

Page 1 1 UNITED STATES PATENT AND TRADEMARK OFFICE 2 BEFORE THE PATENT TRIAL AND APPEAL BOARD 3 4 FOIL BOARDING COMPANY, : 5 INC., : 6 Petitioner, : 7 V. : 8 MHL CUSTOM, INC. : 9 Patent Owner. : 10 11 12 13 DEPOSITION OF STEFANO BRIZZOLARA, PH.D. 14 July 18, 2024 15 Blacksburg, Virginia 16 9:30 a.m. 17 18 19 20 21 22 23 24 25 Reported by: Frank R. Austin, RMR-CRR	Page 3 1 INDEX 2 WITNESS EXAMINATION BY PAGE 3 STEFANO BRIZZOLARA, PH.D. 4 Mr. Theuerkauf 4, 65 5 Mr. Bridges 61 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Page 2 1 The deposition of STEFANO BRIZZOLARA, PH.D. 2 was taken at the The Inn At Virginia Tech and Skelton 3 Conference Center, 901 Prices Fork Road, Blacksburg, 4 Virginia, 24061, on July 18, 2024, commencing at 9:30 5 a.m., in the presence of counsel for the parties. 6 It was agreed that Frank R. Austin, 7 Registered Merit Reporter, Certified Realtime 8 Reporter, and Notary Public in and for the 9 Commonwealth of Virginia, would take said deposition 10 in machine shorthand and transcribe the same to 11 typewriting by means of computer-aided transcription. 12 13 APPEARANCES: 14 GRAY ICE HIGDON 15 BY: ROBERT THEUERKAUF, ESQ. 16 MEGAN GIBSON, ESQ. 17 3939 Shelbyville Road, Suite 201 18 Louisville, Kentucky 40207 19 Counsel on behalf of the Patent Owner 20 21 DOUGLAS BRIDGES, ESQ. 22 453 Dauphin Street, 2nd Floor 23 Mobile, Alabama 36602 24 Counsel on behalf of the Petitioner 25	Page 4 1 STEFANO BRIZZOLARA, PH.D. 2 was duly sworn and deposited as follows: 3 EXAMINATION 4 BY MR. THEUERKAUF: 5 Q. All right. Good morning, Doctor. 6 A. Good morning. 7 Q. So my name is Robert Theuerkauf. I 8 represent MHL Custom, Inc. in these matters. With me 9 is my colleague, Megan Gibson, just for the record. 10 So we're here on two matters before the patent 11 office. They are IPRs 2024-0085 and IPR 2024-0086. 12 Can you please give us your full name 13 for the record. 14 A. Stefano Brizzaloara. 15 Q. Can you give us your business 16 address, please. 17 A. Business address is 602 Kelly Lane, 18 Blacksburg, 24060. 19 Q. Who are you employed by, Doctor? 20 A. I am employed by Virginia Tech, but 21 in -- in -- I serve as a private consultant, right? 22 Virginia Tech is not involved in that. 23 Q. I'm going to show you -- let's see -- 24 this first document. If you wouldn't mind taking a 25 look at that, and it's -- you'll see in the lower

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1 right-hand corner there I've written 19, which was
2 the 19th document filed in the 0085 IPR.
3 MS. GIBSON: I don't think that one is
4 in your link, Doug.
5 THE WITNESS: 0085, yes.
6 BY MR. THEUERKAUF:
7 Q. Have you seen this document before?
8 A. Let me see. Oh, yeah, yeah, yes.
9 Q. Just another formality here. I'm
10 going to show you --
11 A. The reason why I'm here, I believe.
12 Q. I'll show you a second document here
13 that's also labeled paper 19, but it is for the 0 --
14 sorry -- for the 86 IPR. Have you seen this document
15 before?
16 A. Yes. Patent, yes.
17 Q. You, I think, just answered this
18 question, but you understand that you are here today
19 to give a deposition for these two IPR matters
20 pending before the patent and trademark office?
21 A. Yes.
22 Q. Is it your understanding that the 85
23 IPR is in regards to the 856 -- I'm sorry -- in
24 regards to the 9586659 patent?
25 A. Correct, yes. As it's written here,

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1 yes.
2 Q. The 86 IPR is in regards to the
3 9359044 patent?
4 A. Yes.
5 Q. Okay.
6 A. I actually remember about the numbers
7 of this patent by the last three digits because they
8 always -- they always refer this way. I'm not able
9 to tell you if the first four digits are correct, but
10 I believe so.
11 Q. So that will help. So you're okay if
12 I refer to the two patents at issue as the 04 --
13 A. The last three digits, yes.
14 MR. BRIDGES: Can I just -- please let
15 him finish speaking so --
16 THE WITNESS: I'm sorry.
17 MR. BRIDGES: For the court reporter's
18 benefit, let him finish his questions before
19 answering.
20 MR. THEUERKAUF: Yes. I appreciate
21 that, Doug. I was just getting ready to
22 mention.
23 BY MR. THEUERKAUF:
24 Q. First let me ask, Doctor, have you
25 given a deposition before?

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1 A. Not in a patent litigation case. I
2 served as an expert witness in other kind of
3 litigations, big companies.
4 Q. Do you know roughly how many
5 depositions you've given?
6 A. Yes. I think three or four.
7 Q. Three or four. Okay. So as Doug
8 mentioned, obviously we've got a court reporter
9 taking everything down that we say today. So if you
10 wouldn't mind -- in normal conversation it's very
11 easy and human nature to speak over each other. But
12 if you wouldn't mind trying your best to let me
13 finish my question before you answer, and I'll do my
14 best to let you finish your answer before I ask my
15 next question; is that fair?
16 A. Agreed.
17 Q. Also just sometimes we videotape
18 these. Today we're not. So if you can please give a
19 verbal answer to all the questions. Sometimes we'll
20 shake or nod our head, but if it's a yes or a no --
21 A. Yes, yes, I understand.
22 Q. Okay. So you said -- you had
23 mentioned you had given three or four depositions,
24 but they weren't in patent cases. Can you tell me
25 what types of cases those were?

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1 A. Litigation between companies about
2 different technical issues.
3 Q. Okay.
4 A. Contract breaches, yeah.
5 Q. Okay. Did any of those cases involve
6 like hydrofoil technology?
7 A. No. In general they involve marine,
8 like ships, boats. I'm a naval architect. That is
9 my field.
10 Q. All right.
11 A. Hydrofoils are relatively new, right?
12 Q. Sorry?
13 A. Hydrofoils are relatively new in this
14 field.
15 MR. THEUERKAUF: Doug, I will real
16 quick, for whatever reason, his CV wasn't
17 attached when it was filed to his
18 declarations, but we can get that at some
19 point, I assume.
20 MR. BRIDGES: Yeah, absolutely. If you
21 want, I can forward you a copy of his CV,
22 and you can look at it to see during -- see
23 if there's anything that you wanted to raise
24 as an exhibit or talk about, and I will give
25 you time review it.

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1 MR. THEUERKAUF: Okay.
2 BY MR. THEUERKAUF:
3 Q. Doctor, could you -- I apologize
4 again. I don't have your CV, but could you describe
5 your educational background for us?
6 A. Yes. I studied naval architecture
7 and marine engineering at Genova University where I
8 graduated 19 -- okay. Don't remember the date. It's
9 too far back. Then I also took a Ph.D. from
10 University of Naples Federico II in joint venture
11 with Genova. It was a joint Ph.D., again, in naval
12 architecture. That's my declaration, I guess,
13 highest degree, is that.
14 Q. Do you recall the date that you
15 reached your highest degree?
16 A. Yes. 2000.
17 Q. 2000. Okay.
18 A. The master's was 1994.
19 Q. How long have you been employed by
20 Virginia Tech?
21 A. Virginia Tech, since 2016. Started
22 University of -- my academic career -- I also worked
23 in the shipyard, but my academic career I started in
24 Genova University. Then I moved to MIT. Then I came
25 here in 2016.

