 321:2
321:3,4,9,13
322:5,6,13
323:1,20 324:6
403:21 406:3
413:12,13
list
17:18 32:21 50:5
50:10 66:3,8
67:6,8 113:18
literature

14:6 20:11,15
50:4 64:11
171:1,4
litigation
27:7
little
72:22 95:11,11,21
130:2 232:14
252:3 294:17
329:22 342:10
394:16 399:7,10
403:20 404:5
406:18 407:8
412:10
live
177:2
lived
30:16
LLC
1:9
LLP
2:6 3:7,16 4:4
421:15
local
115:14 117:10
118:3 121:7
130:16 154:10
190:9 194:7
204:10 214:19
214:22 215:16
217:4 220:20
300:10 408:21
409:5
localized
270:6 294:14,22
295:10 298:4,17
298:22 300:18
301:12,18
304:15,18 305:9
305:19 328:14
locally
310:10
located
106:13,19
location
90:16,17 167:2,20
183:17 249:17

413:20 414:2,6
414:11
locations
165:3 239:5,10,17
240:9,11 248:18
249:21 369:15
logic
62:1,3,4 165:6
168:22 171:19
172:7 173:1
201:2 260:19
270:9,22 271:20
278:16 280:6
281:3,22 282:8
282:19 293:18
294:2 296:12
299:9 316:11
321:8
London
272:22
long
8:18 24:3 37:14
66:11 86:6
129:13,14
160:14 174:13
183:16 185:21
204:18 329:17
330:3 390:20
396:8
longer
412:5
look
12:7 13:10 14:11
18:13,18,20
19:2,11,16 37:8
38:17 39:7 41:5
41:13 51:5 65:1
65:20 67:21
87:7 93:22
96:14 105:8
111:18 121:4
128:8 135:10
136:18 137:1
138:11 139:1
140:14 152:17
153:10,21
160:10 161:14

161:16,22
164:18 166:1
185:10 190:15
190:16 197:21
243:11 244:21
247:7 248:22
249:16 250:21
254:6,9,11,13
254:13 262:1
267:11 269:3
270:3 272:10
273:1 277:11,14
308:6,10 314:16
324:20 335:5
338:16 339:17
341:15 342:10
383:13,14
384:12 388:14
400:5 419:22
looked
26:5 53:9,11
58:16 65:5,6
74:21 76:9,12
88:5 109:2
127:6 128:11,14
128:15 133:1,14
133:22 135:2,19
136:1 150:15
151:1 153:1,22
155:9 174:20
248:7 253:22
254:3,5,15
255:8,13,16
256:12 259:4,7
259:10 262:22
263:6 268:16
269:4 270:18
271:15 273:16
275:6,20 276:2
276:18,20
282:16 291:17
314:15 346:4
348:21 368:19
looking
12:8 35:18 37:9
52:10 78:1
86:20 95:20

116:15 129:10
135:20 144:15
145:18 150:13
204:12 213:16
221:4,13 228:17
246:5 248:2
249:2 251:22
256:20 259:9
261:7 276:16
325:17 328:19
335:1 340:9
346:20
looks
105:6 170:15
272:9 341:3
lose
228:9
lost
262:18
lot
31:4 37:9 48:21
132:3 273:11
283:16 294:19
388:13 399:8
404:4
low
400:2,6
Lower
284:15 356:6
lucky
405:5
lunch
175:1,3

M

M
4:10
mac
160:2
Macnab
343:17 344:13
355:3 356:21
357:13 359:1
366:22
Macnab's
344:7 350:16
352:4 355:5
357:21 358:4

378:20
magic
172:13
magical
246:7,12
magnitude
295:11
MAIER
2:5 3:15 421:15
mailed
259:5
main
314:8
maintain
146:22 147:6,12
147:21 148:1
253:5 317:4,6
maintained
75:20 147:4,5
402:11
maintains
251:17 252:12,18
252:20 272:3
293:3
majority
298:5 299:6
300:21 301:13
302:5,9 306:14
making
67:11 68:1
149:15 176:10
216:18 241:18
267:2
malfunction
295:2
mammals
11:12
manager
52:15 53:16,21
manages
334:21
maneuvers
117:7 317:1,19,20
319:7,8
manifests
378:15
manual

215:20 216:8
350:12,17
352:15,21
355:11 356:12
356:15 357:3
363:5 364:17
366:15 368:19
369:3,11,14
371:8,12 376:18
377:7 379:13,19
380:9,18 381:6
381:10,14 382:5
382:20
manually
117:6 207:8
208:6
manuals
346:6,7 348:21
349:3,11,14
350:1,9 351:4
365:14,16 366:1
375:19 378:5
379:1
manual's
383:3
March
9:2 10:15
marine
11:12,20 12:3,19
13:5,13 14:15
14:21 15:5,21
16:6,10 17:2,3
17:12,16,20,22
18:4,10,22 19:6
19:9,17,19 20:6
20:13 21:4,15
22:13 23:1,8,14
24:14 25:2,6,13
25:19 26:1,9,17
27:7,22 28:18
29:2,14 30:22
31:5,6 33:14
35:4 43:17
45:19 46:6,14
46:21 49:5
53:21 54:15
55:3,10 57:7,8

62:12,18 69:2
70:12,22 75:5
75:10 153:16
195:3 218:12
307:19 308:3
309:12,18 311:9
312:4,19 313:6
384:14,15
385:11,16
400:10
mark
10:3 152:17
229:5 269:6
271:1,4
marked
8:14 10:8 51:7,9
55:22 72:4,8,13
72:14 138:8
139:6 150:14
152:14 221:17
221:20 255:18
258:10 269:8
272:13 338:18
338:19 339:3,14
339:22
marking
91:22
marriage
421:21
mass
166:20 167:4,14
167:14,15 227:8
345:22 374:4
massive
394:21 399:13
Master's
56:18 57:22 74:4
material
166:19 274:1
materials
66:1,8,21 67:6,8,9
350:4
matrix
90:14
matter
57:16 79:19
158:10 246:13

278:11,12 335:8
339:15 422:2
maturity
60:13
maximum
187:8 388:17,22
389:5,9,16,20
390:2,13 394:6
396:9
McCLELLAND
2:5 3:15 421:15
mean
38:12 73:2 76:12
84:18 89:3,6
90:18 93:4
94:19 96:7
104:12 106:2
107:13 108:13
112:15 115:12
122:17 123:22
154:8 157:7
174:5 184:6
187:6 193:8
194:20 195:4,9
195:12,14
196:21 213:5,10
228:16 230:11
235:22 239:2,13
266:5 268:6
280:14 286:5
316:7 318:2
326:1 336:2
349:1 372:9,14
372:22 397:22
402:20 403:2
406:22 407:14
410:14 413:5
meaning
29:3,4 48:15
114:12 118:18
128:2 143:21
148:8,14 151:6
151:15 154:16
166:12 196:18
200:19 225:22
266:6 359:12,14
means

47:17,19 61:16
90:2,3,14 92:2
114:17 116:18
117:9 121:15
144:1 149:2
155:1,1 165:9
165:10,12
168:19 172:9
177:16 180:1,21
189:4 190:9
192:18 193:7,8
199:14 206:7
209:18 213:8
214:11,13
219:19 221:5
266:9 279:6
316:13 321:15
322:20 323:11
325:19,20 336:2
345:16 391:15
397:4,8 411:10
420:5
meant
19:12 92:4 102:4
143:11 155:14
195:11 267:21
381:10
measure
303:19 314:5
336:14
measurement
201:9 417:16,20
418:1 419:19
measurements
198:12 201:15
204:19 310:8
333:10 409:15
415:10 418:14
419:3
mechanical
46:4 56:19
202:19
mechanics
12:14 47:7,10
170:17 233:6
mechanisms
11:4

meet
40:9
meeting
35:10
meetings
35:2,13,16
meets
46:21 354:9
member
34:2 36:10,14
37:5 52:7 74:15
members
34:6
membership
5:12 72:11
memory
19:13,16 225:3
mention
367:7 370:9
382:6
mentioned
50:22 84:17
111:12 125:7
169:11 170:8
179:13 284:16
337:13 346:16
347:8 381:6
met
49:3
meters
85:6,9,19 106:15
106:21 107:20
184:4,10,16,21
186:7
method
206:18,22 208:14
208:17,17
257:12 265:11
308:11,19 309:9
312:22 333:21
384:13
methodology
312:1 374:19
Mexico
23:14
Michael
1:13 2:1 3:13 5:2

6:5 7:3 15:9
339:1 421:5,14
middle
73:17 161:14
210:5 212:9
272:2
Mike
7:13
mild
412:9
mildly
92:1
miles
86:10,12 290:15
million
367:21
milliseconds
408:11
mind
37:18,21 97:11,15
100:3 104:20
132:12 168:18
189:4,7 195:6
250:7 293:13
394:21
minds
267:3
minimize
394:3 395:16
minimum
187:9,10,11 389:9
389:11 390:4,7
398:11,21
409:21 410:6,7
minute
158:18 200:15
335:6,6 336:14
351:11
minutes
168:12,15 227:16
227:16 228:2,4
303:2 410:22
mischaracterize
157:7
mislabel
111:11
mislabeled

103:9 104:1,5
missed
113:10 361:18
364:10 375:9
missing
14:7 130:22
131:2 205:12
243:3 275:10
misstates
28:2 31:10 33:6
34:18 49:10
58:18 67:10
105:14 212:17
216:2 283:2
299:5 301:8
312:8 330:9
348:19 351:12
357:8,18 358:1
373:17 378:14
380:15 381:16
misstating
357:9
mistake
92:13,20
misunderstandi...
397:16
MIT
12:16 30:5 32:10
35:22 36:4 47:9
347:4
Mm-hmm
294:21
mode
176:7,8,8 177:6
177:16 317:1,2
319:1,10,12,13
319:14 346:12
346:18 401:7,10
402:6,8,17,18
403:10,18
404:14 405:10
model
47:19,20 48:19
141:4,15 142:5
142:11 143:5,15
144:5 145:9,11
146:17 165:11

165:13 166:6,9
166:11,12 168:9
168:16 170:4
230:1,8,11
231:7,8,16,20
235:1,5,10,11
235:15 236:6,10
236:20,21,22
238:2,11,18,20
239:3,7,10,18
239:22 240:7,12
240:17 241:3
242:1,9 243:2,5
243:22 244:18
245:9,22 246:2
246:19 247:16
247:18,19,20,22
248:1,13,20
249:4,9,14
251:1,18 252:12
252:16,19,20
253:5,12 261:2
265:13,22
267:15 281:7
283:18,19 284:4
284:13 285:1,6
286:7,17,21
287:2,6,10,11
287:14,18 288:8
288:16 289:5,6
289:9,15 290:2
290:10,16,21
291:6,9,15,21
292:2,11 293:3
293:5 295:21
296:4,7,14
297:20 298:15
298:21 300:9,20
301:7 302:10,20
307:7 310:6,15
310:19,21 311:5
312:7 318:6,8
318:10,11,12,14
321:15,22,22
322:3,21 324:9
334:18 370:9
372:18 374:4,6

374:9,16,18
375:2,3 378:1
382:9,12,15
383:6,7 415:11
416:17 418:12
419:2,21
modeled
230:1 253:2
modeling
142:20 363:6
378:16 417:17
418:21
models
48:10 169:2
172:10 283:20
373:21 374:2
model-based
47:16,17 48:4,6
165:6,10,10,12
165:12,19 166:6
166:6 168:21
171:9,19 172:7
172:22 231:17
235:20 253:1
260:12,14,17,18
270:9,21 271:20
278:16 280:5
281:3,22 282:8
282:19 283:10
285:17 293:18
294:2 296:12
297:3 299:9
301:1 302:6,15
304:9,20 305:11
321:8,14 322:20
323:3,5,11,19
324:17 326:8,17
326:22 336:1
416:4,5,8,14
417:7,8 418:13
modes
112:16 115:4
116:16 175:17
176:5,7,11,17
177:15 317:5
319:18 402:6
modulate

397:20
modules
342:19
moment
12:9 41:6 50:21
51:22 61:18
127:18 135:12
151:2 165:15
256:12 275:3
324:21 340:15
340:18 391:8
moments
59:1
monitors
121:16
Mooring
14:4
morning
7:18,19 233:12
287:1 324:14
372:17,20
373:20 402:13
motion
166:13,14,15,16
167:5
motor
190:17 193:8
202:21 203:17
203:18,18
mountain
89:7
mouth
285:4
move
14:20 82:15 83:6
167:15,16,18,19
168:10 297:15
316:18 318:5
361:7 367:22
390:19 397:19
398:13 407:12
409:4 417:15
moved
405:4 406:7
movement
398:8
moves

313:22 408:8
moving
314:6 397:20
403:12 407:16
409:5,7 417:20
multiple
70:2 72:2 84:1,9
108:6,16 213:9
213:20 215:3,8
multi-streamer
84:15,21 85:18
183:2

___

N

N
3:1 4:1,1,1 5:1,1
6:1,1 7:1
name
90:11,13 152:12
153:5
names
69:13 152:7
narrow
17:10 26:22 44:2
44:7 45:3,6
219:11
narrowed
239:1,2
narrowing
149:16 238:22
natural
61:13
nature
409:6 411:11
naval
114:13
Navy
29:12 30:18
NCN
344:14,15,18
354:3 359:1
418:4
near
168:13 175:12
315:8 317:16
332:7
necessarily
217:6 264:11

386:17
necessary
21:2 59:3 61:11
163:20 280:6
411:17
need
37:21 63:21 64:5
64:10 122:7
127:2 131:4
163:6,15 168:16
174:11 176:3
203:7 211:12
228:12 241:8
242:12 247:3
276:14 285:16
291:15 299:8
305:2,2 317:2
326:4,17 327:10
384:2 392:9
396:21 408:13
410:22
needed
174:9 217:7
267:7 309:21
317:17 356:12
357:11
needing
405:19
needs
102:5 158:20
234:22 283:16
285:11 302:9
negating
305:4
Nessie-4
53:16
Nessie-5
54:4
network
110:12 343:1,7
344:15,17 345:5
352:5 418:5
NEUSTADT
2:6 3:16 421:15
never
26:8 32:7 35:17
76:9,12 78:16

157:5 158:13
164:6 230:15
231:13 275:9
285:2,21 358:19
387:7 391:4
395:1 406:17
new
4:6,6 23:11 92:12
93:11 94:15,21
95:15,17 96:3
96:17,19 100:19
101:4,11,21
102:16,20,21
103:22 104:4
105:17 106:6,6
106:10,11 134:6
137:2 141:20,21
155:4,6 159:21
178:3 180:18
201:9 202:5
203:4 209:20,22
235:3 274:1
302:18 409:9
newspaper
335:6
Newton's
167:6,17 345:22
nice
271:1 299:17
401:9
night
420:19
ninety
38:10,10
node
343:2,7,21 344:15
344:17 345:5
352:5 418:5
nodes
343:3 344:1,2
373:5
nods
72:21 139:5
207:17
noise
229:4 385:19
386:13,16,20

387:2,10,11,17
387:20,22 388:3
388:7,10,11,12
388:13,17,17,22
389:2,4,5,14,17
389:19,20 390:1
390:2,8,9,13,17
390:20,22
391:13,22 392:2
394:6,11,13,17
394:22 396:9
397:18,21 398:5
398:7,12 399:2
399:7,8,10,15
400:2,6 406:16
406:19 407:8
411:21 412:21
415:10 419:12
419:14 420:6
noisy
230:16,21 388:1
396:19 418:1,14
nonbinding
277:7,10,18,21
nonobviousness
37:12
non-simple
317:1
non-specialist
279:14
noontime
175:1
Nope
367:16
normal
317:19,20 319:7,7
Nos
256:2
Notary
2:16 421:1,3
422:9,14
note
28:15 65:12
notes
26:11 249:19
262:7
notice

2:15 9:19 139:15
164:4
notion
131:9 177:17
notwithstanding
327:7
novel
93:12 111:5
nuances
47:6
number
13:17,19 14:3,11
17:11,15 18:5
19:2 45:4 72:8
80:12 84:12
85:15 86:8
94:10,10 96:2
99:17 104:14
105:10 109:5
110:19 111:1
112:22 113:9,15
115:3 155:2
166:5 168:10,13
170:9 186:18,20
187:8,9,11
234:4 255:4
256:10,11
258:12 269:14
269:20 274:15
347:17
numbers
69:16,18,18 85:10
85:11 273:11
274:11
numeral
342:5
N.W
3:8

