From METEOR 1988 to ANONYMA 2013
and further!

Future Ship Powering Trials and Monitoring Now!

Volume 2

The first PATEs: Post ANONYMA Trial Evaluations,
the continued evaluations of a quasi-steady
'model' propulsion test of 1986, demonstrating
the feasibility and 'efficiency' of quasi-steady trials,
and a Written Discussion with related correspondence

Michael Schmiechen

Published on occasion of the
27th International Towing Tank Conference
at Copenhagen, August 31 to September 06, 2014

VWS Mitteilungen Heft 63, post mortem
Berlin 2014

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in memoriam
Versuchsanstalt für Wasserbau und Schiffbau, Berlin

"All models are wrong. Some are [particularly] useful."

George Box. Quotation following Christian Hesse: Wer falsch rechnet, den bestraft das Leben. München: Beck, 2013/171. Re-translation and [addition]: MS.

PROBLEM

The evaluation of ship powering trials is still treated as hydro-mechanical problem, although it is basically of 'conventional' nature – *not* to be mistaken for 'traditional' –, part of a whole range of intricately intertwined contractual and legal conventions. And having ignored the state of research for decades naval architects are suddenly facing the problem to set up the standards to be met and to be made legally compulsory!

'Theoreticians' at universities and model basins have 'simply' left the very difficult problems of trials and monitoring to 'practicians' at ship yards and model basins. And, hard to believe, ship owners still accept, that the same 'people' providing the predictions are carrying out and analysing the trials 'as well'.

IMPORTANCE

The conventions of the rational theory of propulsion, promoted since 1980, provide a common, sound, thus lasting basis of 'considerable' importance for research and development concerning methods of future efficient and reliable trials and monitoring. This second volume, celebrating the quasi-steady propulsion tests with the research vessel METEOR in the Greenland Sea in 1988, is a collection of further applications, results and discussions mostly originated since publication of the first volume in 2013.

The *first section* deals with my first Post ANONYMA Trial Evaluations, the reliable analysis of traditional trials with two sister ships in the East China Sea. The results, compared with those of an undisclosed traditional approach in an ongoing joint research project of HSVA and SSPA, confirm the 'power' and reliability of the procedure promoted since 1998.

The *second section* deals with the continued analyses of a quasi-steady ‘model’ test, demonstrating the dramatic increase of efficiency and reliability to be gained by quasi-steady model testing and full scale trials and monitoring, the former requiring no hull towing and propeller open water tests, the latter requiring no thrust measurements!

The *third section* covers my Written Discussion of the Report of the SC PSS together with related correspondence.

Continued on the back end-paper

From METEOR 1988
to ANONYMA 2013
and further!

Future Ship Powering
Trials and Monitoring
Now!

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MS 28.08.2014 08:00 h

Preface

The material published in this Volume 2 has been selected from work that originated since the Annual Meeting of STG in November 2013, when Volume 1 of my ‘Festschrift’ has been published to commemorate

- my quasi-steady propulsion tests with the research vessel METEOR in the Greenland Sea in November 1988 and
- my submission of a proposed rational standard for the assessment of ship powering trials to the Japan Marine Standards Association in April 1998, convener of what later became the standard ISO 15016: 2002-06.

My first Post ANONYMA Trial Evaluations (PATEs) of two sister ships in the East China Sea are demonstrating the power of the rational procedure I am promoting since 1998, its stability and, most important, its objectivity.

My recent work on the analysis of a quasi-steady 'model' propulsion test without thrust measurements aims at extremely efficient ship powering trials and monitoring full scale under service conditions, without anybody even noticing that such trials are being performed. The results so far are my substantial contributions to the standard ISO 19030 under development.

This collection of recent work is completed by Written Contributions to the Report of the Specialists Committee on Performance of Ships in Service submitted to the Full Conference of the 27th ITTC.

All the work in this volume, even this volume itself, is completely documented in the Section 'News on ship powering trials' on my website www.m-schmiechen.de. Figures in the Mathcad documents are printed here in black and white, on the website they are available in colour.

Contents

MS 28.08.2014 08:00 h

Links to the pdf-version of this volume as well as to all the material in this volume are to be found under 'From METEOR 1988 to ANONYMA 2013 and further' in the Section 'News on ship powering trials' on my website www.m-schmiechen.de.

'Disclaimer'

Despite utmost care my very intricate texts and programmes may still contain mistakes and obscurities. If brought to my attention I shall 'repair' them and gratefully acknowledge any assistance serving correction and clarification, respectively.

MS 28.08.2014 08:00 h

On the objective identification of the propulsive performance of ships in service

An executive summary

On the objective identification of the propulsive performance of ships in service

THE COMMANDMENTS OF RATIONALITY, OF OBJECTIVITY AND, LAST BUT NOT LEAST, OF EFFICIENCY

"Thou shalt not talk in terms of incoherent models and of incoherently interpreted concepts."

"Thou shalt not introduce more parameters in vain than you can identify reliably without any prior data."

"Thou shalt not adhere to traditional trials, quasi-steady trials being necessary and possible for performance monitoring in service anyhow."

2 Moses 20, 1 – 17. Paraphrases: MS.

Problem

The problem stated in the title is a fundamental problem of the theory of ships, the latter being much more than Coloured Fluid Dynamics, in fact being 'on top' of any performance prediction. The problem is reliably, i. e. objectively to prove any predictions, not to say the 'promises' made concerning the powering performance of ships.

Plan of exposition

In order to provide a survey of the development of the rational theory I am promoting; I shall not repeat any of the many expositions of the rational of my work, but I shall outline the 'history' of my work up to now in more easily understood, rather crude engineering terms.

Model scale tests

Traditionally powering predictions have been and often still are, following Froude's incoherent interpretation of the basic concepts, based on the results of hull towing, propeller open water and propulsion tests with geometrically scaled models of hulls and propellers at different flow conditions, and flow not similar to conditions met on the full scale.

Full scale tests

Thus scaling to full scale conditions based on past experience is necessary, but the problem is that corresponding full scale hull towing and propeller open water tests, necessary to collect the necessary experience, are practically not possible, definitely not routinely under service conditions.

My conclusion

This situation is not my fault! But in view of the dilemma I have drawn the only reasonable conclusion and consequence. In 1980 I have proposed a coherent model and a corresponding procedure of quasi-steady testing, which gets along without hull towing and propeller open water tests. And in the late 1980s I have successfully applied this method on model and full scale on the METEOR under service conditions in very heavy weather.

Model test technique

In the following years the technique has been developed to maturity for model testing. The results compare perfectly well with results of the traditional procedure based on model hull towing and propeller open water tests as documented in this volume. This 'coincidence of results is not necessary, but useful for linking up with past experience, if any.

Traditional trials

In the late 1990s, when I saw the 'incredible' draft of the standard ISO 15016 on the assessment of traditional trials, it occurred to me, that based on a half sentence in my report on the METEOR tests, a much more transparent, objective method was possible. Contrary to the traditional method it does not require any prior data.

ISO 15016 disaster

Despite being error prone, inherently wrong as I demonstrated explicitly long before it became a standard, and thus being no longer acceptable, being inadequate for most of today's purposes, the current, long overdue revision of the standard ISO 15016 perpetuates this deplorable state of affairs by adopting the 'incredible' STAimo method based on a joker to be pulled out of the sleeve.

ANONYMA and PATEs

This method has been developed to maturity and its power has finally been demonstrated in the ANONYMA project and the first Post ANONYMA Trial Evaluations of two sister ships in the East China Sea. The ANONYMA project has been documented in the first volume, the first PATEs are documented in this second volume.

Monitoring

Traditional trials are not at all efficient and completely unacceptable for monitoring purposes. So I came back to the quasi-steady testing, realising that reliable thrust measurements, as I have successfully made on board the METEOR, are practically not routinely possible. Again this is not my fault!

But I drew the consequence and developed a method to identify the resistance and the propulsive efficiency requiring no thrust measurements.

Quasi-steady 'model' test

The first exercise along this line, published in the first volume, suffered from a stupid error, which has subsequently been repaired. The remaining problem, the identification of the current, is subject of the solution proposed and published in this volume.

Familiarity with tools

In the course of nearly thirty five years a full range of 'practical', though fundamental problems, heretofore unsolved, have been solved by approaching them pragmatically based on a thorough understanding of their nature and familiarity with current philosophical, conceptual, statistical and numerical tools, necessary adequately to deal with them. Even at this advanced stage the development is of course not finished, but considered as work in progress.

Developments

The routine for the identification of the current and the powering characteristic of the propeller in behind condition is absolutely stable and an extremely sensitive tool for scrutinising the data. But in the process of 'streamlining' all programmes for routine applications some basic routines have been found still lacking stability, for reasons yet to be identified and 'addressed'.

A conclusion

A surprising fact is, that the community concerned has not yet taken advantage of the dramatic gains possible in research, technology and routine applications, still trying to solve the problems with the inadequate tools of our great-grandfathers and adhering to the doctrine 'Not invented here!' But again this is not my fault!

MS 28.08.2014 08:00 h

Post ANONYMA Trial Evaluations
for two sister ships in the East China Sea

Assessment of traditional trials
Concepts, Units, Routines: PATE_00.2
First ship, four double runs: PATE_01.2
Second ship, four double runs: PATE_02.2
First ship, three double runs: PATE_01.3
Correspondence, Explanations, Discussion

On the evaluation of traditional trials

Problem

Traditional trials, although very inefficient and expensive, are still 'standardly' performed and evaluated according to various 'Codes', which only now are going to be harmonised and finally to be standardised. But (to my satisfaction) the current DIS 15016, intended to up-date the former, inherently old-fashioned, inadequate and error prone standard ISO 15016: 2002-06, has not passed the voting procedure.

'Symptoms'

The current attempt, quickly to cure the symptoms shown by the Draft, perpetuating the old deficiencies, explicitly demonstrated already in 1998, is definitely the wrong strategy, particularly if the 'doctors' themselves have produced the disease. In view of a lasting standard an open discussion accounting for the state of research is required, even if the Rules of ISO, DIN etc are excluding this explicitly.

Model

The evaluation of ship powering trials is still treated as hydro-mechanical problem, although it is essentially of 'conventional' nature – *not* to be mistaken for 'traditional' –, part of a whole range of intricately intertwined legal and contractual conventions. And having ignored the state of research for decades naval architects are suddenly facing the problem to set up the standards to be met and to be made legally compulsory!

Plan

The following detailed rational evaluations of trials with two sister ships at different environmental conditions, together with the routines developed by the way and the related extended explanations, are my most recent contributions to the necessary discussion.

Routines

The most fundamental, extremely simple routine for the identification of the current and the powering characteristic of the propeller in behind condition, is absolutely stable and has served many times as an extremely sensitive tool for scrutinising the data. Without reference to any prior data it already permitted to demonstrate the deficiencies of ISO 15016 and even to identify propeller ventilation, that had remained undetected by a traditional method.

MS 28.08.2014 08:00 h

Written contribution to a talk of Dr. Hollenbach
presented at the 108th Annual meeting of STG

Zur Problematik von Leistungs-Prognosen und Korrelation

Leider war zu dem Vortrag von dem Vortragenden, und mit Duldung des technisch-wissenschaftlichen Beirats, kein Vorabdruck zu erhalten, so dass eine gründliche Diskussion des Vortrages und des geschilderten Projektes gar nicht möglich ist.

Die Kurzfassung im Programm-Heft hat mich jedoch angeregt, dann wenigstens um die Daten der erwähnten Probefahrt zu bitten, um sie unabhängig von einem der bisher gebräuchlichen Verfahren auszuwerten. Leider waren auch diese Daten nicht erhältlich, mit der 'perversen' Begründung, dass sie vertraulich seien.

Denn gerade die Eigentümer der Daten haben natürlich das allergrösste Interesse an einer unabhängigen Auswertung ihrer sehr teuren Daten, die gewöhnlich leider nur sehr 'billig' ausgewertet werden. Und für den Erfolg des Vorhabens ist die unabhängige Auswertung der Daten selbstverständlich unerlässlich.

Das um so mehr, als die derzeitige hoch-aktuelle und hoch-brisante Diskussion um eine allgemein akzeptable, allen heutigen Ansprüchen und Anforderungen genügende Norm für das Auswerten von Probefahrten bei der ITTC, IMO und ISO noch gar nicht zu Ende ist.

Unter dem berechtigten (!) Druck des MEPC der IMO will das TC 8 der ISO so eine Norm bis Ende März 2014 durch alle nationalen Arbeitsgruppen peitschen, obwohl die 27th ITTC erst Anfang September 2014 in Kopenhagen stattfinden wird, und nur die 'Full Conference' auch solche vereinheitlichten Normen akzeptieren kann.

Die ISO Working Group TC8/SC6/WG17 hat auf ihrem Treffen in London am 16. und 17. September 2013 bereits den Draft DIS 15016, für meinen Geschmack sehr selbstzufrieden, 'verabschiedet' und den 'Fahrplan' für das Zustimmung durch die nationalen Gruppen festgelegt. Erwähnt werden ausdrücklich:

> The 1st hurdle to clear. According to the Resolution MEPC.234 (65), “Revised version of ISO 15016 should be available by early 2014”.
>
> The 2nd hurdle to clear. Revised ISO 15016 should be an acceptable way for sea trial in the EEDI guidelines.

Den zuletzt genannten Ansprüchen genügt der bisherige Entwurf aber leider nicht, ganz abgesehen von den mehr als 'problematischen', um nicht zu sagen 'zweifelhaften' EEDI Guidelines.

Nicht ganz überraschend waren bei dem Treffen nicht nur die Niederlande, sondern auch die von MARIN 'betriebene' SAT-Group vertreten, deren 'unglaubliche' Sea Trials Analysis Methode als 'Industrie-Standard' mit Gewalt durchgedrückt werden soll!

Die deutschen Interessen werden nach Auskunft von Herrn Dau von der DIN NSMT alleine von Herrn Dr. Hollenbach vertreten, obwohl die HSVA Mitglied der STA-Group ist! Und damit nicht genug, auch die ITTC war vertreten.

Deren 'ITTC 2012 Guidelines' basieren nämlich auch auf der STA-Methode und wurden, offenbar unbesehen und voreilig, nämlich ohne von der ITTC akzeptiert zu sein, vom Executive Committee an das MEPC der IMO weitergeleitet. Inzwischen hat sich aber meines Wissens das Executive Committee schleunigst davon distanziert, obwohl ja gerade die aktuelle ISO Methode mit den 'ITTC 2012 Guidelines' harmonisiert werden sollte.

Es ist also etwas sehr faul, nicht nur im Staate Dänemark, wie ich dem Chairman des Executive Committee der ITTC nach Lyngby schrieb. Wie konnte es passieren, dass sich die ITTC von MARIN als trojanisches Pferd missbrauchen liess? Und wie ist es möglich, dass viele 'Specialists' immer noch dem Kaiser in seinen neuen Kleidern nachlaufen?

Ein Grund ist in den Regeln der Normungs-Institute zu suchen. Die behaupten zwar den Fortschritt zu unterstützen, durch ihre Regeln für die Besetzung der Arbeits-Gruppen perpetuieren sie aber den tradierten (und nicht ohne Grund beliebten) Zustand und verhindern sogar den schon lange notwendigen Fortschritt für weitere Jahrzehnte.

Dass die NSMT im Falle der Revision ISO 15016 die Einrichtung einer Arbeitsgruppe mit Vertretern von Werften, Reedern und Hochschulen bisher nicht für notwendig hielt, ist für mich mehr als verblüffend. Ich persönlich wurde aber schon formell von der Mitarbeit ausgeschlossen, weil nicht den Hut irgendeiner Interessen Gruppe trage.

Wer mehr über die Details wissen möchte, den verweise ich auf die Festschrift, die ich zu den Jubiläen meiner Versuche mit der METEOR und meiner rationalen Methode zum Auswerten von Probefahrten veröffentlich habe.

Die Festschrift ist heute für Interessenten bei mir erhältlich, solange der Vorrat reicht, oder auf meiner website www.m-schmiechen.de unter 'News on ship powering trials'.

MS 28.08.2014 08:00 h

A correspondence concerning STG procedures
lacking for Written Contributions

-----Ursprüngliche Nachricht-----
From: Michael Schmiechen
Sent: Monday, August 4, 2014 6:50 AM
To: Patrick Käding ; Günter Ackermann
Cc: Iwer Asmussen ; Andrea Bohn-Möller ; Uwe Hollenbach

Subject: STG-Vorträge und deren Diskussion

Sehr geehrter Herr Käding,
sehr geehrter Herr Ackermann,

nach einer wundervollen Reise durch das Baltikum bedanke ich mich endlich bei Herrn Ackermann für die prompte Erledigung meines Anliegens. Der ganze 'unmögliche' Vorgang veranlasst mich aber, Herrn Käding und den TWB zu bitten, die Konsequenzen daraus zu ziehen und endlich wieder zu einem geordneten, schriftlich fixierten Vortrags-Verfahren zurückzukehren, wie es früher üblich und bei den meisten Gesellschaften und allen Tagungen natürlich (!) auch ganz selbstverständliche (!) Praxis ist.

Dazu gehört m. E., dass wenigsten Interessenten spätestens vierzehn Tage vor einem Vortrag ein Manuskript oder die Präsentation zur Verfügung gestellt wird, die alleine Gegenstand von mündlichen und/oder schriftlichen Diskussionen und Beiträgen, entsprechend klaren Regeln dafür, sein sollten. Dass so ein geordnetes Verfahren nicht möglich sei, halte ich nach meinen eigenen Erfahrungen für eine sehr plumpe, sehr 'faule' Ausrede.

Es kann doch gar nicht sein, dass die Regeln für Beiträge nicht klar definiert sind und dass der Vortragende viele Monate nach dem Vortrag gefragt wird, ob ein Diskussions-Redner sein Manuskript überhaupt vor dem Druck im Jahrbuch zur Einsicht erhalten darf, und dass sein Schluss-Wort in wesentlichen Teilen gar nicht zur Diskussion gehört, ohne dass dies jemand bemerkt hätte.

Dazu fällt mir gerade noch ein, dass es ja seit meinem Beitrag zu dem Vortrag von Prof Grim im Jahre 1966 sogar die 'lex schmiechen' gibt, nach der schriftliche Beiträge den Vortragenden schon vor dem Vortrag zur Kenntnis gebracht werden müssen. Ich habe mich, wenn auch knapp, daran gehalten.

Mit freundlichen Grüssen und vielem Dank im Voraus für Ihre Bemühungen auch dieses Anliegen im Interesse der STG (!) befriedigend zu 'erledigen'
Ihr Michael Schmiechen.

-----Ursprüngliche Nachricht-----
From: Ackermann
Sent: Tuesday, July 22, 2014 3:25 PM
To: m.schm@t-online.de ; Uwe Hollenbach
Cc: Patrick Kaeding ; Andrea Bohn-Möller

Subject: STG HV 2013: Vortrag Herr Hollenbach, Diskussion, Jahrbuch

Sehr geehrter Herr Schmiechen,
sehr geehrter Herr Hollenbach,

der jetzige Vorsitzende des TWB der STG, Herr Prof Kaeding, hat mich als seinen Vorgänger im Amt zur Zeit der HV 2013 gebeten, an einer Klärung der Meinungsverschiedenheiten im Zusammenhang mit dem Abdruck der Diskussionsbeiträge und -antworten im Jahrbuch mitzuwirken.

