

Computational Fluid Dynamic Study of Heaving-to

David Allen Hickerson

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

Master of Science
In
Ocean Engineering

Leigh McCue-Weil
Wayne Neu
Chris Roy

24 July 2013
Blacksburg, Virginia

Keywords: heaving-to, hove-to, storm tactics, ocean waves

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Date: August 06, 2013

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Virginia Tech
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Author: Roth, Hal

Title: Handling Storms at Sea © 2008

Description of material: Tables on wave characteristics on pp 14-15 (ONLY)

Fee: WAIVED

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Author: David Hickerson

Title: Thesis: Computational Fluid Dynamic Study of Heaving

Publisher: Virginia Tech

Publication Date: 2013

Distribution Territory: Virginia Tech

Languages: English

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David Hickerson <dahicke@vt.edu>

Permission to use images or figures from Marine Technology, Vol 22, No4, Oct 1985

8 messages

David Hickerson <dahicke@vt.edu>
To: tfaix@sname.org

Wed, Jul 10, 2013 at 11:20 PM

Hi,

I am writing my thesis for an Ocean Engineering Masters at Virginia Tech. I would like permission to use some figures from Marine Technology, Vol 22, No4, Oct 1985 on page 377 in my thesis, Computational Fluid Dynamic study of Heaving-to. The paper this is from is called Fastnet Disaster: Capsizing Study. by Daniel Strohmeier.

Please, contact me at [719-238-4026](tel:719-238-4026) or dahicke@vt.edu.

Thanks,

David Hickerson
dahicke@vt.edu
[719-238-4026](tel:719-238-4026)

Tommie-Anne Faix <tfaix@sname.org>
To: David Hickerson <dahicke@vt.edu>
Cc: Susan Evans <sevans@sname.org>

Thu, Jul 11, 2013 at 7:36 AM

Hi David –

Please fill out the attached form and return it to Susan Evans Grove, who is copied on this e-mail.

Thank you,

Tommie-Anne

Best regards,**Tommie-Anne Faix****Publications Sales Associate****The Society of Naval Architects and Marine Engineers****601 Pavonia Avenue – Suite #400**

Jersey City, NJ 07306

Main - (201)-798-4800

Direct - (201)-499-5068

Fax - (201)-798-4975

www.sname.org

From: David Hickerson [mailto:dahicke@vt.edu]

Sent: Thursday, July 11, 2013 1:20 AM

To: Tommie-Anne Faix

Subject: Permission to use images or figures from Marine Technology, Vol 22, No4, Oct 1985

[Quoted text hidden]



permissions letter.doc

51K

David Hickerson <dahicke@vt.edu>
To: Tommie-Anne Faix <tfaix@sname.org>
Cc: Susan Evans <sevans@sname.org>

Thu, Jul 11, 2013 at 1:24 PM

Hi Susan,

I am working on my Master's Thesis and would like to include some figures from a Marine Technology issue from 1985. I am including the SNAME request form. I have never done this before, how long does this process normally take? I am defending my thesis on 24 July, will I have enough time?

Also, Thanks Tommie-Anne.

Thanks,

David Hickerson
dahicke@vt.edu
719-238-4026

[Quoted text hidden]



MTpermissions letter for Fastnet Capsizing Study -- requested by David Hickerson.doc

51K

Susan Evans <sevans@sname.org>
To: David Hickerson <dahicke@vt.edu>, Tommie-Anne Faix <tfaix@sname.org>

Fri, Jul 12, 2013 at 6:16 AM

David,

The process is quick. So quick in fact that you may consider this email permission to sue SNAME copyrighted material with proper acknowledgement as on form.