___

O

O
4:1 5:1 6:1 7:1
oath
2:18
object
15:10 206:16
273:17 296:20
354:22 362:9

objecting	193:21 196:9	358:11,15,18	401:20	2:2 421:14
285:16,18	200:22 201:5	359:8,17,22	**obtains**	**officiated**
objection	203:15 205:18	360:4,12,19	20:10	2:17
12:21 13:6 15:7	206:6 208:2	361:3,9,14,21	**obvious**	**offshore**
15:11 16:1,12	212:6,16 213:4	362:3,13,22	39:20 40:7,18	26:20 45:11 46:2
16:17 18:11	213:14,21	363:11,21 364:5	41:1,10,22	**Oh**
23:16 24:6 27:9	214:12 215:10	364:8,14,21	231:15	61:8 72:15
28:2,21 30:11	216:1,10 219:3	365:5,13,21	**obviously**	135:20 160:14
31:10,15 32:5	219:18 220:8,17	366:6,11,17	63:14 250:8	254:18 258:16
32:18 33:6 34:8	227:2 230:3	367:1,9 368:13	386:2	**oil**
34:18 38:4,15	232:4 241:14	368:17 369:6,12	**occur**	20:2,9 24:16 25:9
41:12 42:1,12	242:2,10,18	370:1,10,17	407:19	45:9,10
44:5,16 49:7,10	243:7 244:1	371:2,19 372:8	**occurred**	**okay**
51:11 57:15	245:12 246:3,21	372:15 373:3,17	421:14	8:7,8 10:2 12:17
58:18 60:4	250:13 251:9	374:14 375:5,13	**occurs**	13:10 17:1,15
62:20 67:10	265:8 266:22	376:1,7 377:22	409:3	23:18 25:5 27:2
68:2,6 69:14	267:18 274:18	378:6,13 379:10	**ocean**	27:11 28:13
71:8 74:17 76:7	275:7,22 276:5	379:16 380:7,15	11:13 43:15,16,22	32:1 33:2,10
76:14 77:8	276:8 277:3,16	381:4,16 382:2	44:15,18,22,22	36:18,20 37:5
85:20 89:10,21	278:1,6,20	382:11,18	45:2,8,14,17,19	39:7,13 42:8
93:10 96:5	279:2 282:9,21	383:10 395:7,14	46:7,9,14,21	45:8 46:18 50:5
97:19 98:7,14	283:2,12 284:6	398:19 399:20	49:5 56:19 59:6	53:6 54:17 55:2
99:8,20 101:9	284:14 285:7	406:8 407:20	62:8,12,16,18	55:20 58:12,15
102:2 103:3,8	286:13 287:4,15	418:10 419:8	63:12,22 64:3,5	59:11 60:12
104:16 105:14	288:1,9,17	420:12,15	64:9 68:22 69:1	62:15 63:8,9,18
107:3 108:1,7	289:10,17 290:4	**objections**	70:11,22 82:14	63:21 66:20
111:4 113:12	290:11,22	71:11 232:6	233:6 295:15	67:5 73:11,20
114:10 120:17	291:10 292:4,13	279:1	**October**	74:19 76:17
123:6,20 124:15	292:19 293:6,20	**obligatory**	83:11 84:15	77:1 78:4 79:4
125:2,15,19	294:11 295:6,22	163:13	154:2,6 170:5	79:13 83:19
126:2 127:20	296:5,8,21	**Oblon**	268:19,22 270:1	86:6,21 87:2
129:17 131:18	297:7 298:1	2:5 3:15 7:13,15	273:9,15 274:13	88:6 91:2 93:5
132:2 135:6	299:2,13,22	421:15	274:15 275:5	94:2 96:16 97:3
136:10,17	300:12 301:8,20	**observing**	**offer**	100:3,8 101:20
140:13,20 141:5	302:12 304:21	414:7	341:17	102:3 103:12
143:7 144:7	305:12,20 306:5	**obstacle**	**offers**	105:20 107:17
146:2 148:11	307:8 311:17	391:16	157:15,18	107:19 108:20
149:19 155:13	312:8 323:10	**obtain**	**offhand**	109:1 110:14
155:22 156:13	330:9 345:11	171:8,18 174:2	226:2	111:12 117:4,13
157:1,4,21	348:19 349:8,18	223:14 255:2	**office**	118:17 120:3,22
158:8,17,18	350:11,20	**obtained**	1:1 5:17,20	122:12 123:14
171:11 173:9	351:12 352:10	25:12 172:21	256:20,21	128:15 129:14
177:20 184:1	352:12,19 353:8	173:14	258:22 259:4,6	129:20 130:5
185:5,9 188:20	353:14,20	**obtaining**	259:10 262:5	132:6 133:20
189:16 190:14	354:13,17,21	174:14 260:4	272:21 274:3,5	135:10,22 139:1
191:3,11,20	355:6,17 356:3	261:14 262:9	274:6,7 277:2	139:14 141:2
192:10,16	357:7,17 358:1	263:20 264:3	**offices**	143:12 153:10

156:20 160:21
161:8 162:2
164:18,20 165:3
166:16 167:19
168:8 170:3,16
172:15 173:17
174:17 175:7
180:4,7,20,22
181:3 182:19,21
183:10 186:5,9
188:3,8 189:12
189:22 193:5
194:3,21 196:3
197:4 198:8
199:8 200:17
201:22 202:22
206:8 209:4
219:6 221:11,17
223:22 225:1,19
226:4 232:8
239:20 244:14
251:5 252:9
253:14 255:15
256:22 257:3
258:8,16,19
259:17 260:1
261:5,20 263:5
266:17 268:9
269:6,19,21
271:11 272:10
273:13,19
276:12 280:10
283:6 287:7
291:17 296:14
302:22 304:4,6
306:22 308:17
313:13 314:18
316:4 317:11
324:20 332:2,17
334:22 335:15
339:7 340:2,8
340:11,13,16
342:1,6 344:12
347:21 358:22
364:10 373:19
374:3,7 377:10
383:19 384:2,7

386:1,9 390:17
392:5 393:3
408:9 411:3
413:2 415:21
417:2,3,5,14
419:12,22
420:18,19
old
94:15
omitted
234:8
once
16:3 199:5,6
231:10 249:9
250:4 302:1
396:1,2,5
410:18 420:16
ones
42:6 67:2 122:9
131:4,6 155:15
169:13 177:5
one-year-old
334:20 335:20
345:19
onset
314:7
open
106:5
Opening
5:13 6:4 138:15
338:22
opens
96:13
operate
177:6,7 178:10
179:4,20,20
284:5 387:12
399:10
operated
207:8 208:6
operates
392:9
operating
57:6 185:15
412:2
operation
178:10 180:17

396:19
operational
176:6 177:15
operations
295:16 317:18,20
318:22 319:5,8
319:9
opinion
24:7 25:17 26:7
38:2,8,14 40:6
40:13,15,22
41:9 42:5 43:20
43:21 55:14
65:14,15 66:15
66:16 76:9 95:1
95:8 97:4,17
120:2,9 132:7
164:10 185:4
224:19 234:11
234:12,13 277:7
277:10,18,21
279:10 338:11
347:15 350:5,13
350:15 369:16
382:7
opinions
37:11,17 40:4
42:3 65:18 66:9
91:13,15 137:9
221:11 276:15
279:9,10
opportunity
150:3
oppose
314:10
opposite
21:11 105:19
Opposition
277:21
optimal
177:7
optional
175:17
options
398:17
oral
274:9

Orca
342:19 343:2,7,11
order
22:17 42:4 47:10
60:12,17,21
74:7 86:8 117:1
121:21 127:8
133:8 174:1,15
179:4 236:17
242:16 306:8
317:4 326:5
338:1 339:4
348:14 351:18
390:19 397:17
398:12 400:17
401:12 402:3,12
405:12 408:18
409:10 410:11
412:12 419:4,14
ordered
168:10
ordinary
39:14,18 40:1,8
40:18,22 41:2
41:11 42:10,22
43:13 46:12,22
49:3 50:7,18
53:7 55:15 56:7
56:16 57:14,19
58:5,8,15 59:5
59:13,22 62:15
64:20 65:3
68:15,21 69:5
69:13 78:5,21
79:4,9 80:3,4,9
92:19 96:1
101:6,22 115:2
116:14 117:15
148:7 151:6,15
154:7 189:9
190:2 191:16
223:10 237:21
328:5,6 330:2
organize
33:20
original
160:12,15

originally
278:12
outcome
422:1
outputs
202:21
outrageous
28:11 29:7,16
31:2
outside
59:12 102:5
339:5
outstanding
11:5
overall
118:15 193:9
197:4 314:11
325:16 351:15
371:11 415:15
416:2
overboard
396:20
overlapping
45:16
overnight
174:18
overriding
323:18
oversee
149:7 150:6
overseeing
149:13,18
oversees
121:1,10 133:16
134:16,17 149:2
151:7,16 154:16
154:18
owner
1:10 3:12 4:2
7:14 129:5,21
130:13 134:1
135:14,18
159:22 160:5
175:8 181:13
255:12 315:3,6
Oyvind
54:19

P				
P	142:8 170:7	77:1 153:11	312:21 322:15	98:5,13 100:10
3:1,1 4:1,1 7:1	335:2,4	234:1 272:8	343:8 350:1	101:6,14 102:1
page	**papers**	276:3 292:22	351:15 352:22	102:20 103:19
5:2,9 6:2 8:20	13:22 15:16	348:18	353:22 367:2	106:10 109:14
10:20 14:2,3,12	18:22 27:11	**parallel**	370:5 381:9	109:22 116:7
19:3 39:8 51:19	170:9,18	78:6,14 79:1,5	382:12 415:15	119:10 120:10
52:9,10,12	**paragraph**	80:6,10 81:6,13	416:1 419:13	123:8,11,18
56:10,12 63:1	10:20,21 38:19	82:1,9 376:9	420:4	125:4,6,11,18
73:9,17 79:16	39:7,13 40:19	402:12 404:18	**partial**	126:6,12,13
80:16,20 81:1,2	42:11 43:2 47:1	406:3	124:6,9	129:2,5,6,20,22
81:14 87:7	50:5,19 55:15	**parameter**	**partially**	130:13 132:16
91:16 111:20	56:4,6,11,12,15	388:18,21 389:16	398:7	132:18 133:7,9
130:4,5,12	59:3 60:2,7 61:5	394:5 395:21	**participated**	134:1 135:14,17
135:19 136:2	62:6,22 63:1	396:9 397:3,6,8	30:17 137:18	135:18,21
139:1 141:13	68:16,21 70:1	397:14 398:3	**particles**	137:10 140:22
142:1 150:15,18	73:19 75:15	**parameters**	167:16,19	142:7,10,14,19
151:1,3,11	109:8 111:17,20	384:17,19,22	**particular**	142:21 143:4,8
154:1 160:22	115:5 119:5,18	391:2 392:16	23:13 56:3 98:21	143:10,11 144:3
161:7 175:10	120:12,16 121:4	395:18	186:2 188:4,8	145:17,21 146:6
181:10,10 222:2	133:1,13 148:21	**parent**	266:2,5,7,8	146:12,19,21
233:3 234:16	151:21 153:21	153:19 278:12	267:6,7 331:19	147:2,4,11,20
237:12 239:14	153:22 154:1	334:20	347:18 381:7	147:22 148:13
253:15 256:5,6	161:22 162:7,9	**parentheses**	**parties**	156:15,17,18,19
256:11 257:4,6	181:10 199:6,6	112:15	421:20,22	157:15 158:7
257:7 259:13	202:12 205:13	**parlance**	**parts**	159:22 160:5
261:13,20 263:1	207:12,20 219:8	212:3	115:13,18,21	161:1,13,16
268:9,14,15	220:5 221:3,5	**part**	118:5 163:12	163:10,12,16
269:13 270:3	224:18 225:4,17	10:4 23:20 24:11	**party**	164:9,13 165:2
271:17,22,22	233:3,21 234:5	38:16 43:5,6	421:11	171:10,20 172:2
273:2,3,3	234:15,15	44:21 45:14	**pass**	172:6 173:2,11
274:14 277:2,5	237:11 238:19	59:9 96:2,3	333:10	174:21 175:7,8
277:22 278:4,18	248:8 258:5	101:7,8 103:16	**passages**	176:2,22 177:8
282:15 286:10	262:8 263:1	105:9 112:20	163:16	178:20 179:3,21
315:5,7 331:20	272:2 278:18	113:2 114:1,22	**passion**	180:11,11,12,13
332:3,7 339:16	281:16 282:16	116:4,8,13,20	30:4,7	180:15 181:2,3
341:4,15,16	286:11,14,16	117:2 121:19	**passionate**	181:7,13 182:1
342:4,11 370:22	292:22 317:12	142:14,22	30:13	182:4,14 183:20
372:4	317:14,16 319:3	143:17 148:4	**patent**	186:17,19,20
pages	320:11,14,14	158:22 159:9	1:1,2,6,8,10,10	188:2,4 189:3,9
1:21 38:10 256:7	324:7 332:4	166:18 168:5	3:12 4:2 5:17,19	189:13,18 192:4
273:3 276:21	341:16 342:18	196:15 202:4	6:9,10,11 7:14	193:4 197:22
375:19	353:18 355:3	218:18 231:19	43:14 56:1	198:6 199:9
paper	359:1 367:4	281:17 294:5	60:14 61:9,14	201:2 203:3
14:21 15:5,13,22	370:18 415:1,5	295:18 302:2,16	65:6 91:2,5,10	205:5 207:7,14
16:10 17:11,12	417:1	303:18 306:3	91:12,13,17	207:19 208:5,19
17:15 19:3	**paragraphs**	310:5,14,16,18	92:2,7 93:1,4	220:22 221:4,6
	75:2,4 76:5,20	311:6,18,21	94:20 95:17	222:10,11,15,20

223:2,5,7
224:12 227:4
229:14 236:9
237:6,16,20,22
238:22 240:4,15
240:18,19,20
241:2 242:3,7
243:16,20 244:7
244:15,16 245:8
245:11 246:7,8
246:13,18 247:1
247:3,4 248:22
249:8 251:11,22
252:2,7,9 253:6
253:10,13,14,20
253:22 254:10
254:11,13,19
255:9,11,12,14
256:12,17,18,21
258:3,18 260:10
260:13,15
261:12,18,21
264:14,15,16
265:1 266:3,12
268:10,15
269:14,22
270:18,22
271:19 272:7,21
273:6,7 274:3,5
274:6,7,11,12
274:16,17,20,22
275:2 277:2
282:3,12,18
284:8,22 285:5
285:14 287:3,13
287:17 288:3,5
288:14,18,21
290:7,20 291:18
292:10 296:22
297:2,5,21
298:16,18 299:7
300:8 301:11,11
301:15 302:2,5
302:11,15,16
303:10,20,22
304:4,5,12,19
305:1,5,10

306:9,15 307:1
307:6 308:7
315:3,6,13
316:1,3 318:6
323:22 325:20
326:22 327:8,13
327:17 328:2
329:22 331:4,7
331:8,14 333:3
337:11,20 338:2
338:10,12
341:21 342:6,8
347:14 348:7,15
349:15 353:19
355:16,22
356:22 357:2,5
357:22 360:18
362:21 367:6
368:11 369:21
370:16,22 372:4
373:11,15
377:19 378:10
379:8 380:4,14
381:2 382:17
383:5,15,18
385:4,7,14
387:5 389:1
392:18 393:12
404:14 406:6,11
407:18,18,18
409:21 410:10
411:8,9 412:7
413:2
patentable
106:11
patented
93:4 183:21
189:18 200:21
205:3
patents
22:6 39:19 41:10
41:21 43:10
47:13,15 49:13
49:13,17 50:2,3
59:9,13,18,21
60:22 61:11,19
61:20 64:11

