UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

FOIL BOARDING COMPANY, INC.,
Petitioner,
V.
MHL CUSTOM, INC.
Patent Owner.

DEPOSITION OF STEFANO BRIZZOLARA, PH.D.
July 18, 2024
Blacksburg, Virginia
9:30 a.m.

Reported by: Frank R. Austin, RMR-CRR

The deposition of STEFANO BRIZZOLARA, PH.D. was taken at the The Inn At Virginia Tech and Skelton Conference Center, 901 Prices Fork Road, Blacksburg, Virginia, 24061, on July 18, 2024, commencing at 9:30 a.m., in the presence of counsel for the parties.

It was agreed that Frank R. Austin, Registered Merit Reporter, Certified Realtime Reporter, and Notary Public in and for the Commonwealth of Virginia, would take said deposition in machine shorthand and transcribe the same to typewriting by means of computer-aided transcription.

APPEARANCES:

GRAY ICE HIGDON
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STEFANO BRIZZOLARA, PH.D.
was duly sworn and deposed as follows:

EXAMINATION

BY MR. THEUERKAUF:

Q. All right. Good morning, Doctor.
A. Good morning.
Q. So my name is Robert Theuerkauf. I represent MHL Custom, Inc. in these matters. With me is my colleague, Megan Gibson, just for the record. So we're here on two matters before the patent office. They are IPRs 2024-0085 and IPR 2024-0086.
Can you please give us your full name for the record.
A. Stefano Brizzaloara.
Q. Can you give us your business address, please.
A. Business address is 602 Kelly Lane, Blacksburg, 24060.
Q. Who are you employed by, Doctor?
A. I am employed by Virginia Tech, but in -- in -- I serve as a private consultant, right? Virginia Tech is not involved in that.
Q. I'm going to show you -- let's see -- this first document. If you wouldn't mind taking a 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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MR. THEUERKAUF: Okay.
BY MR. THEUERKAUF:
Q. Doctor, could you -- I apologize again. I don't have your CV, but could you describe your educational background for us?
A. Yes. I studied naval architecture and marine engineering at Genova University where I graduated 19 -- okay. Don't remember the date. It's too far back. Then I also took a Ph.D. from University of Naples Federico II in joint venture with Genova. It was a joint Ph.D., again, in naval architecture. That's my declaration, I guess, highest degree, is that.
Q. Do you recall the date that you reached your highest degree?
A. Yes. 2000.
Q. 2000. Okay.
A. The master's was 1994.
Q. How long have you been employed by Virginia Tech?
A. Virginia Tech, since 2016. Started University of -- my academic career -- I also worked in the shipyard, but my academic career I started in Genova University. Then I moved to MIT. Then I came here in 2016.

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

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MIT?
A. Yes.
Q. What was your position at --
A. At MIT, I went there for my sabbatical year. Title was visiting Peadbody associate professor. Then I remained there. They convinced me to stay while I was there. So I remained there for five years basically.
Q. Okay. What was your field of study?
A. Field of study, again naval architecture. The group was the ocean engineering group, but since I am a naval -- ocean engineering covers even more applications than naval architecture, but my field was naval architecture and hydrodynamics.
Q. Then currently -- you may have already stated this. I apologize if you have. Then when you came to Virginia Tech, what was your title there?
A. I joined as associate professor. Then I was promoted as -- to professor two years ago, three years ago.
Q. Again, so what's your field of study at Virginia Tech?
A. Okay. Naval architecture and marine

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

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

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A. Yeah, I didn't check the dates. Sorry.
Q. So I assume you have an engagement letter?
A. Yes, yes.
Q. Is that engagement letter with counsel, or is it with Foil Boarding Company?
A. I think it's -- if I remember, it's with the company, and it was through the attorney's office.
Q. Okay.
A. All my communication is always passed through the attorney's office.
Q. I'm going to show you a document here, and it's been designated in the 86 IPR as Foil 1002. Do you recognize this document?
A. Yes.
Q. Can you tell me what that document is?
A. It's my declaration, right, written declaration for one of the two patents. Should be cited. Yes, it is 044.
Q. Okay. If you would look, I believe it is page 91. Should be the last page there.
A. Okay.