Best Regards,

Susan Evans Grove
Publications Director
The Society of Naval Architects and Marine Engineers
601 Pavonia Ave.
Jersey City, NJ 07306
201-499-5091
sevans@sname.org

-----Original Message-----

From: David Hickerson [<mailto:dahicke@vt.edu>]
Sent: Thu 7/11/2013 3:24 PM
To: Tommie-Anne Faix
Cc: Susan Evans
Subject: Re: Permission to use images or figures from Marine Technology, Vol 22, No4, Oct 1985

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David Hickerson
dahicke@vt.edu
719-238-4026

On Thu, Jul 11, 2013 at 7:36 AM, Tommie-Anne Faix <tfaix@sname.org> wrote:

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>
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>
> ** **
>
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> Tommie-Anne****
>
> ** **
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> *Best regards,*
>
> * *
>

> *Tommie-Anne Faix*
>
> *Publications Sales Associate*
>
> *The Society of Naval Architects and Marine Engineers*
>
> *601 Pavonia Avenue - Suite #400*
>
> *Jersey City, NJ 07306*
>
> * *
>
> *Main - (201)-798-4800*
>
> *Direct - (201)-499-5068*
>
> *Fax - (201)-798-4975*
>
> * *
>
> *www.sname.org *
>
> ** **
>
> *From:* David Hickerson [mailto:dahicke@vt.edu]
> *Sent:* Thursday, July 11, 2013 1:20 AM
> *To:* Tommie-Anne Faix
> *Subject:* Permission to use images or figures from Marine Technology,
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>
> ** **
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> Please, contact me at 719-238-4026 or dahicke@vt.edu.****
>
> Thanks,
>
>
> David Hickerson
> dahicke@vt.edu
> 719-238-4026****
>

David Hickerson <dahicke@vt.edu>
To: Susan Evans <sevans@sname.org>
Cc: Tommie-Anne Faix <tfaix@sname.org>

Mon, Jul 22, 2013 at 4:22 PM

Hi Susan,

I just want to make sure I understand. Was your last email message to me a grant of permission to use the excerpts in my thesis?

Dave

[Quoted text hidden]

Mail Delivery Subsystem <mailer-daemon@googlemail.com>

Mon, Jul 22, 2013 at 4:22 PM

To: dahicke@vt.edu

Delivery to the following recipient failed permanently:

sevans@sname.org

Technical details of permanent failure:

Google tried to deliver your message, but it was rejected by the server for the recipient domain inbound.smtp.vt.edu by inbound.smtp.vt.edu. [198.82.183.88].

The error that the other server returned was:

550 5.7.1 <sevans@sname.org>... Relaying denied

----- Original message -----

X-Google-DKIM-Signature: v=1; a=rsa-sha256; c=relaxed/relaxed;

d=google.com; s=20120113;

h=mime-version:in-reply-to:references:date:message-id:subject:from:to

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rDHw==

X-Received: by 10.66.141.232 with SMTP id rr8mr15512268pab.184.1374531775286;

Mon, 22 Jul 2013 15:22:55 -0700 (PDT)

MIME-Version: 1.0

X-Received: by 10.66.141.232 with SMTP id rr8mr15512262pab.184.1374531775171;

Mon, 22 Jul 2013 15:22:55 -0700 (PDT)

Received: by 10.66.76.73 with HTTP; Mon, 22 Jul 2013 15:22:55 -0700 (PDT)

In-Reply-To: <EC3151905DCBBF4AB58DDE8E8496EA6701EF5196@SNAME-MAIL.sname-office.org>

References: <CAM8sabAHFUfYvsQqeWcZRjd2k38WQw7pUV7bGO0a+A6EFCUBVw@mail.gmail.com>

<EC3151905DCBBF4AB58DDE8E8496EA67021CC593@SNAME-MAIL.sname-office.org>

<CAM8sabCPWtqEhMbhyP_HqAfBFJ62NYzxOJ_vGG1Y2xpoU_eT-g@mail.gmail.com>

<EC3151905DCBBF4AB58DDE8E8496EA6701EF5196@SNAME-MAIL.sname-office.org>

Date: Mon, 22 Jul 2013 16:22:55 -0600

Message-ID: <CAM8sabBRAH8Yv3N2oKgrQmWiFQuzj8hxox8V7be6Oq7DnJL1KA@mail.gmail.com>

Subject: Re: Permission to use images or figures from Marine Technology, Vol
22, No4, Oct 1985

From: David Hickerson <dahicke@vt.edu>

To: Susan Evans <sevans@sname.org>

Cc: Tommie-Anne Faix <tfaix@sname.org>

Content-Type: multipart/alternative; boundary=001a11330f1431224304e2211e70

X-Gm-Message-State: ALoCoQnF9veLiuNA8++yk6d7Zxf6TzQecajzSOCU0vmbZ4bO3

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lyqljNiRpRr0affaMVu0QIBtSTNhYVwiEDSRPvg==

Hi Susan,

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Dave

On Fri, Jul 12, 2013 at 6:16 AM, Susan Evans <sevans@sname.org> wrote:

> **
>
> David,
>
> The process is quick. So quick in fact that you may consider this email
> permission to sue SNAME copyrighted material with proper acknowledgement as
> on form.