78:3 91:7 112:5
117:2,4,12
185:3 186:12
187:13 208:9
223:16 224:2,3
239:12 245:15
249:15,22 250:6
250:12,17,19
254:20 255:5
264:12 276:21
281:12 284:3,11
285:22 289:12
289:14 291:14
296:17 317:8,10
325:15 327:13
337:14,19
341:18 377:1
patent's
179:7 196:21,22
284:10
Pause
262:20 386:11
PCT
184:7 188:14
190:13 194:16
202:14 207:22
221:19 223:15
224:13
PDs
303:13
pending
134:11
people
14:5 21:12 25:16
28:6 35:19,21
36:1,12 46:1
65:6,11 66:16
69:4,10,20
71:17 152:8
170:12 171:2
172:2 229:4
230:14 231:17
279:5 328:15
387:13,18
perceived
345:17
perfectly

161:18 356:4
perform
234:8,17,19
performance
289:20 312:16
313:19
performed
346:22
performing
317:19 319:7
period
66:11 204:17
283:17
permits
216:8
person
19:1 29:1 30:9
36:13 39:14,17
40:1,8,11,18,21
41:2,11 42:9,19
42:22 43:13
46:3,12,12,16
46:17,22 47:5,7
49:2,14,16
50:18 53:7
55:14 56:7,16
57:5,14,19 58:5
58:8,15,19 59:5
59:13,22 60:10
60:17 62:15
64:20 65:3
68:15,20 69:3,5
69:6,12,20 71:1
71:20 72:2 78:5
78:20 79:4,8
80:3,4,9 92:18
92:19 93:7 96:1
101:6,21 113:17
115:1 116:14
117:15 131:20
152:9 158:1
165:11 172:17
173:5 181:22
182:3 189:8,12
190:2,22 191:16
192:18 223:10
228:16 229:18

328:5,6 330:2
330:13
personal
23:22 67:4
123:13 249:19
persons
89:19
perspective
373:6
pertinence
21:21
pertinent
15:13 18:14,19
23:18
Perusing
164:20 199:8
259:22 270:15
280:11
Peter
5:16 152:11,19
153:1,4 155:21
156:7
petition
129:22 221:19
petitioner
3:2 7:16 130:13
Petitioners
1:7
Petroleum
1:4 4:10 7:12
PGS
136:8 156:11
phases
365:7
PhD
6:13
phenomena
229:9,11,13,21
233:15
phenomenon
83:5
photocopied
160:13
photocopying
369:15
phrase
37:22 47:12

88:12,14 190:3
194:13 238:21
249:14 251:1,7
285:15 286:4
349:22 392:15
phrases
281:10
physics
11:11 48:20
56:20
Ph.D
48:20 51:3,4,20
52:1 56:19
57:22 58:11
picture
89:16 98:15
114:5
piece
280:12 408:19
pioneered
11:2
place
35:8 111:18
132:16 228:9
237:10 373:15
381:21
placed
184:15
places
134:20 339:14
plain
321:14
plainly
133:3 315:13
plan
75:22 396:4
planes
117:10 211:5,8
226:13
planned
75:11,12
planning
75:4 104:20
platform
240:14 391:16
playing
210:14 211:2

226:14
pleasant
30:8
please
17:6 27:18 28:19
71:5,10 259:14
283:1 391:7
plenty
12:7 13:2,4 31:16
47:13
plural
212:1
plurality
257:13,17 384:15
384:16
plus
169:17 190:17,17
point
13:21 37:3,13,14
38:1 39:22 43:8
45:2 99:17
111:16 128:12
131:10 132:17
135:1 159:8,16
176:10 200:10
212:19 228:11
229:1 237:9
247:5 286:8
300:22 326:21
335:1 336:9,18
337:8 339:2
344:20 352:7
353:6 354:6
359:3 373:15
375:10 402:18
409:2 418:7,19
418:20 419:5,17
pointed
304:13 382:21
pointing
250:16
points
365:7
poor
312:13
poorly
234:9,17,19,21

POSA
149:2
position
18:8 148:17
184:6 204:18,21
217:18 218:17
222:4,5,8,9,15
222:16,22 225:9
235:12,14 236:2
236:5 260:4,12
261:9,14 262:10
262:14 263:10
263:20 264:4,7
264:10 265:18
281:20 295:12
308:21 328:10
329:20 332:18
335:9 336:5,8
336:11,18 337:7
337:10 343:22
344:3,19,22
345:21 352:6,9
353:4,7 354:4,7
359:2,5 378:20
383:8 384:14
385:10,16
391:10 392:19
393:4 395:21
396:10 398:6,13
414:7 418:6,9
418:18 419:6,16
419:18 420:9,11
420:14,17
positional
332:19 333:3,7,9
333:14 334:5
positioned
183:20
positioning
54:4,9 118:22
119:7 122:15,20
122:22 128:7
155:8 161:3
162:11 165:7,19
166:2 175:15
176:4 181:19
182:11 195:3

206:13,19
216:16,17 217:1
217:2,8,9,12,15
217:19 218:4,5
218:15 219:1,14
222:22 257:13
257:18 260:5
261:10,15
262:10 263:22
264:4 265:21
270:10 278:17
280:7 281:4
290:1,9 294:8
297:21 303:17
307:20 308:13
308:22 309:2,13
309:19 311:3,10
313:7 314:22
325:1,5,10
326:14 327:6
329:19 330:4,18
342:13 344:9
345:8,14 348:17
349:7 350:8
352:4 354:11
370:14 371:18
372:6,13,19
373:12 386:15
386:21,22 387:3
387:11 392:6,12
393:4,16,20
396:14,15 399:5
404:16 405:4,11
413:10,14,16,18
414:4,8,12
positions
89:19 121:17
194:5,6 195:21
195:22 196:4,5
196:16,17
197:18 198:3,4
198:9,13 203:9
203:9,14,14
204:7,7 209:19
211:17,18 212:1
212:4,14,15
214:18 235:6

237:6,13,19
238:1,6,17
239:2,9,16
240:6 241:2
245:22 248:12
264:19 265:20
286:5,6,16,19
298:22 303:13
303:16,21
306:11,18 307:4
307:5,14,17
308:2,21 309:16
311:2,21 312:7
312:14,21
314:20 320:3
324:22 325:4,9
325:10,12 326:5
326:11,12
327:11 328:10
329:8,18 330:5
330:17,22 331:1
331:5 334:14
342:12,20 343:3
343:21 344:8
345:7 348:16
349:6 350:7
352:3 354:10
401:20,21
405:10 407:2
positive
292:10
possible
42:3 80:13 81:7
96:6 132:22
150:1 157:13
183:14 216:11
244:6,14 289:22
290:8 294:10
404:15 414:20
possibly
245:16 310:1
potentially
206:2 242:15
pounds
118:11
power
399:12

practical
131:12 179:17
187:1,7 406:15
412:2
practice
64:13 85:14
132:18 174:2
181:7 187:21
236:17 290:19
375:2 412:3
practiced
183:8
practicing
132:15 180:10,11
298:15 300:7
329:11 337:10
376:22 397:18
practitioner
64:12
preceding
195:8
precise
118:7 317:17
319:21 320:1
preclude
133:10
precludes
227:20
predetermined
180:5
predict
239:6 306:11,18
307:5 336:8
342:12,20 344:8
344:18 345:7,14
348:16 349:6
350:7 352:2
353:4 354:10
368:3 415:18
416:10 418:17
419:2
predicted
240:6 260:4,12
261:9,14 262:10
262:14 263:20
264:3,6,10,19
286:5 308:20

309:16 310:15
314:20 325:4,9
325:11 326:5,11
326:12 328:10
329:18 330:5,21
330:22 331:5
337:2 401:20
predicting
237:5,12,19 238:6
238:16 239:9,16
241:2 248:11
263:10 265:20
286:19 298:22
303:15,21 307:3
307:17 308:2
311:2 312:6,14
312:21 324:21
329:8 330:17
337:7 343:20,22
344:3 368:2
378:20
prediction
144:1,3 236:10,20
236:21,22
240:13 245:18
247:11 248:1
310:16,17 311:4
311:6,19,21
342:11 343:3
344:8 345:7
346:10 348:15
349:5 350:6
352:2 354:9
363:6 367:7
369:22 371:4,8
371:14 381:9
410:11 417:10
417:13 418:2,9
418:21,21,22
predictions
311:13 333:4
409:14
predictive
29:10 47:17
112:15,18 113:1
113:5,11 114:9
114:19 117:16

117:20,22 141:4
141:15 142:5,11
142:20 143:2,5
144:5 146:17
165:5,10,19
166:5 168:21
171:9,19 172:6
172:13,14,22
231:8,16 235:1
235:15 236:6
238:2,11,17,20
239:3,7,10,18
239:22 240:7,12
240:17 241:3
242:1,9 243:2,5
243:22 244:18
245:9,22 246:2
246:19 247:16
247:17 248:13
248:20 249:4,9
249:14 251:1,2
253:12 260:18
261:1 265:22
267:15 270:8,21
271:20 278:16
279:6 280:5,17
281:3,6,22
282:7,18 283:9
283:18,19 284:4
284:12 285:1,6
285:17 286:6,17
286:21 287:2,6
287:10,11,14,18
288:8,16 289:5
289:6,9,15
290:2,10,16,21
291:6,9,15
292:2,12 293:18
294:1 296:7,12
296:14 297:3,19
298:15,21 299:9
300:8,20 301:1
301:7 302:2,6
302:10,15,19
303:12 304:9,20
305:11,16,22
306:16 307:7,11

307:12,14 310:2
310:6,18,20
313:15 321:8
323:2 324:9
334:18 370:9
372:18 410:3
416:7 417:17
419:13 420:4
predictor
346:11,12 350:10
350:19 375:20
379:2
predicts
343:3 352:6
354:4 359:2
418:6
predominant
385:21
preferable
163:18 164:2
323:15
preferably
163:11,13 164:5,7
164:12 165:8
251:17 252:11
252:20 262:14
264:7 265:11,14
265:18 267:9,19
267:21 268:2,6
272:3 293:3,9
293:14 298:6,19
302:17 310:21
315:15 320:15
320:17 322:7,14
323:21 327:22
328:1
preference
264:18 267:17
preferred
109:8
preliminary
128:16 129:5,21
134:1 135:13,18
160:1 277:7,20
premier
33:13 170:17
prepared

136:5 341:2
346:8
preplanned
75:20
preplot
81:5,11,20
preplots
75:7,13
preplotted
80:21
present
4:9 126:12 153:9
155:10 206:17
220:2,4 257:20
275:12
presentation
34:12
presented
98:5 375:18
presenting
274:1
presently
262:9 264:2
presents
294:7
presumably
54:2
presume
55:6 174:17
191:12,15 195:4
260:6 327:14
329:21
presumed
63:6
presumes
102:22 185:15
presumption
107:4
prevent
314:7
prevents
204:19
previous
54:16 63:1 71:2
71:22 113:14
199:1 201:14
219:10 234:1,16

255:17 388:15
previously
55:22 182:15
258:10
primarily
66:17 305:3
364:16 387:1
primary
19:22
principal
9:22
principle
94:15 386:18
principles
15:16 16:13 17:4
17:13 18:2,6,7,9
20:1,3 44:13
45:4,16
prior
40:1 43:9 50:13
63:6 64:10 65:2
65:17 66:5
68:13,18 69:9
70:10,20 71:5
71:15,17 91:21
92:2,4,7,12,14
92:16,18,21
93:9,11,18 94:4
94:8,9,16,18
95:3,4,8,8,14,15
95:20,22 96:3
97:5,7,8,9,12,18
97:21 98:2,5,12
98:17,19 99:7
99:10,12,18
100:1,4,5,13,16
100:20 101:1,3
101:7,12 102:6
102:9,14,15,17
102:19,22 103:1
103:7,9,15,21
104:2,9,9,11,12
104:15 105:9,13
105:18,20 106:7
110:20,21 111:2
111:3,7,8,10,14
112:2 137:18

202:2 241:21
242:8,22 243:16
243:20 244:6,11
244:16,18 245:6
245:10 246:1,14
246:17 257:20
266:8 316:12
340:1 369:18
priorities
276:14
priority
54:12 78:21
83:21 85:4,18
108:17 183:14
237:22 256:13
256:18 258:3
263:16 268:17
271:16 273:8,14
274:21,22 275:4
275:10,13,15,18
393:22 395:10
395:17
privy
120:7
probability
36:16 405:7
probably
87:21 93:22
102:15,17,21
104:11,12,20
105:20 274:2
problem
23:20 83:16,18
199:22 226:21
403:16
problems
19:9 20:12 21:14
26:9 35:3,7
50:12,13 83:12
83:14 203:7
280:21 400:10
401:18
procedure
334:12,13
proceeding
221:21
proceedings

72:9 87:5 262:20
274:9 348:2
386:11
proceeds
390:21
process
33:21 48:11
60:13 68:5,7
70:6 165:18
166:4 407:1,11
processing
36:2 109:19
112:11 115:9,11
116:17 165:4
270:7 278:15
280:4,16 281:2
281:21 288:7
296:11
produce
189:20 217:12,17
373:21 386:20
388:11 394:22
399:6,8 401:12
produces
386:16 388:10
producing
388:7
product
346:6
products
32:22
professional
23:10 52:5 73:13
74:10,14
Professor
346:4 347:2,3,14
348:5 363:9
proficient
46:6
progress
15:3
project
52:14 53:16 54:4
171:8
prolonged
400:15
prominence

250:15
promise
78:17,18 113:6
promises
133:9
promoting
12:12
propagation
346:17,18
proper
22:17 243:3
244:14 245:9
248:9 283:10
294:18 324:8
properly
165:6 270:9
278:17 280:6
281:4 282:1,20
284:5 286:5
287:22 289:22
290:8 291:7,8
294:9 295:5,12
296:15 297:4,6
297:20 338:9,14
proportional
399:3 406:12
propose
198:21
proposed
136:8 140:3,3,6
141:3 142:2
145:3,5 150:16
proposing
127:11
prosecution
261:7
protect
331:4,7
protection
329:12
protective
339:4
prove
333:16
proved
332:20
provide

8:3 24:7 25:1
26:11 31:7
37:10,16 38:2
38:13 39:14
40:6,15 55:21
67:6,7 80:14
85:21 86:2
119:15 120:8
122:19 148:17
170:3 187:7
192:21 193:22
205:16 206:17
230:1 295:4
313:10 348:14
350:5,15 406:2
415:6 420:7
provided
38:8 40:19 120:5
123:2 128:9,16
138:1,5 141:12
171:9 186:13
188:1 216:7
255:4,7 261:21
262:4 356:20
398:2
provides
10:17 51:19
52:11 56:6,15
132:17 140:2
150:2 153:12
173:17 193:17
212:3 215:2
223:3 292:1
293:17 326:1
providing
179:11 212:1,14
provision
102:6
proviso
155:17 248:1
provisos
157:12,19,22
158:5 179:13,17
180:7 182:15
Public
2:16 421:1,3
422:9

publication
19:14
publications
13:8,10,20 18:14
18:18,21 21:10
170:12
published
13:16 20:16
26:19 188:14
202:14
publishing
170:18,18
pure
383:6
purport
350:18
purpose
108:9,11 155:2
226:7,7 385:3
406:20 412:16
purposes
191:6 406:15
412:2
Pursuant
2:15
pushing
83:2
put
18:1 21:7 22:16
38:17,20 39:1,2
39:3 47:10
48:16,17 49:15
59:17 61:12
66:6 69:10
89:16 90:20
92:1,3,9 107:6
127:17 150:9
155:1,1 157:12
158:21 171:22
172:1,5,6,8
173:4 178:4
180:18 183:20
184:5,9 186:3
186:22 199:3,9
199:17 202:7,8
211:6 221:8
228:8,8 238:14

244:5 267:9
282:5 283:13,15
285:4,18 293:14
294:18 302:19
318:14 327:5,13
327:18 329:2,6
333:18,19,20,21
348:11,11 351:1
351:17 353:1
356:16 375:15
376:16 377:1
381:8 389:3
401:2 403:22
408:14 410:19
puts
267:22 285:11
287:17 298:4
311:19 327:18
327:21 329:14
387:16 388:19
389:1 395:17
putting
177:22 200:19
293:13 298:10
298:10 376:12
387:10
p.m
175:3 420:22
421:18

_____

Q

qualifications
52:5 71:17
quality
76:2 401:13
question
12:17 15:4,19
16:3,8,8,9 17:8
17:11 20:18
22:22 24:22
26:22 27:3,4,17
29:6 30:2 31:3
32:12 33:4 41:8
42:4 58:7 68:17
69:5,7,7 70:17
71:4 78:19
79:20 80:4
97:13 99:3