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Q. Is that your signature, Doctor?
A. Yes, it is, yes.
Q. Doctor, did you write this declaration?
A. The -- yes, most of it, yes.
Q. When you say most of it, was there someone that helped you write it?
A. I received a first draft from the attorney which I completed with all the technical parts, yes.
Q. Do you remember how much time you spent preparing this declaration?
A. Not exactly, but yeah, I -- I don't remember exactly. It took some time.
Q. Okay. Would you say it was more than ten hours?
A. I don't remember exactly, but it -- yeah, probably, maybe, yeah.
Q. Maybe ten?
A. Yeah.
Q. Do you recall how much that you have -- that you charged for the preparation of this declaration?
A. I -- my rate at that time was $400 per hour, yes.

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Q. Okay. You don't know the total charge amounts?
A. I don't remember. Yeah, I don't remember now. I can go back and check.
Q. We can just do a little housekeeping here, too. I'm going to show you another document here that is labeled Foil 1002, but it's for the 85 IPR. Take a look at that. Do you recognize this document?
A. Yes. It's the other declaration, yes.
Q. It's for the 659 patent?
A. 695, yes.
Q. Is that your signature?
A. Yes.
Q. On --
A. On the last page, yes.
Q. 83?
A. Yes.
Q. Real quick, Doctor, I meant to tell you, too, earlier when we talking sort of ground rules, if at any point you need to take a break, just let me know. We can obviously do that. The only thing that I would ask is if there's a pending 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 be 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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Q. It end on page 8?
A. Yes.
Q. I guess, for a lack of better words, where did you obtain the information regarding the legal principles?
A. From the attorney's office, yes.
Q. So were you aware of these -- any of these legal principles prior to counsel providing them to you?
A. In a general sense, yes. As principles, they have been drafted very well by the attorney's office obviously.
Q. Prior to your involvement in these matters, have you ever been asked to conduct an invalidity analysis before?
A. No.
Q. Do you know what -- sorry. Go ahead.
A. Again, in a broader sense some analysis of this kind to verify that my patent were valid. So I counterchecked my patents against the state of the art and other patents to be sure my intention could be protected, yes.
Q. Do you know whether any of your patents have been challenged before?
A. Challenged? Not that I know.

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Q. So on page 9 of your 044 declaration, there's a publication mentioned there, Etkin and Reid Dynamics of Flight Stability and Control?
A. Yes.
Q. Do you see that?
A. Yes.
Q. What is your experience with that publication?
A. I studied this text for my research.
Q. Your research related to these matters?
A. Part of it, yes.
Q. Have you had experience with that text prior to your involvement with these matters?
A. Yes.
Q. In what way?
A. Again, as a reference textbook to consult to address different kinds of studies, involving hydrofoils obviously. The textbook talks about airplanes obviously, but same principles and methods can be applied to hydrofoils. Same -- maybe, yeah.
Q. Sorry?
A. Maybe you should know that professors usually read a lot of different books not necessarily

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related to their field of expertise because they like to study.
Q. I'm going to show you -- a little bit more housekeeping here. So I'm going to show you first what was marked as Foil 1011. It's U.S. patent 6443786. Have you seen that document before?
A. Yes.
Q. It's the Woolley patent. It's referred to as Woolley patent.
A. Yes.
Q. Is that -- was that the first time that you saw the Woolley patent in conjunction with your work on these matters?
A. Yes.
Q. Then I'm going to show you what is marked Exhibit 3001, and it is U.S. patent 6234856. Do you recognize that document?
A. Yeah, yeah. It's the previous version, I believe, of the same inventor.
Q. Have you studied that document before?
A. I studied one of them. I cannot tell you which one of the two, but yes, one of the two, I studied it. I cannot tell right now, if I look into here, there will be the exact reference. I can tell

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

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is in four parts. That is the English translation.

MR. BRIDGES: We'll just add -- if you ask questions about it or if it's referred to, we'll make sure we are referring to the correct one.

BY MR. THEUERKAUF:

Q. And do you recall, did you study the English version?

A. Yes. I don't understand Swedish. I went through the pages to see if there was correspondence at least from the figures and the creations, but yes, I studied mostly in the English, only the English version, yes.

Q. In the context -- if you want to refer to the 044 patent, which again is Foil 1001, and specifically in regards to claim 1 of that patent --

A. Yes.

Q. -- you understand, correct, that the claim 1 one recites as part of the claim that it's designed to private passive static stability?