Um die Vorgeschichte zusammenzufassen: Herr Schmiechen hatte zu dem Vortrag von Herrn Hollenbach während der Tagung zu der Diskussion beigetragen. Seine schriftlich der STG eingereichte Fassung enthielt allerdings einige Themen, zu denen die er in der Diskussion nichts vorgetragen hatte. Seit vielen Jahren ist es üblich, dass sowohl die Abdrucke der Vorträge als auch die der Diskussionsbeiträge etwa den Darstellungen während der Veranstaltung entsprechen sollen. (Das mag früher einmal anders gewesen sein.) Deshalb hatte ich Herrn Schmiechen die Streichung einiger Passagen vorgeschlagen und nach ein oder zwei E-Mail-Wechseln hatten wir einen Kompomiss gefunden, der jetzt auch in das Manuskript für das Jahrbuch übernommen ist.

Als dann etwas später Herr Hollenbach seine Antwort auf den Diskussionsbeitrag bei der STG einreichte, konnte er von dieser Vorgeschichte nichts wissen. Er hat deshalb die Ergebnisse von Vergleichen mit Rechnungen von Herrn Schmiechen einbezogen, die er erst in 2014, also nach der Tagung an-

gestellt hat. Dies hätte auch nicht als Diskussionsbeitrag übernommen werden dürfen, höchstens als Nachtrag. (Die abschließende redaktionelle Durchsicht des Manuskiptes steht noch bevor.) Herr Schmiechen beanstandete - zu Recht - diese Ungleichbehandlung und ich freue mich, dass Herr Hollenbach sofort zugestimmt hat, als ich ihm den folgenden Änderungsvorschlag machte:
Der erste Satz des 5. Absatzes ist das Ende der Antwort und wird um das Wort "inzwischen" ergänzt: "Freundlicherweise hat sich einer unserer Chinesischen Kunden inzwischen bereit erklärt....nach Ihrer 'rationalen Methode' auswerten können." -- ENDE der Antwort---.

Mit freundlichen Grüßen
Günter Ackermann.

From: Michael Schmiechen
Sent: Monday, July 21, 2014 9:33 AM
To: Andrea Bohn-Möller
Cc: Uwe Hollenbach ; Moustafa Abdel-Maksoud
Subject: STG HV Berlin 2013: Vortrag Hollenbach und Dikussion dazu

An Frau Bohn-Möller,
Geschäftsstelle der STG,

mit der Bitte um Weiterleitung

an den vorherigen und den jetzigen
Vorsitzenden der TWB der STG,
Herrn Prof. Dr. Ackermann bzw.
Herrn Prof. Dr. Kaeding.

Im November 2013 hat Herr Dr. Hollenbach auf der Hauptversammlung der STG einen Vortrag gehalten, ohne dass, mit Duldung des TWB, bis dahin irgendein Vorabdruck vorlag. Eine gründliche Diskussion des vorgestellten Projektes war daher von vornherein ausgeschlossen.

Ich habe trotzdem auf Grund der Kurzfassung im Programm-Heft vor dem Vortrag einen schriftlichen Beitrag zu dem Thema verfasst und verteilt. Im Hinblick auf die zur Verfügung stehende Zeit habe ich aber nur die grundsätzlichen Bemerkungen daraus mündlich vorgetragen, die Details waren ja für die Dokumentation im Jahrbuch schriftlich fixiert.

Tatsächlich wurde mein Beitrag ‘daher’ aber für die Veröffentlichung im Jahrbuch rigoros auf den mündlich vorgetragenen Teil gekürzt. Wie üblich habe ich die vollständige Fassung jedoch sofort für fortgesetzte Diskussionen auf meiner website veröffentlicht, und dort befindet sie sich auch weiterhin.

Wie aus der anhängenden mail hervorgeht, habe ich erst vor ein paar Tagen auf Nachfrage ‘einen’ kurzen Vortrags-Text und die Beiträge zur Diskussion, so wie die Antworten von Herrn Hollenbach bekommen, nachdem Frau Bohn-Möller bei Ihm angefragt hat, ob ich die Dinge ‘überhaupt’ haben dürfte! Allein dieses ‘Prozedere’ ist selbst nach bescheidensten Maßstäben ein offener Skandal und erst als mir das bewusst wurde, habe ich begonnen diesen Brief zu verfassen.

Denn leider kommt es noch ‘viel schlimmer’! Die Antwort von Herrn Hollenbach auf meinen Beitrag bezieht sich zu wesentlichen Teilen gar nicht auf meinen schriftlichen Beitrag, ob nun gekürzt oder ungekürzt, sondern auf Dinge, die erst im Laufe der lange danach folgenden Monate ‘stattfanden’, wie im Text detailliert belegt, nämlich meine Auswertungen von Daten, die er mir auf mein Drängen Dankens werter zur Verfügung stellen durfte.

In aller gebotenen Bescheidenheit verlange ich jetzt im Hinblick auf gleiche, korrekte (!) Behandlung, dass auch seine Antwort ‘entsprechend’ gekürzt wird. Da der Umbruch des Jahrbuchs noch nicht abgeschlossen ist, bereitet das überhaupt keine Probleme. Wenn schon ‘Tugend-Terror’ (Thilo Sarrazin), dann bitte konsequent und nach vorher festgelegten Spielregeln, die nicht jeder nach seinem Bedarf während des Spiels ändern darf.

Damit sich interessierte Kollegen informieren und selber ein Urteil bilden können, befinden sich meine endgültigen Analysen mi allen Details und meine gesamte zu dem Projekt und seiner ‘Entwicklung’ gehörende Korrespondenz mit Herrn Hollenbach ohnehin inzwischen auf meiner website, weil die sonst nirgends dokumentiert würden. Leider fehlt für Vergleichs-Zwecke bisher noch die ebenso detaillierte Veröffentlichung der Analysen von Herrn Hollenbach.

Tatsächlich hat nach meiner Übersetzung meiner ‘vor-letzten’, sehr ausführlichen Antwort an Herrn Hollenbach schon eine sehr gründliche Korrespondenz mit Herrn Dr. Gennaro aus Genua stattgefunden. Auch die findet sich auf meiner website und wird zusammen mit der ‘vor-letzten’ Antwort im zweiten Band meiner Festschrift zum Jubiläum meiner Versuche mit der METEOR gelegentlich der 27th ITTC Anfang September in Kopenhagen veröffentlicht.

Ausgelöst durch meine wiederholten, begründeten Feststellungen zu dem inakzeptablen STA-Verfahren, zu dem kläglichen Versagen des ITTC Specialists Committee on the Performance of Ships in Service, dem Herr Hollenbach bisher noch angehört, und zu der darauf folgenden voreilig, contra legem getroffenen Entscheidung des ITTC Executive Committee hat das Advisory Council der ITTC, dem natürlich auch die HSVA angehört, jetzt im Hinblick auf die vertraglichen und gesetzlichen Implikationen von Probefahrten weitreichende Änderungen, auch in den Beziehungen der ITTC zur ISO und zur IMO, empfohlen. Zur Information und als Anregung hänge ich den Bericht des Chairmans, Prof. Strasser aus Wien, an.

Welche Konsequenzen diese Änderungen unter anderem für die von MARIN betriebene STA-Group, zu der auch die HSVA bisher noch gehört, und das vertriebene, m. E unhaltbare STAimo-Verfahren hat, wird die Zukunft zeigen. Das Gleiche trifft für die Neu-Ausgabe der Norm ISO 15016 zu, sowie für die in der Entstehung begriffene Norm ISO 19030 zu.

Letztere wird unter anderem Gegenstand des Vortrages von Herrn Brehm auf dem STG Colloquium on ‘Performance of Energy Saving Devices’ und des Vortrages von Herrn vom Baur auf dem STG Reederei-Sprechtag ‘Schiffsmaschinenbau’ am 16. Oktober sein. An beiden Veranstaltungen werde ich persönlich nicht teilnehmen können, ich möchte zu den genannten Vorträgen aber evtl. schriftliche Beiträge liefern, da ich inzwischen wesentliche Vorarbeiten zu den Problemen geleistet habe und z. T. auch schon veröffentlicht habe und demnächst veröffentlichen werde. Welche Spielregeln gelten dafür?

Mit freundlichen Grüssen und der höflichen Bitte um Ihr Verständnis für mein billiges Verlangen und diese langen, m. E. notwendigen Erläuterungen des ‘politischen’ Kontextes und der sehr diversen Interessen-Konflikte
Ihr Michael Schmiechen.

PS. Selbstverständlich werde ich auch diese Bitte und die Antworten darauf auf meiner website veröffentlichen.

From: Michael Schmiechen
Sent: Friday, July 18, 2014 12:03 PM
To: Hollenbach@hsva.de
Subject: Re: ISO 15016: Beispiel

Guten Morgen Herr Hollenbach,

wie ‘schön’, dass ich jetzt endlich und nur auf Nachfrage nicht nur Ihren Aufsatz, sondern auch Ihre Antworten zu den Beiträgen erhalten habe. Leider habe ich jetzt wegen viel dringenderer Aufgaben keine Zeit, mich im Detail damit zu beschäftigen.

Zu ihrer Frage nach meiner Auswertung PATE_02 fällt mir aus dem Stand nur ein, dass ich bei den ‘idealen’ Verhältnissen, bei denen meine Methode, wie ich selber ausdrücklich festgestellt habe, per definitionem Probleme hat, ja tatsächlich den environmental parameter für Wind und Wellen nicht identifizieren konnte.

Ihr Schlusswort in Gottes Ohr. Ich werde dazu im zweiten Band meiner ‘Festschrift’, der zur ITTC erscheinen wird, Stellung nehmen. Darin werde ich auch meine Beiträge zur Vorgeschichte der aktuellen Entwicklungen in ITTC, ISO und IMO dokumentieren.

ISO 15016 betreffend müssen Sie unbedingt verhindern, dass dieselben ‘Leute’, die nur die Fehler von 2002 wiederholt haben, diese jetzt ganz schnell ‘reparieren’, bevor die ITTC zu Potte gekommen ist.

So viel, so schnell, wie immer (noch) in Eile,
Ihr Michael Schmiechen.

Prof. Dr.-Ing. M.Schmiechen

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To whom it may concern

PATEs:
Post ANONYMA trial evaluations

References

Contents

General remarks

Rational evaluation

The rational evaluations are solely based on extremely simple propeller, current and environment conventions and on the mean data reported, though without their confidence ranges. No prior data and parameters will be used, particularly not those derived from corresponding model tests. Thus the procedure and its results are as transparent and observer independent as necessary for the rational resolution of 'conflicts' of any type!

Subsequent trustworthy predictions (!) of the powering performance at loading conditions and sea states differing from those prevailing during the trials are *not* subject of this exercise. But at the end of the Conclusions of PATE_01 serious doubts concerning any traditional convention based on prior data are being expressed and future solutions are being outlined.

Traditional procedures

Contrary to the rational procedure promoted and demonstrated all traditional procedures are based on prior data, and this not only for the prediction mentioned, but incorrectly already for the evaluation of the powering performance at the trials conditions.

But both these essential operations cannot meet the requirements of transparency and observer independence unless based on additional data observed at various conditions, permitting to identify all parameters necessary for the trustworthy prediction.

In a way the situation is still similar to the conduct and evaluation of model tests according to Froude's procedure, where the 'essential', the frictional part cannot be modelled, but is being based on prior data.

'Direct power method'

The STAimo-System aggressively promoted by MARIN is based on the propulsive efficiency as input value, (to be) pulled as joker out of the sleeve and is still being based on the unsubstantiated claims, already pinpointed in the chapter on 'The Emperor's New Clothes' in my paper on 'Future Ship Powering Trials Now!' brought to the attention of colleagues worldwide in May 2013.

Concepts and symbols

Table of names and symbols

Names		**Symbols**	
rational	**traditional**	**rational**	**traditional**
'Bodies'			
Ground		G	
Water		W	water
Air	Wind	A	wind
Seaway	Waves	S	wave
Hull		H	
Shaft		S	
Propeller		P	
'Speeds'			
Hull speed relative to ground	ship speed over ground	V_{HG}	V_{G}
Hull speed relative to water	ship speed in water	V_{HW}	V_{H}, V_{S}
Hull speed relative to air	relative wind velocity	$V_{HA} = -V_{AH}$	$V_{Wind\ rel}$
Water speed relative to ground	current velocity	V_{WG}	
Water speed relative to hull	relative current velocity	V_{WH}	
Air speed relative to ground	wind velocity	V_{AG}	V_{Wind}
Air speed relative to hull		V_{AH}	
Wave speed relative to ground	wave velocity	V_{SG}	V_{Wind}
Hull speed relative to wave		V_{HS}	
Evaluations			
rational		rat	
traditional		trad	
Conditions			
trials		trial	
reference		ref	

Remarks

Speeds

The speeds relative to the hull are the longitudinal speeds, positive in the forward direction.

The notational conventions for speeds imply sign reversal with the reversal of indices, e. g.

$$V_{WH} = -V_{HW} .$$

Thus the speed of the incoming water is negative at positive forward hull speed, while traditionally the speed of wind incoming from ahead is 'counted' positive.

This inconsistency is particularly evident at the no-wind condition, precisely the 'no wind relative to the water' condition

$$V_{AW} = V_{AH} + V_{HW} = 0 ,$$

resulting correctly in the negative relative wind speed

$$V_{AH} = -V_{HW} .$$

and in the relation

$$V_{HA} = V_{HW} .$$

The reason for this confusion is to be found in the inconsistent traditional jargon. In the analysis not the air speed is being used, but the hull speed relative to the air as is the hull speed relative to the water.

Powers

Further, the shaft power supplied is positive and, as matter of convenience, the shaft power required is traditionally counted positive as well, in accordance with the balance of powers

$$P_{S.sup} - P_{S.req} = 0$$

at steady conditions, 'hopefully' prevailing at traditional trials.

While the supplied power convention introduced

$$P_{S.sup} = p_0 N^3 + p_1 N^2 V_{HW}$$

is straightforward, the required power convention introduced

$$P_{S.req} = q_0 V_{HW}{}^2 V_{HW} + q_1 | V_{HA} | V_{HA} V_{HW}$$

in cases of constant sea state during the trials needs careful consideration.

Writing the convention in detail

$$-P_{S.req} = q_0 V_{WH}{}^2 V_{WH} + q_1 | V_{HA} | V_{HA} V_{WH}$$

results in the original format

$$P_{S.req} = q_0 V_{HW}{}^2 V_{HW} + q_1 | V_{HA} | V_{HA} V_{HW}$$

only, if not the incoming wind is considered, but the speed of the ship relative to the air, as is usually done and has been stated before.

Conventions, i. e. axioms

In terms of logics the conventions mentioned are axioms introduced as common reference to be agreed upon by the parties involved. As in case of the rational theory of hull-propeller interaction the conventions are not rabbits magically pulled out of a hat, but **they are based on the simplest possible ideal models meeting the basic standards of invariance and providing a sufficiently rich structure to describe the data <u>in the usually very narrow range of data and of interest</u>.**

The aim is not to increase the complexity of the overall model, but to aggregate it so that the few remaining parameters can be identified reliably. The essential problem for theoretician and practicians alike is to understand the conventional nature of the procedure. The identification of the parameters, systems identification, is a necessary tool, but not the essential aspect.

The supplied power convention adopted

$$P_{S.sup} = p_0\, N^3 + p_1\, N^2\, (V_{HG} - V_{WG})$$

has the 'dramatic' advantage that it permits clearly and cleanly to separate two problems, each described by a set of linear equations to be solved for the few parameters to be identified.

The first problem is to identify the parameters of the powering function and the parameters of the unknown current prevailing during the trails, often based on the convention of a simple harmonic tide superimposed on a mean current. The second problem is to identify the parameters of the environmental convention

$$P_{S.req} = q_0\, V_{HW}^{\ 3} + q_1\, |\, V_{HA}\, |\, V_{HA}\, V_{HW} + q_2\, H_S^{\ 2}\, V_{HS}^{\ 2}\, V_{HW},$$

both operations based on the same mean data reported.

The 'local' convention for the first partial power required at the prevailing conditions (!), formerly briefly called 'required water power', implies that the propeller permanently operates at the same hull advance ratio and at the same power ratio. And this implies that the unknown propulsive efficiency is constant.

With the quadratic convention for the force of the air the 'local convention for the second partial power required at the prevailing conditions (!), formerly briefly called 'required wind power', is thus nothing else but a theorem in the context of the axiomatic system!

For lack of data the third partial power required at the prevailing conditions (!), formerly briefly called 'required wave power', with the 'observed' wave height and the 'observed' hull speed relative to the wave is usually not explicitly accounted for.