104:19 113:8
114:7,21 115:20
117:14 124:1
133:20 134:5,6
134:11 136:3
137:2 141:20,21
141:22 144:17
145:10 147:17
166:8 181:20
224:5,11 229:5
229:7 235:4
243:13 244:2
245:4 248:16
266:13 277:13
292:6 296:19
297:14 300:7
301:10,11
304:17 312:3
348:4 361:6,8
361:11,19 362:6
362:18 363:15
363:17 366:10
367:13,21 368:1
369:8,18 373:7
373:13 380:20
381:20 382:14
388:11 398:4
questioning
273:18
questions
8:2,3,5 61:17
67:18,22 83:20
113:6 134:13,15
147:14 188:5
245:2 328:4
371:5 375:17
377:18 380:2
416:20
quick
232:12,20 262:18
quite
38:13 43:22
147:18,19 285:2
373:13
quizzed
32:20
quote

181:18 182:10
238:1 278:15
280:18 350:1,4
351:14 356:16
quoted
351:14
quotes
151:7 286:1,2
quoting
351:13,18 368:5
Q-Marine
54:5 87:9,10,13
87:15,22 88:3
399:6,16,19

_____

R

R
3:1 4:1 7:1
raging
170:19
raised
356:7 367:19
raising
367:17,18
random
285:20
range
186:4
ranges
44:20
ranging
42:3
rapidly
204:20
rare
301:3
rarely
396:6 403:8
404:5
reach
60:13,21 227:17
336:20
reached
43:1 221:2
228:11 360:9
reaction
322:2 383:22
386:2 407:8

reactively
313:21
read
13:1 26:3 41:3
49:13,17 50:2,3
52:17 59:8,17
60:22 61:10
64:10 76:14
77:22 94:20
96:11,18,18,20
96:22 97:10,16
98:12 99:17
104:13 105:10
105:16,19 106:3
110:5 118:9
123:21 130:1
134:9,16 135:7
143:8,10,11
147:1 152:1,9
154:15 156:19
165:21 173:5
182:14 189:14
192:4,19 199:5
199:6 221:3
225:19 251:11
252:18 253:13
258:5 259:22
270:12 272:8
276:2 280:8,8
281:14,15,18
296:22 297:13
298:13 302:3
304:12 312:22
313:12 319:3
327:19 335:1,4
349:10,19,21
350:13 352:20
355:18 357:10
362:15 371:3
373:6 376:6,16
376:18 379:12
379:19,20
380:17 381:6
382:6,20 385:12
reading
55:6 59:12 61:18
61:20 92:11

93:7 96:7,8 97:3
98:17 101:6
105:16 106:4,5
106:10 114:13
117:15 119:1
123:8,11 144:17
146:9,19,20
152:6 156:14
165:20 189:9,12
203:2 209:19
260:20 292:22
299:7 302:14
316:2 324:7
330:14 331:9
371:7 380:9
reads
92:15,18 203:2
ready
175:5 210:16
real
85:12,13 336:1
realistic
291:13
reality
82:12,13 420:5
realize
412:13
realizes
227:4
really
45:6 46:6 97:14
139:11 228:7
294:15 295:13
325:19 328:22
391:17 410:22
realm
172:15
realtime
384:15,18,21
reason
8:9,11 35:1 53:3
122:2 178:12
180:6 221:16
267:6 280:2
298:9,10 328:8
reasonable
123:4,10,17

125:10 131:20
158:1 181:14
182:8 186:22
201:21 203:2
237:18 238:5
412:20
reasoning
68:9
reasons
12:10,12 132:12
133:10 199:21
202:19 341:14
recall
24:15,16,18 54:20
88:1,12 108:22
119:22 129:10
129:18 152:4,5
153:5,7 226:2
237:7 258:6
343:18 413:8
414:15
recalling
224:17
received
194:6 195:22
196:5,17 197:19
198:4 203:10
204:8 209:19
211:18 214:18
384:18
receives
215:13
receiving
217:4
Recess
87:3 232:21
303:3 377:11
recipients
122:14,17,19
recite
130:9 262:9
264:3 321:4
recited
109:14 257:12,14
recites
311:8 321:7
reciting

180:13
recognize
92:19 93:14
105:12 382:5
recognized
83:11,12,15,18
171:22 356:13
recognizes
247:8 324:8
recollection
55:7 128:18
129:12
recollections
199:9
recommendation
181:5
recommended
254:18
recommends
181:3
record
7:6 10:7 51:6
126:14 133:13
138:12 252:3,5
255:22 256:1
340:18,20
356:13 362:16
386:10 420:21
420:22 421:9
recorded
388:21 389:15
394:8
records
80:12
refer
190:3,16 247:4
319:4 381:14
reference
14:11 67:13 70:5
71:5 224:6,10
224:12,20
225:18,20 226:1
237:10 244:6,12
244:16,18 245:6
245:10 246:1,14
246:17 255:10
255:13 258:4

313:5
referenced
219:7 347:6
369:15
references
10:1 12:7,8 65:2
66:5 68:13,19
69:9 70:10,20
266:8
referred
6:8 188:18
190:11 202:2
239:14 363:8
referring
106:16 191:1
194:15 195:16
196:6 200:20
201:18 202:11
206:3 207:12
208:17 209:2,10
209:13,16,21,22
215:19 216:17
217:2,9,22
218:4,9,10,10
219:2,13,14,17
256:4 388:15
393:14
refers
105:18 188:21
189:15,17
190:18 191:4,8
194:22 199:9,11
205:14,15
207:19,20 315:9
318:18 343:8
reflected
43:1 69:12
refresh
225:2
refute
279:17,17
regard
22:13 25:5 59:12
390:22 391:1
regarding
77:13 341:17
344:7 349:15

regards
33:19
regime
399:9
Registration
422:14
regular
106:13,19 317:18
318:22 319:4,9
reinforce
19:16 322:14
reinforced
304:1
reinforces
311:22 322:11,12
reinvent
173:6
reject
93:7,15
rejected
257:8 258:3
rejection
256:21 260:3
related
46:3 56:20
251:12 421:19
relates
109:4
relating
37:11 235:18,22
236:1,2
relation
129:1
relative
161:3
relatively
204:18
relevant
13:22 14:9 34:3
49:13 50:3,6
63:6 64:10 70:2
70:20 237:22
reliable
85:22 86:2 329:4
relied
66:17 276:4
303:19 304:7

351:22 352:14
355:3 357:15
358:3 364:12,15
364:16 365:4,11
365:18 377:7
378:19
relies
350:16
rely
65:13 66:15
  161:12 251:16
270:20 272:6
320:7 343:16
344:6 348:5
349:3 356:21
357:21 359:15
376:5 383:3
410:11
relying
235:12,14 347:16
376:10
remain
402:22 403:1
remains
97:6
remarks
261:21 262:2,4
remember
34:20 37:4 42:5
  42:13,16 55:1
55:11,18 65:5
65:10 71:21
84:16,17 85:10
85:11,15 86:4
88:4,6,13
101:16 108:19
152:7,8,12
227:7,15,19
228:3 249:17,20
250:21 251:4,12
254:4 255:3,15
255:17 333:21
346:7 356:15
372:21 376:11
377:4 414:5
remind
94:1 225:2

314:14
reminded
224:14
remote
194:7 196:1,5,17
  197:19,22 198:5
199:18 200:19
201:9 202:5,7
203:5,21 209:9
209:19 210:6,8
210:10,19 211:3
211:4,7,10,13
211:19 212:1,13
213:1,3,9,11,19
213:22 214:5,15
214:19 215:2,7
215:17,18 217:5
220:21
remove
415:10 419:14
render
40:22 41:8 91:15
  338:1,10
rendered
40:4 91:13
rendering
55:14 65:18 66:9
  66:21 185:4
221:12
repeat
68:17 250:3
292:5
repeatable
68:8
repeated
250:4
repeatedly
266:14
repeating
29:17 324:18
rephrase
283:3
replacement
259:15
replying
53:5
report

5:15 6:4 31:8
37:19,22 38:12
40:16 41:8,17
41:18,18 42:9
42:14 65:22
67:17 74:19,20
74:21 75:3,15
76:21 80:4,16
81:1,15 82:5
86:11 88:7,11
118:19 132:16
133:2 136:21
137:3,7 152:5,9
152:19 153:1
155:18 159:20
162:6 224:14
244:8 248:8
255:10 275:15
286:11,15 338:5
338:8,17 339:1
341:1,11,16,17
347:6 348:6
349:4,16,21
350:2,5 351:9
351:19 353:17
355:15,19,22
357:4,10 359:15
360:11 362:12
370:5 371:3,9
372:1 373:2,7
375:15 376:6,13
377:14 378:9
379:4,6 380:13
381:1,5 382:6
382:16 383:3
385:20
Reported
1:22
reporter
2:16 13:18 84:4
99:4 158:14,19
421:2
reports
26:15 27:6,20
28:17 31:9
152:1
repositioned

384:20,21
represent
139:12
representation
87:8
representative
40:11
represented
421:12
representing
340:12
reproduce
162:16 173:6
320:14
reproduced
162:6
requesting
340:14
require
57:20 58:2 60:3,8
62:16 117:7
121:6 124:14
127:10 142:4
143:5 144:12,21
149:6 150:10
173:21 175:14
176:11 177:13
177:18 186:4,20
236:9,14 238:11
238:17,20
239:21 240:7,16
245:21 248:19
252:15 253:11
285:5 301:6
304:19 305:10
307:2 312:18,19
373:11 406:6
409:21 411:9
required
58:16 59:4,14
66:17 142:9
143:20 145:20
155:19 156:17
163:17 168:20
178:22 179:3,6
185:22 239:18
253:5 268:6

289:19 293:15
295:12 298:15
299:20,21 300:9
300:22 305:18
306:3 330:17
requirement
47:2 60:15
141:11,14 164:1
176:21 183:16
243:2,4,21
298:21 315:14
322:5,16 323:1
324:6 409:17
410:9
requirements
61:21 63:10 73:7
73:8,18 185:13
186:14 285:14
287:17
requires
56:9,18 57:22
58:8 64:21
124:10,22 144:2
146:15,19,21
149:10 157:9
176:18 229:14
230:5,5 244:11
265:21 267:14
286:20 287:2
307:18 309:17
314:13 320:6
324:12,21 325:3
359:11 403:5
410:6
requiring
239:3 241:3,22
242:8
research
10:18,22 11:8,16
11:20 12:5,13
12:18
reserved
90:13
resolution
84:22
respect
12:3 23:12

186:18 322:7
366:3 389:14
respectable
170:13
respective
309:2
respond
69:20 158:20
responded
60:9 136:21
137:2,12,13
responds
406:18
response
39:10 129:5,21
134:1 135:14,19
135:21 137:4
159:9,10,22
160:1,3,6 175:8
181:13 228:14
255:13 258:9,22
259:10 260:3
262:4 315:3,6
331:19,20
responses
128:8,16
rest
163:10 371:12
restate
110:22
restricted
339:5
restrictive
164:15
result
12:14 68:9
108:12 156:18
171:7 172:21
221:12 223:15
396:20
results
33:20 65:13,16
66:3 67:19
400:14
resumes
35:18
returns

348:1
reverse
403:16
review
13:22 14:5 19:3
27:10 59:2
91:12 100:9,10
128:13 129:22
170:7,9 276:17
348:8
reviewed
9:6,12 14:8 34:11
54:21 55:8
91:10 137:6
170:10 383:15
384:10,11
reviewing
18:22
revisit
230:18
revolution
408:9
Ricciuti
3:14 7:15
right
7:20 8:21 10:13
10:18,22 11:6
11:14,15,21
12:5,20 13:5
25:7 29:11
38:17 39:6,15
40:9 42:5,11,17
42:20,21 43:2,5
43:20 44:11
46:15 50:19
51:20 52:12
53:1 54:1,5,6,10
54:11,15 56:16
58:10 59:7 60:2
60:3,8 62:19
64:1,6,21 67:1
67:19,20,22
69:16 71:7 73:1
73:21 74:5 75:8
75:16,21 76:2,6
76:9,21 78:14
78:19 79:11

80:16,18 81:3,6
82:5,6,16 83:8
83:11 84:12
85:19,22 86:11
87:9 88:1,13,16
89:6 91:21
92:22 93:9,18
94:18 97:2
100:11 101:15
101:17,18
102:11 103:7
105:13 106:21
108:22 109:2,15
110:5,9,21
111:10,15
112:16 113:22
114:9 115:6,14
116:1 118:14,22
119:7,11 121:13
122:16 123:5,12
124:14 125:11
127:6,19 128:18
129:2,12,18
130:21 132:9,12
132:14 133:5
136:2,5,8,16,19
137:6,10 139:4
139:22 140:12
140:18,19
141:16,18 142:5
143:10,16 144:5
144:6,13 146:1
148:10,19 149:4
150:6 152:22
153:2,5,16
154:14 155:12
156:12 158:9,22
159:7 162:7,20
163:3,9 164:3
170:22 171:5,20
172:7 173:2,19
174:8 175:5,8
176:8,9,13,19
177:19 179:8
180:7 183:2,11
183:21,22 184:6
184:8,17 185:21

186:2,8,15,18
188:9 191:2
194:16 195:16
196:7 197:8,19
198:15 199:2,12
200:11 201:13
201:16,17,20
202:15 203:14
204:3 205:4,7
205:17 206:5
207:14,15,16,22
208:20 212:15
213:2 214:11,21
215:4,17 216:9
218:21 219:8,17
222:17 223:3,5
223:12 224:4,17
225:10,14 226:5
226:14,18 230:2
231:9 233:1,6
233:13,16 234:9
234:11 235:1,2
235:8,12,13
236:7,17 237:2
237:16 238:7
242:9 243:17,18
244:12 248:1,9
248:14,20 249:4
249:6,9,15
250:2,5,7
251:20 252:17
252:22 253:20
254:4 257:1
258:15 259:21
260:5,20 261:2
261:10 263:7,11
263:17,21 264:1
264:4,13 265:7
266:8,12 267:8
267:17 268:3,7
268:16 270:1
271:20 272:7,18
272:21 273:10
273:16 274:4,17
275:11 276:19
276:22 286:20
289:7 292:3,12

293:19 295:5,21
296:7 297:6,15
298:16 301:4
303:10,21
304:15 305:19
307:20 308:4,5
308:9 309:7,8
309:19 310:6
311:6 312:3
319:9,10 320:11
320:21 321:13
321:21 322:10
323:3,9,17
324:10 325:6,12
326:14 327:11
329:20 331:15
332:12 333:17
334:8 335:9
336:11 337:11
337:14,16,21,22
338:3 342:2,9
343:11,12,17
344:10,11,15
345:9 347:5
350:19 352:17
353:7,19 354:11
357:6 359:16
361:1 365:20
366:10,19,22
370:16 371:18
377:21 378:12
379:9 381:15,19
382:4 385:7,17
385:20 388:18
389:13,17,18,21
389:22 390:3
391:9,19 392:7
392:21 393:6,8
393:17 394:2,14
395:6,22 396:16
397:21 398:8
399:3 400:8,11
400:15,16,19
401:15 402:14
405:4 407:12,13
409:18 410:16
411:14 412:7

413:19 414:4,9
414:18,21 415:3
415:7 416:2
417:9,11,17
418:9,22 419:7
420:20
rigs
45:9,10
ring
37:2
rise
322:16
risk
391:15 392:17
road
31:20 168:12
276:13
robot
408:10
robots
11:3 44:14
Roman
342:5
room
335:7 340:21
rough
86:8 415:11
routine
396:7
run
102:5 412:9
running
411:7
rush
20:21
Ryan
4:3 7:14