A. Passive -- claim 1 says passively stable.

Q. Let me refer you to -- it's the

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paragraph in claim 1 that begins, "A hydrofoil fixedly interconnected." Do you see that?

A. Fixedly interconnected, yes.

Q. Do you see there it says --

A. There it is static, yes.

Q. It says, "The Hydrofoil, having no movable surface and designed to provide passive static stability, controlled solely by weight shift of the user"?

A. Correct.

Q. In the context of the 044 patent, what does the term the "static stability" mean to you?

A. Yeah. Static stability means that -- let me give a proper definition. Starting from an equilibrium condition, right, if you perturb at the angle, either pitch -- in this case I believe they are mostly concerned with pitch. But perturb the equilibrium condition with a small variation of pitch angle in that case, small and slow variation, so slow that you can neglect the dynamic effects, the device is able to produce restoring moment that will bring you back to the equilibrium motion. So you perturb the equilibrium condition, and you are not in equilibrium anymore, but forces and moments that are

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developed in water tend to restore the device on to the initial equilibrium condition. That is static stability, because it neglects dynamic effects. Dynamic effects can be neglected if this happens very slowly so that you can neglect velocity and acceleration effects.

Q. Have you seen the claim construction that was given to that term "static stability" by the district court in a separate piece of litigation?

A. I'm sorry?

Q. By the district -- by a district court in a separate piece of litigation?

A. No.

Q. You -- okay. Are you familiar with -- or have you looked at any documents that you are aware of that relate to a litigation between my client, MHL Custom, Inc. and a company called Wadoo?

A. Yes.

Q. You have seen documents from that case?

A. Yes.

Q. Were you aware or are you aware that the Court in that case, in the Wadoo case, construed the term "static stability"?

A. Yes, but by -- but I didn't elaborate

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on that.

Q. Then you had just given us your explanation of static stability. What does that --

A. The definition that I believe every --

Q. Sorry.

A. A definition that I believe every professor of naval architecture or even aerospace engineering would give --

Q. Then in the context --

A. -- that you can find in referenced textbooks. There's no need to reconstruct the definition of static stability in my opinion.

Q. Then in the context of the 044 patent, in that same claim phrase that we were looking at, what does it mean then when it says -- what's your understanding then when it says passive static stability?

A. Passive? My understanding of passive, after analyzing patents, is that there are no means of active control. So passive means that you have no means of controlling the forces, yes, force.

Q. I think you had said earlier that in static stability there's are the forces and moments

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that would return it to the equilibrium position?
A. Yes.
Q. Is that correct?
A. Correct.
Q. Is it your position then when it says "passive static stability" that there are no active control mechanisms to return it to that equilibrium position? Is that correct?
A. That's correct.
Q. And so are you familiar then -- is there a concept then of active static stability?
A. That is stability achieved under active controls. Yes.
Q. Can you describe for us what that would be? What type --
A. Yes. For instance, you could have movable flaps. You could move flaps. You could orient the wind, different angle of attack, by some mechanism that needs to be controlled. Right. In this case there is none of such devices. Although there is a patent managements to -- let me cite it perfectly. It mentions the possibility for the human that is on board to shift his weight on board.
Q. So with respect to your declaration and the study of the Woolley -- is it okay if I refer

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to the one patent as the Woolley reference?
A. Yes. Thank you.
Q. With respect to your study of the Woolley reference, in the Evolo report and your opinions given in both of your declarations -- I'm sorry. Not both, but in your opinions given in your declaration for the 044 patent, were you applying that means of passive static stability that you just gave to us?
A. Yes.
Q. In your answer in regards to static stability, you mentioned equilibrium. Can you explain what you mean by equilibrium?
A. Equilibrium is where -- it happens when all the forces acting on the system -- the system in this case is the foil board, human on board -- all the forces and moment, are balanced. So the sum of the forces is equal to zero, sum of moments equal to zero in every direction. Of course equilibrium implies a steady state condition. Equilibrium can only happen when you are travelling at a constant speed, right? You will achieve a constant altitude, too.
Q. Would that still be your understanding of equilibrium in the context of the