Units

Data in SI-Units, if not explicitly stated otherwise, and non-dimensionalised in view of further use in some mathematical subroutines, which by definition cannot handle arguments of different units!

length	m	$nm := 1852 \cdot m$
angle	rad	$deg := \frac{\pi}{180} \cdot rad$
time	sec	$min := 60 \cdot sec$
		$hr := 3600 \cdot sec$
frequency	$Hz := \frac{1}{sec}$	$rpm := \frac{1}{min}$
speed	$kts := \frac{nm}{hr}$	$kts = 0.514 \frac{m}{s}$
mass	kg	$t := 10000 \cdot kg$
force	$N := newton$	$kN := 10^3 \cdot N$
		$MN := 10^3 \cdot kN$
power	$W := watt$	$kW := 10^3 \cdot W$
		$MW := 10^3 \cdot kW$

General constants

'field strength'	$g := 9.81 \cdot \frac{m}{s^2}$	$g := 9.81$	
density of seawater	$\rho := 1.025 \cdot 10^3 \cdot kg \cdot m^{-3}$	$\rho := \frac{\rho}{kg \cdot m^{-3}}$	Assumed1
tidal frequency	$\omega_T := \frac{2 \cdot \pi}{12.417 \cdot hr}$	$\omega_T := \omega_T \cdot hr$	

Sample 95 % confidence radius

$$St_{95}(f) := 2 + \frac{10}{f^2}$$

95 % Student's fractiles

$$C_{95}(\Delta v, f) := \left| \begin{array}{l} s \leftarrow Stdev(\Delta v) \\ \Delta v_{95} \leftarrow \frac{St_{95}(f) \cdot s}{\sqrt{f}} \\ \Delta v_{95} \end{array} \right.$$

Routines

Normalise data

$$J(D,V,N) := \frac{V}{D \cdot N} \qquad KP(\rho,D,P,N) := \frac{10^6 \cdot P}{\rho \cdot D^5 \cdot N^3}$$

Sort data in down and up-wind runs

$$\text{Sort\_runs}(J_{HG}, K_P, \psi_{HG}) := \left| \begin{array}{l} j_0 \leftarrow 0 \\ j_1 \leftarrow 0 \\ \text{for } i \in 0..\text{last}(\psi_{HG}) \\ \quad \left| \begin{array}{l} \text{if } \psi_{HG_i} > \frac{\pi}{2} \\ \quad \left| \begin{array}{l} S_{j_0,0} \leftarrow J_{HG_i} \\ S_{j_0,1} \leftarrow K_{P_i} \\ j_0 \leftarrow j_0 + 1 \end{array} \right. \\ \text{otherwise} \\ \quad \left| \begin{array}{l} S_{j_1,2} \leftarrow J_{HG_i} \\ S_{j_1,3} \leftarrow K_{P_i} \\ j_1 \leftarrow j_1 + 1 \end{array} \right. \end{array} \right. \\ S \end{array} \right.$$

Tidal current convention

$$VT(v,\omega_T,\Delta t) := v_0 + v_1 \cdot \cos(\omega_T \cdot \Delta t) + v_2 \cdot \sin(\omega_T \cdot \Delta t)$$

Directions of runs

$$\text{dir}(\psi_{HG}) := \text{if}\left(\psi_{HG} > \frac{\pi}{2}, 1, -1\right)$$

Analyse power supplied

$$\text{Supplied}_T(\rho, D, \Delta t, V_{HG}, \psi_{HG}, N_S, P_S) := \left| \begin{array}{l} \text{for } j \in 0..\text{last}(\Delta t) \\ \quad \left| \begin{array}{l} A_{sup_{j,0}} \leftarrow (N_{S_j})^3 \\ A_{sup_{j,1}} \leftarrow (N_{S_j})^2 \cdot V_{HG_j} \end{array} \right. \end{array} \right.$$

$$A_{sup_{j,2}} \leftarrow -\left(N_{S_j}\right)^2 \cdot dir\left(\psi_{HG_j}\right)$$

$$A_{sup_{j,3}} \leftarrow A_{sup_{j,2}} \cdot \cos\left(\omega_T \cdot \Delta t_j\right)$$

$$A_{sup_{j,4}} \leftarrow A_{sup_{j,2}} \cdot \sin\left(\omega_T \cdot \Delta t_j\right)$$

$$X_{sup} \leftarrow geninv\left(A_{sup}\right) \cdot P_S$$

$$P_{S.sup} \leftarrow A_{sup} \cdot X_{sup}$$

$$\Delta P_{S.sup} \leftarrow P_S - P_{S.sup}$$

for $k \in 0..1$

$$p_k \leftarrow X_{sup_k}$$

$$p_{n_k} \leftarrow \frac{10^6 \cdot p_k}{\rho \cdot D^{(5-k)}}$$

$$p_2 \leftarrow Stdev\left(\Delta P_{S.sup}\right)$$

$$c \leftarrow svds\left(A_{sup}\right)$$

$$p_3 \leftarrow \frac{c_4}{c_0}$$

for $k \in 0..2$

$$v_k \leftarrow \frac{X_{sup_{2+k}}}{X_{sup_1}}$$

for $j \in 0..last(\Delta t)$

$$V_{WG_j} \leftarrow VT\left(v, \omega_T, \Delta t_j\right)$$

$$V_{HW_j} \leftarrow V_{HG_j} - V_{WG_j} \cdot dir\left(\psi_{HG_j}\right)$$

$$J_{HW_j} \leftarrow J\left(D, V_{HW_j}, N_{S_j}\right)$$

$$K_{P.sup_j} \leftarrow KP\left(\rho, D, P_{S.sup_j}, N_{S_j}\right)$$

$$\begin{bmatrix} \Delta P_{S.sup} & v & V_{WG} \\ V_{HW} & p & P_{S.sup} \\ J_{HW} & p_n & K_{P.sup} \end{bmatrix}$$

Check distributions

$$
\text{norm\_distr}(\text{sampl}) := \left|
\begin{array}{l}
r \leftarrow \text{rows}(\text{sampl}) \\
c \leftarrow \text{cols}(\text{sampl}) \\
\text{for } i \in 0..r-1 \\
\quad \left|
\begin{array}{l}
\text{fract} \leftarrow \dfrac{2\cdot(i+1)}{r+1} - 1 \\
\text{dst} \leftarrow \text{fract} \\
\text{distr}_i \leftarrow \sqrt{2}\cdot\text{root}(\text{erf}(\text{dst}) - \text{fract}, \text{dst}) \\
\text{for } j \in 0..1 \\
\quad A_{\text{distr}_{i,j}} \leftarrow \left(\text{distr}_i\right)^j
\end{array}
\right. \\
\text{for } j \in 0..c-1 \\
\quad \text{sampl}_{\text{sort}}^{\langle j\rangle} \leftarrow \text{sort}\left(\text{sampl}^{\langle j\rangle}\right) \\
\text{distr}_{\text{par}} \leftarrow \text{geninv}\left(A_{\text{distr}}\right)\cdot\text{sampl}_{\text{sort}} \\
\text{sampl}_{\text{fair}} \leftarrow A_{\text{distr}}\cdot\text{distr}_{\text{par}} \\
\text{for } j \in 0..c-1 \\
\quad \text{distr}_{\text{par}_{2,j}} \leftarrow \dfrac{\text{distr}_{\text{par}_{1,j}}}{\sqrt{r}} \\
\left[\text{distr} \quad \text{sampl}_{\text{sort}} \quad \text{sampl}_{\text{fair}} \quad \text{distr}_{\text{par}}\right]
\end{array}
\right.
$$

Analyse power required: wind and wave speeds correlated!

$$\mathrm{Required}\left(V_{HW}, P_S, V_{HA}\right) := \left|\begin{array}{l} \text{for } i \in 0 .. \mathrm{last}\left(V_{HW}\right) \\ \quad \left|\begin{array}{l} A_{req_{i,0}} \leftarrow \left(V_{HW_i}\right)^3 \\ A_{req_{i,1}} \leftarrow V_{HA_i} \cdot \left|V_{HA_i}\right| \cdot V_{HW_i} \end{array}\right. \\ X_{req} \leftarrow \mathrm{geninv}\left(A_{req}\right) \cdot P_S \\ P_{S.req} \leftarrow A_{req} X_{req} \\ \Delta P_{S.req} \leftarrow P_S - P_{S.req} \\ \text{for } k \in 0 .. 1 \\ \quad q_k \leftarrow X_{req_k} \\ q_2 \leftarrow \mathrm{Stdev}\left(\Delta P_{S.req}\right) \\ c \leftarrow \mathrm{svds}\left(A_{req}\right) \\ q_3 \leftarrow \dfrac{c_1}{c_0} \\ \left[\Delta P_{S.req} \;\; q \;\; P_{S.req} \;\; A_{req} \;\; X_{req}\right] \end{array}\right.$$

Analyse power required: sea state provisionally accounted for

$$
\text{Required}_S(V_{HW}, P_S, V_{HA}, H_S, V_{HS}) :=
\begin{array}{l}
\text{for } i \in 0..\text{last}(V_{HW}) \\
\quad \begin{array}{|l} A_{req_{i,0}} \leftarrow (V_{HW_i})^3 \\ A_{req_{i,1}} \leftarrow V_{HA_i} \cdot |V_{HA_i}| \cdot V_{HW_i} \\ A_{req_{i,2}} \leftarrow (H_{S_i} \cdot V_{HS_i})^2 \cdot V_{HW_i} \end{array} \\
X_{req} \leftarrow \text{geninv}(A_{req}) \cdot P_S \\
P_{S.req} \leftarrow A_{req} X_{req} \\
\Delta P_{S.req} \leftarrow P_S - P_{S.req} \\
\text{for } k \in 0..2 \\
\quad q_k \leftarrow X_{req_k} \\
q_3 \leftarrow \text{Stdev}(\Delta P_{S.req}) \\
c \leftarrow \text{svds}(A_{req}) \\
q_4 \leftarrow \dfrac{c_1}{c_0} \\
\left[\Delta P_{S.req} \;\; q \;\; P_{S.req} \;\; A_{req} \;\; X_{req} \right]
\end{array}
$$

Analyse power required: wind and wave speeds correlated!
'in ideal' ill-conditioned (!) case, parameter of first partial power
introduced as identified for sister ship

$$\text{Required}_R\left(V_{HW}, P_S, V_{HA}, X_{req.0}\right) := \begin{array}{|l} \text{for } i \in 0..\text{last}\left(V_{HW}\right) \\ \quad \begin{array}{|l} A_{req_{i,0}} \leftarrow \left(V_{HW_i}\right)^3 \\ A_{req_{i,1}} \leftarrow V_{HA_i} \cdot \left|V_{HA_i}\right| \cdot V_{HW_i} \end{array} \\ X_{req_0} \leftarrow X_{req.0} \\ P_{S.req.1} \leftarrow X_{req_0} \cdot A_{req}^{\langle 0 \rangle} \\ X_{req_1} \leftarrow \dfrac{A_{req}^{\langle 1 \rangle} \cdot \left(P_S - P_{S.req.1}\right)}{A_{req}^{\langle 1 \rangle} \cdot A_{req}^{\langle 1 \rangle}} \\ P_{S.req.2} \leftarrow A_{req}^{\langle 1 \rangle} \cdot X_{req_1} \\ P_{S.req} \leftarrow P_{S.req.1} + P_{S.req.2} \\ \Delta P_{S.req} \leftarrow P_S - P_{S.req} \\ \text{for } k \in 0..1 \\ \quad q_k \leftarrow X_{req_k} \\ q_2 \leftarrow \text{Stdev}\left(\Delta P_{S.req}\right) \\ c \leftarrow \text{svds}\left(A_{req}\right) \\ q_3 \leftarrow \dfrac{c_1}{c_0} \\ \left[\Delta P_{S.req} \;\; q \;\; P_{S.req} \;\; A_{req} \;\; X_{req}\right] \end{array}$$

END of PATEs:
Post ANONYMA trial evaluations
Preliminaries

Prof. Dr.-Ing. M.Schmiechen

MS 1305081300
1401221400
1404011700

To whom it may concern

Powering performance of a bulk carrier during speed trials in ballast condition reduced to nominal no wind condition

MS 140910140
Correction of the labels of the plot of propulsive efficiencies reported, traditionally identified from model tests according to Dr. Hollenbach!

Preface

Preamble

The present analysis of a powering trial is **an upgraded version of the first of my 'post-ANONYMA trial evaluations' published earlier as PATE_01. For the whole context and for more details the Conclusions of PATE_01 should be referred to!**

Data provided

The powering trial analysed according to the rational procedure promoted is one of the reference cases of an ongoing research project. As usual only the anonymised data, just mean values of measured quantities and crude estimates of wind and waves, have been made available for the analysis.

Further, for comparison with the evaluation according to an unspecified, more or less traditional procedure, few results have been provided.

Rational evaluation

The following analysis is solely based on extremely simple propeller, current and environment conventions and on the mean data reported, though without their confidence ranges. No prior data and parameters will be used, particularly not those derived from corresponding model tests. Thus the procedure and its results are as transparent and observer independent as necessary for the rational resolution of 'conflicts' of any type!

Subsequent trustworthy predictions (!) of the powering performance at loading conditions and sea states differing from those prevailing during the trials are *not* subject of this exercise. But in the Conclusions at the end of PATE_01 serious doubts concerning any traditional convention based on prior data are being expressed and future solutions are being outlined.

'Disclaimer'

In spite of utmost care the following evaluation, in the meantime a document of more than thirty pages, may still contain mistakes. The author will gratefully appreciate and acknowledge any of those brought to his attention, so that he may correct them.

References

Reference:C:\PATEs\PATE_00.2.mcd

General remarks
Concepts
Names
Symbols
Remarks
Units
Routines

Trial identification

Identify trial and evaluation

$TID := "01.2"$

$EID := concat("PATE\_", TID)$ $EID = "PATE\_01.2"$

'Constants'

$D_P := 7.05 \cdot m$ $D_P := D_P \cdot \frac{1}{m}$ diameter of propeller

$h_S := 3.85 \cdot m$ $h_S := h_S \cdot \frac{1}{m}$ height of shaft above base

Trials conditions

$T_{aft} := 7.42 \cdot m$ $T_{aft} := T_{aft} \cdot \frac{1}{m}$ draft aft

Nominal propeller submergence

$h_{P.Tip} := h_S + \frac{D_P}{2}$ $h_{P.Tip} = 7.375$

$s_{P.Tip} := T_{aft} - h_{P.Tip}$ $s_{P.Tip} = 0.045$

At this small nominal submergence and the sea state reported the propeller may have been ventilating even at the down wind conditions.

Wave

$$\psi_{WaveH} := \begin{bmatrix} 5 \\ 175 \\ 175 \\ 5 \\ 5 \\ 175 \\ 175 \\ 5 \end{bmatrix} \cdot deg$$

$H_{Wave} := 3.3 \cdot m$ wave height

$H_{Wave} := \frac{H_{Wave}}{m}$

Water depth

$d_{Water} := 65 \cdot m$

Mean values reported

For ready reference the matrices of the mean values of the measured magnitudes, alias 'quantities', are printed here and converted to SI Units. Further down intermediate results are printed as well to permit checks óf plausibility.

It is noted here explicitly, that no confidence radii of the mean values have been reported.

Day time

$$time := \begin{bmatrix} 5 & 21 \\ 5 & 48 \\ 6 & 04 \\ 6 & 28 \\ 6 & 44 \\ 7 & 7 \\ 7 & 25 \\ 7 & 46 \\ 8 & 10 \\ 8 & 29 \\ 8 & 41 \\ 9 & 5 \end{bmatrix}$$

Heading

$$\psi_{HG} := \begin{bmatrix} 180 \\ 0 \\ 0 \\ 180 \\ 180 \\ 0 \\ 0 \\ 180 \\ 180 \\ 0 \\ 0 \\ 180 \end{bmatrix} \cdot deg$$

Rel. wind velocity

$$V_{HA} := \begin{bmatrix} 35 \\ 11 \\ 11 \\ 35 \\ 41 \\ 10 \\ 10 \\ 42 \\ 44 \\ 8 \\ 7 \\ 45 \end{bmatrix} \cdot kts$$

Rel. wind direction

$$\psi_{HA} := \begin{bmatrix} 5 \\ 160 \\ 160 \\ 5 \\ 5 \\ 160 \\ 155 \\ 5 \\ 5 \\ 165 \\ 160 \\ 0 \end{bmatrix} \cdot deg$$

Shaft frequency

$$N_S := \begin{bmatrix} 52.47 \\ 52.47 \\ 66.58 \\ 66.60 \\ 82.26 \\ 82.27 \\ 94.85 \\ 94.86 \\ 102.81 \\ 102.88 \\ 104.89 \\ 104.87 \end{bmatrix} \cdot \frac{1}{min}$$

Measured shaft power

$$P_S := \begin{bmatrix} 1924 \\ 1758 \\ 3232 \\ 3639 \\ 6358 \\ 6038 \\ 9344 \\ 9730 \\ 12425 \\ 12055 \\ 12778 \\ 13248 \end{bmatrix} \cdot kW$$

Ship speed over ground

$$V_{HG} := \begin{bmatrix} 6.657 \\ 8.210 \\ 11.044 \\ 7.967 \\ 11.442 \\ 14.018 \\ 15.784 \\ 13.049 \\ 14.256 \\ 17.152 \\ 17.380 \\ 14.211 \end{bmatrix} \cdot kts$$

Further it is mentioned here, that in Mathcad the operational indices standardly start from zero as usual in mathematics and thus in the mathematical subroutines available in the Numericl Recipes subroutine package. Thus the possible change of the standard, resulting in intransparent code, is not a viable choice..

'Duration' of measurements

$s_{mean} := 1\ nm$ $\qquad s_{mean} := \frac{s_{mean}}{m}$ $\qquad$ Distances sailed at each run

Sailing the same distance at different speeds, here one nautical mile, is in accordance with the name 'miles runs', in German 'Meilen-Fahrten', but has the disadvantage, that the average values derived from the sampled values have wider confidence ranges at the higher speeds.

'Non-dimensionalise' magnitudes

$V_{HA} := V_{HA} \cdot \frac{sec}{m}$ $\qquad N_S := N_S \cdot sec$ $\qquad P_S := P_S \cdot \frac{1}{MW}$ $\qquad V_{HG} := V_{HG} \cdot \frac{sec}{m}$

Times of measurements

$ni := last\left(time^{\langle 0 \rangle}\right)$ $\qquad i := 0 .. ni$

$dur_i := \frac{s_{mean}}{V_{HG_i}}$ $\qquad t := time^{\langle 0 \rangle} + time^{\langle 1 \rangle} \cdot \frac{min}{hr} + \frac{dur}{2} \cdot \frac{sec}{hr}$

$t_m := mean(t)$ $\qquad \Delta t := t - t_m$

Normalise data

At this stage for preliminary check of consistency only!

$J_{HG_i} := J\left(D_P, V_{HG_i}, N_{S_i}\right)$ $\qquad K_{P.o_i} := KP\left(\rho, D_P, P_{S_i}, N_{S_i}\right)$

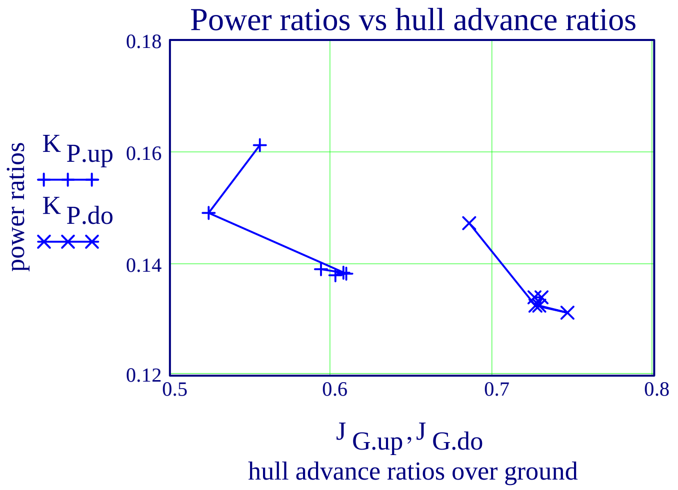
Sort runs

$S := Sort\_runs\left(J_{HG}, K_{P.o}, \psi_{HG}\right)$

$J_{G.up} := S^{\langle 0 \rangle}$ $\qquad K_{P.up} := S^{\langle 1 \rangle}$ $\qquad J_{G.do} := S^{\langle 2 \rangle}$ $\qquad K_{P.do} := S^{\langle 3 \rangle}$

$$J_{G.up} = \begin{bmatrix} 0.555 \\ 0.524 \\ 0.609 \\ 0.602 \\ 0.607 \\ 0.593 \end{bmatrix} \quad K_{P.up} = \begin{bmatrix} 0.161 \\ 0.149 \\ 0.138 \\ 0.138 \\ 0.138 \\ 0.139 \end{bmatrix} \quad J_{G.do} = \begin{bmatrix} 0.685 \\ 0.726 \\ 0.746 \\ 0.729 \\ 0.730 \\ 0.725 \end{bmatrix} \quad K_{P.do} = \begin{bmatrix} 0.147 \\ 0.133 \\ 0.131 \\ 0.132 \\ 0.134 \\ 0.134 \end{bmatrix}$$

Scrutinise data



Evidently the values at the first double run are outliers eliminated without further study of possible reasons in PATE_01.1. In the traditional evaluation the values at the first two double runs, i. e. the first four data sets have been ignored. For ready comparison of results the same data set is being used here.