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1 Q. So your academic career, you said
2 Geneva?
3 A. Genova, Genova, Italy, yeah, not
4 Geneva, Switzerland. That's a common mistake. I
5 don't know why Americans do that.
6 Q. So when you first started your
7 academic career, what was your position?
8 A. My position was -- in the very
9 beginning I was -- it's an Italian title. I'm not
10 sure how to translate it in English, but I served as
11 -- you could call it here research assistant for a
12 year. Then I moved -- in Italian it's called
13 ricercatore. A year after ricercatore -- here in the
14 U.S. it is the first step of the academic career,
15 right, in Italy. Here you would translate it as
16 assistant professor.
17 Q. What was your field of research then?
18 A. Yes. Naval architecture and marine
19 engineering. Specific field is hydrodynamics.
20 Architecture covers a lot of fundamental subjects as
21 you can imagine. Architecture is the discipline that
22 you study to design and build the ships, right, or
23 boats. So it covers hydrodynamics, structuring
24 dynamics, and my major field is hydrodynamics.
25 Q. Okay. Then you said you had gone to

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1 MIT?
2 A. Yes.
3 Q. What was your position at --
4 A. At MIT, I went there for my
5 sabbatical year. Title was visiting Peadbody
6 associate professor. Then I remained there. They
7 convinced me to stay while I was there. So I
8 remained there for five years basically.
9 Q. Okay. What was your field of study?
10 A. Field of study, again naval
11 architecture. The group was the ocean engineering
12 group, but since I am a naval -- ocean engineering
13 covers even more applications than naval
14 architecture, but my field was naval architecture and
15 hydrodynamics.
16 Q. Then currently -- you may have
17 already stated this. I apologize if you have. Then
18 when you came to Virginia Tech, what was your title
19 there?
20 A. I joined as associate professor.
21 Then I was promoted as -- to professor two years ago,
22 three years ago.
23 Q. Again, so what's your field of study
24 at Virginia Tech?
25 A. Okay. Naval architecture and marine

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1 engineering, yes.
2 Q. All right. What is the earliest date
3 that you've worked with hydrofoils?
4 A. Good question. I would say before I
5 moved to MIT, so my first research project that was
6 funded by the Office of Naval Research when I was
7 still in Italy, and it involved hydrofoils, special
8 kind of hydrofoils, for very high speeds. It was
9 2000 -- around 2009-2010. That is the first time I
10 studied hydrofoils for research and studied hydrofoil
11 also as a student in a different way.
12 Q. So that project in 2009-2010. I
13 believe you said it was hydro -- high-speed
14 hydrofoils?
15 A. Exactly.
16 Q. What type of watercraft was that?
17 A. It was a surface craft, hydrofoil
18 craft, yes.
19 Q. I apologize if this is an unartful
20 question. When you say surface craft --
21 A. Surface craft means that it's meant
22 to operate at the surface, over the sea. It
23 doesn't -- it doesn't detach from the surface. It
24 maintains at least the hydrofoils in the water,
25 right? Nor does it dive under water. Otherwise, you

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1 would call it underwater.
2 Q. Was this a large craft, small craft?
3 A. Yeah, the size can change. The study
4 was more general, but it was -- you could say that
5 the application could be for crafts, between -- I
6 don't know -- 10 meters and 20 meters of length, yes.
7 Q. What came of that research? Was
8 there a boat developed based on that research?
9 A. Boat developed, and a lot of research
10 to design the hydrofoils and make sure that it
11 performed in a predictable and stable way.
12 Q. Since that time have you been
13 involved in any other research projects involving
14 hydrofoils?
15 A. Yes. Actually, almost continuous I
16 would say.
17 Q. Do you recall when you were first
18 retained for these matters that we are here for
19 today?
20 A. Not exactly, but I believe sometime
21 around September last year, August. I don't remember
22 exactly when it all started. I think we started the
23 communication earlier, but then the actual, I mean,
24 study I made was around September.
25 Q. Okay.

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1 A. Yeah, I didn't check the dates.
2 Sorry.
3 Q. So I assume you have an engagement
4 letter?
5 A. Yes, yes.
6 Q. Is that engagement letter with
7 counsel, or is it with Foil Boarding Company?
8 A. I think it's -- if I remember, it's
9 with the company, and it was through the attorney's
10 office.
11 Q. Okay.
12 A. All my communication is always passed
13 through the attorney's office.
14 Q. I'm going to show you a document
15 here, and it's been designated in the 86 IPR as Foil
16 1002. Do you recognize this document?
17 A. Yes.
18 Q. Can you tell me what that document
19 is?
20 A. It's my declaration, right, written
21 declaration for one of the two patents. Should be
22 cited. Yes, it is 044.
23 Q. Okay. If you would look, I believe
24 it is page 91. Should be the last page there.
25 A. Okay.

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1 Q. Is that your signature, Doctor?
2 A. Yes, it is, yes.
3 Q. Doctor, did you write this
4 declaration?
5 A. The -- yes, most of it, yes.
6 Q. When you say most of it, was there
7 someone that helped you write it?
8 A. I received a first draft from the
9 attorney which I completed with all the technical
10 parts, yes.
11 Q. Do you remember how much time you
12 spent preparing this declaration?
13 A. Not exactly, but yeah, I -- I don't
14 remember exactly. It took some time.
15 Q. Okay. Would you say it was more than
16 ten hours?
17 A. I don't remember exactly, but it --
18 yeah, probably, maybe, yeah.
19 Q. Maybe ten?
20 A. Yeah.
21 Q. Do you recall how much that you
22 have -- that you charged for the preparation of this
23 declaration?
24 A. I -- my rate at that time was \$400
25 per hour, yes.

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1 Q. Okay. You don't know the total
2 charge amounts?
3 A. I don't remember. Yeah, I don't
4 remember now. I can go back and check.
5 Q. We can just do a little housekeeping
6 here, too. I'm going to show you another document
7 here that is labeled Foil 1002, but it's for the 85
8 IPR. Take a look at that. Do you recognize this
9 document?
10 A. Yes. It's the other declaration,
11 yes.
12 Q. It's for the 659 patent?
13 A. 695, yes.
14 Q. Is that your signature?
15 A. Yes.
16 Q. On --
17 A. On the last page, yes.
18 Q. 83?
19 A. Yes.
20 Q. Real quick, Doctor, I meant to tell
21 you, too, earlier when we talking sort of ground
22 rules, if at any point you need to take a break, just
23 let me know. We can obviously do that. The only
24 thing that I would ask is if there's a pending
25 question, just answer that, and then we'll take a

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1 break.

2 With respect to this declaration that

3 you are looking at now, would it be accurate to say

4 the same thing occurred in that counsel sent you a

5 first draft, and then you --

6 A. Yes.

7 Q. -- worked on it from that point?

8 A. Exactly.

9 Q. I'm going to show you another

10 document here that is labeled Foil 1001, and it's the

11 U.S. patent 9359044 or the 044 patent. That is the

12 patent at issue in the 86 IPR.

13 A. Yes.

14 Q. Do you recognize that patent?

15 A. Yes.

16 Q. Had you ever seen that patent prior

17 to --

18 A. Before, no.

19 Q. I'll show you another one here that

20 is labeled Foil 1015. It's the U.S. patent 9586659.

21 Do you recognize that document --

22 A. Yes.

23 Q. -- as the patent at issue in the 85

24 IPR?

25 A. Yes.

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1 Q. So I believe you testified earlier

2 that -- so you had never seen the -- it is true to

3 say you had never seen the 659 or the 044 patent

4 prior to your engagement by Foil?

5 A. Yes.

6 Q. That's correct?

7 A. Yes.

8 Q. I should have asked earlier, but I

9 believe you had testified that you had not -- that

10 you have not been involved in any patent cases

11 before?

12 A. Yes.

13 Q. Do you have any patents as an

14 inventor?

15 A. Yes.

16 Q. Do you know how many?

17 A. About ten probably, maybe 11.

18 Q. Can you say that again?

19 A. Probably the total is 11 with the two

20 pending patents. So I'm familiar with the patenting

21 process a little bit.

22 Q. Do any of the patents that you have

23 as an inventor, do any of the pending applications

24 you have as an inventor deal with hydrofoils?

25 A. Yes. At least one.

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1 Q. Do you recall which one that is?

2 A. For the hydrofoil craft we talked

3 about before, but actually there is a second one

4 actually that involves hydrofoils as well. Yes,

5 correct.