> Best Regards,

> Susan Evans Grove
> Publications Director

> The Society of Naval Architects and Marine Engineers

> 601 Pavonia Ave.

> Jersey City, NJ 07306

> 201-499-5091

> sevans@sname.org

> -----Original Message-----

[Quoted text hidden]

Mail Delivery Subsystem <mailer-daemon@googlemail.com>

Mon, Jul 22, 2013 at 4:22 PM

To: dahicke@vt.edu

Delivery to the following recipient failed permanently:

tfaix@sname.org

Technical details of permanent failure:

Google tried to deliver your message, but it was rejected by the server for the recipient domain inbound.smtp.vt.edu by inbound.smtp.vt.edu. [198.82.183.88].

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----- Original message -----

X-Google-DKIM-Signature: v=1; a=rsa-sha256; c=relaxed/relaxed;
d=google.com; s=20120113;
h=mime-version:in-reply-to:references:date:message-id:subject:from:to
:cc:content-type:x-gm-message-state;
bh=ZkHiuUVbedWL4VQCooRRfTuWz7eKtDcVNxWO/hRjn/k=;
b=WuOIQZnppaAr9VZkQHhpNvgqsMJLW4H3QMw4gPXn/KqChJBzTcirPcQPuT1EAtFABc
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3NOR/55T2hyYJ8gEIQhg5pTdLuRcJ7Ou2FH95ncDwn4w2ObesQojWM4Nlrizqr1kHed8
+kN4J8ZICJrAKwWAJjnK36fTSKlaBPQob897zfgg0T+rpWnl9TaNr8Bxki6tbEpGIA1Q
IBCA==

X-Received: by 10.66.141.232 with SMTP id rr8mr15512267pab.184.1374531775286;
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References: <CAM8sabAHFUfYvsQqeWcZRjd2k38WQw7pUV7bGO0a+A6EFCUBVw@mail.gmail.com>
<EC3151905DCBBF4AB58DDE8E8496EA67021CC593@SNAME-MAIL.sname-office.org>
<CAM8sabCPWtqEhMbhyP_HqAfBFJ62NYzxOJ_vGG1Y2xpoU_eT-g@mail.gmail.com>
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From: David Hickerson <dahicke@vt.edu>

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Cc: Tommie-Anne Faix <tfaix@sname.org>

Content-Type: multipart/alternative; boundary=001a11330f1431224304e2211e70

X-Gm-Message-State: ALoCoQnExAviK2uBJ+a3G0DJtSPJG1uAsy9s1HqOfiH+TVSDHjpHe0ljoh+
tiC4uBHxd2joNfUQHpc448nUD4/uRMbN5D4VoV+QASf+hQSbJGYNu9usoNa2M5tEZHBQO+
rDI+m1C7clwGj6hTwzNo2WI6+b7CmtvQ==

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> Best Regards,

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> Susan Evans Grove
> Publications Director

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> The Society of Naval Architects and Marine Engineers
> 601 Pavonia Ave.
> Jersey City, NJ 07306
> 201-499-5091

> sevans@sname.org

>

>

>

>

> -----Original Message-----

[Quoted text hidden]

Tommie-Anne Faix <tfaix@sname.org>

Tue, Jul 23, 2013 at 6:47 AM

To: dahicke@vt.edu

Hi Dave -

I received your voicemail - please see below e-mail. Susan has given permission for you to use our copyrighted material. Please let me know if you have any questions.