Outlying data eliminated

$ne := 4$ $\qquad ni := last(t) - ne$

$i := 0 .. ni$

$\Delta t_{red_i} := \Delta t_{i+ne}$ $\qquad \Psi_{HG.red_i} := \Psi_{HG_{i+ne}}$ $\qquad V_{HA.red_i} := V_{HA_{i+ne}}$

$\Delta t := \Delta t_{red}$ $\qquad \Psi_{HG} := \Psi_{HG.red}$ $\qquad V_{HA} := V_{HA.red}$

$N_{S.red_i} := N_{S_{i+ne}}$ $\qquad P_{S.red_i} := P_{S_{i+ne}}$ $\qquad V_{HG.red_i} := V_{HG_{i+ne}}$

$N_S := N_{S.red}$ $\qquad P_S := P_{S.red}$ $\qquad V_{HG} := V_{HG.red}$

Normalise reduced data

$J_{HG_i} := J\left(D_P, V_{HG_i}, N_{S_i}\right)$ $\qquad K_{P_i} := KP\left(\rho, D_P, P_{S_i}, N_{S_i}\right)$

$S := Sort\_runs\left(J_{HG}, K_P, \Psi_{HG}\right)$

$J_{HG.up} := S^{\langle 0 \rangle}$ $\qquad K_{P.up} := S^{\langle 1 \rangle}$ $\qquad J_{HG.do} := S^{\langle 2 \rangle}$ $\qquad K_{P.do} := S^{\langle 3 \rangle}$

$J_{HG.up} = \begin{bmatrix} 0.609 \\ 0.602 \\ 0.607 \\ 0.593 \end{bmatrix}$ $\qquad K_{P.up} = \begin{bmatrix} 0.138 \\ 0.138 \\ 0.138 \\ 0.139 \end{bmatrix}$ $\qquad J_{HG.do} = \begin{bmatrix} 0.746 \\ 0.729 \\ 0.730 \\ 0.725 \end{bmatrix}$ $\qquad K_{P.do} = \begin{bmatrix} 0.131 \\ 0.132 \\ 0.134 \\ 0.134 \end{bmatrix}$

Read results of PATE_01.1
for ready comparison with the results
of the foregoing analysis of the trial
ignoring only the data of the first double run,
different from the traditional analysis!

$Record_{01.1} := READPRN(\text{"Results\_PATE\_01.1"})$

$\left[Internal_{rat.01.1} \;\; Final_{rat.01.1} \;\; Internal_{trad.01.1} \;\; Final_{trad.01.1} \right] := Record_{01.1}$

$\left[Res_{sup.01.1} \;\; Res_{req.01.1} \right] := Internal_{rat.01.1}$

$$\begin{bmatrix} \Delta P_{S.sup.01.1} & v_{01.1} & V_{WG.01.1} \\ V_{HW.01.1} & p_{01.1} & P_{S.sup.01.1} \\ J_{HW.01.1} & p_{n.01.1} & K_{P.sup.01.1} \end{bmatrix} := Res_{sup.01.1}$$

$\left[\Delta P_{S.req.01.1} \;\; q_{01.1} \;\; P_{S.req.01.1} \;\; A_{req.01.1} \;\; X_{req.01.1} \right] := Res_{req.01.1}$

$\left[Run_{01.1} \;\; \Delta t_{01.1} \;\; V_{HW.rat.trial.01.1} \;\; P_{S.rat.trial.01.1} \;\; N_{S.rat.trial.01.1} \right] := Final_{rat.01.1}$

$\left[V_{WG.trad.corr.01.1} \;\; J_{HW.trad.corr.01.1} \;\; K_{P.sup.trad.01.1} \right] := Internal_{trad.01.1}$

$\left[Run \;\; \Delta t_{trad.01.1} \;\; V_{HW.trad.ref.01.1} \;\; P_{S.trad.ref.01.1} \;\; N_{S.trad.ref.01.1} \right] := Final_{trad.01.1}$

Analyse power supplied
including identification of tidal current

Conventions adopted

Propeller power convention

$$PS_{sup}(p, N, V) := p_0 \cdot N^3 + p_1 \cdot N^2 \cdot V$$

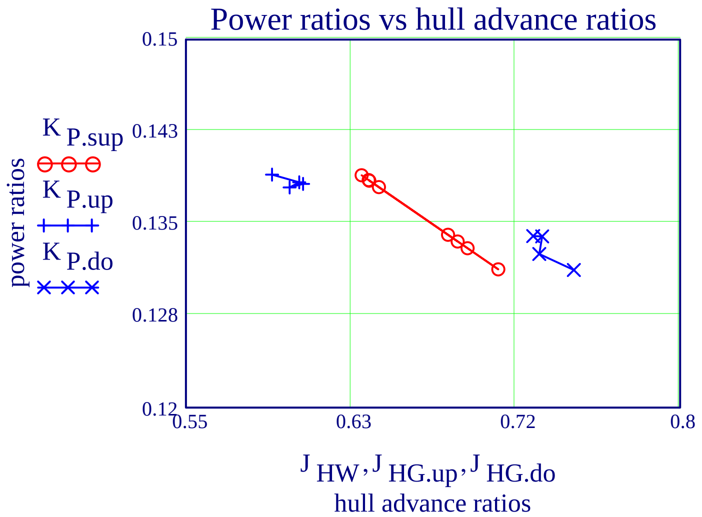
Tidal current velocity convention

$$VT(v, \omega_T, \Delta t) := v_0 + v_1 \cdot \cos(\omega_T \cdot \Delta t) + v_2 \cdot \sin(\omega_T \cdot \Delta t)$$

Evaluate

$$Res_{sup} := Supplied_T(\rho, D_P, \Delta t, V_{HG}, \psi_{HG}, N_S, P_S)$$

$$\begin{bmatrix} \Delta P_{S.sup} & v & V_{WG} \\ V_{HW} & p & P_{S.sup} \\ J_{HW} & p_n & K_{P.sup} \end{bmatrix} := Res_{sup}$$



$$p = \begin{bmatrix} 3.744 \\ -0.281 \\ 0.029 \\ 1.306 \cdot 10^{-3} \end{bmatrix}$$

$$p_n = \begin{bmatrix} 0.210 \\ -0.111 \end{bmatrix}$$

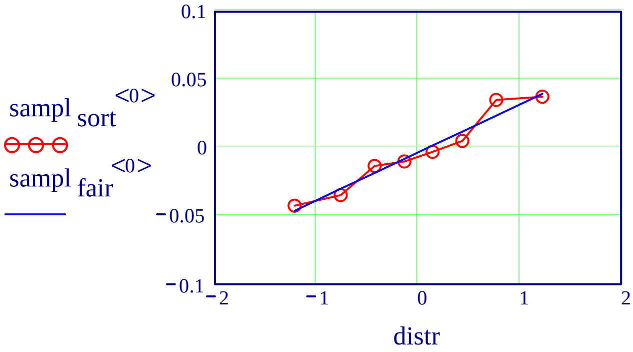
Nota bene: The propeller performance in the behind condition identified is that at the hull condition, the loading condition and the sea condition prevailing at the trials!

Supplied power residua

Check distribution of residua

Values of random variables need to be tested for normal distribution before using mean values and and standard deviations.

$$\left[\text{distr} \;\; \text{sampl}_{sort} \;\; \text{sampl}_{fair} \;\; \text{distr}_{par}\right] := \text{norm\_distr}\left(\Delta P_{S.sup}\right)$$



$$\text{distr}_{par} = \begin{bmatrix} -3.008\cdot 10^{-3} \\ 0.035 \\ 0.012 \end{bmatrix}$$

According to the result plotted the following error analysis is justified.

95 % confidence radius

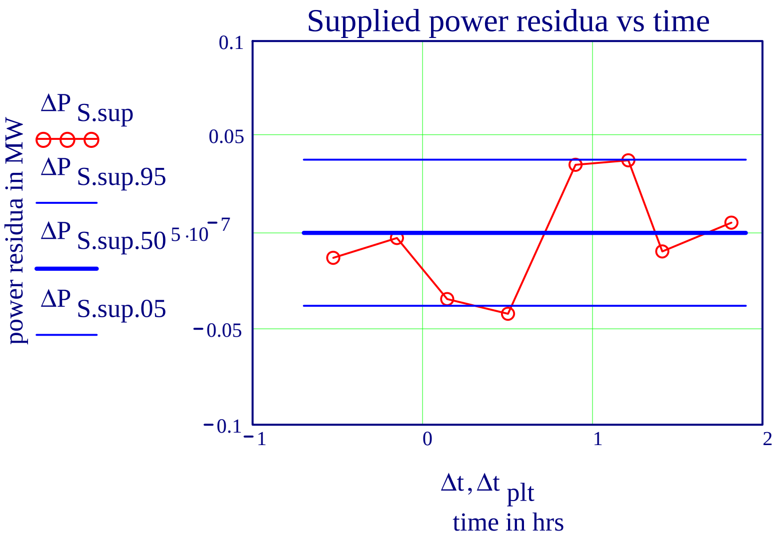
number of samples | of parameters | of degrees of freedom

$n_s := ni + 1$ $\quad n_p := 4$ $\quad f := n_s - n_p$

$P_{S.sup.95} := C_{95}\left(\Delta P_{S.sup}, f\right)$ $\quad P_{S.sup.95} \cdot \frac{MW}{kW} = 38.1$ kW

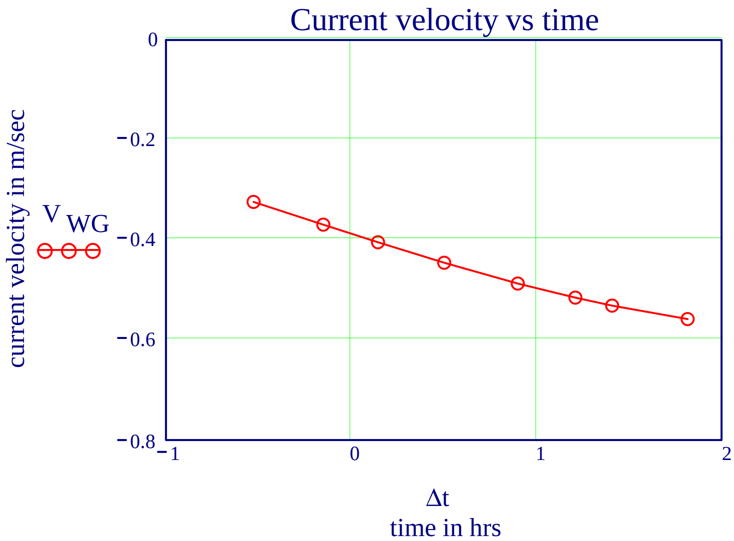
$k := 0..1$ $\quad \Delta t_{plt_0} := -0.7$ $\quad \Delta t_{plt_1} := 1.9$

$\Delta P_{S.sup.05_k} := -P_{S.sup.95}$ $\quad \Delta P_{S.sup.50_k} := 0$ $\quad \Delta P_{S.sup.95_k} := P_{S.sup.95}$



Accordingly the conventions adopted 'describe' the power data perfectly well! The relatively small value of the confidence radius cannot be judged objectively, as the confidence ranges of the mean values have not been provided as in case of the analysis of the ANONYMA trials.

Current velocity identified



During the trials the current changed more than half a knot!

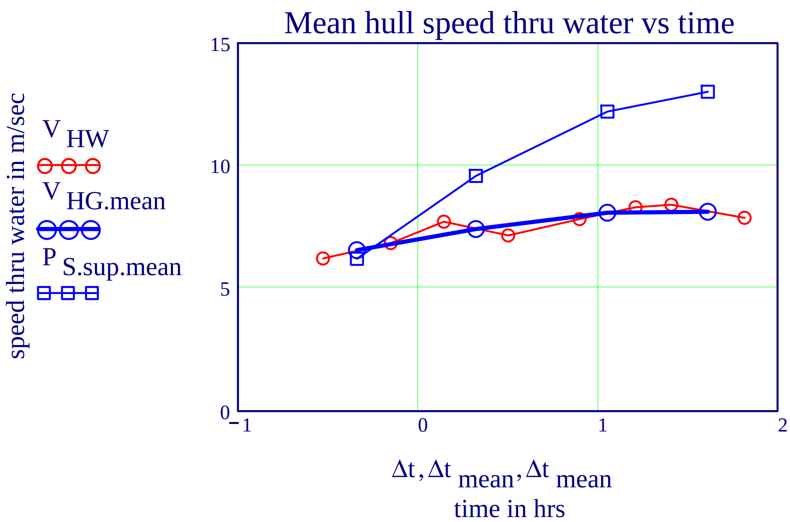
$V_{WG.mean} := v_0$ $\quad V_{WG.mean} \cdot \frac{m}{kts \cdot sec} = -0.669$ Nominal mean current in kts

$V_{WG.ampl} := \sqrt{(v_1)^2 + (v_2)^2}$ $\quad V_{WG.ampl} \cdot \frac{m}{kts \cdot sec} = 0.466$ Nominal tidal amplitude in kts

Mean velocity over ground and mean power

$nj := \frac{ni - 1}{2}$ $\quad j := 0 .. nj$ $\quad \Delta t_{mean_j} := \frac{\Delta t_{2 \cdot j} + \Delta t_{2 \cdot j + 1}}{2}$

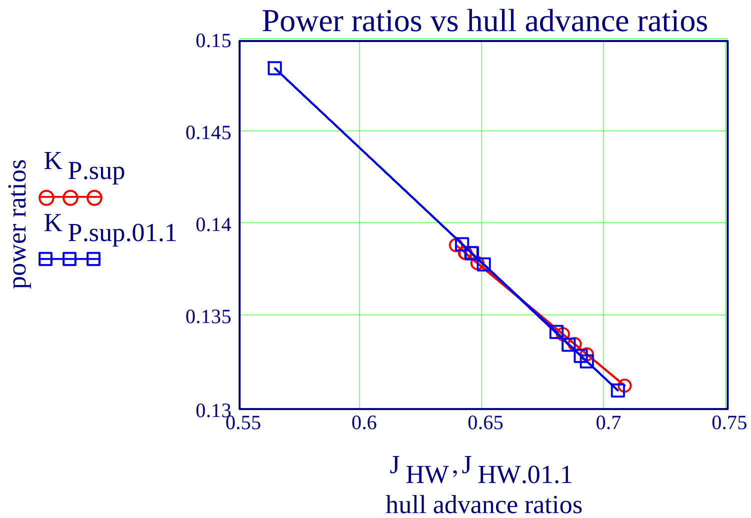
$V_{HG.mean_j} := \frac{V_{HG_{2 \cdot j}} + V_{HG_{2 \cdot j + 1}}}{2}$ $\quad P_{S.sup.mean_j} := \frac{P_{S.sup_{2 \cdot j}} + P_{S.sup_{2 \cdot j + 1}}}{2}$



In the present case the mean speed over ground happens to be equal to the speed over ground at the mean time between the two corresponding runs.

Compare with results of PATE_01.1

Powering performances



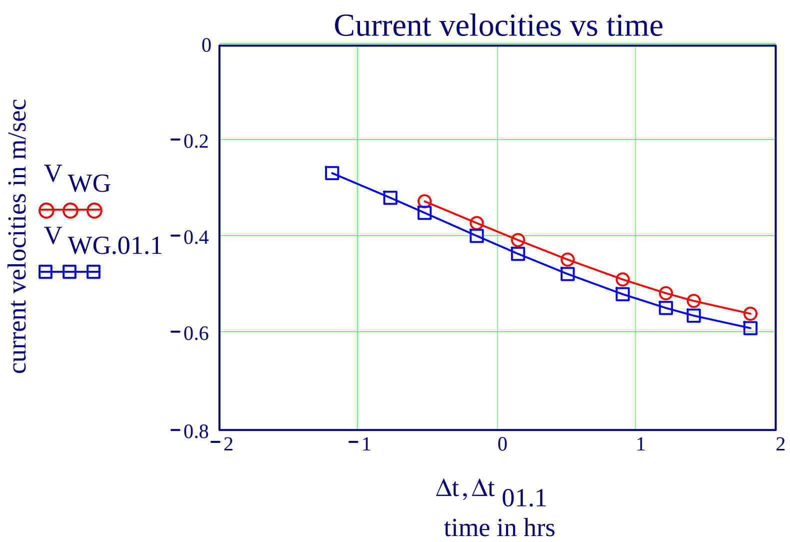
$$p_{01.1} = \begin{bmatrix} 3.914 \\ -0.317 \\ 0.027 \\ 2.402\cdot 10^{-3} \end{bmatrix}$$

$$p = \begin{bmatrix} 3.744 \\ -0.281 \\ 0.029 \\ 1.306\cdot 10^{-3} \end{bmatrix}$$

$$\Delta K_P := p_{n.01.1} - p_n \qquad \Delta K_P = \begin{bmatrix} 9.478\cdot 10^{-3} \\ -0.014 \end{bmatrix}$$

The powering performances in the behind conditon identified for the two different data sets are differing only very slightly in value and in tendency.

Currents



$$V_{WG.01.1.red_i} := V_{WG.01.1_{i+2}}$$

$$\Delta V_{WG} := V_{WG.01.1.red} - V_{WG} \qquad \text{mean}\left(\Delta V_{WG}\right)\cdot\frac{m}{kts\cdot sec} = -0.057 \text{ kts}$$

The currents identified for the two different data sets are also slightly differing .