6 Q. In any of your research have you done

7 work with airplanes?

8 A. Airplanes, no, I wouldn't say so.

9 Q. Do you have any education in

10 aerospace engineering?

11 A. Aerospace? No.

12 Q. Have you heard the term with respect

13 to patents, have you heard the term "claim

14 construction"?

15 A. Yes.

16 Q. Do you have an understanding of what

17 that means?

18 A. I think I explain it in here. So let

19 me. I wouldn't -- I would like to avoid to describe

20 it in a different way. It must be written in the

21 preamble. I can't find it right now. I think the

22 claim constructor is the definition of claims that a

23 patent does, right? Is it correct?

24 Q. Have you -- I assume, because you've

25 never been involved in patent litigation before,

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1 that have you gone through a claim construction

2 process in the past?

3 MR. BRIDGES: Objection to form.

4 MR. THEUERKAUF: Okay.

5 BY MR. THEUERKAUF:

6 Q. I guess I'll just -- have you been

7 asked outside of this matter to construe the claims

8 of a patent before?

9 A. Yes, yes, when I -- when I had to

10 describe the object of my patents.

11 Q. Have you in your own patents, have

12 you had any experience in drafting the claims

13 yourself?

14 A. Yes.

15 Q. Have you --

16 A. Sometimes they were drafted by legal

17 experts. Some other times on the basis of my initial

18 drafts. Some other times they were drafted on the

19 basis of a conversation and description that I gave

20 to the legal experts.

21 Q. Okay. In your declarations -- let's

22 take, I guess, first the declaration related to the

23 044 patent. Starting at page 5, there is a section

24 titled Legal Principles. Do you see that?

25 A. Yes.

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1 Q. It end on page 8?
2 A. Yes.
3 Q. I guess, for a lack of better words,
4 where did you obtain the information regarding the
5 legal principles?
6 A. From the attorney's office, yes.
7 Q. So were you aware of these -- any of
8 these legal principles prior to counsel providing
9 them to you?
10 A. In a general sense, yes. As
11 principles, they have been drafted very well by the
12 attorney's office obviously.
13 Q. Prior to your involvement in these
14 matters, have you ever been asked to conduct an
15 invalidity analysis before?
16 A. No.
17 Q. Do you know what -- sorry. Go ahead.
18 A. Again, in a broader sense some
19 analysis of this kind to verify that my patent were
20 valid. So I counterchecked my patents against the
21 state of the art and other patents to be sure my
22 intention could be protected, yes.
23 Q. Do you know whether any of your
24 patents have been challenged before?
25 A. Challenged? Not that I know.

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1 Q. So on page 9 of your 044 declaration,
2 there's a publication mentioned there, Etkin and Reid
3 Dynamics of Flight Stability and Control?
4 A. Yes.
5 Q. Do you see that?
6 A. Yes.
7 Q. What is your experience with that
8 publication?
9 A. I studied this text for my research.
10 Q. Your research related to these
11 matters?
12 A. Part of it, yes.
13 Q. Have you had experience with that
14 text prior to your involvement with these matters?
15 A. Yes.
16 Q. In what way?
17 A. Again, as a reference textbook to
18 consult to address different kinds of studies,
19 involving hydrofoils obviously. The textbook talks
20 about airplanes obviously, but same principles and
21 methods can be applied to hydrofoils. Same -- maybe,
22 yeah.
23 Q. Sorry?
24 A. Maybe you should know that professors
25 usually read a lot of different books not necessarily

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1 related to their field of expertise because they like
2 to study.
3 Q. I'm going to show you -- a little bit
4 more housekeeping here. So I'm going to show you
5 first what was marked as Foil 1011. It's U.S. patent
6 6443786. Have you seen that document before?
7 A. Yes.
8 Q. It's the Woolley patent. It's
9 referred to as Woolley patent.
10 A. Yes.
11 Q. Is that -- was that the first time
12 that you saw the Woolley patent in conjunction with
13 your work on these matters?
14 A. Yes.
15 Q. Then I'm going to show you what is
16 marked Exhibit 3001, and it is U.S. patent 6234856.
17 Do you recognize that document?
18 A. Yeah, yeah. It's the previous
19 version, I believe, of the same inventor.
20 Q. Have you studied that document
21 before?
22 A. I studied one of them. I cannot tell
23 you which one of the two, but yes, one of the two, I
24 studied it. I cannot tell right now, if I look into
25 here, there will be the exact reference. I can tell

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1 you, yeah, the first one, yes.
2 Q. The 786?
3 A. 786, which is referenced in my
4 declaration.
5 Q. So I assume, too, you are also
6 familiar with what's been referred to as the Evolo
7 report?
8 A. Yes.
9 Q. I'll represent to you that the Evolo
10 report has been labeled in these matters as 41003.
11 We can get you copies if you want, but I don't know
12 that we need to -- obviously by -- if I ask any
13 specific questions about the Evolo report, I will
14 give you a copy, but --
15 A. Okay.
16 Q. -- it's a large document. So I'm
17 trying to avoid having to do that.
18 MR. BRIDGES: For clarification, there
19 are multiple exhibits regarding the Evolo
20 report. I want the record to be clear. We
21 have both the Swedish language version and
22 then multiple parts, I think five, because
23 of it's size. I want to make sure it's
24 clear.
25 MR. THEUERKAUF: Correct. The Foil 1003

Page 25 1 is in four parts. That is the English 2 translation. 3 MR. BRIDGES: We'll just add -- if you 4 ask questions about it or if it's referred 5 to, we'll make sure we are referring to the 6 correct one. 7 BY MR. THEUERKAUF: 8 Q. And do you recall, did you study the 9 English version? 10 A. Yes. I don't understand Swedish. I 11 went through the pages to see if there was 12 correspondence at least from the figures and the 13 creations, but yes, I studied mostly in the English, 14 only the English version, yes. 15 Q. In the context -- if you want to 16 refer to the 044 patent, which again is Foil 1001, 17 and specifically in regards to claim 1 of that 18 patent -- 19 A. Yes. 20 Q. -- you understand, correct, that the 21 claim 1 one recites as part of the claim that it's 22 designed to provide passive static stability? 23 A. Passive -- claim 1 says passively 24 stable. 25 Q. Let me refer you to -- it's the	Page 27 1 developed in water tend to restore the device on to 2 the initial equilibrium condition. That is static 3 stability, because it neglects dynamic effects. 4 Dynamic effects can be neglected if this happens very 5 slowly so that you can neglect velocity and 6 acceleration effects. 7 Q. Have you seen the claim construction 8 that was given to that term "static stability" by the 9 district court in a separate piece of litigation? 10 A. I'm sorry? 11 Q. By the district -- by a district 12 court in a separate piece of litigation? 13 A. No. 14 Q. You -- okay. Are you familiar 15 with -- or have you looked at any documents that you 16 are aware of that relate to a litigation between my 17 client, MHL Custom, Inc. and a company called Wadoo? 18 A. Yes. 19 Q. You have seen documents from that 20 case? 21 A. Yes. 22 Q. Were you aware or are you aware that 23 the Court in that case, in the Wadoo case, construed 24 the term "static stability"? 25 A. Yes, but by -- but I didn't elaborate
Page 26 1 paragraph in claim 1 that begins, "A hydrofoil 2 fixedly interconnected." Do you see that? 3 A. Fixedly interconnected, yes. 4 Q. Do you see there it says -- 5 A. There it is static, yes. 6 Q. It says, "The Hydrofoil, having no 7 movable surface and designed to provide passive 8 static stability, controlled solely by weight shift 9 of the user"? 10 A. Correct. 11 Q. In the context of the 044 patent, 12 what does the term the "static stability" mean to 13 you? 14 A. Yeah. Static stability means that -- 15 let me give a proper definition. Starting from an 16 equilibrium condition, right, if you perturb at the 17 angle, either pitch -- in this case I believe they 18 are mostly concerned with pitch. But perturb the 19 equilibrium condition with a small variation of pitch 20 angle in that case, small and slow variation, so slow 21 that you can neglect the dynamic effects, the device 22 is able to produce restoring moment that will bring 23 you back to the equilibrium motion. So you perturb 24 the equilibrium condition, and you are not in 25 equilibrium anymore, but forces and moments that are	Page 28 1 on that. 2 Q. Then you had just given us your 3 explanation of static stability. What does that -- 4 A. The definition that I believe 5 every -- 6 Q. Sorry. 7 A. A definition that I believe every 8 professor of naval architecture or even aerospace 9 engineering would give -- 10 Q. Then in the context -- 11 A. -- that you can find in referenced 12 textbooks. There's no need to reconstruct the 13 definition of static stability in my opinion. 14 Q. Then in the context of the 044 15 patent, in that same claim phrase that we were 16 looking at, what does it mean then when it says -- 17 what's your understanding then when it says passive 18 static stability? 19 A. Passive? My understanding of 20 passive, after analyzing patents, is that there are 21 no means of active control. So passive means that 22 you have no means of controlling the forces, yes, 23 force. 24 Q. I think you had said earlier that in 25 static stability there's are the forces and moments

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1 that would return it to the equilibrium position?