Thank you,
Tommie-Anne

Best regards,

Tommie-Anne Faix
Publications Sales Associate
The Society of Naval Architects and Marine Engineers
601 Pavonia Avenue - Suite #400
Jersey City, NJ 07306

Main - (201)-798-4800
Direct - (201)-499-5068
Fax - (201)-798-4975

www.sname.org

-----Original Message-----

From: Susan Evans

Sent: Friday, July 12, 2013 8:16 AM

To: David Hickerson; Tommie-Anne Faix

Subject: RE: Permission to use images or figures from Marine Technology,
Vol 22, No4, Oct 1985

David,

The process is quick. So quick in fact that you may consider this email permission to use SNAME copyrighted material with proper acknowledgement

[Quoted text hidden]

Use of a figure from your web page inclusion in a Master's thesis

5 messages

David Hickerson <dahicke@vt.edu>

Thu, Jul 11, 2013 at 2:14 PM

To: info@nauticed.org

Hi,

I am finishing a Ocean Engineering Master's thesis at Virginia Tech. The thesis is called, Computational Fluid Dynamic Study of Heaving-to. As part of the introduction and explanation of Heaving-to, I would like to use the figure on this page of your web site:

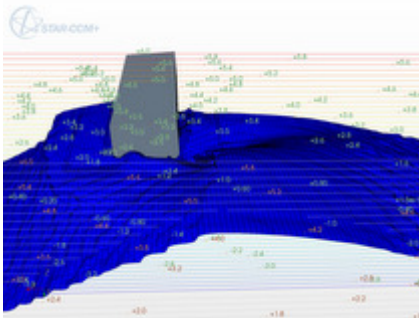
<http://www.nauticed.org/sailing-blog/more-about-heaving-to-in-a-sailboat/>

I included an image of one my computer simulations to determine wave height reduction behavior. In the image the boat is broadside to the wave, which is not the correct angle for heaving-to with respect to the waves. The boat was being used to generate the wake that interacted with the wave producing the wave reduction. For the simulation, it happened to be simpler to run it this way.

In the case that you are not the image author, could you tell me who is and how I can reach them.

Thanks,

David Hickerson
dahicke@vt.edu
719-238-4026



Scalar_Scene_Weather_-_wave_height_image_00585.png
541K

Grant Headifen <grant@nauticed.org>

Thu, Jul 11, 2013 at 2:57 PM

To: David Hickerson <dahicke@vt.edu>

David

This would be fine with us. Of course just reference that it is Courtesy of NauticEd. Good luck with the thesis.

Cheers

Grant

Read my latest blog at <http://www.nauticed.org/sailing-blog>
it's quite enlightening (please "like" it via facebook)

Grant Headifen

Ph +1 512-696-1070

<http://www.nauticed.org>

I invite you to become a Fan <http://www.facebook.com/nauticed>

Twitter: <http://www.twitter.com/nauticed>

Take our the Free Basic Sail Trim Course at <http://www.nauticed.org/freesailingcourse>

[Quoted text hidden]

[Quoted text hidden]

<Scalar_Scene_Weather_-_wave_height_image_00585.png>

David Hickerson <dahicke@vt.edu>

Thu, Jul 11, 2013 at 6:53 PM

To: etd@vt.edu

Hi,

For my thesis, is the below email sufficient documentation of permission for ETD publication?

Dave

[Quoted text hidden]

David Hickerson <dahicke@vt.edu>

Fri, Jul 12, 2013 at 1:05 AM

To: Grant Headifen <grant@nauticed.org>

Grant,

Thank you very much. I will be defending my thesis at the end of the month and when it has been approved I could send you a link if you are interested in looking at it.

Fair weather and follow sea,

Dave Hickerson

[Quoted text hidden]

Grant Headifen <grant@nauticed.org>
To: David Hickerson <dahicke@vt.edu>

Fri, Jul 12, 2013 at 6:28 AM

David

Yes - I'd also be interested if you want in you doing a guest blog post on our Sailing Blog. A basic summary of findings.

Cheers
Grant

NauticEd™

Read my latest blog at <http://www.nauticed.org/sailing-blog>
it's quite enlightening (please "like" it via facebook)

Grant Headifen

Ph +1 512-696-1070

<http://www.nauticed.org>

I invite you to become a Fan <http://www.facebook.com/nauticed>

Twitter: <http://www.twitter.com/nauticed>

Take our the Free Basic Sail Trim Course at <http://www.nauticed.org/freesailingcourse>

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Cheers

Grant

<image.jpg>

**Read my latest blog at <http://www.nauticed.org/sailing-blog>
it's quite enlightening (please "like" it via facebook)**