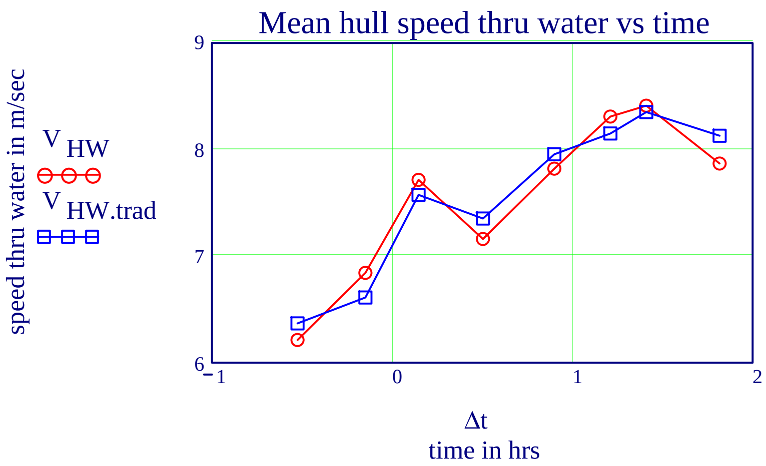
Scrutinise results of an undisclosed traditional evaluation

Part 1 concerning the speed through the water

Hull speed thru water reported

$$V_{HW.trad} := \begin{bmatrix} 12.38 \\ 12.85 \\ 14.72 \\ 14.29 \\ 15.46 \\ 15.84 \\ 16.23 \\ 15.80 \end{bmatrix} \cdot kts \qquad V_{HW.trad} := V_{HW.trad} \cdot \frac{sec}{m}$$

$$J_{HW.trad_i} := \frac{V_{HW.trad_i}}{D_P \cdot N_{S_i}} \qquad J_{HW.trad} = \begin{bmatrix} 0.659 \\ 0.684 \\ 0.679 \\ 0.660 \\ 0.658 \\ 0.674 \\ 0.677 \\ 0.660 \end{bmatrix}$$



**Current velocity identified
by traditional procedure**

$$V_{WG.trad_i} := \left(V_{HG_i} - V_{HW.trad_i}\right)\cdot dir\left(\psi_{HG_i}\right)$$

**Tidal approximation
as in the rational evaluation**

$$A_{WG.trad_{i,0}} := 1$$

$$A_{WG.trad_{i,1}} := \cos\left(\omega_T \cdot \Delta t_i\right)$$

$$A_{WG.trad_{i,2}} := \sin\left(\omega_T \cdot \Delta t_i\right)$$

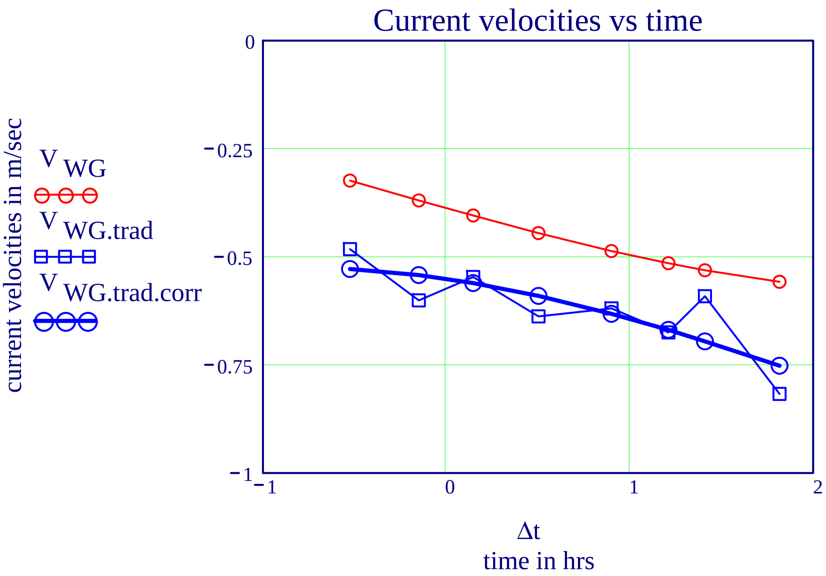
$$X_{WG.trad} := geninv\left(A_{WG.trad}\right)\cdot V_{WG.trad}$$

$$X_{WG.trad} = \begin{bmatrix} -0.816 \\ 0.264 \\ -0.122 \end{bmatrix}$$

$$V_{WG.trad.corr} := A_{WG.trad}\cdot X_{WG.trad}$$

$$\Delta V_{WG.trad} := V_{WG.trad} - V_{WG.trad.corr}$$

$$V_{HW.trad.corr_i} := V_{HG_i} + V_{WG.trad.corr_i}\cdot dir\left(\psi_{HG_i}\right)$$



Nominal mean currents and tidal amplitudes compared

Nominal mean currents in kts

Rational

$$V_{WG.mean} \cdot \frac{m}{kts \cdot sec} = -0.669$$

Nominal tidal amplitudes in kts

$$V_{WG.ampl} \cdot \frac{m}{kts \cdot sec} = 0.466$$

Traditional

$$v_{trad} := X_{WG.trad}$$

$$V_{WG.mean.trad} := v_{trad_0}$$

$$V_{WG.ampl.trad} := \sqrt{\left(v_{trad_1}\right)^2 + \left(v_{trad_2}\right)^2}$$

$$V_{WG.mean.trad} \cdot \frac{m}{kts \cdot sec} = -1.586$$

$$V_{WG.ampl.trad} \cdot \frac{m}{kts \cdot sec} = 0.566$$

Mean difference of traditionally identified current

In view of the intricate current conditions in the East China Sea the comparison of the nominal tidal currents is not particularly meaningful, while the results plotted suggest the comparison of the mean difference in the currents identified being more reasonable in the present context.

$$\Delta V_{WG} := V_{WG.trad} - V_{WG}$$

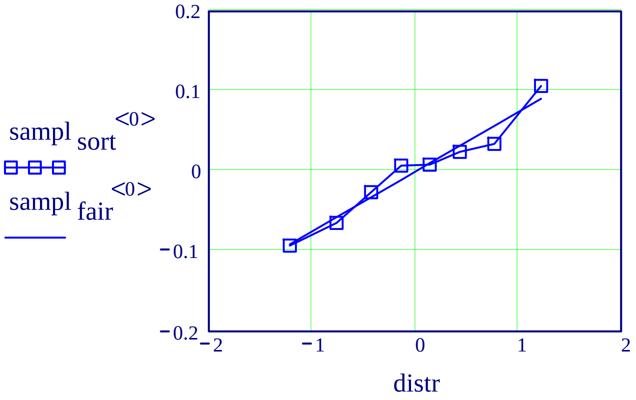
$$\Delta V_{WG.mean} := mean\left(\Delta V_{WG}\right)$$

$$\Delta V_{WG.mean} \cdot \frac{m}{kts \cdot sec} = -0.325 \quad kts$$

Check distribution of differences in current

$$\Delta\Delta V_{WG_i} := \Delta V_{WG_i} - \Delta V_{WG.mean}$$

$$\left[distr \quad sampl_{sort} \quad sampl_{fair} \quad distr_{par} \right] := norm\_distr\left(\Delta\Delta V_{WG}\right)$$



$$distr_{par} = \begin{bmatrix} 0.000 \\ 0.075 \\ 0.026 \end{bmatrix}$$

According to the plot of differences in currents identified and the subsequent check of the distribution the differences are 'of cause' not quite normally distributed. Thus the following analysis is not quite justified.

95 % confidence radius

number of samples — of parameters — of degrees of freedom

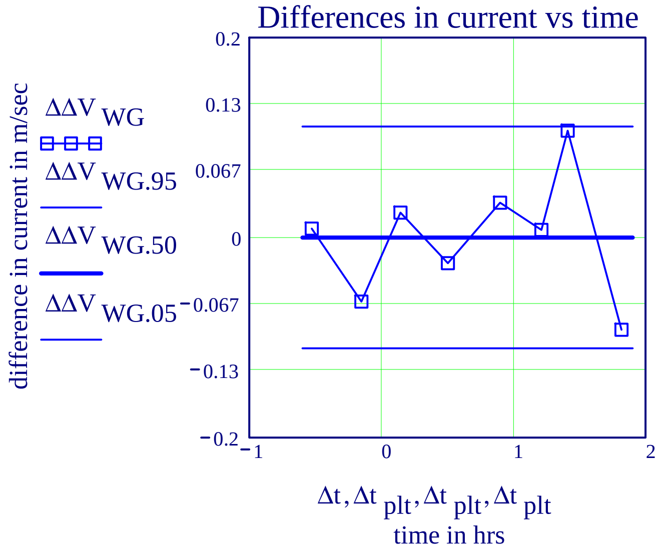
$n_s := ni - 1$ $\quad n_p := 3$ $\quad f := n_s - n_p$

$\Delta\Delta V_{WG.95.rad} := C_{95}\left(\Delta\Delta V_{WG}, f\right)$ $\quad \Delta\Delta V_{WG.95.rad} \cdot \frac{m}{kts \cdot sec} = 0.215$ kts

$k := 0..1$ $\quad \Delta t_{plt_0} := -0.6$ $\quad \Delta t_{plt_1} := 1.9$

$\Delta\Delta V_{WG.50_k} := 0$

$\Delta\Delta V_{WG.95_k} := \Delta\Delta V_{WG.95.rad}$ $\quad \Delta\Delta V_{WG.05_k} := -\Delta\Delta V_{WG.95.rad}$



Shaft power ratios vs hull advance ratios

$$V_{HW.trad.corr_i} := V_{HW_i} - \Delta V_{WG.mean} \cdot dir\left(\psi_{HG_i}\right)$$

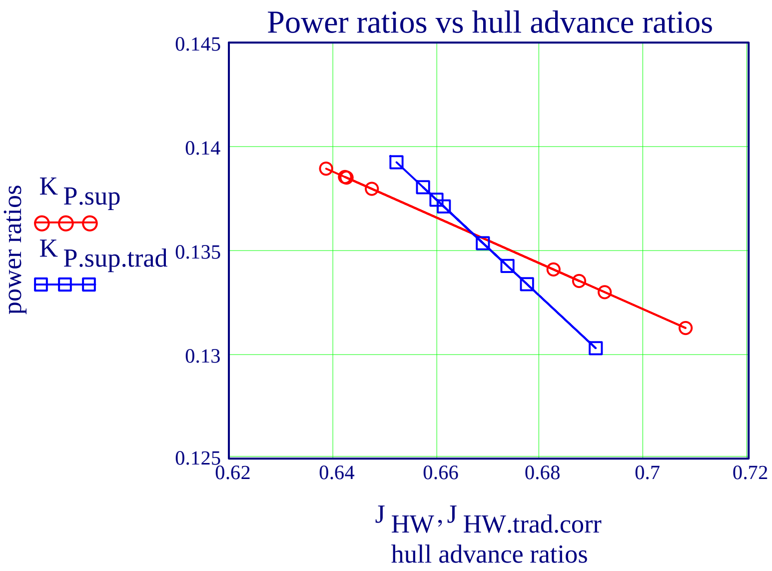
$$J_{HW.trad.corr_i} := \frac{V_{HW.trad.corr_i}}{D_P \cdot N_{S_i}}$$

Fairing power ratios

$$A_{KP_{i,k}} := \left(J_{HW.trad.corr_i}\right)^k$$

$$X_{KP} := geninv\left(A_{KP}\right) \cdot K_P$$

$$K_{P.sup.trad} := A_{KP} \cdot X_{KP}$$



Evidently the power ratios versus the advance ratios identified differ significantly in tendency. There may be many reasons, among them the surface effect due to the extremely small nominal propeller submergence not correctly being accounted for in the undisclosed traditional procedure.

Scrutinise results of an undisclosed traditional evaluation

End of Part 1 concerning the hull speed through the water

Analyse power required

Specify relative environmental conditions

Relative wind from ahead

$V_{HA.x_i} := V_{HA_i} \cdot \cos\left(\psi_{HA_i}\right)$

$V_{HA.x} = \begin{bmatrix} 21.012 \\ -4.834 \\ -4.834 \\ 21.524 \\ 22.549 \\ -3.867 \\ -3.264 \\ 23.062 \end{bmatrix}$

Check wind speed over ground

$V_{AG_i} := \left(V_{HA.x_i} - V_{HG_i}\right) \cdot \mathrm{dir}\left(\psi_{HG_i}\right)$

Approximate quadratically

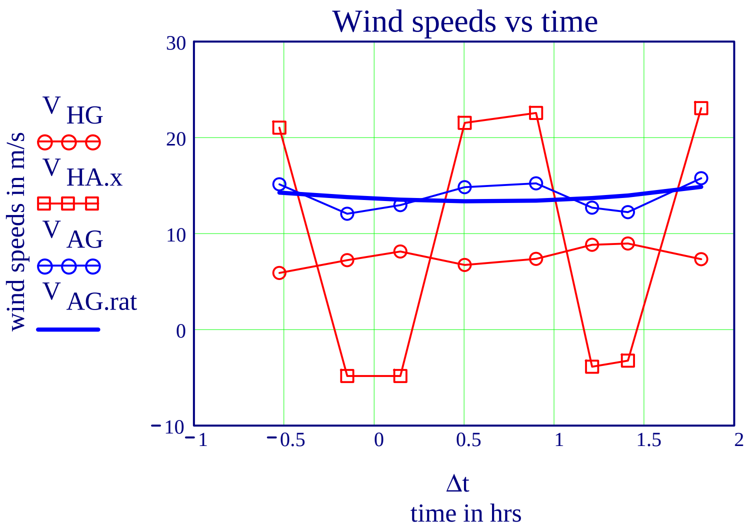
$k := 0 .. 3$

$A_{AG_{i,k}} := \left(\Delta t_i\right)^k$

$X_{AG} := \mathrm{geninv}\left(A_{AG}\right) \cdot V_{AG}$

$X_{AG} = \begin{bmatrix} 13.629 \\ -0.890 \\ 0.582 \\ 0.156 \end{bmatrix}$

$V_{AG.rat} := A_{AG} \cdot X_{AG}$



$V_{AG.rat} = \begin{bmatrix} 14.237 \\ 13.777 \\ 13.514 \\ 13.349 \\ 13.412 \\ 13.679 \\ 13.966 \\ 14.864 \end{bmatrix}$

Relative wind speed corrected

$\Delta V_{AG} := V_{AG.rat} - V_{AG}$

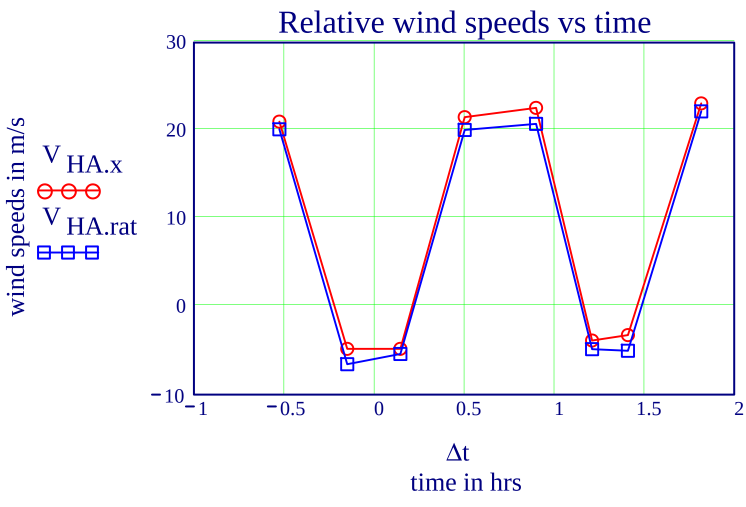
$$\Delta V_{AG} = \begin{bmatrix} -0.888 \\ 1.732 \\ 0.559 \\ -1.462 \\ -1.803 \\ 0.988 \\ 1.761 \\ -0.887 \end{bmatrix}$$

Evidently the differences depend on the direction of the runs relative the wind.

But as oscillations of the wind speed over ground are not expected to correlate with the varying directions of the runs, a correction of this systematic effect, in the measured relative wind speed, maybe due to the installation of the wind meter, is appropriate. But it is worth noting, that the corrected values remain nominal values!

$$V_{HA.rat_i} := V_{HG_i} + V_{AG.rat_i} \cdot dir\left(\psi_{HG_i}\right)$$

$$V_{HA.rat} = \begin{bmatrix} 20.124 \\ -6.566 \\ -5.394 \\ 20.062 \\ 20.746 \\ -4.856 \\ -5.025 \\ 22.175 \end{bmatrix}$$



Conventions adopted

First power' convention

$P_{S.req.0}(q, V_{HW}) := q_0 \cdot V_{HW}^3$

Second power convention

$P_{S.req.1}(q, V_{HW}, V_{HA}) := q_1 \cdot V_{HA} \cdot |V_{HA}| \cdot V_{HW}$

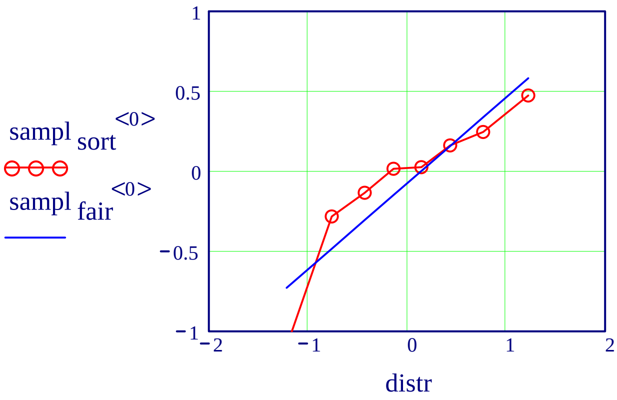
Evaluation

$Res_{req} := Required(V_{HG}, P_{S.sup}, V_{HA.rat})$

$\begin{bmatrix} \Delta P_{S.req} & q & P_{S.req} & A_{req} & X_{req} \end{bmatrix} := Res_{req}$

Check distribtution

$\begin{bmatrix} distr & sampl_{sort} & sampl_{fair} & distr_{par} \end{bmatrix} := norm\_distr(\Delta P_{S.req})$



$distr_{par} = \begin{bmatrix} -0.072 \\ 0.537 \\ 0.190 \end{bmatrix}$

Evidently the first value is an outlier as is also shown in the following plot. The following estimate of confidence is thus not quite justified.

95 % confidence radius

number of samples $n_s := ni + 1$

of parameters $n_p := 2$

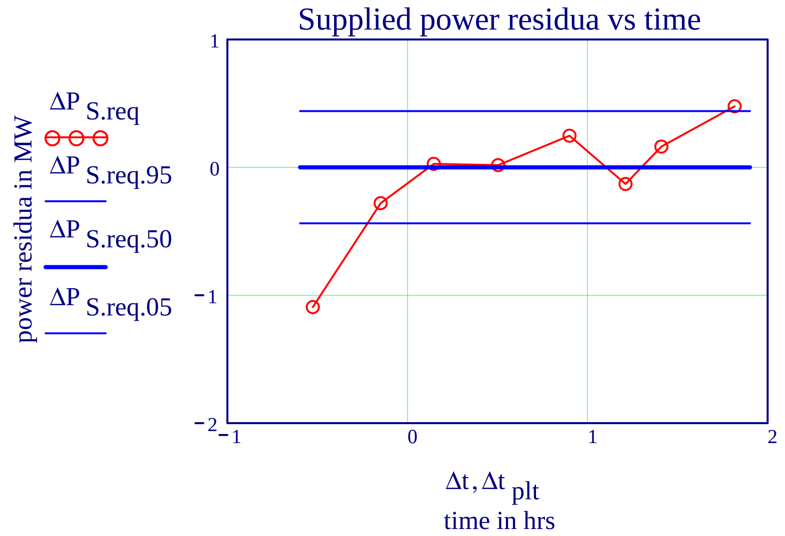
of degrees of freedom $f := n_s - n_p$

$P_{S.req.95} := C_{95}(\Delta P_{S.req}, f)$

$P_{S.req.95} = 0.439$

$k := 0 .. 1$ $\Delta t_{plt_0} := -0.6$ $\Delta t_{plt_1} := 1.9$

$\Delta P_{S.req.05_k} := -P_{S.req.95}$ $\Delta P_{S.req.50_k} := 0$ $\Delta P_{S.req.95_k} := P_{S.req.95}$



$$q = \begin{bmatrix} 0.0182 \\ 1.5773 \cdot 10^{-3} \\ 0.4726 \\ 0.2040 \end{bmatrix}$$

As usual the required power residua are much larger than in case of the supplied power due to the uncertainties in the wind measurements and the crude wave observations.