2 A. Yes.

3 Q. Is that correct?

4 A. Correct.

5 Q. Is it your position then when it says

6 "passive static stability" that there are no active

7 control mechanisms to return it to that equilibrium

8 position? Is that correct?

9 A. That's correct.

10 Q. And so are you familiar then -- is

11 there a concept then of active static stability?

12 A. That is stability achieved under

13 active controls. Yes.

14 Q. Can you describe for us what that

15 would be? What type --

16 A. Yes. For instance, you could have

17 movable flaps. You could move flaps. You could

18 orient the wind, different angle of attack, by some

19 mechanism that needs to be controlled. Right. In

20 this case there is none of such devices. Although

21 there is a patent managements to -- let me cite it

22 perfectly. It mentions the possibility for the human

23 that is on board to shift his weight on board.

24 Q. So with respect to your declaration

25 and the study of the Woolley -- is it okay if I refer

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1 to the one patent as the Woolley reference?

2 A. Yes. Thank you.

3 Q. With respect to your study of the

4 Woolley reference, in the Evolo report and your

5 opinions given in both of your declarations -- I'm

6 sorry. Not both, but in your opinions given in your

7 declaration for the 044 patent, were you applying

8 that means of passive static stability that you just

9 gave to us?

10 A. Yes.

11 Q. In your answer in regards to static

12 stability, you mentioned equilibrium. Can you

13 explain what you mean by equilibrium?

14 A. Equilibrium is where -- it happens

15 when all the forces acting on the system -- the

16 system in this case is the foil board, human on

17 board -- all the forces and moment, are balanced. So

18 the sum of the forces is equal to zero, sum of

19 moments equal to zero in every direction. Of course

20 equilibrium implies a steady state condition.

21 Equilibrium can only happen when you are travelling

22 at a constant speed, right? You will achieve a

23 constant altitude, too.

24 Q. Would that still be your

25 understanding of equilibrium in the context of the

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1 044 patent?

2 A. Let me explain. You cannot speak

3 about stability. The concept of rigid body to be

4 stable cannot be separated from the equilibrium. So

5 the assumption is you start from an equilibrium

6 condition, and then from that equilibrium condition

7 you are stable. The two concepts go together.

8 Q. Is that your understanding of

9 equilibrium in the context of the 044 patent?

10 MR. BRIDGES: Objection to form.

11 MR. THEUERKAUF: Let me rephrase because

12 I want to be sure we are clear here.

13 BY MR. THEUERKAUF:

14 Q. So your explanation of equilibrium

15 that you just gave, is that your understanding in the

16 context also of the 044?

17 MR. BRIDGES: Again -- go ahead.

18 MR. THEUERKAUF: Yeah.

19 MR. BRIDGES: Object to form. You can

20 answer.

21 MR. THEUERKAUF: I just want to be sure

22 because I want -- what's wrong with the

23 question so we can clear --

24 MR. BRIDGES: Because the term

25 "equilibrium" is used in the specification

Page 32

1 in several places in the 044, but he was

2 also talking about equilibrium as it is used

3 with respect to static stability, and so I'm

4 not clear if you are talking about it as it

5 relates to his understanding of the term

6 "static stability" or in as that term might

7 be used throughout the specification.

8 MR. THEUERKAUF: Fair.

9 BY MR. THEUERKAUF:

10 Q. In the 044 patent there is mention of

11 equilibrium, correct?

12 A. I believe so, yes.

13 Q. In your study of the 044 patent,

14 would your understanding of -- or after having read

15 and studied the 044 patent, is the way the 044 patent

16 uses the term "equilibrium" different from how you

17 just explained equilibrium to us?

18 A. I think they call it longitudinally

19 trimmed motion. For them that is the equilibrium

20 condition. That corresponds to the equilibrium

21 condition.

22 Q. Is the understanding -- the

23 understanding you gave us of equilibrium, is that

24 different than what you believe equilibrium or how

25 equilibrium is being discussed in the 044?

Page 33

1 A. No, I don't think so.

2 Q. Okay. So is it also your

3 understanding then that the terms trim and

4 equilibrium --

5 A. Trim motion, trim motion, my

6 understanding is longitudinally trim motion means an

7 equilibrium condition, yes.

8 Q. With respect to the Woolley reference

9 that you studied, does it discuss equilibrium?

10 A. Not in let's say very scientific --

11 it mentions equilibrium, yes, and it mentions

12 stability as well. I don't believe that it goes in

13 much more detail. The references is there. But --

14 listen, among engineers, the concept of equilibrium

15 condition is unequivocal. There isn't a possibility

16 for multi different definitions of equilibrium.

17 There is just one. That is -- you cannot -- okay.

18 Q. So --

19 A. If somebody mentions equilibrium, I

20 understand the universe of the definition of

21 equilibrium that all engineers use. There's no need

22 to redefine it in a patent, I believe.

23 Q. Do you have any belief that in the

24 Woolley reference that they're using the term

25 "equilibrium" different than how you would understand

Page 34

1 it?

2 A. No, I don't think so.

3 Q. Before I forget, have you by any

4 chance spoken to the inventor of the Woolley

5 reference?

6 A. No. Unfortunately, no, none of these

7 inventors. Maybe instructed, but --

8 Q. Have you spoken to any of the

9 students who are professors involved with the Evolo

10 report?

11 A. No. Spoken about this matter you

12 mean, yes.

13 Q. So you haven't spoken to anybody --

14 let me just -- so with respect to the Evolo report,

15 have you spoken to any of the students or the

16 professors?

17 A. Not about this matter because I know

18 one of the students who happens to be a professor now

19 here in the U.S., but we never -- we have never

20 spoken about this. She doesn't even know I serve as

21 an expert witness.

22 Q. I see. Okay.

23 A. But I speak to her about other stuff.

24 I avoided deliberately speaking to her about this.

25 Q. So with respect to the concepts we've

Page 35

1 just been discussing, both equilibrium -- well, let

2 me back up first. You gave us or spoke to us about

3 your understanding of static stability and passive

4 static stability. Are you familiar with the term or

5 concept of "dynamic stability"?

6 A. Yes.

7 Q. And can you give us your

8 understanding of dynamic stability?

9 A. Yes. I think I mentioned it before a

10 little bit. So when you verify your -- analyze the

11 dynamic stability, you introduce or you account for

12 other dynamic forces that originates from velocity

13 and acceleration of the motions. So, for example, if

14 you focus on pitch, you will consider forces and

15 moments due to pitch velocity, pitch rate and pitch

16 acceleration as opposed to static stability which

17 neglects these kind of hydrodynamic forces and

18 movements.

19 Q. So something -- well, I'm trying to

20 think of the best way to ask the question. How

21 are static stability and dynamic stability related?

22 A. Related? You could say that dynamic

23 stability comprises static stability, or actually

24 dynamic stability goes one step beyond static

25 stability, because it considers additional effects

Page 36

1 due to motion, velocities and motion accelerations.

2 If you like, it's a more accurate way of estimating

3 the stability of the motion of --

4 Q. Is it accurate to say that -- that

5 you cannot be dynamically stable unless you are

6 statically stable?

7 A. That's a good question. Why are you

8 asking this?

9 Q. Because it's related to these

10 patents.