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044 patent?
A. Let me explain. You cannot speak about stability. The concept of rigid body to be stable cannot be separated from the equilibrium. So the assumption is you start from an equilibrium condition, and then from that equilibrium condition you are stable. The two concepts go together.
Q. Is that your understanding of equilibrium in the context of the 044 patent?
MR. BRIDGES: Objection to form.
MR. THEUERKAUF: Let me rephrase because I want to be sure we are clear here.
BY MR. THEUERKAUF:
Q. So your explanation of equilibrium that you just gave, is that your understanding in the context also of the 044?
MR. BRIDGES: Again -- go ahead.
MR. THEUERKAUF: Yeah.
MR. BRIDGES: Object to form. You can answer.
MR. THEUERKAUF: I just want to be sure because I want -- what's wrong with the question so we can clear --
MR. BRIDGES: Because the term "equilibrium" is used in the specification

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in several places in the 044, but he was also talking about equilibrium as it is used with respect to static stability, and so I'm not clear if you are talking about it as it relates to his understanding of the term "static stability" or in as that term might be used throughout the specification.
MR. THEUERKAUF: Fair.
BY MR. THEUERKAUF:
Q. In the 044 patent there is mention of equilibrium, correct?
A. I believe so, yes.
Q. In your study of the 044 patent, would your understanding of -- or after having read and studied the 044 patent, is the way the 044 patent uses the term "equilibrium" different from how you just explained equilibrium to us?
A. I think they call it longitudinally trimmed motion. For them that is the equilibrium condition. That corresponds to the equilibrium condition.
Q. Is the understanding -- the understanding you gave us of equilibrium, is that different than what you believe equilibrium or how equilibrium is being discussed in the 044?

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A. No, I don't think so.
Q. Okay. So is it also your understanding then that the terms trim and equilibrium --
A. Trim motion, trim motion, my understanding is longitudinally trim motion means an equilibrium condition, yes.
Q. With respect to the Woolley reference that you studied, does it discuss equilibrium?
A. Not in let's say very scientific -- it mentions equilibrium, yes, and it mentions stability as well. I don't believe that it goes in much more detail. The references is there. But -- listen, among engineers, the concept of equilibrium condition is unequivocal. There isn't a possibility for multi different definitions of equilibrium. There is just one. That is -- you cannot -- okay.
Q. So --
A. If somebody mentions equilibrium, I understand the universe of the definition of equilibrium that all engineers use. There's no need to redefine it in a patent, I believe.
Q. Do you have any belief that in the Woolley reference that they're using the term "equilibrium" different than how you would understand

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it?
A. No, I don't think so.
Q. Before I forget, have you by any chance spoken to the inventor of the Woolley reference?
A. No. Unfortunately, no, none of these inventors. Maybe instructed, but --
Q. Have you spoken to any of the students who are professors involved with the Evolo report?
A. No. Spoken about this matter you mean, yes.
Q. So you haven't spoken to anybody -- let me just -- so with respect to the Evolo report, have you spoken to any of the students or the professors?
A. Not about this matter because I know one of the students who happens to be a professor now here in the U.S., but we never -- we have never spoken about this. She doesn't even know I serve as an expert witness.
Q. I see. Okay.
A. But I speak to her about other stuff. I avoided deliberately speaking to her about this.
Q. So with respect to the concepts we've

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just been discussing, both equilibrium -- well, let me back up first. You gave us or spoke to us about your understanding of static stability and passive static stability. Are you familiar with the term or concept of "dynamic stability"?
A. Yes.
Q. And can you give us your understanding of dynamic stability?
A. Yes. I think I mentioned it before a little bit. So when you verify your -- analyze the dynamic stability, you introduce or you account for other dynamic forces that originates from velocity and acceleration of the motions. So, for example, if you focus on pitch, you will consider forces and moments due to pitch velocity, pitch rate and pitch acceleration as opposed to static stability which neglects these kind of hydrodynamic forces and movements.
Q. So something -- well, I'm trying to think of the best way to ask the question. How are static stability and dynamic stability related?
A. Related? You could say that dynamic stability comprises static stability, or actually dynamic stability goes one step beyond static stability, because it considers additional effects

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due to motion, velocities and motion accelerations. If you like, it's a more accurate way of estimating the stability of the motion of --
Q. Is it accurate to say that -- that you cannot be dynamically stable unless you are statically stable?
A. That's a good question. Why are you asking this?
Q. Because it's related to these patents.
A. Let me think about it. So the easy answer is yes, you cannot be dynamically stable -- and a lot of references textbooks will tell you this, yes. So first the static stability is a necessary condition to achieve also dynamic stability. That is true. If you are statically stable -- you need to be statically stable to -- it will help dynamic stability. There may be cases, though, I believe, where you can achieve dynamic stability if you are not statically stable.
Q. Okay.
A. But what you say is true in most cases, yes.
Q. So what you are -- just be sure I'm clear. In most cases you are saying it's true