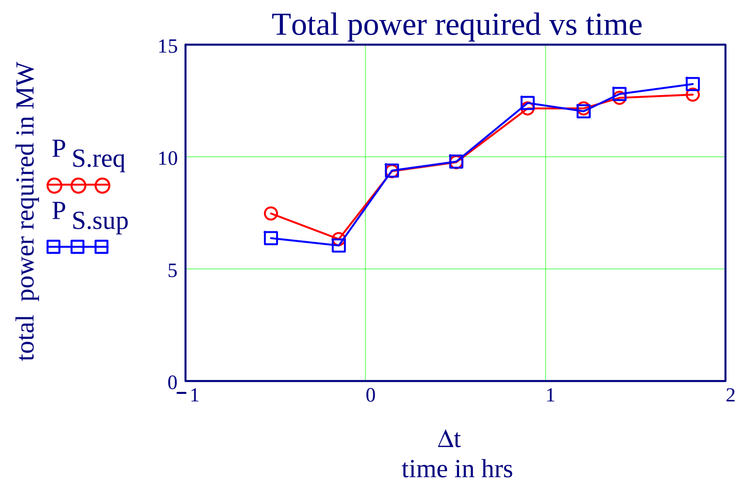
In view of the values of the powers measured the value of the confidence radius is felt to be quite realistic, the relative values ranging from 7.0 to 3.3 %.

$$P_{S.req.95.rel_i} := \frac{P_{S.req.95}}{P_{S_i}}$$

$$P_{S.req.95.rel} = \begin{bmatrix} 0.069 \\ 0.073 \\ 0.047 \\ 0.045 \\ 0.035 \\ 0.036 \\ 0.034 \\ 0.033 \end{bmatrix}$$

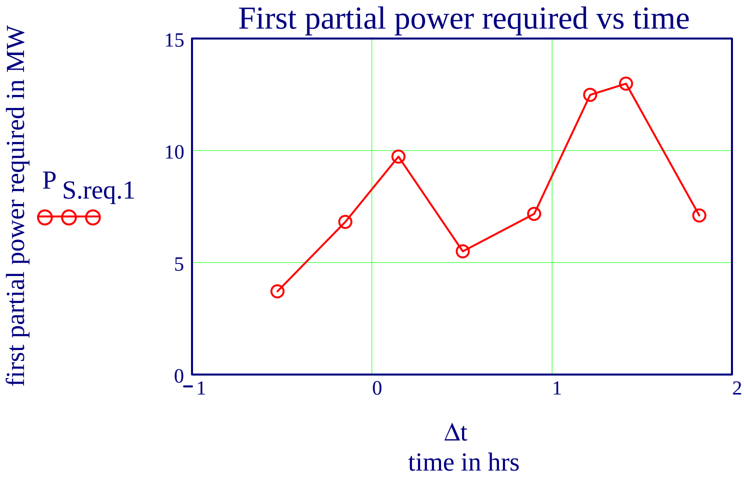
Powers required

Total power required



First partial power required

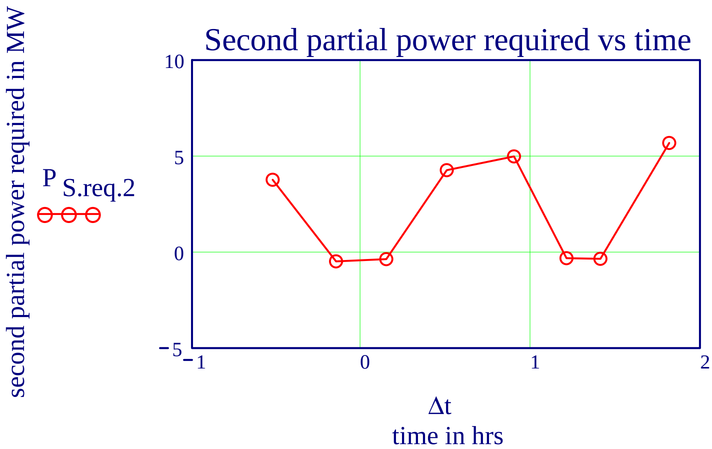
$P_{S.req.1} := A_{req}^{\langle 0 \rangle} \cdot X_{req_0}$



$P_{S.req.1} = \begin{bmatrix} 3.704 \\ 6.811 \\ 9.724 \\ 5.494 \\ 7.164 \\ 12.477 \\ 12.982 \\ 7.097 \end{bmatrix}$

Second partial power required

$P_{S.req.2} := A_{req}^{\langle 1 \rangle} \cdot X_{req_1}$



$P_{S.req.2} = \begin{bmatrix} 3.760 \\ -0.490 \\ -0.373 \\ 4.262 \\ 4.979 \\ -0.328 \\ -0.356 \\ 5.670 \end{bmatrix}$

Re-order runs

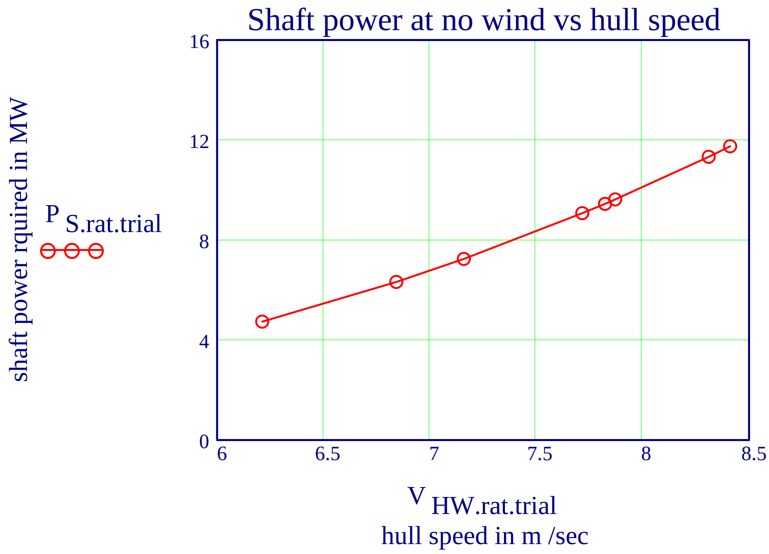
$R_{i,0} := i + 4 \qquad R^{\langle 1 \rangle} := V_{HW} \qquad R := \text{csort}(R, 1) \qquad Run := R^{\langle 0 \rangle}$

Run number re-ordered
according to increasing hull speed through speed
The natural count of runs is coveniently reduced by 1!

Nominal power vs hull speed
at the nominal no wind condition

$V_{HW.rat.trial} := R^{\langle 1 \rangle}$

$C_{PV} := q_0 + q_1$ $\qquad C_{PV} = 0.01974$ $\qquad P_{S.rat.trial_i} := C_{PV} \cdot \left(V_{HW.rat.trial_i}\right)^3$



$$P_{S.rat.trial} = \begin{bmatrix} 4.729 \\ 6.322 \\ 7.242 \\ 9.064 \\ 9.443 \\ 9.618 \\ 11.321 \\ 11.740 \end{bmatrix}$$

Nota bene: The power at the nominal no wind condition identified is that at the hull condition, the loading condition and the sea condition prevailing at the trials!

Powering performance
at the nominal no wind condition

Normalise power coefficient

$$C_{PV.n} := \frac{C_{PV} \cdot 10^6}{\rho \cdot D_P^{\,2}}$$

Identify equilibrium

$J := 0.5$ $\qquad K := 0.15$ $\qquad$ Initial values

Given

$K = p_{n_0} + p_{n_1} \cdot J$

$K = C_{PV.n} \cdot J^3$

Solve

$$\begin{bmatrix} J_{HW.noVAW} \\ K_{P.noVAW} \end{bmatrix} := \mathrm{Find}(J, K)$$

$J_{HW.noVAW} = 0.699$ $\qquad K_{P.noVAW} = 0.132$

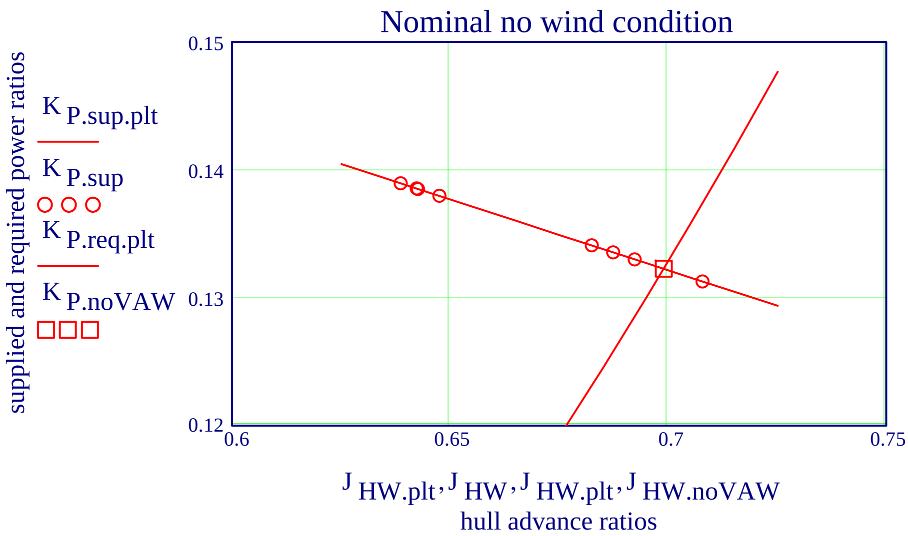
Results plotted

$k := 0 .. 10$

$J_{HW.plt_k} := 0.625 + 0.01 \cdot k$

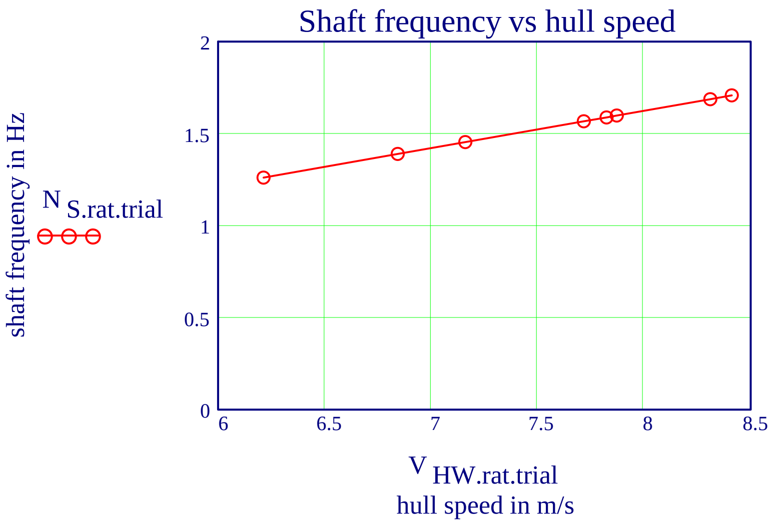
$K_{P.sup.plt_k} := p_{n_0} + p_{n_1} \cdot J_{HW.plt_k}$

$K_{P.req.plt_k} := C_{PV.n} \cdot \left(J_{HW.plt_k}\right)^3$



Frequency of shaft rev's
at the nominal no wind condition

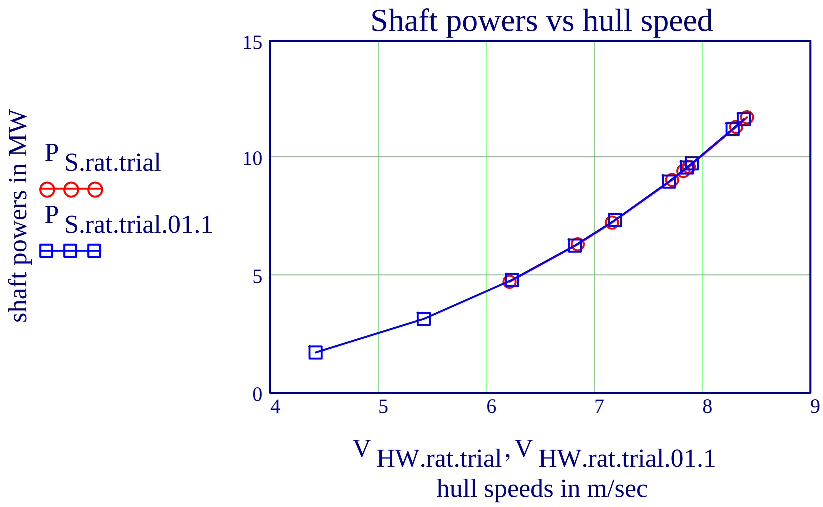
$$N_{S.rat.trial_i} := \frac{V_{HW.rat.trial_i}}{J_{HW.noVAW} \cdot D_P}$$

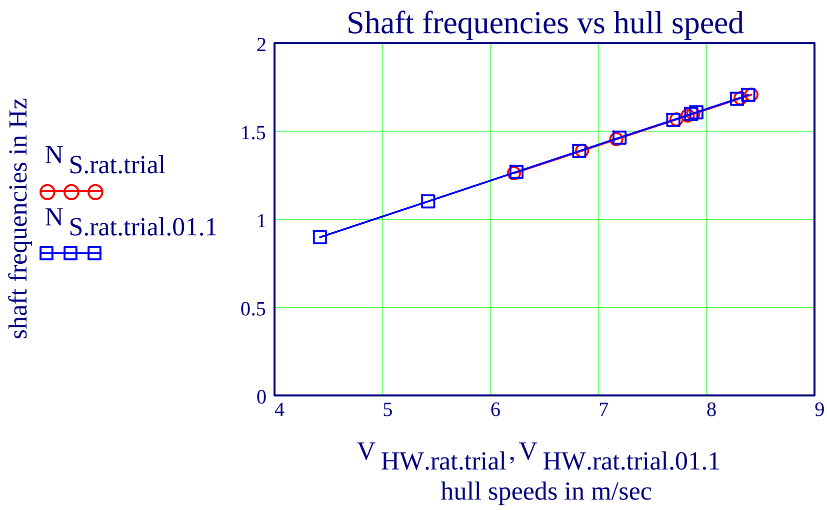


$$N_{S.rat.trial} = \begin{bmatrix} 1.261 \\ 1.389 \\ 1.453 \\ 1.566 \\ 1.587 \\ 1.597 \\ 1.686 \\ 1.707 \end{bmatrix}$$

Compare with results of PATE_01.1

Power





Evidently the final results do not differ for the two different data sets!

Scrutinise results of an undisclosed traditional evaluation

Part 2 concerning the powers supplied and required

The results of the traditional evaluation are those predicted for the reference condition, which differes only slightly from the trials condition.

Trials condition

$T_{aft.trial} := 7.42 \cdot m$

$T_{fore.trial} := 6.12 \cdot m$

$D_{Vol.trial} := 58894.1 \cdot m^3$

Reference condition

$T_{aft.ref} := 7.60 \cdot m$

$T_{fore.ref} := 6.10 \cdot m$

$D_{Vol.ref} := 59649.0 \cdot m^3$

Propeller power supplied (delivered) and shaft frequency at reference condition reported

$$V_{HW.trad} = \begin{bmatrix} 6.369 \\ 6.611 \\ 7.573 \\ 7.351 \\ 7.953 \\ 8.149 \\ 8.349 \\ 8.128 \end{bmatrix} \quad P_{S.trad} := \begin{bmatrix} 4.4224 \\ 5.8975 \\ 9.2628 \\ 7.4969 \\ 9.8683 \\ 12.0176 \\ 12.7595 \\ 10.5436 \end{bmatrix} \cdot MW \quad N_{S.trad} := \begin{bmatrix} 75.8 \\ 81.8 \\ 94.6 \\ 89.4 \\ 97.5 \\ 102.7 \\ 105.0 \\ 99.7 \end{bmatrix} \cdot rpm \quad \eta_D := \begin{bmatrix} 0.828 \\ 0.824 \\ 0.801 \\ 0.808 \\ 0.788 \\ 0.780 \\ 0.770 \\ 0.781 \end{bmatrix}$$

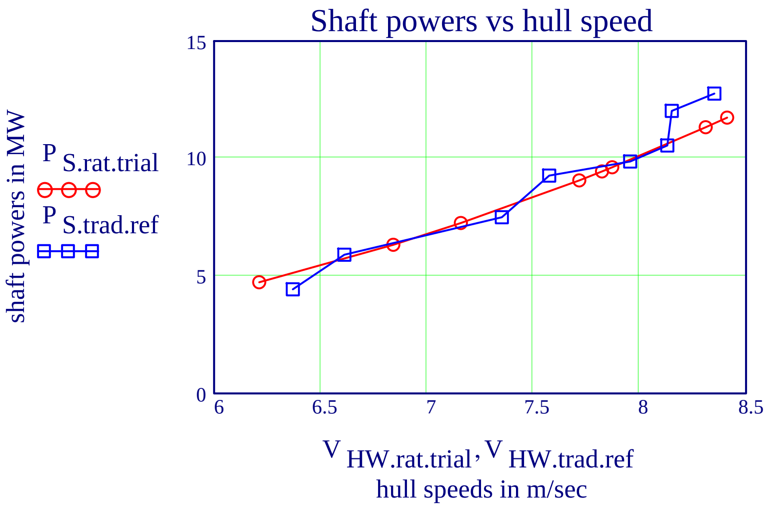
$$P_{S.trad} := \frac{P_{S.trad}}{MW} \qquad N_{S.trad} := \frac{N_{S.trad}}{Hz}$$

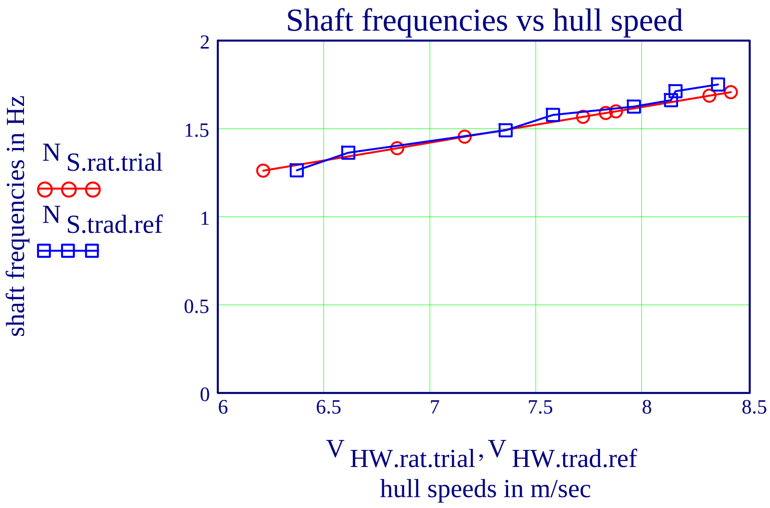
$$ref^{\langle 0 \rangle} := V_{HW.trad} \qquad ref^{\langle 1 \rangle} := P_{S.trad} \qquad ref^{\langle 2 \rangle} := N_{S.trad} \qquad ref^{\langle 3 \rangle} := \eta_D$$

$$ref := csort(ref, 0)$$

$$V_{HW.trad.ref} := ref^{\langle 0 \rangle} \quad P_{S.trad.ref} := ref^{\langle 1 \rangle} \quad N_{S.trad.ref} := ref^{\langle 2 \rangle} \quad \eta_{D.trad} := ref^{\langle 1 \rangle}$$

As far as has been disclosed the results of the traditional evaluation are based on the considerable number of nine small corrections and most importantly on the 'calculated propulsive efficiency values' reported, as has been explicitly stated in a remark.





Evidently the results of the rational evaluation at the trials condition, requiring no prior data, and the results of the traditional evaluation at the only slightly different reference condition, requiring very many prior data, last but not least the computed values of the propulsive efficiency, are very nearly the same, not to say 'identical'.