11 A. Let me think about it. So the easy

12 answer is yes, you cannot be dynamically stable --

13 and a lot of references textbooks will tell you this,

14 yes. So first the static stability is a necessary

15 condition to achieve also dynamic stability. That is

16 true. If you are statically stable -- you need to be

17 statically stable to -- it will help dynamic

18 stability. There may be cases, though, I believe,

19 where you can achieve dynamic stability if you are

20 not statically stable.

21 Q. Okay.

22 A. But what you say is true in most

23 cases, yes.

24 Q. So what you are -- just be sure I'm

25 clear. In most cases you are saying it's true

Page 37

1 that --

2 A. It helps. Static stability helps to

3 verify dynamic stability.

4 Q. To be clear, you're saying in some

5 cases you could be dynamically stable without being

6 statically stable?

7 A. I have -- yeah, yeah, to think about

8 it, it could -- I think it could happen, yes.

9 MR. BRIDGES: When you reach a point

10 that's comfortable for a break --

11 MR. THEUERKAUF: Actually, I was just

12 getting ready to do that myself.

13 (Whereupon, a recess was taken.)

14 BY MR. THEUERKAUF:

15 Q. Professor, right before the break, we

16 were talking some about dynamic stability. You had

17 mentioned that you thought there might be other --

18 that there probably were conditions where you could

19 be dynamically stable but not statically stable?

20 A. Yeah.

21 Q. In what context, what conditions are

22 you talking about where that could occur?

23 A. For instance, typically ships are

24 statically unstable to yaw, but many of them are

25 dynamically stable to yaw.

Page 38

1 Q. You say statically unstable in yaw

2 but dynamically stable in yaw?

3 A. Yes, exactly.

4 Q. So --

5 A. Because when you study the stability,

6 you should actually consider the effect of all forces

7 in moment deriving from all motion. Very often, as

8 in the case of this patent, you isolate a particular

9 motion like pitch, and you consider that motion in

10 isolation. That is wrong from a fundamental point of

11 view, because in reality you cannot just have pitch

12 motion alone, right? You will have other motion

13 happening while pitch is changing, and these other

14 motions actually produce additional forces in the

15 moment, which may actually contribute or not

16 contribute to dynamic stability.

17 So a proper way to verify dynamic

18 stability is not to isolate a motion from any other,

19 like it's done in this patent. It's wrong. It's

20 flawed. And second, include the effects of all the

21 degrees of freedom, other degrees of freedom. So

22 when I tell you a ship will be dynamically stable in

23 yaw, it's because I consider also sway, for instance.

24 The effect of sway motion that will happen at the

25 same time with yaw.

Page 39

1 Q. Still speaking of dynamic stability,

2 in a dynamic -- in a dynamically stable craft, is it

3 also returning to the equilibrium position that you

4 discussed earlier?

5 A. Eventually, yes.

6 Q. And so is there a time component to

7 dynamic stability?

8 A. Time component. There may be

9 different ways actually to return to the equilibrium

10 condition, yes, because you are now solving for the

11 motion in time, right? Static doesn't have time as a

12 variable. Dynamic has time to follow the actual

13 motion. But as I told you, you shouldn't focus and

14 isolate to just one motion. You should consider all

15 of them at the same time if you want to do it

16 properly. Then if you want to simplify, you can

17 simplify, but then the result may be wrong or too

18 approximate. There are various levels of

19 approximations in fact.

20 Q. Okay. So just, again, apologize for

21 repeating. I want to be sure I'm clear. So when we

22 were discussing static stability, I believe -- I

23 don't want to put words in your mouth. Correct me if

24 I'm wrong. But with respect to static stability, the

25 device is -- when it's disturbed, is going to have

Page 40

1 forces of moments that are created that give it an

2 initial tendency to return to its equilibrium

3 position?

4 A. Exactly. It's like -- you start from

5 an equilibrium condition. We established that. Then

6 perturbing it means you don't consider the transient

7 that will be there while you pass from the

8 equilibrium condition to the perturbed condition.

9 You don't consider it. You put it there kind of

10 instantaneous, right? And then you see what happens

11 there in static condition. If the forces in moment

12 will tend to restore the vehicle to the initial

13 referenced equilibrium condition, then you say that

14 it's stable, statically stable. While dynamically

15 stable, you perturb there, and then you follow all

16 the transient that will eventually, eventually bring

17 you back to the initial equilibrium condition.

18 Q. That's why we say time is involved

19 with dynamic stability?

20 A. Time is involved.

21 Q. Because it eventually gets back to

22 the equilibrium position?

23 A. Because it's stable, yes. And the

24 usual simplification that is always done is to assume

25 that this perturbation is a small perturbation from

Page 41 1 the equilibrium condition. If it's a large 2 perturbation, that's a whole other problem. 3 Q. In your study of the -- 4 A. Sorry. And I finish. When you 5 consider -- if you consider a large perturbation, you 6 may not return to the initial equilibrium condition. 7 Q. So we were talking about equilibrium 8 and stability. Can something -- can a craft, 9 hydrofoil craft, for example, be in equilibrium but 10 not be stable? 11 A. Oh, yes. But wait, wait, wait, wait, 12 wait. Okay. From a practical point of view, no, 13 because from an abstract point of view, which is when 14 you study the nature of the equilibrium, you first 15 find equilibrium condition and then verify if there 16 is a static stability around that equilibrium 17 condition, but you are at an abstract level. If you 18 are talking about practical, real life, if you are 19 not stable, right, you will never establish 20 equilibrium condition, right. 21 Q. So I just -- 22 A. You may find another equilibrium 23 condition. As I told you, the concept of stability 24 refers to an initial equilibrium condition. You 25 cannot tell you are stable at every condition, or you	Page 43 1 talking about, these patents, hydrofoil device, can 2 it be stable but not have an equilibrium? 3 MR. BRIDGES: Object as to form. 4 THE WITNESS: No. 5 BY MR. THEUERKAUF: 6 Q. Let me ask just to clear because of 7 the objection, but with respect to your study of -- 8 A. If you're stable, let me -- let me -- 9 if you are stable, it means that there is an 10 equilibrium condition around which you are stable. 11 Q. Okay. 12 A. So if you tell me I'm stable, I 13 should ask you stable around what? Equilibrium 14 condition. Which condition? Tell me the condition, 15 right? Can't be stable in general. 16 Q. So without an equilibrium, you can't 17 be stable? 18 A. Yeah, because simply the concept of 19 stability implies that there is an initial 20 equilibrium condition, that there is equilibrium 21 condition. Somehow it's perturbed. Then if you're 22 stable, you will get back to the equilibrium. 23 Q. So in the 659 patent, also looking at 24 claim 1 of that patent -- 25 A. 659.
Page 42 1 can tell, but you have to verify every condition. 2 When you say you are stable, you have to say also 3 what is the initial equilibrium condition. The two 4 concepts goes hand in hand. 5 Q. Okay. 6 A. So if you're unstable -- suppose I 7 take this equilibrium condition, and I tell you I am 8 unstable at this equilibrium condition. This means 9 that this equilibrium condition cannot exist, cannot 10 be achieved. It is still possible that vehicle finds 11 another equilibrium condition. It is possible that 12 the vehicle finds another equilibrium condition at 13 which it will be stable. So that equilibrium 14 condition is practically achievable. 15 Q. Okay. And again, I apologize if I'm 16 repeating here, but again, I'm just trying to be sure 17 I'm understanding. I believe what you have said is 18 if the craft is not stable, you will never reach an 19 equilibrium position? 20 A. If the craft is not stable from a 21 given equilibrium condition, it will never reach that 22 equilibrium condition. It will reach maybe another 23 equilibrium condition, yes. 24 Q. Maybe I'll ask it a different way. 25 Maybe it will help. Can a device like we have been	Page 44 1 Q. Correct. 2 A. Claim 1, yes. 3 Q. You'll see at the beginning of claim 4 1 it says, "A passably stable weight shift controlled 5 personal hydrofoil watercraft." Do you see that? 6 A. Yes. 7 Q. What is your understanding in the 8 context of this patent what passively stable means? 9 A. Okay. It is defined in -- at the 10 way -- the way the inventor defined stability is -- 11 or verifies stability is described in this paragraph, 12 page -- column 6 of the patent. And it gives an 13 equation, right? The pitching moment coefficient can 14 be written as CM equals CM, C, sub M, knot, plus C, C 15 sub N, alpha times alpha, times C, sub M, Q times Q, 16 and it describes. Then he says, "To ensure a 17 trimmable, stable hydrofoil, the following condition 18 must be true" -- and CM alpha less than zero -- so 19 here, as I told you, the inventor isolates, 20 artificially isolates, one motion, one degrees of 21 freedom, pitch, from all our possible motion 22 happening in reality. And then it analyzes that 23 motion, the moment of pitch due to variation of angle 24 of attack alpha, which is regarded as a static 25 variation. So when I analyze the static stability, I