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Ph +1 512-696-1070

<http://www.nauticed.org>

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Thanks,

David Hickerson

dahicke@vt.edu

719-238-4026

<Scalar_Scene_Weather_-_wave_height_image_00585.png>



David Hickerson <dahicke@vt.edu>

Requesting permission to use excerpts of Storm Tactics Handbook 3rd Edition in Thesis

3 messages

David Hickerson <dahicke@vt.edu>
To: info@paracay.com

Wed, Jul 10, 2013 at 9:26 PM

Hi,

I am writing a thesis for an ocean engineering Master's degree called the Computational Fluid Dynamic study of Heaving-to. During which I found the book Storm Tactics Handbook by Lin and Larry Pardey to be a very good resource. I have quoted a table on page 116 from the book and made references to other parts of this work. The use of this work in my thesis has been to frame the problem, so that the computer simulations that I have run are done in the right context, drift rate, wave characteristics, etc. My thesis is in the draft stage now and I intend on defending it on July 24. I would like to get permission to use these excerpts in my Thesis which will go into the ETD system, a electronic database for theses and dissertations.

Thank you for your consideration,

David Hickerson
dahicke@vt.edu
719-238-4026

Lin and Larry <lpardey@xtra.co.nz>
Reply-To: Lin and Larry <lpardey@xtra.co.nz>
To: "dahicke@vt.edu" <dahicke@vt.edu>

Thu, Jul 11, 2013 at 10:02 PM

Hi David

Our publishing partner forwarded your request. We are pleased you found the information in Storm tactics Handbook to be useful. Yes you may use the information in your Thesis, with proper attribution. Best of luck and we would be interested in learning more about your conclusions.

I am currently updating the book. If you have any suggestions or information to add, please let me know.

Sincerely,
Lin Pardey

From: Jim Morehouse <jim@paracay.com>
To: Lin Pardey <lpardey@xtra.co.nz>
Sent: Friday, 12 July 2013 2:53 AM
Subject: FW: Requesting permission to use excerpts of Storm Tactics Handbook 3rd Edition in Thesis

This is for you Lin.

Jim

Jim Morehouse

Paradise Cay Publications, Inc.

[707.822.9063](tel:707.822.9063)

[800.736.4509](tel:800.736.4509)

From: David Hickerson [mailto:dahicke@vt.edu]

Sent: Wednesday, July 10, 2013 8:27 PM

To: info@paracay.com

Subject: Requesting permission to use excerpts of Storm Tactics Handbook 3rd Edition in Thesis

[Quoted text hidden]

David Hickerson <dahicke@vt.edu>
To: Lin and Larry <lpardey@xtra.co.nz>

Fri, Jul 12, 2013 at 1:39 AM

Hi Lin,

Thank you very much for your permission.

It was your book that inspired me to do this study for my thesis at Virginia Tech. Having been a lake sailor, I wanted to move up to the big pond. I was concerned about storms and picked up your book. I had heard about heaving-to and became interested in how effective it was in reducing the size of the wave.

My study involves using computational fluid dynamics (CFD) to simulate the conditions. I had to do some simplifications because my computer was of limited size. For instance I used a prismatic profile hull at 90 degrees to generate the wake instead of a CAD model of a sail boat. Since I was interested in the wake and the wave interaction, I considered this acceptable. What I found was that the wake carries the water from the back side of the wave, where it is descending, and moves it on top of the crest causing it not reach its full height. For the limited amount trials that I have run, it appears that a given boat will have a set amount of wave height reduction that it can achieve on big waves. I came to this conclusion for two reasons. I ran three steep waves, 3m high by 25m long, 6.5m high by 55m long, and 8m by 67m long. The hull with a full length keel and draft of 1.4m generated a 0.9m wave height reduction on all three waves. The second reason that I believe this, is that the boat can only pull water over the crest down to around the depth of its keel. This is fixed. The other thing I noticed is that there is a bow wave along side the boat. I believe this stabilizes the boat on the way up the face of the wave. This counters the force of the breaking wave on the free board, by moving the center of buoyancy in the opposite direction.

I was not able to simulate sea anchors or drogues, but I think sea anchors will help increase wave height reduction because of their depth.

I defend my thesis on the 24th, and some time after that VT will publish it to their thesis and dissertation database. After that I can send you a link if you would like to look at it.

Fair weather and following seas,

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