S

S
1:13 2:1 3:1,4 4:1
5:1,2,7 6:1,5 7:1
7:3 339:1 421:5
421:14
sacrificial
121:20 122:1
sampling
77:3,6,14,21

satellite
408:8
satisfied
188:1 329:17
satisfies
186:13 305:1
345:6 350:6
351:9
saw
129:16 269:7
333:12
saying
22:5,19,20 29:2
48:22 49:16
50:1 60:16
105:5,19 122:3
146:7 147:16,20
160:16 176:16
178:19 184:20
192:6 197:6
203:20 205:3
209:20 215:16
218:19 223:7
231:1,6 245:16
247:1 250:14
261:11 319:16
326:22 336:7
342:19 370:6
374:21 397:15
398:21 415:22
says
11:2,10 13:1
32:13 43:12
47:16 52:4,17
52:21 57:4 62:8
63:5 73:6,11,21
74:3 91:20,21
95:21 99:14
102:12 106:13
109:8 110:7
113:15,21 115:8
118:10 121:5
126:13 130:6,13
133:3 135:8
141:3 143:2,15
145:13 151:5,14
154:6,19 160:22

163:11,12 165:2
165:15,17
174:12 175:13
177:12 180:17
181:7,13 188:9
188:12 189:1
190:1,20 191:2
191:9,13 193:10
194:4 195:20
196:15 197:2,7
197:18,20 198:9
199:4,16,20
200:5 203:4
204:13,17
205:10,21
206:12,16 207:5
208:5,11,13,22
209:4,6 211:16
212:13 213:22
214:18 216:14
218:3,14,22
220:2 222:3
228:12 237:18
252:22 253:16
256:2 257:7,11
257:17 258:22
259:5,13 260:12
262:2,13 264:1
264:6,14 265:11
267:19 268:1,1
268:19 270:5
273:3 277:20
278:4,9 280:13
286:8 293:2,22
295:10 296:9
297:9 298:5,19
301:11,12,15
304:14 309:9
312:22 315:11
319:21 321:9
323:2,15,19
326:16 328:22
330:21 331:18
333:3 341:16
342:11 343:1
345:13 353:9,12
363:5 381:13

384:13 387:21
392:19 394:15
396:20 397:13
416:10 418:17
scheme
193:3 346:2
351:15 371:11
406:9,10 415:15
416:2
Schlumberger
153:18
school
48:9,9 49:15
Science
43:14 46:8,13
63:12,13,22
64:3,8
science-driven
11:3
scope
42:10 51:11
74:17 76:10,13
89:10,21 171:11
173:9 185:2
186:11,19
187:17 273:18
274:18 275:8,22
276:5,8,17
277:3,16 278:1
278:6,20 279:2
282:11 300:6
301:17,19 330:6
349:20 350:11
350:20 351:12
352:13,19 353:8
353:14,21
354:14,21 355:7
355:17 356:3
357:7,17 358:2
358:12,15,18
359:8,17 360:1
360:4,13,19
361:3,10,14,21
362:3,13,22
363:11,21 364:5
364:8,14,21
365:5,13,21

366:8,11,17
367:1,10 368:14
368:18 369:6,12
370:1,10,17
371:19 372:8,15
373:3,18 374:14
375:5,13 376:7
377:22 378:6,13
379:10,18 380:7
380:16 381:4,17
382:2,11,18
383:10 399:20
408:3 418:10
419:8 420:12,15
screening
76:16
Sc.D
1:13 2:1 5:2 7:3
421:5,14
se
192:1 217:12
410:9 418:1
Seal
139:7
search
65:14 66:13 68:8
69:20 133:12
searches
65:17 66:4 67:12
67:19,22 71:13
searching
70:19
seats
114:3
seawalls
45:12
second
10:21 51:19
52:10 63:10
73:18 96:18
129:3 143:1
145:6,7,16
196:15 228:1
256:4 262:18
269:13 311:19
311:20,22 335:2
345:10 386:5

secondary
37:11,20 38:14
39:4 304:1
seconds
198:11 201:8,15
203:6 210:3
216:19 217:6
218:19 336:22
410:1,3,8,15,18
411:5 412:6,12
412:14,22 413:1
secret
160:17
section
53:20 67:17
112:5 164:21
237:12 277:6
349:3,14,15
352:17 355:21
357:4 367:5
369:19 370:9,15
370:21 371:16
372:1,3 373:1
373:14 377:18
379:7,15 380:3
380:13 381:1,13
381:14 382:16
sections
38:18
see
14:8 30:7 39:6
40:16 42:4
43:18 45:20
50:7,14 52:4,7
53:17,19 56:21
57:10 62:9,13
65:7,22 72:10
72:17 73:6,11
73:15,20,21
74:1,11 75:3
77:3 91:17
94:10,20 100:8
101:16 106:14
112:6,12 115:9
115:10 121:11
129:20 130:4,6
130:10,18

133:18 138:16
139:2,18 140:4
140:9 150:12
151:3,9,18,21
153:13 154:1,3
154:11,12,17
160:17,22 161:5
161:17 162:14
175:19 177:10
178:1,20 188:10
188:16 189:1
194:10,13 196:1
197:22 198:14
200:7 204:15,22
206:14,20
207:10 208:4,15
211:20 221:9
222:3,12 224:16
224:19 225:4
226:2 234:3,15
237:12 238:3
249:21 250:20
252:13 253:14
253:17,21
254:16 256:10
256:16 257:2,3
257:9,15,16,21
257:22 258:8,11
258:21 259:3,13
259:18,19 260:1
260:6 261:15,16
261:20 262:2,11
262:15,17 264:5
264:8,9 265:1
268:10,17,20
269:1,13,16
270:4,11,16
272:1,4,17
273:4,11 274:16
275:6 277:1,5,6
277:20 278:4,19
279:4 304:10
308:7,8,15,16
308:17 309:4,14
313:12 314:22
315:8,19 317:21
329:12 332:3,15

339:16 340:6
341:4,19 342:4
342:13,21 343:5
345:2,13 348:8
349:22 391:10
405:1 415:12,15
415:19 416:11
seeing
48:6
seek
174:4
seen
129:7 158:5,13
182:22 245:14
249:18,19 274:2
274:2 285:21
SEG
5:11 32:1,4,12
33:4 52:7 72:10
72:19 74:8,15
segment
95:11
seismic
11:20 12:3,20
13:5,13 14:15
14:22 15:6,21
16:6,10,16,18
16:21,22 17:2,3
17:4,5,12,14,17
17:21,22 18:3,4
18:10,13,19,22
19:6,9,17,19
20:6,13 21:4,16
22:14 23:1,8,14
24:14 25:2,6,13
25:20 26:1,9,17
27:8,22 28:18
31:5,6 33:14,15
33:19 34:5 35:4
43:17 45:20
46:15,21 49:9
54:15 55:3,10
57:6,7,8 62:12
62:18 64:18
69:2 70:12,22
75:5,10 78:8
79:7 80:7,15

82:8 102:12,21
122:4 153:16
195:3 218:12
225:10 293:4
384:14,16
385:11,16
388:20 389:15
394:8 396:4
400:10
self
165:20
send
121:7 122:21
131:7 134:21
154:20 389:6
409:10
sending
149:17 211:4
409:8 411:18,18
sends
110:11 123:15
124:4,13,20
125:9 126:8
127:12 130:15
134:18 140:7
148:9 151:8,16
154:9,16,20
390:5 391:12,21
392:1 408:15
411:16
sense
23:9 45:11 48:1
142:21 155:15
176:1,21 177:7
178:17 254:22
277:12,14,15
333:4 396:7
412:4
senses
396:10
sensing
11:11 44:10
413:20 414:2,6
sensors
333:10 414:11
sent
389:21 390:3,10

390:11 404:15
409:3
sentence
47:11 49:1 61:7
121:5 130:13
151:11,14
159:16 161:2,7
163:5,14 164:12
164:14,16 165:9
165:14,15,21
175:12,21 176:6
181:10 188:10
188:19 189:14
192:7 194:3
195:8 197:16
198:9 199:2,4
200:4,11 201:13
201:14,19 202:1
202:2 204:5,12
208:4,11 209:15
210:22 212:10
216:14,21
219:13 220:18
221:8 222:3
225:16 251:6
252:15 262:13
262:22 268:1
270:5,12,19
271:17 280:12
280:18 292:1,9
293:15 294:7
295:4,9 297:17
304:14 318:21
320:16 323:18
332:4,9,12,15
332:22
sentences
63:16 163:20,21
164:8 199:22
219:20 285:18
377:6
separate
78:19 287:7
318:8,12
separation
176:7,18 177:6,16
319:12,13

389:10,11 390:7
398:11
September
129:15 253:19
273:8 422:13
sequence
193:4
series
8:2
serious
400:10
serve
108:9
set
150:1 259:15
372:20 397:6,7
402:10,11,17
405:16,21 421:6
422:3
seven
69:17 74:5
shake
168:5
shakes
168:10
shaky
419:21
shallow
185:19
shape
384:14 385:11,16
shapes
388:7
sharp
196:11
shell
102:4 142:15
shells
287:7 288:11
shining
300:10
ship
81:17 100:14,14
100:17,18,18,19
101:7,11 102:4
102:5,6,7
109:18

Shock
14:4
shoes
230:18
shorter
409:22 410:8
412:12
show
38:9 66:3 81:14
86:10 87:8
269:5 279:22
351:14 357:12
358:4
showing
93:8 94:5 144:14
shown
81:1,2,9 83:7
89:7 95:7 98:4
98:22 161:14
414:13
shows
82:8 93:11
110:16 284:1
390:9,15,16
413:10,12,12
side
73:9 82:22 83:2
314:10
signal
172:16 228:14
signals
131:7 134:18,21
149:17 222:4,8
222:17,22
384:15,18,21
signature
8:21 341:5
signed
9:1,7,10,14 38:12
341:7,11
significant
57:7 153:15
168:4
similar
27:14 80:12
271:12 272:9
Simon

5:10
simple
12:18 15:5 33:4
58:6 99:3
170:16 181:20
304:17 332:18
335:18 345:1,15
345:16 353:9,12
356:11 359:10
359:12,15 374:3
374:4,9
simpler
117:14 375:1
simplified
374:16
simplifies
208:14
simplistic
415:11
simply
30:1 38:13
170:21 204:4
235:6,12,14
261:8 264:18
267:16 307:3
336:10 337:9
344:20 352:8
353:4 354:6
359:4 373:13
383:8 396:15
417:13 418:8,13
420:4
Singapore
9:4,5
single
26:14 27:5,19
31:7 82:21
226:18 244:13
348:12 356:8
sir
10:10 33:2
sit
9:17,18 77:17
99:16 132:13
158:1 230:6
231:21,22
site

295:11 309:22
sits
281:6
situation
187:19 391:19,20
392:3,21 405:5
situations
128:1 291:13
392:7,13 393:5
404:13
six
69:17 84:19
86:10,12 182:22
183:1 209:8
Sixth
2:8 3:18 421:16
sketch
87:18 89:11,15
sketches
89:4
skill
39:15,18 40:1,8
40:18,22 41:2
41:11 42:10,19
42:22 43:13
46:12,22 49:3
50:7,18 53:8
55:15 56:7,16
57:14,19 58:5,8
58:15 59:5,13
59:22 62:15
64:20 65:3
68:15,21 69:5
69:13 78:5,21
79:4,9 80:3,5,9
92:19 96:1
101:6,22 115:2
116:14 117:15
154:7 189:9
190:2,22 191:16
223:10 228:17
229:18 237:21
328:5,6 330:2
skilled
113:17
skills
232:2 408:5

skimming
78:1
skims
103:20 116:22
sky
211:3
slides
346:8
slight
403:17
slow
130:2 334:22
408:2 410:20
slower
409:18,19 412:10
slowly
283:4
small
40:12 280:12
314:16 388:12
397:11,11 405:8
407:8
smaller
397:12
smart
374:6
Smith
346:11,12 350:10
350:18 375:20
379:2
snake
398:1
societies
34:3 35:13
society
33:10,14,16,18
34:1,2,6,12,14
35:2,11,16 36:5
36:10,14 37:6
72:19 74:8
software
100:19 101:4
105:2 116:22
346:20
solution
60:12,16 173:4
solutions

50:13 173:7,8
173:13
sophistication
50:11
sorry
20:21 24:22
56:10,14 61:8
72:12 84:4
88:10 105:21
106:1 115:1
135:20 138:21
165:1 231:14
406:1 413:17
sort
12:15 169:12
183:13 225:21
229:14 267:2
311:22 334:11
386:3
sorts
26:21 164:6
374:2 398:2
sounded
231:16
sounds
140:15,17 271:12
source
89:5 102:12,21
375:22 376:5
378:4
sources
89:1,9,12,12,20
90:17
so-called
167:13,21
spaced
411:4
spatial
77:2,6,14,20
SPD
176:12 218:22
388:9 398:8
399:2
SPDs
122:6 123:3
124:11 125:1
127:2,5,7,17,18

128:6 131:3,10
132:8,20 133:4
134:22 156:12
157:10 176:19
177:4,14,18
186:19 263:21
288:8 291:8,8
295:5 306:12
308:4 312:5
331:6 394:2
395:6,13
speak
66:13
speaking
412:11
speaks
221:16 279:20
291:20
special
185:17 302:4
specialist
29:4 34:15 346:3
specific
21:20 22:4,6,9
24:19 25:1,3
29:3 31:6 37:13
37:21 40:20
44:13 49:2 58:5
64:2,4 76:14
81:10 82:19
84:12 103:18
122:3 147:14
149:1 157:14,16
157:17 159:8
166:12 177:22
224:8 237:9
265:2,3,4
267:13 268:4
289:2 351:17
398:21 405:22
416:3
specifically
23:3 61:12 71:16
115:7 116:10
126:13 170:10
207:3 248:15
413:8

specification
121:8 133:15
141:8 143:1,18
147:1 173:10
175:18 176:22
181:17 182:10
249:3 250:11,12
264:16 288:21
322:15
specifications
173:11 236:13,16
237:20 250:6
261:4 314:9
328:13
specifics
54:20 55:11,17,19
116:4 117:11
128:12 147:13
149:21 215:14
267:11
specified
61:14 116:5,6
117:2 118:1,2,4
118:8,13 133:16
325:17
specifies
289:4,5
specify
58:21 99:14
121:9 144:4
205:19 209:9
215:14 268:3
specifying
203:21
Spectra
342:20 343:2,8
speculate
99:22 203:1
267:8 301:3
327:2
speculating
247:12 300:2
327:5
speculation
203:16 248:5
267:14 294:13
329:21

speculative
300:11
speech
250:15
speed
29:12,13 307:18
308:3 309:12,17
310:9 311:9
312:4,19 313:2
313:6 405:19
spell
32:3,13 36:19
126:21 145:19
spelled
146:17
spelling
32:16
spent
72:1
spirit
125:3,6,18 140:22
142:7 146:6
189:11 261:3
spit
238:15
spite
97:9
SPIVAK
2:5 3:15 421:15
spoke
227:7 345:18
spot
48:13
sprang
12:1
springs
239:11
spurt
335:10
square
118:11 334:2,3
squares
333:20
stability
228:9
stalling
399:7,9

standard
100:15
standing
339:8
standpoint
237:21
start
188:8 227:13
314:9 388:7
401:17 411:7
420:16
started
348:9
starting
52:11,14 197:1
220:6 221:5
252:10 272:6
356:9
starts
82:21 161:15
168:1 208:1,3
210:8 257:3
314:6 332:9
state
14:6 28:10 153:2
236:11,15 239:4
240:13 419:10
stated
370:11
statement
5:19 28:7 35:6
38:5 40:14
76:19 89:22
93:8 100:20
131:5 145:16
154:13 161:13
251:16 252:10
272:20 282:5
284:19 290:3
298:6,19 304:3
304:7,8 316:4
322:14 324:2,7
328:12 348:12
353:1 359:16
392:14
statements
76:4 77:6,13