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that --
A. It helps. Static stability helps to verify dynamic stability.
Q. To be clear, you're saying in some cases you could be dynamically stable without being statically stable?
A. I have -- yeah, yeah, to think about it, it could -- I think it could happen, yes.
MR. BRIDGES: When you reach a point that's comfortable for a break --
MR. THEUERKAUF: Actually, I was just getting ready to do that myself.
(Whereupon, a recess was taken.)
BY MR. THEUERKAUF:
Q. Professor, right before the break, we were talking some about dynamic stability. You had mentioned that you thought there might be other -- that there probably were conditions where you could be dynamically stable but not statically stable?
A. Yeah.
Q. In what context, what conditions are you talking about where that could occur?
A. For instance, typically ships are statically unstable to yaw, but many of them are dynamically stable to yaw.

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Q. You say statically unstable in yaw but dynamically stable in yaw?
A. Yes, exactly.
Q. So --
A. Because when you study the stability, you should actually consider the effect of all forces in moment deriving from all motion. Very often, as in the case of this patent, you isolate a particular motion like pitch, and you consider that motion in isolation. That is wrong from a fundamental point of view, because in reality you cannot just have pitch motion alone, right? You will have other motion happening while pitch is changing, and these other motions actually produce additional forces in the moment, which may actually contribute or not contribute to dynamic stability.
So a proper way to verify dynamic stability is not to isolate a motion from any other, like it's done in this patent. It's wrong. It's flawed. And second, include the effects of all the degrees of freedom, other degrees of freedom. So when I tell you a ship will be dynamically stable in yaw, it's because I consider also sway, for instance. The effect of sway motion that will happen at the same time with yaw.

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Q. Still speaking of dynamic stability, in a dynamic -- in a dynamically stable craft, is it also returning to the equilibrium position that you discussed earlier?
A. Eventually, yes.
Q. And so is there a time component to dynamic stability?
A. Time component. There may be different ways actually to return to the equilibrium condition, yes, because you are now solving for the motion in time, right? Static doesn't have time as a variable. Dynamic has time to follow the actual motion. But as I told you, you shouldn't focus and isolate to just one motion. You should consider all of them at the same time if you want to do it properly. Then if you want to simplify, you can simplify, but then the result may be wrong or too approximate. There are various levels of approximations in fact.
Q. Okay. So just, again, apologize for repeating. I want to be sure I'm clear. So when we were discussing static stability, I believe -- I don't want to put words in your mouth. Correct me if I'm wrong. But with respect to static stability, the device is -- when it's disturbed, is going to have

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forces of moments that are created that give it an initial tendency to return to its equilibrium position?
A. Exactly. It's like -- you start from an equilibrium condition. We established that. Then perturbing it means you don't consider the transient that will be there while you pass from the equilibrium condition to the perturbed condition. You don't consider it. You put it there kind of instantaneous, right? And then you see what happens there in static condition. If the forces in moment will tend to restore the vehicle to the initial referenced equilibrium condition, then you say that it's stable, statically stable. While dynamically stable, you perturb there, and then you follow all the transient that will eventually, eventually bring you back to the initial equilibrium condition.
Q. That's why we say time is involved with dynamic stability?
A. Time is involved.
Q. Because it eventually gets back to the equilibrium position?
A. Because it's stable, yes. And the usual simplification that is always done is to assume that this perturbation is a small perturbation from

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the equilibrium condition. If it's a large perturbation, that's a whole other problem.
Q. In your study of the --
A. Sorry. And I finish. When you consider -- if you consider a large perturbation, you may not return to the initial equilibrium condition.
Q. So we were talking about equilibrium and stability. Can something -- can a craft, hydrofoil craft, for example, be in equilibrium but not be stable?
A. Oh, yes. But wait, wait, wait, wait, wait. Okay. From a practical point of view, no, because from an abstract point of view, which is when you study the nature of the equilibrium, you first find equilibrium condition and then verify if there is a static stability around that equilibrium condition, but you are at an abstract level. If you are talking about practical, real life, if you are not stable, right, you will never establish equilibrium condition, right.
Q. So I just --
A. You may find another equilibrium condition. As I told you, the concept of stability refers to an initial equilibrium condition. You cannot tell you are stable at every condition, or you