Page 45 1 change the angle of attack or I change the flying 2 height, if I consider heave, or I change the yaw 3 angle if I consider yaw. Then I look to the forces 4 in the moment, and I see they will -- but all of them 5 together, not just those due to a change of pitch 6 angle. 7 Okay. Here he considers a change of 8 pitch angle or angle of attack and the pitch rate, 9 the moment, the pitch moment produced by the pitch 10 rate, which is a dynamic component, because now we 11 consider the velocity at which pitch is changing over 12 time. So now there's time. 13 If we want to be exact, we should 14 also consider the moment due to the acceleration of 15 pitch, because when pitch changes, it may change with 16 no acceleration, constant velocity, or it may change 17 with variable velocity over time, which implies an 18 acceleration. And the most general condition is when 19 it changes with the variable velocity over time. 20 So if we want to be exact and 21 precise, we should add another term which is not in 22 here, that implies pitch moment due to pitch 23 acceleration, which is called added inertia moment. 24 Now, 90 percent -- I cannot tell you 25 a precise figure, but 90 percent of aeronautical	Page 47 1 same explanation is given in both patents, right? 2 Q. Okay. 3 A. And in one patent they actually call 4 it static, as you actually noted, let me note, and in 5 the other they don't. They avoid to do that, 6 probably deliberately, because somebody might have 7 objected to it. 8 Q. So with respect to your study of -- 9 let me ask this. That understanding then of claim 1 10 of the 659, and that understanding being that stable 11 is referring both to static and dynamic, did you 12 apply that understanding in your analysis of the 13 Woolley -- the Woolley reference and the Evolo 14 report? 15 A. Yeah. 16 Q. If we look at your declaration for 17 the 044 patent -- I'm specifically on page 22 where 18 there is a discussion of the Woolley reference -- in 19 paragraph 56 you are stating that the front blade or 20 front wing of the Woolley device is causing an upward 21 lifting force; is that correct? 22 A. Yeah, because -- yeah. 23 Q. Okay. Then in the next paragraph you 24 are talking about the rear blade or rather wing of 25 the Woolley device, and that creates a downward
Page 46 1 engineers will tell you that this moment is 2 negligible, true when you are in the air, not true 3 when you are in water, because added mass and added 4 inertia forces, moments, are very important in water 5 as opposed to air. 6 So clearly -- you can clearly see 7 this is an aeronautical engineer approach to some 8 kind of dynamic stability verification, which I 9 repeat is very simplified because it isolates pitch 10 from any other motion that will happen in reality. 11 Q. So -- 12 A. So this is their concept of stability 13 as defined by this paragraph, and it's, if I can tell 14 you, fundamentally inaccurate. I don't say it's 15 wrong, but it's not perfect. 16 Q. So I guess getting back to my 17 question, though, is the term "stable" used in claim 18 1 of the 659, is it your understanding that it's 19 referring to static dynamic -- sorry. Let me finish 20 my question. Is it referring to static and dynamic 21 or static or dynamic or just one or the other? 22 A. As it is defined in column 6, it 23 refers to a tentative of very fine dynamic stability, 24 static and dynamic stability, and a tentative, which 25 is fundamentally inaccurate. Okay. Actually, the	Page 48 1 force; is that correct? 2 A. True. 3 Q. Then ultimately you state at the end 4 of paragraph 57 the use of counteracting forces 5 between the upward force caused by the forward blade 6 of the hydrofoil, and the downward force caused by 7 the rear blade of a hydrofoil is a well-known method 8 for increasing pitch stability by a POSITA. Do you 9 see that? 10 A. Yes. 11 Q. Is that an accurate statement? 12 A. The concept is -- it could be phrased 13 differently maybe. I didn't phrase it in the best 14 possible way. But the concept is this -- and it's 15 well known by aeronautical engineers that design 16 wings with the tails, tail stabilizers. Typically 17 the wing, the main wing, produces upward lift, and to 18 be stable in pitch, the tail stabilizer typically has 19 negative lift, because that configuration is more 20 prone to be stable than other configurations. 21 Q. Okay. Is the statement here, the 22 last sentence of paragraph 57, is that saying that 23 the front blade and the rear blade counter each other 24 or, in other words, result in zero rotation in pitch? 25 MR. BRIDGES: Object as to form.

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1 THE WITNESS: Should I -- so -- okay.
2 Let me clarify. Counteracting here doesn't
3 mean that the lift produced by the front
4 blade is cancelled out by the rear blade.
5 Obviously not, because otherwise you
6 wouldn't sustain the weight of the vehicle.
7 So front wing is giving positive lift,
8 upward lift, much greater than the negative
9 lift provided by the rear wing. Okay.
10 Then, yes, to achieve an equilibrium
11 condition, the total moment, sum of the
12 moment acting on -- on the craft will be
13 zero obviously.
14 BY MR. THEUERKAUF:
15 Q. So again I just want to be sure. So
16 this statement, the last sentence of paragraph 57, is
17 it accurate to say then what you're conveying here is
18 that the sum of the moments between the front wing
19 and the rear wing are zero?
20 A. No. You need to consider all the
21 moments acting on the device, the moment, the weight
22 of the human being on board. No, I'm not saying that
23 the moment -- the sum of the two moments needs to be
24 zero, no. What I'm saying is this kind of
25 configuration where the front main wing produces

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1 positive lift, that's much greater than it should be
2 do if it was alone. So suppose you have to support a
3 total weight of 100 pounds. The front wing will need
4 to give more than 100 pounds of lift, because the
5 rear wing is actually giving negative lift. So, yes,
6 the sum of the forces, I'm saying to you, will be
7 equal to the weight that you have to support,
8 because, otherwise, you won't have the equilibrium in
9 the vertical direction. Right. Yes.
10 Q. So we are talking about then the
11 craft being in an equilibrium position; is that
12 correct?
13 A. If you consider -- yeah. Again,
14 because this -- if you consider this statement in the
15 context of stability, again, you have to start from
16 an equilibrium condition, and then you will check
17 what happens when you perturb it. And this
18 configuration is much more prone to give a restoring
19 moment that will bring you back to the initial
20 equilibrium condition and then other configurations.
21 It's a well-known principle to any aeronautical
22 engineer.
23 Q. This statement, the last sentence of
24 paragraph 57, it doesn't say anything about those --
25 about the change in forces or the restoring moments,

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1 correct?
2 A. No, no, but it talks -- it highlights
3 the fact that you want to have negative lift in the
4 rear blade that somehow reduces the positive lift
5 that you produce with the main wing. It wants to
6 highlight this concept that is used. Many airplanes
7 fly this way, with the tail wing giving negative lift
8 and the main wing giving positive lift.
9 Q. But it doesn't speak to -- that
10 sentence, that statement in paragraph 57, doesn't
11 speak to the restoring moments that are created for
12 stability, correct?
13 A. No, no.
14 Q. Then on the front blade again --
15 A. Because I believe the goal of that
16 paragraph is to tell that this kind of configuration
17 is a good one to achieve stability. That's the
18 purpose of that statement.
19 Q. But that statement doesn't mean that
20 it would achieve stability?
21 A. If you can or cannot, it depends on
22 the actual geometry. I cannot tell you in general.
23 I cannot be so general. I can tell you, as I wrote
24 here, that it is a better configurations than others,
25 than others, yes, I can tell.