351:1,19
states
 1:1 53:2 74:16
  222:18 242:3
  298:18 305:15
  315:14 380:18
  385:3,6,14
stating
 92:10 191:17
status
 161:2 316:15
stay
 402:17,20
staying
 67:12
steamer
 144:22 177:6
steer
 223:11,20 224:1
  231:8 287:22
  332:17 394:14
steerable
 107:21 188:13
  190:8,12,22
  191:9,19 192:8
  192:15 193:1,6
  193:16,20 194:1
  202:13 207:7,13
  207:21 220:3
  226:5,8
steered
 402:21
steering
 54:14 114:2
  223:13 225:14
  226:21 326:17
  387:19 388:3,4
  404:7
stems
 148:22
step
 145:6,7 203:7
  308:20 311:20
  346:1 385:22
  386:4 407:5,11
  411:11,11
  412:18

step/function
 262:9 264:3
stick
 392:18
stiffness
 166:22
stop
 211:9 394:17
stops
 406:17
story
 290:17 357:13,15
  385:9
straight
 78:6,13 79:1,5
  80:5,10,22 81:6
  81:13 82:1,9
  83:1 376:16
  401:9 402:12
  403:19,21,22
  404:2,17 406:3
straightforward
 255:6
straitjacket
 31:1 285:15
strategy
 160:17
streamer
 52:19 53:12,17
  54:5,8,14 79:3
  80:15 81:2 82:8
  82:21 86:17
  87:12 90:19
  94:11 105:1,1,1
  105:2,3,8 106:6
  106:14,20 107:7
  108:6,16 118:21
  119:6 122:15,20
  122:22 128:7
  143:16 145:14
  146:1 155:8
  159:6,7,14,15
  162:11,13 163:8
  163:15 165:7,16
  166:2 167:3
  175:15 176:7,18
  177:16 178:4

181:19 182:11
183:5,20 184:4
184:15,21
185:21 186:2
187:12 195:3
198:13 206:13
206:18 216:16
216:17 217:1,2
217:8,9,11,14
217:19 218:3,4
218:14 219:1,13
226:9,21,21
230:2,12 231:7
233:22 235:7,7
257:14 260:4
261:9,15 262:10
263:22 264:4
265:21 270:10
278:17 280:7
281:4 290:1,9
294:8 295:2
297:21 303:16
307:19 308:13
308:22 309:2,13
309:18 311:3,10
314:22 315:12
315:13,17,18
316:6,7,11,18
316:20 319:12
319:13,18 320:2
320:19,20 321:5
321:11,12,18,21
322:8,10,17,19
323:8,9,16,17
324:15,16,22
325:5,10 326:3
326:14 327:6
329:18 330:4,18
333:15 342:13
344:9 345:8
348:17 349:6
350:8 352:3
354:10 370:14
371:17 372:6,13
372:19 373:12
384:14,19,20
385:11,16

386:15,21 387:3
387:19 388:3,4
390:10 391:13
392:6,12 393:4
393:8,12,16,20
394:7,13 396:14
396:15 400:9,17
401:22 404:16
405:3,11 413:10
413:14,17 414:3
414:7,8,12
streamers
 24:4,4 52:15
  75:20 78:7,14
  79:1 80:21 81:5
  81:12 82:1,9,14
  83:6 84:1,10,14
  84:22 85:4,17
  86:7,10 88:15
  88:19 90:2,8,13
  90:16 93:21
  104:7,15 122:4
  122:6,10,11
  127:18 148:18
  157:16,17 166:3
  166:7,9,10,11
  166:17,18 183:1
  183:2,11 184:14
  186:7,8 218:12
  223:11,13,20
  224:2 225:10,14
  231:5,9 233:9
  233:19 251:18
  252:12,16
  262:15 264:8,12
  264:20 265:12
  265:19 268:2
  287:22 290:14
  293:4 294:16
  295:12 296:16
  297:4 316:19
  318:9,10,12,13
  318:14,19,20
  322:2 327:10
  328:11 332:17
  334:8 388:6
  389:9,12 390:8

390:19 391:6
394:14 396:11
396:12 397:19
397:20 398:1,13
400:14,18 401:2
401:12,14,14,20
402:2,9,13,16
403:12 404:6
405:6
Street
 2:7 3:8,17 421:16
strict
 202:18
strong
 131:5 295:16
  322:2 335:12
stronger
 294:16
strongest
 295:1
structural
 166:18
structure
 327:9
structured
 371:9
structures
 45:11 396:5
stuck
 412:15,22
students
 12:13 32:7
studied
 229:12
study
 11:4 19:22 22:21
  29:12 45:9
  247:10
studying
 11:11 18:12,17
stuff
 45:15 48:12
  205:10
subcomponents
 116:21
subject
 179:13 182:14

195:8 275:2
278:11,12 339:3
submarine
27:13 34:5
submarines
19:22 20:5,8,11
submission
275:3
submissions
273:4 274:10
submitted
8:13,17 10:5
338:5,17 341:2
353:16
submitting
338:8
subsection
348:18
subsequent
208:11
substantially
86:13
subtle
105:11
success
37:17 38:3
successful
84:7 170:2
174:10 180:17
223:4,6 325:15
331:11 387:5
successfully
223:21 230:1
sudden
227:18
suffer
217:6 218:20
sufficient
351:8 368:9
suggest
208:11
suggested
131:11 151:5
suggesting
333:22
suggestion
295:4

suggestive
408:12
suggests
327:9 398:15
399:21
summary
11:19 12:4,18
summer
7:10
summons
274:9
sun
299:16 300:9
306:20
sunny
299:21
super
185:17
supermaneuver...
11:13
supervise
345:19
support
44:22 320:5
351:19 352:1
357:2,16 358:10
supported
175:16 177:14
358:17,20
supporting
375:19
supportive
353:18 354:8,16
354:19 355:4
357:1 359:5
suppose
10:3
sure
20:19 22:4 36:7
40:21 42:20
47:14 63:18
73:5 78:1 79:15
81:11 87:2 93:6
94:2 111:17
130:3 139:8
142:16 147:18
159:18 160:16

162:22 175:2
180:18 183:7
229:16 230:14
236:19 237:11
249:11 254:12
254:22 255:16
263:5 269:5,7
270:14 271:5
274:1 289:3
303:5,8 317:2
325:22 328:20
339:7 340:19
367:12 371:15
380:1 386:6
393:22 395:10
399:14 400:3
surface
399:14
surprise
28:6
survey
13:13 15:6 23:13
23:15 24:14
25:2,13 26:17
27:8,22 28:18
57:7 75:19 76:2
80:15,21,22
81:12 82:8 85:1
396:4
surveying
15:22 20:7 21:5
25:20 26:2
33:14 55:3
153:16
surveys
11:20 12:4,20
13:5 14:16,22
16:6,10,16 17:2
17:3,12,17,21
17:22 18:4,10
19:6,9,17,19
20:13 21:16
22:14 23:2,8
24:2 25:6 26:9
31:5,6 35:4
43:17 45:20
46:15,21 49:9

57:6,9 62:12,18
64:18 69:2
70:12,22 75:5
75:10 83:22
400:11
suspend
295:16
SWAFFORD
3:6
swimming
44:21
switch
287:17 299:17
306:7,20 330:11
switched
306:1 389:22
switches
327:15 329:13
switching
330:16
sworn
7:4 421:7
symbol
98:17
synchronize
405:1
synonym
265:6
synonymous
28:4,5 197:13
synthesis
229:15
system
47:21 48:5,7
53:17 54:5
90:12,22 101:11
107:11,13,15,18
109:6,9,10,11
109:13,21,21
110:4,8,9,10,15
110:20 111:2,5
112:3,9,10,14
113:5,22 115:21
118:16,18,20,21
119:5,6,17
120:11 121:1,6
121:7,9,16

122:5,8,13,18
123:2,3,5,15,15
123:16,18 124:4
124:4,5,12,13
124:14,20,21
125:9,9,10
126:7,8,9,13
127:3,5,12,13
128:3 130:6,9
130:14,15,16
131:14 132:8,19
133:16 134:10
134:21 136:3,4
139:2,19,22
140:7,8,8 141:6
141:8,9,16
142:10,12,19
143:4,15,22
144:2 145:21
146:15,21
147:16,22 148:8
148:9,10,22
149:2,3,7,8,13
149:21 150:6,16
151:4,7,13,16
154:4,8,8,9,16
154:19 155:7
157:9,10 158:6
159:4,12 161:1
161:8,15 162:5
163:2,6 165:4
165:11,13,17
166:2,3 173:16
173:18 174:10
175:14 176:12
176:19 177:3,13
177:18 178:3,9
178:12,15 179:1
179:4,7,12,19
179:21 180:3,4
180:5,8,13,13
180:18 181:15
181:18 182:4,6
182:10 188:10
188:12,18,19
189:1,4,13,15
189:19 190:1,2

190:7,10,11,13	222:5,9,16	407:21 408:5,7	232:12,20 269:3	169:6 180:9
190:21 191:1,8	223:1 225:13	408:14,15,22	272:10 277:11	186:7 193:12
191:18,21,22	226:18,22 228:8	409:1,5,8,13,16	277:14 280:20	195:1 198:5,16
192:1,2,7,14	228:18 229:1,2	411:2 412:13	294:6 302:21,22	198:17 201:10
193:5,7,9,10,11	229:19 230:1	415:19 416:11	305:4 317:2	207:3 208:4
193:13,15,18,19	231:3 234:2,8	418:4	318:19 323:16	212:20 213:1
193:22 194:5,7	234:17 235:17	**systems**	325:11 328:22	215:11,12
194:8,12,15,21	235:19 251:17	14:4 43:15 46:13	333:9 334:13	217:21 218:11
195:2,2,4,5,7,10	252:11 253:2,3	46:20 48:16	338:16 339:17	218:12 220:10
195:14,15,16,18	253:5 268:4	49:4,19 54:9	340:11 345:20	220:14 230:19
195:21 196:1,3	270:7 272:3	62:9,17 63:13	377:9 383:14	235:20 244:19
196:6,6,12,18	278:10,13 279:6	64:1,3,5,9 68:22	384:2,12 387:22	274:12 276:20
196:21,22 197:2	279:17,21	107:8 109:16	404:19 417:8	279:16 286:15
197:6,8,10,14	280:14 281:1,5	130:17 154:10	**taken**	291:12 311:18
197:19 198:2,5	282:2,4,7,20	172:4 180:16	163:16 399:18	314:8 319:2
198:16,17,20	283:11,17,20	212:19 213:9	419:19 421:8	331:21 346:15
199:1,11,13,17	284:5,10,12,22	214:15 283:22	**takes**	356:14 365:6
199:18 200:2,5	285:5 287:1,9	285:8 313:19	46:2 161:2 201:8	370:19 374:9
200:9,13,17,20	287:13 288:6,12	316:10 408:4,13	315:17 320:19	387:4 396:6
200:21,21 201:4	288:15 289:4,7	**system's**	326:16	420:16
201:8,10,12,14	289:9,16,20	162:10	**talk**	**talks**
201:18,19,22	291:19 293:3	**S.A.R.L**	21:19,19,22 41:6	12:5 130:8 220:5
202:1,5,6,8,11	294:1 296:10	1:6	46:1 78:18	308:1
202:12,16,17,18	300:20 302:18		149:20 170:9	**tangle**
202:21,21 203:4	302:20 305:15	**T**	197:1 198:8	228:7 290:16
203:5 204:4,6,9	307:2 312:13	**T**	233:15 386:4	400:14 401:15
204:13,19 205:2	313:10,21,22	4:1 5:1,1,7 6:1,1	**talked**	401:20
205:3,6,8,14,16	314:6,12 315:14	232:7 278:22	36:10,12,14 59:1	**tangling**
205:21 206:1,3	320:17 321:15	417:4	140:18 274:12	226:9,21 400:9,17
206:12 207:6,9	321:15 322:16	**table**	333:5	401:22 402:3
207:13,19,21	322:21,21	38:11 39:4 139:4	**talking**	**targeted**
208:6,7,8 209:1	323:13 324:10	139:18	21:8,8,14 22:7	88:17 89:12
209:2,9,13,18	325:14 327:15	**tag**	25:8 27:15 29:5	**targets**
209:20 210:7,9	329:3,5 330:11	126:18	49:14 58:20	90:21
210:10,11,19,20	331:11 332:20	**tail**	62:1,1,3 63:7,16	**task**
211:8,15,17,19	333:8 334:15,17	94:1,3,6,7	71:16 78:9 79:8	49:15
212:1,13,21	335:10,18,19	**take**	82:3 94:21 96:7	**tasks**
213:2,3,11,20	343:4,9,11	14:11 19:2 32:10	100:14 101:2,10	115:22
214:1,5,19,20	345:6 352:5	37:8 39:7 41:13	101:18 103:17	**teach**
214:22 215:2,17	354:4 360:17	51:5 60:10	103:17,19	265:10
215:18,19,20,20	368:21 372:22	62:21 69:16,19	110:15 114:6	**teaches**
216:15,18,22	373:4,22 374:6	76:4,18 77:4,13	123:22 127:21	174:21 203:8
217:4,4,5,22	384:16 387:6,12	86:22 138:11	132:10,14,15	406:11
218:2,13,16,20	388:18 390:18	145:22 149:22	135:17,21	**teaching**
218:21 219:15	394:22 398:18	152:17 159:6	141:18 145:1	196:15 211:22
219:21 220:2,6	398:20 405:15	160:10 163:2	148:12,14	**team**
220:10,12,15,20	406:6,17 407:3	167:11 174:22	164:16 168:8	23:20 24:11
		197:3 199:18		

technical
32:21 275:15
277:9 307:22
technology
23:5,11 50:12
55:3 61:1,3,10
409:20
tell
8:6 28:20 31:13
32:6 33:3 35:19
71:5,6 95:10
98:16 99:16,22
101:8 104:10,14
185:11 214:4
246:6 335:21
355:19 361:7,19
375:11
telling
29:19 98:18
182:7 377:5,6
tells
178:20 297:2
ten
198:10 201:8,15
203:6 210:3
216:19 217:6
218:19 336:22
410:1,3,8,14,18
411:5 412:5,12
412:14,21 413:1
tension
166:19 167:1
233:12
tenure
12:15 30:5
term
13:13 26:16 27:7
27:21 28:18
89:18 110:4
122:12 123:17
130:14 139:21
143:3 149:1
181:14 182:5,9
189:13 237:5,8
237:15 241:2
249:8 265:20
287:1 303:12,15

303:20 304:8
307:4,5 315:2
322:7 417:19
terms
32:21 90:1
120:19 167:22
187:2,3,4 318:6
345:1,15,16
353:9,12 359:10
359:12,15
territory
143:21 172:14
testified
7:5 233:12
236:18 286:22
312:20 343:19
344:13 372:17
414:14
testifies
359:1
testifying
186:12
testimonies
156:4
testimony
8:10 41:3 92:17
93:6 102:18
109:4 110:19
111:1 121:13
133:3,21 138:1
142:17 157:8
163:1 167:7
172:18 290:21
298:20 302:8
303:6 343:16
344:6 345:12
347:10 350:16
351:22 352:4
353:4,17 354:3
355:2,2,5
356:19 357:20
357:21 358:8,22
366:21 371:6,15
376:3 378:20
379:5 383:2
421:9
Thank

20:20 30:10
thanks
384:5
thin
240:14
thing
26:14 27:5,19
28:8 32:6 44:19
47:20 77:10
196:18 210:20
215:6 240:2
247:5 295:13
318:11 355:5
365:8 407:15
things
13:15 24:8 26:20
27:2,2 28:4
29:11 30:4,5
43:7 46:18 54:2
54:8 62:21 83:4
92:11,11,12
101:11 107:6,16
109:17 118:6
119:19 132:3,6
146:15 164:6
172:16 178:21
197:11 203:6
209:20,22 210:5
227:21 228:15
230:20,21 231:4
233:11 242:4
251:12 267:20
324:18 346:9
347:22 371:11
376:12 377:4
399:12,13
407:14,15
think
16:6 17:10 19:14
21:20 22:10
25:4 27:17 31:3
31:5 40:12
42:18 50:21
59:2 61:12
82:22 90:1 92:6
92:13 93:5
104:19 105:5

108:18 113:4
128:19 129:13
131:20 132:13
142:9 143:20
145:20 147:10
147:17 150:13
150:19 159:1
180:7 192:6,9
198:1 207:2
211:12 217:21
227:5 228:16
241:4 245:4
255:8 265:2,7
265:17 266:2
267:9 295:18
297:14 298:8
300:6,14 301:4
301:22 302:4
313:14 324:1,18
328:1 336:4
340:3 347:8
360:8 369:10
388:14 397:15
404:11
thinking
38:16 43:1 47:5
49:1 58:4 60:1
62:2 228:11
248:2
THOMAS
3:4
thorough
100:10
thought
42:21 43:4 47:4
47:10 48:16,22
50:17 67:8
137:10,15
140:18 177:21
271:9 375:16
387:7,13
thousand
179:19 290:14
three
8:13,15,17 33:8
41:21 57:5
64:17 69:16