Computed values of the propulsive efficiency analysed

$k := 0 .. 1$

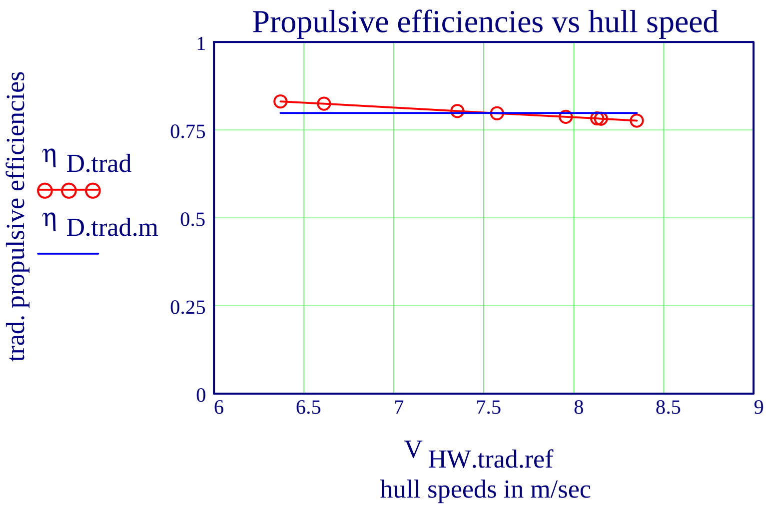
$A_{eta_{i,k}} := \left(V_{HW.trad.ref_i}\right)^k$

$X_{eta} := \text{geninv}\left(A_{eta}\right) \cdot \eta_D$

$\eta_{D.trad} := A_{eta} \cdot X_{eta}$

$\eta_{D.trad.mean} := \text{mean}\left(\eta_{D.trad}\right)$

$\eta_{D.trad.m_i} := \eta_{D.trad.mean}$



This analysis shows that the traditional evaluation is practically in accordance with the convention, implying that the propeller is permanently operating at the same normalised condition, resulting in the quadratic resistance law..

$C_{RV.tot} := \eta_{D.trad.mean} \cdot C_{PV}$

$R_{HW.trad.tot_j} := C_{RV.tot} \cdot \left(V_{HW.trad.ref_j}\right)^2$

How the computed values of the propulsive efficiency have been arrived at in the traditional evaluation remains undisclosed, while **the resistance and the propulsive efficiency can be identified in a rational way solely from data acquired at quasi-steady monitoring tests without any prior information what-so-ever being necessary,** as has been shown in a 'model' study published on my website and in the Festschrift 'From METEOR 1988 to ANONYMA 2013 and further' also to be found on the website.

Scrutinise results of an undisclosed traditional evaluation

End of Part 2 concerning the powers supplied and required

Recording results

of the rational evaluation at the trial condition
of the traditional evaluation at the reference condition

$\Delta t_{trad} := \Delta t$

$$Record := \left| \begin{array}{l} Internal_{rat} \leftarrow \left[Res_{sup} \;\; Res_{req} \right] \\ Final_{rat} \leftarrow \left[Run \;\; \Delta t \;\; V_{HW.rat.trial} \;\; P_{S.rat.trial} \;\; N_{S.rat.trial} \right] \\ Internal_{trad} \leftarrow \left[V_{WG.trad.corr} \;\; J_{HW.trad.corr} \;\; K_{P.sup.trad} \right] \\ Final_{trad} \leftarrow \left[Run \;\; \Delta t_{trad} \;\; V_{HW.trad.ref} \;\; P_{S.trad.ref} \;\; N_{S.trad.ref} \right] \\ record \leftarrow \left[Internal_{rat} \;\; Final_{rat} \;\; Internal_{trad} \;\; Final_{trad} \right] \\ record \end{array} \right.$$

$File := concat("Results\_", EID)$

$WRITEPRN(File) := Record$

Print final rational results

$final_{rat}^{\langle 0 \rangle} := Run$

$final_{rat}^{\langle 1 \rangle} := V_{HW.rat.trial} \cdot \dfrac{m}{kts \cdot sec}$

$final_{rat}^{\langle 2 \rangle} := P_{S.rat.trial}$

$final_{rat}^{\langle 3 \rangle} := N_{S.rat.trial} \cdot \dfrac{min}{sec}$

$$final_{rat} = \begin{bmatrix} 4.000 & 12.072 & 4.729 & 75.632 \\ 5.000 & 13.299 & 6.322 & 83.317 \\ 7.000 & 13.915 & 7.242 & 87.178 \\ 6.000 & 14.997 & 9.064 & 93.951 \\ 8.000 & 15.203 & 9.443 & 95.243 \\ 11.000 & 15.296 & 9.618 & 95.826 \\ 9.000 & 16.150 & 11.321 & 101.177 \\ 10.000 & 16.347 & 11.740 & 102.410 \end{bmatrix}$$

Conclusions

For the whole context and for more details the Conclusions of PATE_01 should be referred to!

The rational evaluation produces nearly the same results for the two data sets analysed. In the near future a data set further reduced, to include only the data of three double runs as usually performed, will be analysed in PATE_01.3.

For the rational evaluation the change from the trials condition to the reference condition results in an increase in the resistance due to the change in the displacement volume, and in an increase in the propulsive efficiency due to the larger nominal submergence of the propeller, maybe compensating each other.

But the result of the rational evaluation still includes the relatively small power required for moving in the sea state reported. **Thus the strictly accidental coincidence of the results in powers remains as unexplained as the whole undisclosed traditional procedure. In fact any traditional procedure is doomed to fail in any cases where no prior experience and data are available.**

END
**Powering performance
of a bulk carrier
during speed trials
in ballast condition
reduced to nominal
no wind condition**

Prof. Dr.-Ing. M.Schmiechen

MS 1305081300
1401221400
1404011700

To whom it may concern

Powering performance of a bulk carrier during speed trials in ballast condition reduced to nominal no wind condition

MS 140910140
Correction of the labels of the plot of propulsive efficiencies reported, traditionally identified from model tests according to Dr. Hollenbach!

Preface

Preamble

The present analysis of a powering trial is **a second of my 'post-ANONYMA trial evaluations'** using the same sub-set of data as in the undisclosed traditional evaluation. **For the whole context and for more details the Conclusions of PATE_01 should be referred to!**

The evaluation is based on the data acquired during the trials with a sister ship of the one, whose trials took place in the East China Sea a fortnight later and the of which have been analysed before in **the first of my 'post-ANONYMA trial evaluations'** PATE_01.1 and PATE_01.2.

As the trials and reference conditions have been the same these data sets and their evaluations provide the rare chance to compare many 'things'. A number of interesting comparisons are already offered; additional ones will be provided on request.

Data provided

The powering trial analysed according to the rational procedure promoted is another reference case of the ongoing research project mentioned. As usual only the anonymised data, just mean values of measured quantities and crude estimates of wind and waves, have been made available for the analysis.

Further, for comparison with the evaluation according to an undisclosed, more or less traditional procedure, few results have been provided, thus permitting to demonstrate the inherent deficiencies of the traditional procedure.

'Disclaimer'

In spite of utmost care the following evaluation, in the meantime a document of more than thirty pages, may still contain mistakes. The author will gratefully appreciate and acknowledge any of those brought to his attention, so that he may correct them.

References

Reference:C:\PATEs\PATE_00.2.mcd

General reamarks
Concepts
Names
Symbols
Remarks
Units
Routines

Identify trial and evaluation

TID := "02.2"

EID := concat("PATE_" , TID) EID = "PATE_02.2"

'Constants'

$D_P := 7.05 \cdot m$ $D_P := D_P \cdot \frac{1}{m}$ diameter of propeller

$h_S := 3.85 \cdot m$ $h_S := h_S \cdot \frac{1}{m}$ height of shaft above base

Trials conditions

$T_{aft} := 7.42 \cdot m$ $T_{aft} := T_{aft} \cdot \frac{1}{m}$ draft aft

Nominal propeller submergence

$h_{P.Tip} := h_S + \frac{D_P}{2}$ $h_{P.Tip} = 7.375$

$s_{P.Tip} := T_{aft} - h_{P.Tip}$ $s_{P.Tip} = 0.045$

At this small nominal submergence and the sea state reported the propeller may have been ventilating even at the down wind conditions.

Wave

$$\psi_{WaveH} := \begin{bmatrix} 70 \\ 110 \\ 110 \\ 70 \\ 70 \\ 110 \\ 110 \\ 70 \end{bmatrix} \cdot deg$$

$H_{Wave} := 1.0 \cdot m$ wave height

$H_{Wave} := \frac{H_{Wave}}{m}$

Water depth

$d_{Water} := 65 \cdot m$

Mean values

For ready reference the matrices of the mean values of the measured magnitudes, alias 'quantities', are printed here and converted to SI Units. Further down intermediate results are printed as well to permit checks óf plausibility.

It is noted here explicitly, that no confdence radii of the mean values have been reported.

Day time / Heading / Rel. wind velocity / Rel. wind direction

$$time := \begin{bmatrix} 12 & 56 \\ 13 & 27 \\ 13 & 44 \\ 14 & 12 \\ 14 & 30 \\ 14 & 56 \\ 15 & 13 \\ 15 & 37 \\ 15 & 57 \\ 16 & 18 \\ 16 & 30 \\ 16 & 57 \end{bmatrix} \quad \psi_{HG.o} := \begin{bmatrix} 74 \\ 256 \\ 256 \\ 76 \\ 75 \\ 246 \\ 247 \\ 75 \\ 73 \\ 248 \\ 248 \\ 72 \end{bmatrix} \cdot deg \quad V_{HA} := \begin{bmatrix} 5 \\ 12 \\ 17 \\ 13 \\ 18 \\ 22 \\ 25 \\ 18 \\ 18 \\ 24 \\ 24 \\ 19 \end{bmatrix} \cdot kts \quad \psi_{HA} := \begin{bmatrix} 30 \\ 40 \\ 40 \\ 40 \\ 50 \\ 40 \\ 30 \\ 50 \\ 50 \\ 25 \\ 25 \\ 45 \end{bmatrix} \cdot deg$$

Shaft frequency / Measured shaft power / Ship speed over ground

$$N_S := \begin{bmatrix} 52.06 \\ 52.05 \\ 66.00 \\ 66.01 \\ 82.53 \\ 82.54 \\ 95.27 \\ 95.26 \\ 103.08 \\ 103.07 \\ 106.47 \\ 106.46 \end{bmatrix} \cdot \frac{1}{min} \quad P_S := \begin{bmatrix} 1666 \\ 1615 \\ 3010 \\ 3149 \\ 6041 \\ 5940 \\ 9274 \\ 9555 \\ 12188 \\ 11767 \\ 13060 \\ 13579 \end{bmatrix} \cdot kW \quad V_{HG} := \begin{bmatrix} 9.230 \\ 7.245 \\ 9.778 \\ 11.223 \\ 13.958 \\ 12.786 \\ 14.608 \\ 15.047 \\ 15.937 \\ 16.001 \\ 16.478 \\ 15.986 \end{bmatrix} \cdot kts$$

Further it is mentioned here, that in Mathcad the operational indices standardly start from zero as usual in mathematics and thus in the mathematical subroutines available in the Numericl Recipes subroutine package. Thus the possible change of the standard, resulting in intransparent code, is not a viable choice..

'Duration' of measurements

$s_{mean} := 1\ nm$ $\qquad s_{mean} := \frac{s_{mean}}{m}$ $\qquad$ Distances sailed at each run

Sailing the same distance at different speeds, here one nautical mile, is in accordance with the name 'miles runs', in German 'Meilen-Fahrten', but has the disadvantage, that the average values derived from the sampled values have wider confidence ranges at the higher speeds.

'Non-dimensionalise' magnitudes

$V_{HA} := V_{HA} \cdot \frac{sec}{m}$ $\qquad N_S := N_S \cdot sec$ $\qquad P_S := P_S \cdot \frac{1}{MW}$ $\qquad V_{HG} := V_{HG} \cdot \frac{sec}{m}$

Times of measurements

$ni := last(time^{\langle 0 \rangle})$ $\qquad i := 0 .. ni$

$dur_i := \frac{s_{mean}}{V_{HG_i}}$ $\qquad t := time^{\langle 0 \rangle} + time^{\langle 1 \rangle} \cdot \frac{min}{hr} + \frac{dur}{2} \cdot \frac{sec}{hr}$

$t_m := mean(t)$ $\qquad \Delta t := t - t_m$

Normalise data

At this stage for preliminary check of consistency only!

$J_{HG_i} := J\left(D_P, V_{HG_i}, N_{S_i}\right)$ $\qquad K_{P.o_i} := KP\left(\rho, D_P, P_{S_i}, N_{S_i}\right)$

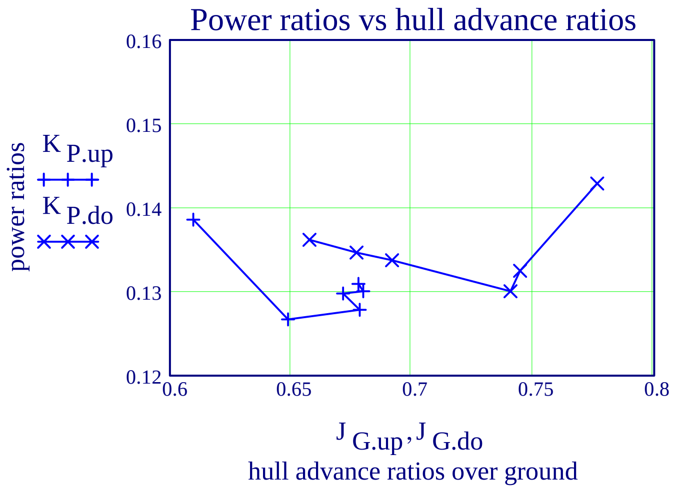
Sort runs

$S := Sort\_runs\left(J_{HG}, K_{P.o}, \psi_{HG.o}\right)$

$J_{G.up} := S^{\langle 0 \rangle}$ $\qquad K_{P.up} := S^{\langle 1 \rangle}$ $\qquad J_{G.do} := S^{\langle 2 \rangle}$ $\qquad K_{P.do} := S^{\langle 3 \rangle}$

$$J_{G.up} = \begin{bmatrix} 0.609 \\ 0.649 \\ 0.678 \\ 0.671 \\ 0.680 \\ 0.678 \end{bmatrix} \quad K_{P.up} = \begin{bmatrix} 0.139 \\ 0.127 \\ 0.128 \\ 0.130 \\ 0.130 \\ 0.131 \end{bmatrix} \quad J_{G.do} = \begin{bmatrix} 0.776 \\ 0.744 \\ 0.740 \\ 0.692 \\ 0.677 \\ 0.657 \end{bmatrix} \quad K_{P.do} = \begin{bmatrix} 0.143 \\ 0.132 \\ 0.130 \\ 0.134 \\ 0.135 \\ 0.136 \end{bmatrix}$$

Scrutinise data



Evidently the values at the first double run are outliers to be eliminated without further study of possible reasons.
In the traditional evaluation the values at the first two double runs, i. e. the first four data sets have been ignored.

Outlying data eliminated

$ne := 4$ $\qquad ni := last(t) - ne$

$i := 0 .. ni$

$\Delta t_{red_i} := \Delta t_{i+ne}$ $\qquad \psi_{HG.red_i} := \psi_{HG.o_{i+ne}}$ $\qquad V_{HA.red_i} := V_{HA_{i+ne}}$

$\Delta t := \Delta t_{red}$ $\qquad \psi_{HG} := \psi_{HG.red}$ $\qquad V_{HA} := V_{HA.red}$

$N_{S.red_i} := N_{S_{i+ne}}$ $\qquad P_{S.red_i} := P_{S_{i+ne}}$ $\qquad V_{HG.red_i} := V_{HG_{i+ne}}$

$N_S := N_{S.red}$ $\qquad P_S := P_{S.red}$ $\qquad V_{HG} := V_{HG.red}$

Normalise reduced data

$J_{HG_i} := J\left(D_P, V_{HG_i}, N_{S_i}\right)$ $\qquad K_{P_i} := KP\left(\rho, D_P, P_{S_i}, N_{S_i}\right)$

$S := Sort\_runs\left(J_{HG}, K_P, \psi_{HG}\right)$

$J_{HG.up} := S^{\langle 0 \rangle}$ $\qquad K_{P.up} := S^{\langle 1 \rangle}$ $\qquad J_{HG.do} := S^{\langle 2 \rangle}$ $\qquad K_{P.do} := S^{\langle 3 \rangle}$

$$J_{HG.up} = \begin{bmatrix} 0.678 \\ 0.671 \\ 0.680 \\ 0.678 \end{bmatrix} \qquad K_{P.up} = \begin{bmatrix} 0.128 \\ 0.130 \\ 0.130 \\ 0.131 \end{bmatrix} \qquad J_{HG.do} = \begin{bmatrix} 0.740 \\ 0.692 \\ 0.677 \\ 0.657 \end{bmatrix} \qquad K_{P.do} = \begin{bmatrix} 0.130 \\ 0.134 \\ 0.135 \\ 0.136 \end{bmatrix}$$

Read results of PATE_02.1
for ready comparison with the results
of the foregoing analysis of the trial
ignoring only the data of the first double run,
different from the traditional analysis!