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1 Q. If we look at the -- let me ask this.
2 With respect to the device that's in the Woolley
3 reference and these statements in paragraph 57, if
4 the front blade is creating an upward force, and the
5 rear blade is creating a downward force, would this
6 not cause the device to nose up or torque up in the
7 pitch?
8 A. Yes, it produces -- yes, it produces
9 a pitch up, nose up at the moment, yes, which needs
10 to be balanced by some other moment, for instance, a
11 moment created by the weight of the passenger, right,
12 or propulsion, moment produced by the propulsion or
13 moment produced by the drag force. There's not just
14 lift.
15 Q. Still discussing the Woolley
16 reference, the device, the hydrofoil device in the
17 Woolley reference, is pulled by a towrope, correct?
18 A. That's right.
19 Q. So the propulsive force, if you will,
20 is a pulling force, correct?
21 A. Correct.
22 Q. The towrope is held by the user,
23 correct?
24 A. Yes.
25 Q. So that propulsive force is above the

Page 53

1 water, correct?

2 A. Yes, it is.

3 Q. That pulling force by the towrope is

4 obviously above the water but can be varied in the

5 vertical direction?

6 A. Sure.

7 Q. Correct?

8 A. Yes.

9 Q. If that towrope is lifted, what -- in

10 your opinion, what kind of effect would that have on

11 the hydrofoil?

12 MR. BRIDGES: Object as to form.

13 BY MR. THEUERKAUF:

14 Q. Let me ask a different question. If

15 the towrope lifted in the vertical direction so that

16 the pulling force is higher in the vertical

17 direction, would that tend to have an effect of the

18 hydrofoil pitching down?

19 A. Yes.

20 Q. If that towrope is lowered

21 vertically, would that have a tendency then to cause

22 the hydrofoil to pitch up?

23 A. Correct. The same way -- let me add,

24 for the patent we're discussing, when the human being

25 on board moves forward and aft, it will have the same

Page 54

1 kind of effect.

2 Q. If the propulsive force of the

3 Woolley device was placed below the water near the

4 hydrofoil using, for example, a propeller, would that

5 then cause the hydrofoil to have a tendency to pitch

6 up?

7 A. Oh, to pitch up with respect to what

8 condition? Where do you start from?

9 Q. An equilibrium position.

10 A. No, no, no. To pitch up with respect

11 to when you keep this propulsion force in the air --

12 Q. Say that again?

13 A. So you are moving the propulsion

14 force from the air down to the hydrofoil?

15 Q. Yes.

16 A. Yes. Then I tell you yes, that will

17 cause, with respect to that condition, will cause a

18 nose up.

19 Q. Okay. So just to be sure I'm clear,

20 so we take the towrope away --

21 A. No. You start from this condition

22 where the towrope is up in the air, and you move it

23 down.

24 Q. It would cause it to pitch up?

25 A. Yes.

Page 55

1 Q. If you were to take the towrope away

2 and place a propeller down at the hydrofoil, would it

3 cause it to pitch up?

4 A. With respect to when the towrope was

5 in the air, yes. With respect to -- you need to

6 start from -- with respect to the other hydrofoil

7 that has the propeller there, it won't have any

8 effect.

9 Q. I'm not sure I understand what you

10 mean.

11 A. You should tell me where you want to

12 arrive. Yes, I can tell you, yes, if you move the

13 rope from the air down to the foil level, yes, it

14 will give a nose up at the moment, which will break

15 the equilibrium, because we're assuming that we're

16 starting from an equilibrium condition. In this

17 condition, yes, when I move it down, yes, it will

18 break equilibrium.

19 Q. When you move the propulsive force --

20 A. In this case.

21 Q. Yeah. We are talking about the

22 Woolley reference and the Woolley device. When you

23 move the propulsive force down to the hydrofoil, it's

24 going to break the equilibrium position?

25 MR. BRIDGES: Object as to form.

Page 56

1 THE WITNESS: The initial, initial

2 equilibrium condition, that one, this one,

3 this one, in this condition. We're starting

4 from an equilibrium condition where the

5 towrope is in the air. If we move it -- if

6 I move any point of application, any force

7 from initial equilibrium, I will break the

8 equilibrium condition. That is clear to

9 anyone. I don't understand where you want

10 to arrive.

11 The same way if you move the propeller

12 of the patented invention from the level of

13 the hydrofoil up in the air, you will break

14 equilibrium the same way.

15 BY MR. THEUERKAUF:

16 Q. It wouldn't be stable then, right?

17 A. Stability is different. Stability is

18 different. The stability always needs to start from

19 an equilibrium condition.

20 Q. So if you don't have an equilibrium

21 position --

22 A. If you moved the rope down to the

23 hydrofoil, you need first to achieve equilibrium

24 condition, put yourself in equilibrium first. Then I

25 can tell you if you are stable or not. But first you

Page 57 1 need to be in equilibrium. So you probably will have 2 to adjust the hydrofoil shape, camber, angle of 3 attack to achieve equilibrium condition with the rope 4 down. Then I can tell you if that is stable or not. 5 By itself, the fact that you move the rope in a 6 different position doesn't say anything about the 7 stability by itself. No. It would only tell you 8 that you lose the initial equilibrium, yes. 9 (Whereupon, a recess was taken.) 10 MR. THEUERKAUF: I'm going to show you a 11 document here, and I'm going say this for 12 the record. 13 So it's Dr. Brizzolara's CV, and we've 14 labeled it for the IPR 2024-00085. We 15 labeled it MHL 2030, and for the IPR 16 2024-00086 we've labeled it MHL 2029. 17 BY MR. THEUERKAUF: 18 Q. If you wouldn't mind taking a look at 19 that document, please. Do you recognize that? 20 A. Yes. My CV, yeah. 21 Q. Is that your most up-to-date CV? 22 A. Not sure, because it's dated 2022. 23 Yes, there may be a most updated one. This is one of 24 them, an old one, I would say 2022, yes. It's two 25 years old.	Page 59 1 I was contacted by other two law offices to prepare a 2 written declaration. 3 Q. Who were you contacted by? 4 A. Now I don't remember the names, but I 5 can check. Two different law firms. 6 Q. Do you know who they were 7 representing? 8 A. Yes. One I remember because it's 9 easy to remember. It's Bombard. The other one is a 10 Chinese company. I don't remember exactly the name. 11 Shinzen something. 12 Q. Was it Shinzen Wadoo by any chance? 13 A. Oh, yeah, yeah. 14 Q. Then so prior to your engagement with 15 the Foil Boarding Company, had you talked to any 16 other attorneys or law firms regarding the 044 and 17 659 patents? 18 A. Prior to this, no. 19 Q. Do you recall -- 20 A. I don't think so, no, no. 21 Q. You hadn't? 22 A. No. 23 Q. Okay. Do you recall talking to any 24 attorneys with the law firm of Middleton Reutlinger? 25 A. No, that doesn't ring a bell.
Page 58 1 Q. Then I guess maybe we can get a more 2 up-to-date one later if it's necessary. 3 So prior to your engagement by Foil 4 Boarding Company in these IPR matters, were you 5 familiar with the company MHL Custom, Inc.? 6 A. No. 7 Q. You had not heard of them previously? 8 A. I mean, I knew of their foil boards, 9 yes. 10 Q. So you were aware of MHL -- 11 A. I didn't know -- I knew the website 12 and the foil boards. I didn't know actually the name 13 of the company. I don't think it appears on the 14 website. I know the name of the foil, which is 15 called, I think, E-Foil or something. Yes, I knew 16 that. 17 Q. How did you become aware of the 18 website, the foil boards that you are mentioning? 19 A. Because I am interested in new types 20 of marine crafts, and usually I look around for new 21 types of marine crafts, yeah. 22 Q. Have you spoken to any other 23 attorneys or law firms regarding the patents at issue 24 here, the 044 and the 659 patent? 25 A. Recently? Yeah, yes, yes. Recently	Page 60 1 Q. Specifically do you recall talking to 2 any attorneys at Middleton Reutlinger regarding the 3 044 and 659 patents? 4 A. No. 5 MR. BRIDGES: Put your phone down, 6 please. 7 THE WITNESS: I don't remember to have 8 been engaged with them in any discussion, 9 no. 10 MR. THEUERKAUF: I think that is all the 11 questions I have. I don't know if you're 12 going to have any questions or not, but I 13 guess I'm just for the moment, just because 14 I know there's going to be -- I know you're 15 used to District Court litigation, but 16 because I assume there's going to be other 17 filings in this matter, also by likely 18 Dr. Brizzolara, so just I guess technically 19 not closing the deposition, but no further 20 questions at the moment. 21 MR. BRIDGES: Yeah, I appreciate that. 22 If you'll let us go off the record briefly 23 while I look over my notes to see if there's 24 anything I want to ask him. 25 MR. THEUERKAUF: Sure.