91:7 175:17
176:5,6,11,17
177:15 186:12
197:11 249:21
250:3,5,6,11,12
250:16,16,17,19
272:8 283:22
288:11 376:13
threshold
384:17,19,22
388:18,21 389:2
389:16,20 390:2
390:9 391:2
392:16 394:5
395:18,21 396:8
397:3,5,7,14
398:16
thresholds
398:22
throat
158:20
throw
73:2
throwing
21:19
thrown
88:12
thrusters
406:1
tight
133:9 290:17
411:2
tighter
400:12
tightly
133:7 176:2
time
20:1 24:13 43:13
47:13 55:18
60:9 62:22
66:11 67:16
83:22 85:3,18
88:5 96:8,9,17
96:18 97:12
107:5,9,10,22
108:20 128:19
128:22 129:3,13

136:13 145:15
153:8 167:18
170:12,19 174:8
174:18 182:22
183:8,14 184:6
185:16 204:18
212:11 227:5,22
232:15 250:19
250:20 254:13
254:15 276:15
276:17 283:8
334:4,15 336:9
336:10 337:9,9
337:22 338:4
344:20,21 346:3
346:19 347:16
352:8,8 353:6,7
354:6,7 356:8
357:11 359:4,4
363:22 368:1,6
368:8 371:10
374:5 375:16
376:9 377:2,6
386:15 388:9
402:18 406:7
407:5,9,10
408:5,18 411:15
411:17 412:20
417:16,21 418:7
418:19,20 419:5
419:6,17,18
times
29:17 96:12,20,22
97:3,17 98:13
99:17 104:14
105:7,11,20
250:3,5,11,16
283:7 336:10,15
337:9 344:21
345:22 352:8
353:6 354:6
358:12 359:4
367:22 374:4
418:8 419:6
time-adjusted
332:19
time-lagged

401:21
tires
113:15 114:1
Titanic
30:17
title
27:1
today
8:10 9:17,18 21:8
22:7,21 25:4
29:5 32:8 37:9
77:17 88:5,6
157:3 158:15
178:9 249:21
341:13,22
342:16 356:8
357:20 367:19
Todd
1:22 2:15 421:2
422:8
told
12:6 27:10 28:1,3
60:10 136:2
327:14 408:22
Tom
7:9
tone
356:2,4
top
52:9 84:16 85:10
86:4 87:17
91:20 151:12
167:2 175:12
259:15 262:2
273:1 281:6
315:8 321:1
327:19 331:22
372:4
topic
250:8
total
73:13 184:22
185:1
tow
81:9
towed
12:2 14:9,20 15:1

15:15,17 16:14
18:17 19:15,17
19:18,21 21:9
22:11 27:12,13
27:14 29:4,9,9
30:16,18,19,22
31:4 33:17,22
34:3,15 35:13
75:19 82:14
168:1 170:10
193:13 235:7
336:13,17
towing
14:4 19:7,8 21:18
21:22 27:11
29:10,12,13
82:2 229:4
309:11 313:5
317:18 319:6
328:21 332:21
toy
210:15
TRADEMARK
1:1
trailed
147:19
transcript
5:8 55:8
transfer
235:17,21 236:1
translating
13:16
transmission
283:11 394:7
transmitted
408:17,20
transmitting
278:10 282:20
trapped
281:9
travel
168:6
traveling
169:9 227:12
228:20 229:10
229:22 234:16
336:21 372:21

374:1,22 377:21
378:11,15,17,22
379:8 380:4,12
381:3,22
traverse
80:22
tremendous
399:15
trial
1:2 351:5 375:17
377:3,4
Triantafyllou
1:13 2:1 5:2 6:5
7:3 71:10 339:1
421:5,14
tried
38:20,22 39:1
42:2,18 58:4
145:17 149:11
tries
150:5 156:5
280:19 393:15
393:19 394:2,3
395:5,12
Trisha
4:11 7:10 87:4
troubling
380:1
true
15:19 37:19
40:10 243:10
334:9 341:10,13
368:16 386:12
394:15 421:9
truthful
8:10 9:9
try
8:6 178:2 245:4
284:17 285:15
387:6 396:4
403:18,20
412:17
trying
17:7 29:22 30:1
61:3 65:7
104:13 110:12
121:18 178:19

195:19 196:10
197:16,17
198:18 246:6,15
265:10 267:8
281:10 285:4
297:13 302:17
306:14 331:4,7
332:5,10,16,17
335:7 375:8
387:14,18
395:16 420:2
turn
75:2 167:15
176:8,18 233:2
240:15 256:19
257:6 319:14
342:4
turning
317:11 319:15
401:7
turnkey
60:16
Twelfth
3:8
twist
178:1
twisted
355:8
two
8:2 25:11 62:21
140:15 166:5
183:2,3,10
184:14,14,20,21
186:7 203:20
212:8 225:9
235:18,18,22
236:1 287:7
290:14 292:22
309:21 318:3
326:12 329:13
329:15,18 330:4
330:19 331:5
398:17
two-streamer
185:7
Two-thirds
222:7

two-year-old
335:5,11,21,22
345:20
type
60:16 70:6 141:8
194:4,12,21
195:4,10,15,20
196:3,12 197:7
199:16 200:3,5
200:9,13,17,20
201:4 204:13,19
205:14,16,21
206:13 208:22
209:17 211:16
215:20 216:15
216:16,22 217:1
217:8 218:3,14
219:1,13 334:11
types
50:12
typically
25:14 84:14 86:7
222:4,9,18

U

U
4:1 6:1
UK
207:7,14,19 208:5
208:19
ultimately
223:14
unable
31:7
unacceptable
387:20
uncertainty
174:9
unclear
219:19
uncontrolled
228:7 404:3
underground
25:9
underlined
160:9,11,12,15
259:18,20
261:13

underlining
260:6
underlying
238:14 239:6
underneath
52:4 91:21
268:11 281:7
understand
8:1,5 15:4 16:7
17:1 18:21 27:3
30:20 46:18
47:6,15 58:6
59:11 63:18
64:13 66:7,18
70:17 93:6 96:2
101:7,22 104:13
113:4 114:16
115:20 116:15
117:16,19
124:19 141:19
142:1,16 158:2
162:22 169:1
172:18 189:10
189:13 190:2,22
191:16 192:19
197:17 205:15
210:18,18,22
229:16 241:17
243:14 244:10
245:3 246:15,22
256:19 258:1
261:5 266:10
268:8 273:22
279:8 284:2
300:4 303:5,7
311:1 318:5
328:6,7 336:5,6
340:4 356:19
365:16
understanding
37:19 52:1 55:12
67:5 148:22
189:8 302:8
348:22 358:9
375:10
understands
327:20

understood
59:8,15,19 61:2
70:1 76:1 78:6
78:22 79:5 80:5
80:10 83:21
84:20 99:6,9,12
113:2 126:17
132:21 136:7,15
137:9,11 145:6
145:7,16 281:19
325:22 345:17
410:4
undertook
266:11 378:8
uniform
403:7 404:20
unit
342:11 343:3
344:8 345:7
348:16 349:5
350:7 352:2
354:9
UNITED
1:1
unknown
189:5 219:9
293:14
unknowns
170:11
unofficial
66:12
unpack
404:4
unpatentable
257:8
unreasonable
238:12
unrelated
235:19
unspecified
97:6
unstable
234:9,17
unusual
328:21
unwise
410:2

update
334:5,15 407:5,11
407:14,19 408:2
408:16,18 410:5
410:12,14,14
411:13,21
updated
336:11 337:10
344:21 352:9
353:7 354:7
359:5 409:2
418:8 419:6,18
419:18 420:8,10
420:14,17
updates
409:22 410:7,7
412:5
updating
409:16 410:17
411:9
upset
29:21 30:3
upstream
336:19
USC
257:8
use
75:7,13 88:14
90:10,11 94:14
98:1,4 100:17
142:4,11,20
143:3,5 149:1
170:21 172:6
176:17 195:12
197:15 202:5,20
203:5 208:8,8
211:3 217:17
235:5 236:9
239:18,21
240:16 241:3,22
242:9 243:2,4
244:17 245:8
246:2,18 252:2
252:16,22 253:1
253:11 257:17
267:14 271:8
284:12 285:1,6

287:2 288:6,15
288:15 289:8,9
289:15 297:2,19
300:8 301:6
304:19 305:10
313:10 322:7
324:9 326:4,8
333:7,22 334:14
345:22 351:15
351:16 374:16
382:8,15 387:3
394:20 395:20
399:6 401:11
415:2,9,21
416:14 417:14
417:19 418:17
419:12
useful
313:9 401:13,21
user
61:22
uses
26:16 27:7,21
28:18 110:3
211:4,7 249:8
287:9 304:8
309:1 383:8
394:5 395:18
415:6
USPTO
256:2
usual
294:17
usually
23:19 46:1 90:12
90:21 186:3
214:11 397:9
404:21 407:7
utilize
207:8 208:6
utilizes
165:4,18 270:7
294:1 296:10
297:9,12,13
298:6 300:20
305:16
U.S

1:6,8,10 6:9,10
6:11 222:10
341:18

V

v
1:8
vague
100:3 128:18
129:12 373:7
vaguely
152:4,5
valid
119:16 120:1,10
validity
119:10 120:13
126:6 242:8
243:1,14 244:15
245:9 281:12
vantage
39:22 43:8
variable
319:20 388:6
403:17
variations
40:12
variety
119:19
various
12:10,11 50:6
88:2 112:16
115:4 234:14
279:13 298:8
415:6
vary
328:16
varying
72:1
veers
82:22
vehicle
27:14
vehicles
11:13 20:2
veins
399:12
velocities
311:14 313:11

velocity
235:7,12,14 236:2
236:5 308:12
309:1,10,11,20
310:1,7,11,13
311:5,11 312:12
312:15 313:1,2
313:4,5,9 314:5
334:5,14 335:9
336:8,10,14,15
336:18 337:8,9
344:19,21
345:15,21 352:7
352:8 353:5,6
354:5,6 359:3,4
378:21 383:9
418:6,8,18
419:6,17 420:9
version
44:17 87:15,20
versions
87:22 88:2
versus
41:7 115:14
138:19 152:20
269:17 345:19
vertical
108:14 159:5,12
163:7 315:15
320:17 323:6
vessel
75:19 81:8,14
85:5 88:21 90:8
90:16 100:11
101:1,20,21
235:8 310:9
313:2 314:11
400:15
vessels
57:8 61:1 80:21
Vibrations
14:5
view
17:21 20:5,11
45:2 114:16,17
116:15 118:20
122:12 123:1,13

125:11,21
127:13,16
132:17 133:14
135:3 142:18
146:20 149:8
156:17 159:3
163:1,10,11
170:1 178:1
182:9 199:15
209:2,7,12,15
223:9 236:8,19
238:8 242:6
245:10 253:4,6
253:10 264:10
264:17 265:20
282:17 284:2
286:4,22 289:22
293:16 300:22
309:16 315:21
324:12 325:8
326:21 357:1,3
387:15 403:15
412:4
Viewing
104:3
violate
389:9
violated
181:2
violating
245:17
violation
392:16
Virginia
1:14 2:9,17 3:19
421:4,16 422:10
vitae
5:10 10:13,17
13:11,14 51:17
vital
78:2
voice
284:15 356:6,7
367:17,18,19

W

wait
20:17 200:15

336:13 409:9
410:2 411:5
waits
314:2 408:18
409:1 411:17
want
22:5 23:1,21
24:12 25:11
26:22 27:4,11
29:18 31:20
78:18 80:2 90:4
93:6 122:4,9,10
122:11 126:18
131:6 133:6
147:10 148:20
150:2 155:15
157:17 160:9
161:14,22
175:13 176:2
178:20 180:1,17
181:1 187:18
219:11 224:20
226:17 228:17
229:4,16 231:13
232:12 236:18
237:4 245:1
246:11,13
247:15 251:12
252:5 262:1
265:6 266:15,17
273:12 277:9
279:9,11 280:17
290:17 303:5
304:12 308:10
316:11 326:16
328:22 339:2
363:12 377:5
385:22 391:9
392:11 395:3
397:10,19
400:18 403:6
404:4 406:13
409:13 411:2,3
411:6 412:8,10
412:11,22
wanted
147:18 155:3

183:16 188:4
214:16 226:20
229:18 352:21
377:17 381:8
396:13
wanting
157:13
wants
93:3 127:19
173:15,18
219:16 226:16
390:18 396:17
Washington
3:9
wasn't
120:7 129:14
145:10 358:17
Watch
356:2
watching
310:10 334:22
335:20
water
185:19 232:11
295:15 313:5
391:16
water-referenced
309:11
wave
168:6,9,12 336:21
374:1,22 378:15
waves
82:14 83:2,3
169:9 227:12
228:20 229:10
229:22 234:16
295:15,15,16
372:21 377:21
378:11,17,22
380:4,12 381:3
381:22 383:7
way
8:7 18:1 22:22
26:6 28:13 30:1
76:17 91:22
108:5 114:18,18
123:4,7 131:16

158:4 165:12
168:4 171:14
177:22 178:1,18
179:22 181:14
182:8 189:22
190:15 192:13
198:20 199:4
206:10 221:9
222:7 231:2,10
244:5 250:8
279:20 282:5
283:13 284:18
285:11,18,19
294:8 295:4
296:15,16 297:4
297:5,22 298:13
312:11 326:15
331:10 337:4
349:1 355:10
368:3 375:1
378:17 387:6
389:3 397:16
398:5 399:4,22
403:20 405:20
405:20,21 406:5
419:11 421:22

ways
284:8 294:9
334:1,1,3,4
398:10 419:10

weather
305:8

weight
81:17

weighted
382:7

weird
388:6

went
293:12 346:6

WesternGeco
1:9 129:1 134:2
137:19 138:18
140:12 141:3,12
142:2 143:13,14
144:11,19 151:5
152:2,20 153:19

155:11,12,20
156:10 159:22
161:10,12
176:10,16
223:14 261:22
266:20 267:16
315:3,5 331:19

WesternGeco's
5:13 128:8
129:21 138:15
140:2,6 145:3,5
145:12 150:14
154:14 159:10
160:5 175:22
181:11 255:12
333:1

we'll
41:6 47:13 78:17
113:6 135:11
221:19 277:13
339:18 383:13
395:2 403:18

we're
12:8 21:14 22:7
29:5 49:14 52:9
54:13 61:22
62:1,3 63:7
79:15 80:20
100:4,14 101:10
103:17,19
110:15 114:5
117:5,6 132:10
135:17,21 146:7
148:12 168:8
202:5 210:22
224:3 256:20
259:9 261:6
264:21 266:6
276:20 300:4
307:21 329:21
331:21 339:17
340:6,9 347:20
387:4 396:6
416:19 419:20
420:21

we've
87:1 109:1

144:15 146:16
150:13 186:11
187:16 221:13
232:18 249:2
260:8 270:20
277:1 282:16
286:10 303:1
341:21 342:15
377:8 416:21

WG422
256:2

whatsoever
46:14 223:4

wheel
114:2

Whereabouts
222:6 332:6

WHEREOF
422:3

whim
405:17

whip
337:4

whiplash
337:3

wide
42:2 45:5

widely
26:20 411:4

wife
28:15

Williams
3:7 7:8,9,11

wind
82:20 313:20
314:5

wing
194:8 199:19
200:6,14,18
204:14 205:17
205:22 206:5
215:4,21

wings
190:16

withdraw
133:20

witness

2:18 12:22 13:7
13:19 15:8,12
16:2,13,18
18:12 20:19,21
23:17 24:7
27:10 28:3 29:1
30:12 31:16,19
32:6,19 33:7
34:9,19 38:5,16
41:13 42:2,13
44:17 49:11
57:16 58:19
62:21 67:11
68:7 69:15
72:21 76:8 77:9
84:5 85:21
89:11,22 93:11
96:6 97:20 98:8
98:15 99:9,21
101:10 102:3
103:4,9 104:18
105:15 107:4
108:2,8 111:5
113:13 114:11
120:18 123:7,21
124:16 125:3,16
125:20 126:3
127:21 129:18
131:19 132:3
135:7 136:18
139:5 140:14,21
141:6 143:8
146:3 148:12
149:20 155:14
156:2,14 157:5
157:22 158:9,20
171:12 173:10
177:21 185:10
188:21 189:17
190:15 191:4,12
191:21 192:11
192:17 193:22
196:10 201:1,6
203:17 205:19
206:7 207:17
208:3 212:7,18
213:5,15,22