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can tell, but you have to verify every condition. When you say you are stable, you have to say also what is the initial equilibrium condition. The two concepts goes hand in hand.
Q. Okay.
A. So if you're unstable -- suppose I take this equilibrium condition, and I tell you I am unstable at this equilibrium condition. This means that this equilibrium condition cannot exist, cannot be achieved. It is still possible that vehicle finds another equilibrium condition. It is possible that the vehicle finds another equilibrium condition at which it will be stable. So that equilibrium condition is practically achievable.
Q. Okay. And again, I apologize if I'm repeating here, but again, I'm just trying to be sure I'm understanding. I believe what you have said is if the craft is not stable, you will never reach an equilibrium position?
A. If the craft is not stable from a given equilibrium condition, it will never reach that equilibrium condition. It will reach maybe another equilibrium condition, yes.
Q. Maybe I'll ask it a different way. Maybe it will help. Can a device like we have been

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talking about, these patents, hydrofoil device, can it be stable but not have an equilibrium?
MR. BRIDGES: Object as to form.
THE WITNESS: No.
BY MR. THEUERKAUF:
Q. Let me ask just to clear because of the objection, but with respect to your study of --
A. If you're stable, let me -- let me -- if you are stable, it means that there is an equilibrium condition around which you are stable.
Q. Okay.
A. So if you tell me I'm stable, I should ask you stable around what? Equilibrium condition. Which condition? Tell me the condition, right? Can't be stable in general.
Q. So without an equilibrium, you can't be stable?
A. Yeah, because simply the concept of stability implies that there is an initial equilibrium condition, that there is equilibrium condition. Somehow it's perturbed. Then if you're stable, you will get back to the equilibrium.
Q. So in the 659 patent, also looking at claim 1 of that patent --
A. 659.

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Q. Correct.
A. Claim 1, yes.
Q. You'll see at the beginning of claim 1 it says, "A passably stable weight shift controlled personal hydrofoil watercraft." Do you see that?
A. Yes.
Q. What is your understanding in the context of this patent what passively stable means?
A. Okay. It is defined in -- at the way -- the way the inventor defined stability is -- or verifies stability is described in this paragraph, page -- column 6 of the patent. And it gives an equation, right? The pitching moment coefficient can be written as CM equals CM, C, sub M, knot, plus C, C sub N, alpha times alpha, times C, sub M, Q times Q, and it describes. Then he says, "To ensure a trimmable, stable hydrofoil, the following condition must be true" -- and CM alpha less than zero -- so here, as I told you, the inventor isolates, artificially isolates, one motion, one degrees of freedom, pitch, from all our possible motion happening in reality. And then it analyzes that motion, the moment of pitch due to variation of angle of attack alpha, which is regarded as a static variation. So when I analyze the static stability, I

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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

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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

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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

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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

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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

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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.

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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.

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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

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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.

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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

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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.

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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.

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MR. BRIDGES: If I do, it will be just, you know, probably ten minutes.
(Whereupon, a discussion was held off the record.)
EXAMINATION
BY MR. BRIDGES:
Q. Professor, if you could take a look at the 044 patent, I believe you testified earlier that the 044 patent provided equations related to stability on column 6?
A. Yes.
Q. Is it your understanding that the 689 patent contains an identical disclosure regarding stability in it as well?
A. Yes. I think it's the same text. I didn't check perfectly, but I believe it's the same.
Q. In this column of text, in its discussion on stability, does it discuss the impact of a propulsive force with respect to the stability and pitching moment in this equation that it gives anywhere in the text?
A. Not -- it doesn't explicitly mention a propulsion force or the effect of a propulsion force.
Q. Would somebody of ordinary skill in the art understand that you would need to take into

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account the propulsive force to determine the stability of a device, of a hydrofoil as part of determining the stability of a hydrofoil?
A. Good question. Okay. It depends on the level of simplification you want to use, right? So drastic simplification, you assume the propulsion force doesn't -- is not affected by the change of the pitch, angle or pitch rate or whatever. At a more sophisticated level, you may want to consider these effects, and in general, the recent effect of a change of a pitch angle on the propulsion force or a certain pitch rate or acceleration on the propulsion force. Again, it depends on the level of accuracy or simplification.
Q. In the disclosure given in the 044 patent, and as you stated, simplification of the stability, they do not provide any calculation of that propulsive force or the location of that propulsive force to determine whether or not the hydrofoil is stable?
A. No.
Q. If you can turn to your expert report, which I believe is Exhibit 1002 for the 044 patent. Please turn to paragraph 57.
A. Yes.