Page 61 1 MR. BRIDGES: If I do, it will be just, 2 you know, probably ten minutes. 3 (Whereupon, a discussion was held off the record.) 4 EXAMINATION 5 BY MR. BRIDGES: 6 Q. Professor, if you could take a look 7 at the 044 patent, I believe you testified earlier 8 that the 044 patent provided equations related to 9 stability on column 6? 10 A. Yes. 11 Q. Is it your understanding that the 689 12 patent contains an identical disclosure regarding 13 stability in it as well? 14 A. Yes. I think it's the same text. I 15 didn't check perfectly, but I believe it's the same. 16 Q. In this column of text, in its 17 discussion on stability, does it discuss the impact 18 of a propulsive force with respect to the stability 19 and pitching moment in this equation that it gives 20 anywhere in the text? 21 A. Not -- it doesn't explicitly mention 22 a propulsion force or the effect of a propulsion 23 force. 24 Q. Would somebody of ordinary skill in 25 the art understand that you would need to take into	Page 63 1 Q. The -- you were asked about the 2 statement here where it says, "The use of 3 counteracting forces between the upward force caused 4 by the forward blade of the hydrofoil, the downward 5 force caused by the rear blade of the hydrofoil is a 6 well-known method for increased pitch stability 7 previously." 8 A. Yes. 9 Q. Why does that configuration of a 10 forward-facing front blade and a downward-facing rear 11 blade, why does that increase pitch stability in 12 hydrofoils? 13 A. To simplify, because it is able to 14 provide a higher restoring moment that will bring you 15 back to an equilibrium. So higher stability with 16 respect to a different configuration. 17 Q. Why does it provide a higher 18 restoring moment? 19 A. Okay. Because of the relative change 20 of lift on the main and rear foil due to a change of 21 angle of attack, yeah. 22 Q. Is this understanding of the relative 23 change -- 24 A. The relative -- 25 Q. Please let me finish my question. Is
Page 62 1 account the propulsive force to determine the 2 stability of a device, of a hydrofoil as part of 3 determining the stability of a hydrofoil? 4 A. Good question. Okay. It depends on 5 the level of simplification you want to use, right? 6 So drastic simplification, you assume the propulsion 7 force doesn't -- is not affected by the change of the 8 pitch, angle or pitch rate or whatever. At a more 9 sophisticated level, you may want to consider these 10 effects, and in general, the recent effect of a 11 change of a pitch angle on the propulsion force or a 12 certain pitch rate or acceleration on the propulsion 13 force. Again, it depends on the level of accuracy or 14 simplification. 15 Q. In the disclosure given in the 044 16 patent, and as you stated, simplification of the 17 stability, they do not provide any calculation of 18 that propulsive force or the location of that 19 propulsive force to determine whether or not the 20 hydrofoil is stable? 21 A. No. 22 Q. If you can turn to your expert 23 report, which I believe is Exhibit 1002 for the 044 24 patent. Please turn to paragraph 57. 25 A. Yes.	Page 64 1 this understanding of the change in lift caused by 2 the relative change of the angle something well known 3 in the art for a person of ordinary skill in the art, 4 in designing this? 5 A. Yes, yes. It is taught at the 6 universities, and it's part of classical textbook 7 about dynamic -- flight dynamics. 8 Q. What level of class would normally 9 teach that type of knowledge? 10 A. In undergraduate you would learn 11 about different configurations and what 12 configurations are more stable than others. Graduate 13 level, you go into more detail about the equations 14 and the methods that you can use to verify the 15 stability mathematically. So two different levels of 16 depth, I would say. 17 Q. Would you -- would somebody who has a 18 bachelor's degree in naval architecture or aerospace 19 engineering along with several years of experience in 20 designing hydrofoil-type devices understand these 21 sort of features and how they would affect stability 22 on devices? 23 A. Yes. At least he would know that 24 configuration of this kind is more prone to achieve 25 stability than other configurations.

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1 Q. It's more prone to achieve stability
2 because it provides a better restoring force?
3 A. Exactly, restoring moment.
4 Q. Better restoring moment.
5 A. And pitch.
6 MR. BRIDGES: I have no other questions.
7 MR. THEUERKAUF: All right. I may --
8 off the record.
9 (Whereupon, a discussion was held off the record.)
10 EXAMINATION
11 BY MR. THEUERKAUF:
12 Q. So back to paragraph 57 in your 044
13 declaration, that same sentence we have been talking
14 about the use of counteracting forces between the
15 upward force caused by the forward blade of the
16 hydrofoil and the downward force caused by the rear
17 blade of the hydrofoil is a well-known method for
18 increasing pitch stability by a POSITA. I think your
19 comment just a minute ago was that configuration was
20 more prone to achieving pitch stability; is that
21 correct?
22 A. Yes.
23 Q. But that configuration doesn't tell
24 you whether it will be stable in pitch, correct?
25 A. I think -- I think you can -- you

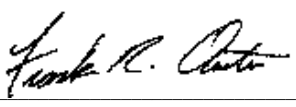
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1 can -- yeah. Let me think. I think you can say that
2 this kind of configuration ensures at least positive
3 static stability.
4 Q. Simply by having the upward force and
5 the downward force?
6 A. Yeah, yes.
7 Q. That configuration with no other --
8 A. Because this configuration can only
9 achieve equilibrium if the center of gravity is in
10 front of the main foil. So when in that condition,
11 then when you perturb equilibrium, it will give you a
12 restoring moment.
13 Q. But just the simple fact then of the
14 upward force of the forward blade and the downward
15 force of the rear blade, that alone doesn't achieve
16 stability, correct?
17 A. I think --
18 MR. BRIDGES: Object as to form. You
19 can answer.
20 THE WITNESS: I think it does, as I
21 said, because it leads to can only achieve
22 equilibrium if the center of gravity is in
23 front of the center inertia of the main
24 foil. So in that respect you will achieve
25 static stability.

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1 BY MR. THEUERKAUF:
2 Q. Last question, Professor. But this
3 sentence that we have been referring to doesn't say
4 anything about the center of gravity, correct?
5 A. No, because it's implied. It can
6 only be there.
7 MR. THEUERKAUF: No further questions.
8 MR. BRIDGES: Do I have a chance to ask
9 one question related to that?
10 MR. THEUERKAUF: Actually, I think that
11 was it.
12 MR. BRIDGES: Good enough.
13 (Whereupon, the deposition concluded at 12:35 p.m.)
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1 CERTIFICATION
2
3 COMMONWEALTH OF VIRGINIA
4 CITY OF ROANOKE
5
6 I, Frank R. Austin, Registered Merit
7 Reporter, Certified Realtime Reporter, and Notary
8 Public in and for the Commonwealth of Virginia, do
9 hereby certify that the witness, STEFANO BRIZZOLARA,
10 PH.D., was duly sworn by me and that the foregoing
11 transcription is a true and correct transcription of
12 the testimony of said witness, as well as a true and
13 correct transcription of the proceedings at large.
14 I further certify that I am not a relative
15 or attorney for either party or otherwise interested
16 in the outcome of this action.
17 In witness whereof, I have hereunto set my
18 hand in Roanoke, Virginia, on the 26th day of July,
19 2024.
20 
21
22
23 FRANK R. AUSTIN, RMR-CRR
24 VIRGINIA NOTARY PUBLIC, ID NO. 7067124.
25 My Commission expires December 31, 2026.

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1	Errata Sheet
2	Deposition of: STEFANO BRIZZOLARA, PH.D.
3	Date: July 18, 2024
4	I have read the foregoing deposition, and I wish to
5	make the following changes:
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