214:13 215:11
216:3,11 219:4
219:19 220:9,18
227:3 230:4
232:5,8,10,14
241:15 242:3,11
242:19 243:8
244:2 245:14
246:4,22 250:14
251:10 265:10
267:1,19 271:12
272:15 275:9
276:9 277:17
278:2,7,21
282:10,12,22
283:3,13 284:7
284:16 285:8
286:14 287:5,16
288:2,11,18
289:11,19
290:13 291:2,12
292:5,15,21
293:8,22 294:13
295:8 296:1,9
296:22 297:9
298:3 299:3,6
299:15 300:2,14
301:10,22
302:14 305:1,14
305:22 306:7
307:10 311:18
312:10 323:11
330:10 339:19
340:2 343:17
345:12 348:20
349:9,19,21
350:12,22
351:13 352:11
352:14,20 353:9
353:22 355:8,18
356:10 357:9
358:3,19 359:10
359:18 360:6,14
360:21 361:11
362:15 363:2,12
363:22 364:15
364:22 365:6,14

365:22 366:7,12
366:22 367:2,21
368:1,19 369:8
369:14 370:2,11
370:18 371:3,20
372:9 373:4,19
374:15 375:15
376:2,8 378:1
378:15 379:12
379:17,19 380:8
380:17 381:5
382:12,19
383:11,20 384:1
384:4 386:6,12
395:9,16 398:20
399:21 406:9
407:21 417:5
418:11 419:9
420:16 421:6,10
422:3
wonderful
30:15 271:10
word
19:12 90:18,19
98:18 114:14
116:4,20,20
131:8 149:1
164:11 172:13
202:16 280:20
320:15 323:21
332:5,10,16
words
13:1 29:2,16
64:13 110:3
114:11 146:14
172:8 178:6
195:10 196:13
209:17 239:8
267:4,10 285:4
320:13 346:16
363:5 374:17
406:12 408:6
wordsmith
197:16
work
12:2 14:9,19 20:5
44:14 49:12

52:11,12 54:8
58:16 59:4,6,12
60:3,8,11 73:13
74:10,22 153:13
155:2 171:7,17
172:21 173:14
174:7 220:11
284:8 285:8
287:7,13 337:6
391:4 395:1
399:4
worked
30:18 53:12 55:2
129:1 170:6
171:17 172:19
337:13
working
52:19 54:14
55:10 158:10
180:16 198:20
201:2 285:10
287:19,21
325:14 327:17
351:3 356:15
387:5 406:17,19
407:9,10 410:18
workings
346:5 363:10,18
Workman
383:14,18 384:7
384:10,11,13
385:4,6,7,20
387:6,14 388:20
389:6,14 390:18
391:21 392:6,12
393:7,15,19
395:5 396:10,13
397:18,19
398:10,18,20
413:2
Workman's
388:18 393:3
works
285:9 287:11
313:21 398:22
world
21:12

worm-in-hole
233:16
worry
388:1
worse
83:4 228:6
wouldn't
40:13 59:21
85:16 180:3,8
184:11 191:16
201:6 228:21
229:22 324:3
387:21 394:13
wrap
416:20
wreak
294:15
write
47:4 166:12,17
167:4
writes
77:20
writing
67:16,17 158:14
327:12
written
26:8,11,15 27:5
27:19 28:4,6,11
28:14 29:8,9,10
29:15 30:22
31:4,8 157:19
158:5,13 279:14
316:16
wrong
27:18 28:5 105:6
126:1 150:19
192:9 228:9
241:13,19 265:6
298:14 336:7
360:3,8,11
366:10 395:4,4
wrote
25:19 37:18 60:1
60:7 71:17
250:10 379:21
W096/21163
222:11

W098/28636
188:15

X

x
1:3,11 5:7 6:1

Y

yeah
54:17 68:18
79:21 89:6
102:13 107:15
110:10 141:21
151:14 159:19
160:14 161:17
169:14 182:20
197:21 210:21
260:16 268:14
292:9 328:20
338:4 339:22
400:3 417:5
419:20
year
82:3
years
19:13 29:12
30:18 43:15
45:18,22 46:2,8
48:12,14,19
54:14 55:9 57:5
60:10 62:11,17
63:11,21 64:6
64:17 69:1
70:10,14,15,21
73:14 74:4,4,5
74:10,14 84:13
171:6,7,17
172:20 173:14
174:6,13 376:13
396:1,3,5
York
4:6,6

Z

zero
23:8 82:10
411:18
zilch

397:13

0

00687
91:3 129:5
00689
55:22
017
253:22 254:10
255:9,11,14
261:12 263:11
263:13 264:16
09/787
256:13
09/787,223
256:3

1

1
1:21 86:18,19
91:17,17,20
92:1,7,21 93:8,8
93:18 94:5,17
95:2,7 98:12
99:1,6,18
102:19 103:1
104:2 106:5
109:1,7 110:15
110:20 111:2,9
112:1,19 113:1
113:9,21 114:7
114:18 115:6,16
116:1,6,11,15
117:15 118:8,14
118:15 130:9
154:6 170:5
181:16 182:9
184:14 185:16
185:21 257:19
260:16,22
268:19,22 270:1
273:2,3 308:7
308:12 309:17
311:12,15,18
312:6 314:15,19
327:3 329:11
330:7 337:20
341:16

1st
273:9,15 274:15
275:5
1(b)
312:21
10
39:8 56:12 100:9
100:10,22
101:18,21 102:4
168:10,12,15
227:16,16
270:18 271:18
293:17 294:7,19
295:9 297:18
298:13 304:6
321:2,3,4,7,9
322:13,13
325:17 396:1,3
396:5
100
85:6,9 409:13
1001
6:9 91:3 252:4
1002
6:12 55:22 74:21
75:15
10022
4:6
1004
221:18 383:18
384:7
1019
221:20
103(a)
257:8
1076
5:10 51:7,7,9,13
1077
5:11 72:4,8,14
1078
5:13 138:8,11,12
138:14 139:2
144:10 150:14
153:22
1079
5:15 152:14,18,20
1080

5:17 255:18,21,22
256:1 259:4,6
259:11
1081
5:18 269:6,8,11
269:12 270:4
271:15 272:1
273:16 275:4,21
1082
5:19 272:11,13
1083
6:3 338:18,19
347:7 348:7
349:16 362:19
377:13 378:9
11
14:2,3 19:3 322:5
323:2 324:6
11:58
175:3
12
104:7,15 105:8
139:1 141:13
142:1 150:15,18
151:1
12:55
175:3
13
151:3,11 315:5,8
137
415:1,5
138
5:14
14
102:9,11,18
175:10 181:10
270:19 271:19
293:17 294:7
297:18 298:14
304:6 321:2,3,4
321:7,10 322:6
322:13 323:2
324:6 413:17
414:4,8,12
145
342:18 348:18
353:18 355:3

359:1 367:4
372:2
146
348:18
15
130:9 154:1
181:16 182:9
260:16,22 330:6
337:20 413:14
413:20 414:2,6
414:11
152
5:16
16
81:1 94:10,10,17
95:2,7,12 96:2
96:15,15 97:5
97:18 98:4,22
99:1,6,18
17
63:1 70:1 80:16
81:2,14
18
39:7 40:19 42:11
43:2 47:1 50:19
55:15 59:3 60:2
60:7 61:5 62:6
62:22 63:11
68:16,21 103:13
104:1
184
224:18 225:4
1850151
273:7
1940
2:7 3:17 421:16
1984
14:13
1991
19:5
1993
52:11,14
1994
53:15 55:4
1995
53:15,20
1997

53:20
1998
54:7,12 82:4
83:11,21 84:10
84:15 86:6,17
87:20 154:6
170:5 268:19,22
270:1 273:9,15
274:15 275:5
1999
253:19 273:8
274:13

2

2
14:3 19:2 170:9
188:5,5,9
208:13 209:1,7
209:12 221:6,13
257:4 259:13
261:13 269:17
269:19 308:6,9
308:11,20 309:6
309:10 312:12
312:18,22 313:8
413:2,3,10
414:3
2/26/03
259:5
2:00
232:16
20
93:20,20 94:5,7
233:3 303:2
20th
9:2
200
106:14,20 107:19
107:19
20005
3:9
2003
259:1 262:5
2012
341:8
2014
129:15 272:18
273:2

2015
1:15 9:2 10:15
421:17 422:4
2017
422:13
202
3:10
2042
8:14 10:3,4,9,9
65:22 66:22
76:18
2050
100:2
2067
258:11,14,21
259:9 261:14
266:20
21
274:13
21st
341:8
21-page
13:11,14
212
4:7
22
1:15 101:16,19
102:4 109:2,5,5
109:9,10,12,20
110:4,19 111:1
111:5,10 113:21
151:13 162:5
272:3 315:14
320:17 421:17
223
258:2
22314
2:9 3:19 421:17
23
56:4,6,10,11,12
56:15
25
257:7 263:2,3
264:1
255
5:17
26

130:5 207:6
256:7 259:1
262:5
269
5:18
27
87:7 135:19
136:2
27th
422:4
272
5:20
277
275:5,19
28
252:10 253:19
272:7 291:18
292:10
28th
273:8

3

3
14:12 80:18 81:9
81:14 82:7 83:7
102:14 106:12
110:4,15 153:11
257:7 269:18,19
277:5,6,22
309:6,9 311:8
312:18 313:4,10
313:12,14
314:13 388:14
393:3,14 394:9
3D
80:15,21 81:11
82:8
3-kilometer
86:16
3.2.1.5
278:5
30
208:13 422:13
311305
422:14
32
75:2 76:5,20
338

6:5
34
75:3,15 76:5,20
291:18
35
111:20 257:8
36
77:1
38
77:2 188:9
189:14 190:1
221:5 233:3
234:15,15
39
151:21 153:21
154:1 233:3,21
234:5 263:2,3
264:1

4

4
153:11 161:13,19
162:6,17,20
164:13,21,22
165:1 171:20
173:1 189:14
190:1 191:17
204:5 249:6,10
249:14 251:6
252:10 260:20
260:21 270:19
271:18 272:6
277:2 291:18
292:10 293:17
294:7 297:18
298:13 303:20
313:12 320:8
321:1 325:17
326:1 327:8
329:10 331:14
4,992,990
222:10
4-D
400:13
4.5-mile
87:12
400
106:15,21 107:19

107:19 184:4,10
184:16,21 186:7
41
202:3 204:5
209:1,12 211:16
413-3000
2:10 3:20
42
237:12
422
1:21 256:7
43
239:14
434-5000
3:10
435221
331:22
446-4800
4:7
45
201:20 202:1
48
200:16 201:18
257:7 320:8
321:13 322:6,12
323:20

5

5
153:11 222:2
239:13 308:17
308:19 314:15
5,000
178:9
51
5:10 320:8
321:13 322:6,12
323:21
520
39:19 40:17 41:9
43:13 56:1,1
74:20 185:3
187:13,22
236:12 249:22
296:17 407:18
411:8
54
161:19 162:5

164:13
55
6:13 220:6 221:6
57
106:17,18 161:19
162:5 164:13
317:12,14,16
319:3
59
342:4,6,11 370:22
372:4

6

6
160:22 161:7
270:3 271:17
278:18 282:15
6,932,017
253:20
6:40
420:19,22 421:18
601
4:5
607
39:19 40:17 41:9
43:14 185:3
187:13,22
236:12 237:6,16
238:7 240:4
241:2,21 242:7
242:22 243:20
244:7,15,16
245:8,11 246:18
247:21 248:3
249:1,22 252:2
252:4,7,9
253:10,14
256:12,18 258:2
258:17 260:9,13
260:15 261:9,18
263:7,9,15,17
264:14,15
266:12 268:10
268:15 270:17
270:22 271:19
272:7 276:4
291:18 292:10
296:17 298:16

300:8 302:10
303:10 304:19
305:10 307:6
308:6 315:4,13
315:22 337:7,11
337:20 338:2,10
338:12 341:21
342:6,8 345:6
347:13 348:7,15
349:15 353:19
355:16,22
356:22 357:2,5
357:22 360:18
362:20 367:6
368:11 369:20
370:16,21 372:4
373:11,15
377:19 378:10
379:8 380:4,13
381:2 382:17
383:5 407:18
409:21 411:8
412:7
610
207:8,14 208:18
62
324:7
63
320:11,14
636
184:8 188:19
189:3,15,18,19
190:5,13 191:2
191:5,10,17
192:4,9,14,19
193:6 194:16
195:11,16 196:6
196:13 197:21
199:4,9 200:21
202:15 203:3,8
203:22 204:8,9
205:3,9 207:1,3
207:22 208:7,8
209:3,9,11,14
209:21 217:10
217:14 218:1,5
218:18 219:2,7

219:14,17 220:4
220:22 221:4,9
221:14,19,22
222:2,14,21
223:7,8,9,15,18
223:19 224:13
226:4,8,22
228:17 399:17
399:18,21 400:4

65
168:13
67
111:17,19,20
115:5
688
252:5 258:10,17
315:4
69
159:18,20 161:22
162:7,9

7

7
5:3 13:19 14:11
17:11 261:20
263:1 271:22
331:20 332:3,7
7,080,607
1:8 6:10 341:19
7,162,967
1:6 6:9
7,293,520
1:10 6:11
710
2:10 3:20
72
5:12 121:4
133:13,19 134:3
135:8
723
256:14,15 258:2
725
3:8
74
133:1
787,723
253:17

8

8
13:17,19 17:15
18:5
8:35
1:16 421:17
80s
170:7
83209
1:20
85
339:19
87
339:19
88
8:20 237:11
238:19 248:8
286:11,14,16
341:4

9

9th
272:17 273:2
90s
170:7,20 229:12
91
6:11 135:10,11
148:21 170:8
93
119:2,5,18 120:12
120:16
967
39:19 40:17 41:9
43:14 91:2,3,5
91:17 92:7
95:17 96:22
98:5,13 100:10
101:6 102:1
109:14,22
119:10,16
120:10 123:18
125:11 126:6
129:2,6,22
132:15,18
135:17,18
137:10 142:19
142:21 143:4

144:3 145:21
147:4,6,11,20
147:22 158:7
161:1,13 164:13
173:2 175:8
185:3 187:13,22
188:3 189:9,12
191:17 196:21
198:6,16 221:6
221:18,20
236:12 249:2,22
251:22 284:22
285:5 287:3,13
289:1,2 290:20
296:16 407:18
98
269:15
9821277
5:18 269:1,16
273:9 274:16
99
54:7 96:11
990
221:21 222:15,20
223:1 224:12
999
179:19

No. 83209

Page	Line	Correction/Change and Reason
69	20	"doesn't respond", "doesn't correspond"
103	20	"skims" to "schemes"
116	22	"skims" to "schemes"
227	7	"hated mass forces" to "added mass forces"
230	19-20	"what he is talking about hydrodynamics now and everything else, this cannot be done." to "what he is talking about hydrodynamics now and everything else? This cannot be done."
284	17	"You try to contaminate them" I certainly used a different word, maybe coordinate them?
313	16	"fit forward control" to "feed-forward control"
313	18	"fit forward control" to "feed-forward control"
314	4	"fit forward control" to "feed-forward control"
329	21-22	"I presume you know the patent a little better than me", to "I presume you know the patent LAW a little better than me".
399	12	"power veins" to "paravanes"
408	5	"time skills" to "time constants"

6/4/15
(Date)

(Signature)

No. 83209

Re: Deposition of **Michael S. Triantafyllou, Sc.D**
        Date: 05/22/2015
        Caption: Petroleum Geo-Services Inc, et al -v- WesternGeco, LLC (PTAB)

Page	Line	Correction/Change and Reason

6/4/15
(Date)

(Signature)

No. 83209

ACKNOWLEDGMENT OF DEPONENT

I, Michael S. Triantafyllou, Sc.D, do hereby acknowledge that I have read and examined the foregoing testimony, and the same is a true, correct and complete transcription of the testimony given by me and any corrections appear on the attached Errata sheet signed by me.

6/4/15

(Date)

(Signature)