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Q. The -- you were asked about the statement here where it says, "The use of counteracting forces between the upward force caused by the forward blade of the hydrofoil, the downward force caused by the rear blade of the hydrofoil is a well-known method for increased pitch stability previously."
A. Yes.
Q. Why does that configuration of a forward-facing front blade and a downward-facing rear blade, why does that increase pitch stability in hydrofoils?
A. To simplify, because it is able to provide a higher restoring moment that will bring you back to an equilibrium. So higher stability with respect to a different configuration.
Q. Why does it provide a higher restoring moment?
A. Okay. Because of the relative change of lift on the main and rear foil due to a change of angle of attack, yeah.
Q. Is this understanding of the relative change --
A. The relative --
Q. Please let me finish my question. Is

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this understanding of the change in lift caused by the relative change of the angle something well known in the art for a person of ordinary skill in the art, in designing this?
A. Yes, yes. It is taught at the universities, and it's part of classical textbook about dynamic -- flight dynamics.
Q. What level of class would normally teach that type of knowledge?
A. In undergraduate you would learn about different configurations and what configurations are more stable than others. Graduate level, you go into more detail about the equations and the methods that you can use to verify the stability mathematically. So two different levels of depth, I would say.
Q. Would you -- would somebody who has a bachelor's degree in naval architecture or aerospace engineering along with several years of experience in designing hydrofoil-type devices understand these sort of features and how they would affect stability on devices?
A. Yes. At least he would know that configuration of this kind is more prone to achieve stability than other configurations.

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

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can -- yeah. Let me think. I think you can say that this kind of configuration ensures at least positive static stability.
Q. Simply by having the upward force and the downward force?
A. Yeah, yes.
Q. That configuration with no other --
A. Because this configuration can only achieve equilibrium if the center of gravity is in front of the main foil. So when in that condition, then when you perturb equilibrium, it will give you a restoring moment.
Q. But just the simple fact then of the upward force of the forward blade and the downward force of the rear blade, that alone doesn't achieve stability, correct?
A. I think --
MR. BRIDGES: Object as to form. You can answer.
THE WITNESS: I think it does, as I said, because it leads to can only achieve equilibrium if the center of gravity is in front of the center inertia of the main foil. So in that respect you will achieve static stability.

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BY MR. THEUERKAUF:
Q. Last question, Professor. But this sentence that we have been referring to doesn't say anything about the center of gravity, correct?
A. No, because it's implied. It can only be there.
MR. THEUERKAUF: No further questions.
MR. BRIDGES: Do I have a chance to ask one question related to that?
MR. THEUERKAUF: Actually, I think that was it.
MR. BRIDGES: Good enough.
(Whereupon, the deposition concluded at 12:35 p.m.)

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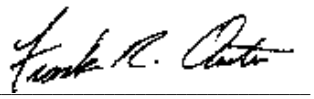
CERTIFICATION

COMMONWEALTH OF VIRGINIA
CITY OF ROANOKE

I, Frank R. Austin, Registered Merit Reporter, Certified Realtime Reporter, and Notary Public in and for the Commonwealth of Virginia, do hereby certify that the witness, STEFANO BRIZZOLARA, PH.D., was duly sworn by me and that the foregoing transcription is a true and correct transcription of the testimony of said witness, as well as a true and correct transcription of the proceedings at large.

I further certify that I am not a relative or attorney for either party or otherwise interested in the outcome of this action.

In witness whereof, I have hereunto set my hand in Roanoke, Virginia, on the 26th day of July, 2024.



FRANK R. AUSTIN, RMR-CRR
VIRGINIA NOTARY PUBLIC, ID NO. 7067124.
My Commission expires December 31, 2026.

Errata Sheet

Deposition of: STEFANO BRIZZOLARA, PH.D.

Date: July 18, 2024

I have read the foregoing deposition, and I wish to make the following changes:

Page	Line	Change	Reason

_____ _____

(SIGNATURE) (DATE)