$Record_{02.1} := READPRN(\text{"Results\_PATE\_02.1"})$

$\begin{bmatrix} Internal_{rat.02.1} & Final_{rat.02.1} & Internal_{trad.02.1} & Final_{trad.02.1} \end{bmatrix} := Record_{02.1}$

$\begin{bmatrix} Res_{sup.02.1} & Res_{req.02.1} \end{bmatrix} := Internal_{rat.02.1}$

$$\begin{bmatrix} \Delta P_{S.sup.02.1} & v_{02.1} & V_{WG.02.1} \\ V_{HW.02.1} & p_{02.1} & P_{S.sup.02.1} \\ J_{HW.02.1} & p_{n.02.1} & K_{P.sup.02.1} \end{bmatrix} := Res_{sup.02.1}$$

$\begin{bmatrix} \Delta P_{S.req.02.1} & q_{02.1} & P_{S.req.02.1} & A_{req.02.1} & X_{req.02.1} \end{bmatrix} := Res_{req.02.1}$

$\begin{bmatrix} Run_{02.1} & \Delta t_{02.1} & V_{HW.rat.trial.02.1} & P_{S.rat.trial.02.1} & N_{S.rat.trial.02.1} \end{bmatrix} := Final_{rat.02.1}$

$\begin{bmatrix} V_{WG.trad.corr.02.1} & J_{HW.trad.corr.02.1} & K_{P.sup.trad.02.1} \end{bmatrix} := Internal_{trad.02.1}$

$\begin{bmatrix} Run & \Delta t_{trad.02.1} & V_{HW.trad.ref.02.1} & P_{S.trad.ref.02.1} & N_{S.trad.ref.02.1} \end{bmatrix} := Final_{trad.02.1}$

Read results of PATE_01.2
for ready comparison with the results
of the following analysis of the trial
with a sister ship a fornight earlier

$Record_{01.2} := READPRN(\text{"Results\_PATE\_01.2"})$

$\left[Internal_{rat.01.2} \;\; Final_{rat.01.2} \;\; Internal_{trad.01.2} \;\; Final_{trad.01.2} \right] := Record_{01.2}$

$\left[Res_{sup.01.2} \;\; Res_{req.01.2} \right] := Internal_{rat.01.2}$

$$\begin{bmatrix} \Delta P_{S.sup.01.2} & v_{01.2} & V_{WG.01.2} \\ V_{HW.01.2} & p_{01.2} & P_{S.sup.01.2} \\ J_{HW.01.2} & p_{n.01.2} & K_{P.sup.01.2} \end{bmatrix} := Res_{sup.01.2}$$

$\left[\Delta P_{S.req.01.2} \;\; q_{01.2} \;\; P_{S.req.01.2} \;\; A_{req.01.2} \;\; X_{req.01.2} \right] := Res_{req.01.2}$

$\left[Run_{01.2} \;\; \Delta t_{01.2} \;\; V_{HW.rat.trial.01.2} \;\; P_{S.rat.trial.01.2} \;\; N_{S.rat.trial.01.2} \right] := Final_{rat.01.2}$

$\left[V_{WG.trad.corr.01.2} \;\; J_{HW.trad.corr.01.2} \;\; K_{P.sup.trad.01.2} \right] := Internal_{trad.01.2}$

$\left[Run \;\; \Delta t_{trad.01.2} \;\; V_{HW.trad.ref.01.2} \;\; P_{S.trad.ref.01.2} \;\; N_{S.trad.ref.01.2} \right] := Final_{trad.01.2}$

Analyse power supplied
including identification of tidal current

Conventions adopted

Propeller power convention

$$PS_{sup}(p, N, V) := p_0 \cdot N^3 + p_1 \cdot N^2 \cdot V$$

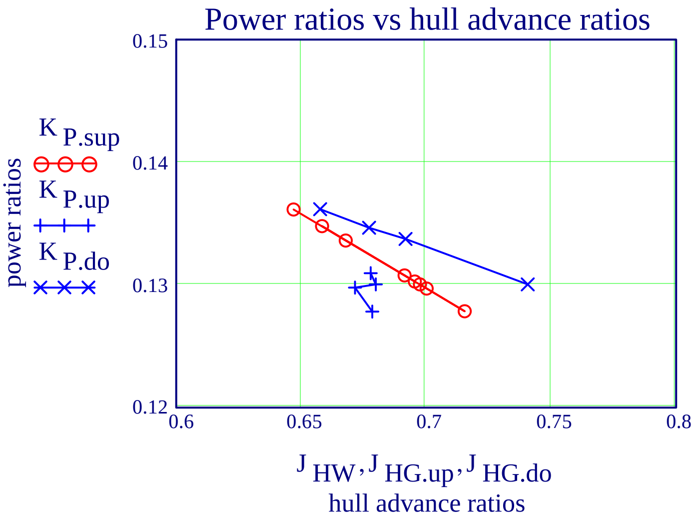
Tidal current velocity convention

$$VT(v, \omega_T, \Delta t) := v_0 + v_1 \cdot \cos(\omega_T \cdot \Delta t) + v_2 \cdot \sin(\omega_T \cdot \Delta t)$$

Evaluate

$$Res_{sup} := Supplied_T(\rho, D_P, \Delta t, V_{HG}, \Psi_{HG}, N_S, P_S)$$

$$\begin{bmatrix} \Delta P_{S.sup} & v & V_{WG} \\ V_{HW} & p & P_{S.sup} \\ J_{HW} & p_n & K_{P.sup} \end{bmatrix} := Res_{sup}$$



$$p = \begin{bmatrix} 3.832 \\ -0.307 \\ 0.012 \\ 2.862 \cdot 10^{-3} \end{bmatrix}$$

$$p_n = \begin{bmatrix} 0.215 \\ -0.121 \end{bmatrix}$$

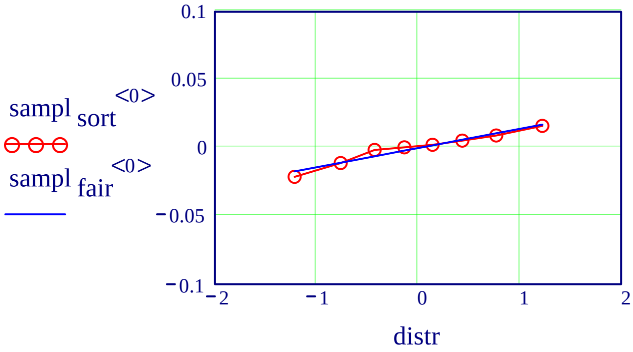
Nota bene: The propeller performance in the behind condition identified is that at the hull condition, the loading condition and the sea condition prevailing at the trials!

Supplied power residua

Check distribution of residua

Values of random variables need to be tested for normal distribution before using mean values and and standard deviations.

$\begin{bmatrix} distr & sampl_{sort} & sampl_{fair} & distr_{par} \end{bmatrix} := norm\_distr(\Delta P_{S.sup})$



$distr_{par} = \begin{bmatrix} 1.043 \cdot 10^{-4} \\ 0.014 \\ 5.001 \cdot 10^{-3} \end{bmatrix}$

According to the result plotted the following error analysis is justified.

95 % confidence radius

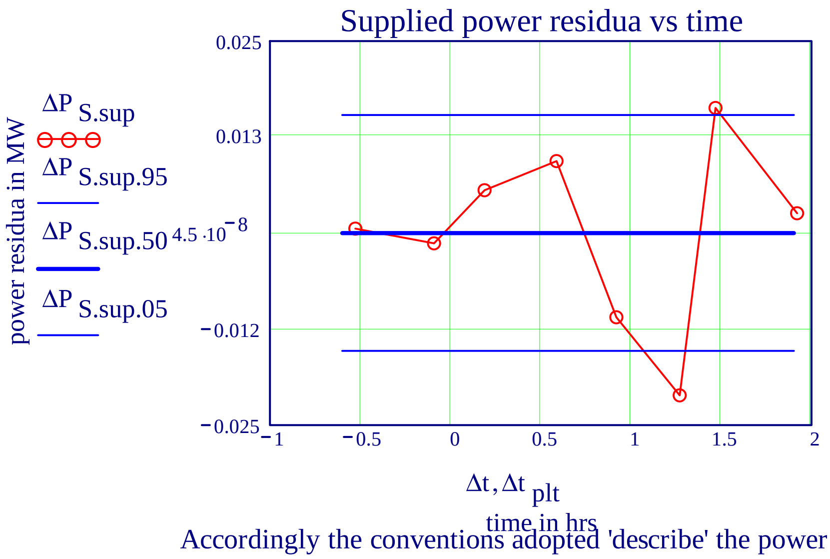
number of samples — of parameters — of degrees of freedom

$n_s := ni + 1$ $\quad n_p := 4$ $\quad f := n_s - n_p$

$P_{S.sup.95} := C_{95}(\Delta P_{S.sup}, f)$ $\quad P_{S.sup.95} \cdot \frac{MW}{kW} = 15.362$ kW

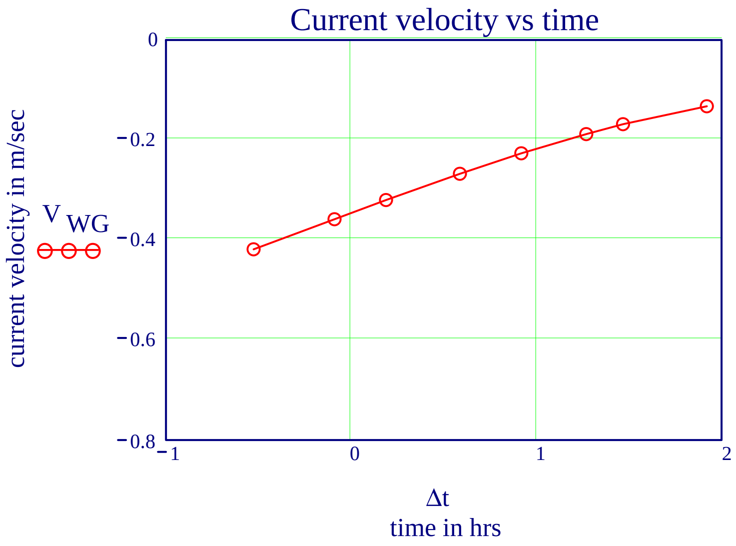
$k := 0..1$ $\quad \Delta t_{plt_0} := -0.6$ $\quad \Delta t_{plt_1} := 1.9$

$\Delta P_{S.sup.95_k} := P_{S.sup.95}$ $\quad \Delta P_{S.sup.50_k} := 0$ $\quad \Delta P_{S.sup.05_k} := -P_{S.sup.95}$



Accordingly the conventions adopted 'describe' the power data perfectly well! The relatively small value of the confidence radius cannot be judged objectively, as the confidence ranges of the mean values have not been provided as in case of the analysis of the ANONYMA trials.

Current velocity identified



$$V_{WG} \cdot \frac{m}{kts \cdot sec} = \begin{bmatrix} -0.815 \\ -0.697 \\ -0.623 \\ -0.520 \\ -0.441 \\ -0.366 \\ -0.328 \\ -0.258 \end{bmatrix} kts$$

During the trials the current changed more than half a knot!

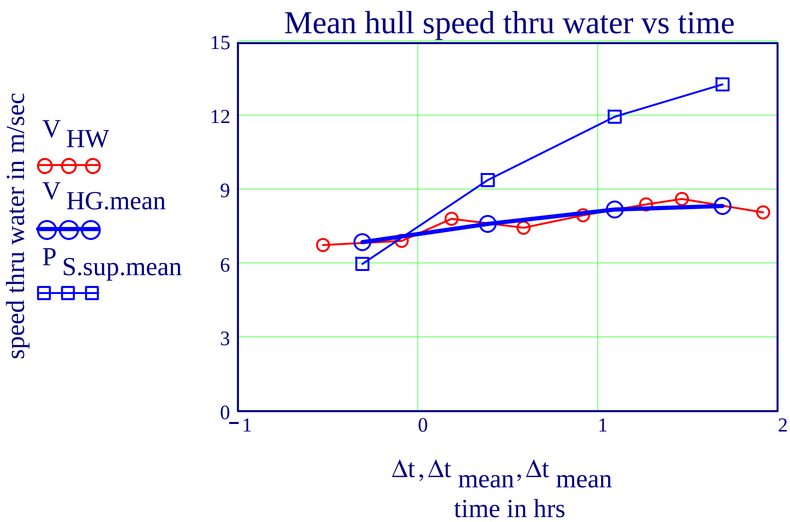
$V_{WG.mean} := v_0$ $\quad V_{WG.mean} \cdot \frac{m}{kts \cdot sec} = -0.725$ Nominal mean current in kts

$V_{WG.ampl} := \sqrt{(v_1)^2 + (v_2)^2}$ $\quad V_{WG.ampl} \cdot \frac{m}{kts \cdot sec} = 0.533$ Nominal tidal amplitude in kts

Mean velocity over ground and mean power

$nj := \frac{ni - 1}{2}$ $\quad j := 0 .. nj$ $\quad \Delta t_{mean_j} := \frac{\Delta t_{2 \cdot j} + \Delta t_{2 \cdot j + 1}}{2}$

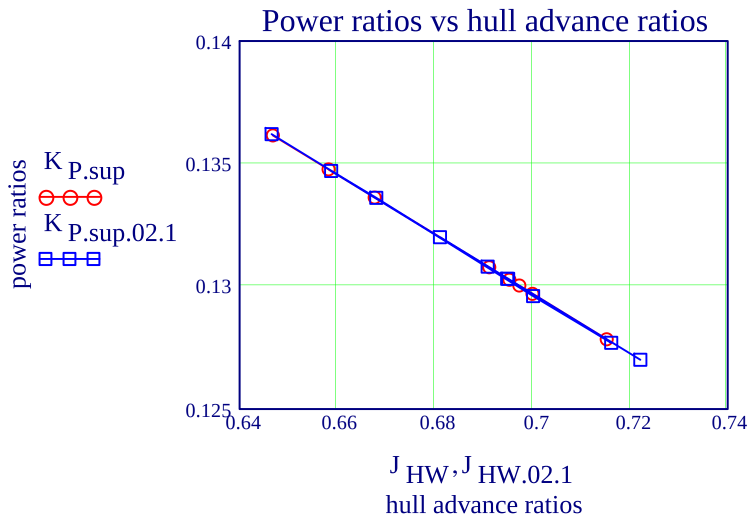
$V_{HG.mean_j} := \frac{V_{HG_{2 \cdot j}} + V_{HG_{2 \cdot j + 1}}}{2}$ $\quad P_{S.sup.mean_j} := \frac{P_{S.sup_{2 \cdot j}} + P_{S.sup_{2 \cdot j + 1}}}{2}$



In the present case the mean speed over ground happens to be equal to the speed over ground at the mean time between the two corresponding runs.

Compare with results of PATE_02.1

Powering performances



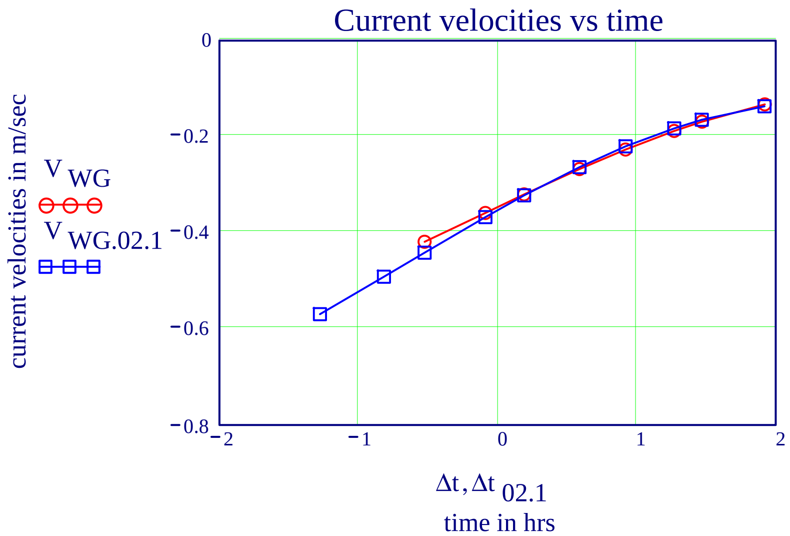
$$p_{02.1} = \begin{bmatrix} 3.841 \\ -0.309 \\ 0.013 \\ 3.014\cdot10^{-3} \end{bmatrix}$$

$$p = \begin{bmatrix} 3.832 \\ -0.307 \\ 0.012 \\ 2.862\cdot10^{-3} \end{bmatrix}$$

$$\Delta K_P := p_{n.02.1} - p_n \qquad \Delta K_P = \begin{bmatrix} 5.161\cdot10^{-4} \\ -7.797\cdot10^{-4} \end{bmatrix}$$

The powering performances in the behind conditon identified for the two different data sets are in perfect agrrement.

Currents



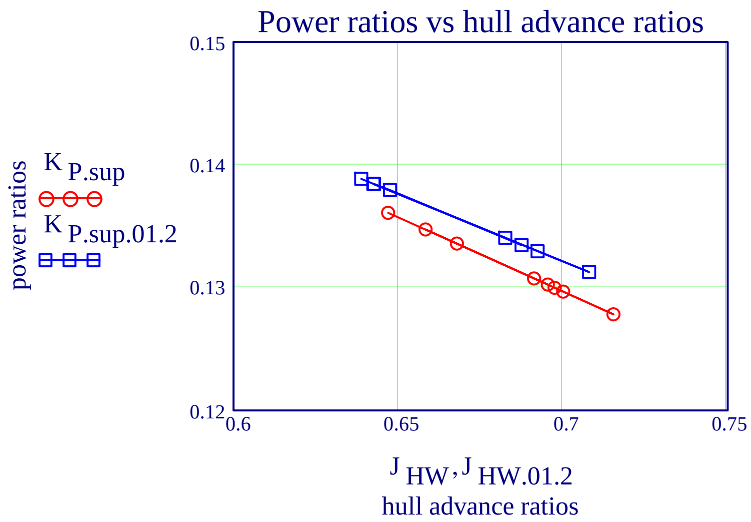
$$V_{WG.02.1.red_i} := V_{WG.02.1_{i+2}}$$

$$\Delta V_{WG} := V_{WG.02.1.red} - V_{WG} \qquad \text{mean}\left(\Delta V_{WG}\right) = -2.146\cdot10^{-3}$$

The currents identified for the two different data sets are also in perfect agrrement .

Compare with results of PATE_01.2

Powering performance



$$\Delta K_P := p_{n.01.2} - p_n \qquad \Delta K_P = \begin{bmatrix} -4.984 \cdot 10^{-3} \\ 0.011 \end{bmatrix}$$

The powering performances in the behind conditon identified for both ships are differing slightly in value and in tendency.

Curent

Identified

$V_{WG.mean} \cdot \frac{m}{kts \cdot sec} = -0.725$ Nominal mean current in kts

$V_{WG.ampl} \cdot \frac{m}{kts \cdot sec} = 0.533$ Nominal tidal amplitude in kts

Identified for the trial a fortnight later

$$V_{WG.mean.01.2} := v_{01.2_0}$$

$$V_{WG.ampl.01.2} := \sqrt{\left(v_{01.2_1}\right)^2 + \left(v_{01.2_2}\right)^2}$$

$V_{WG.mean.01.2} \cdot \frac{m}{kts \cdot sec} = -0.669$ Nominal mean current in kts

$V_{WG.ampl.01.2} \cdot \frac{m}{kts \cdot sec} = 0.467$ Nominal tidal amplitude in kts

Scrutinise results of an undisclosed traditional evaluation

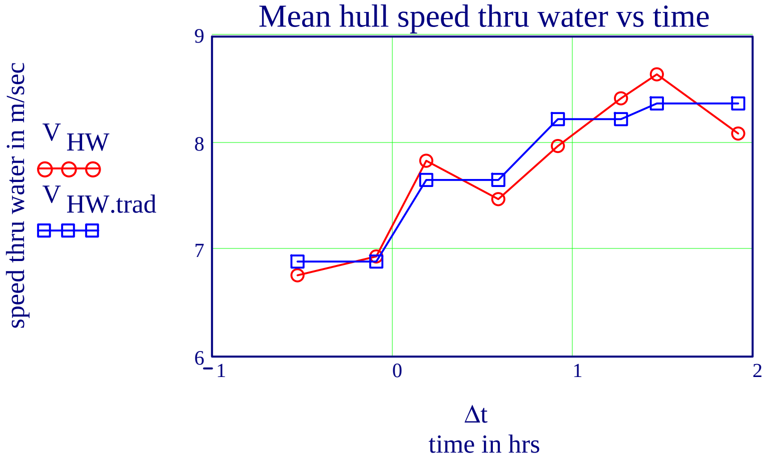
Part 1 concerning the speed through the water

Hull speed thru water reported

$$V_{HW.trad} := \begin{bmatrix} 13.39 \\ 13.39 \\ 14.88 \\ 14.88 \\ 15.99 \\ 15.99 \\ 16.27 \\ 16.27 \end{bmatrix} \cdot kts \qquad V_{HW.trad} := V_{HW.trad} \cdot \frac{sec}{m}$$

$$J_{HW.trad_i} := \frac{V_{HW.trad_i}}{D_P \cdot N_{S_i}} \qquad J_{HW.trad} = \begin{bmatrix} 0.710 \\ 0.710 \\ 0.684 \\ 0.684 \\ 0.679 \\ 0.679 \\ 0.669 \\ 0.669 \end{bmatrix}$$

Mean hull speed thru water vs time



**Current velocity identified
by traditional procedure**

$$V_{WG.trad_i} := \left(V_{HG_i} - V_{HW.trad_i}\right) \cdot dir\left(\psi_{HG_i}\right)$$

**Tidal approximation
as in the rational evaluation**

$$A_{WG.trad_{i,0}} := 1$$

$$A_{WG.trad_{i,1}} := \cos\left(\omega_T \cdot \Delta t_i\right)$$

$$A_{WG.trad_{i,2}} := \sin\left(\omega_T \cdot \Delta t_i\right)$$

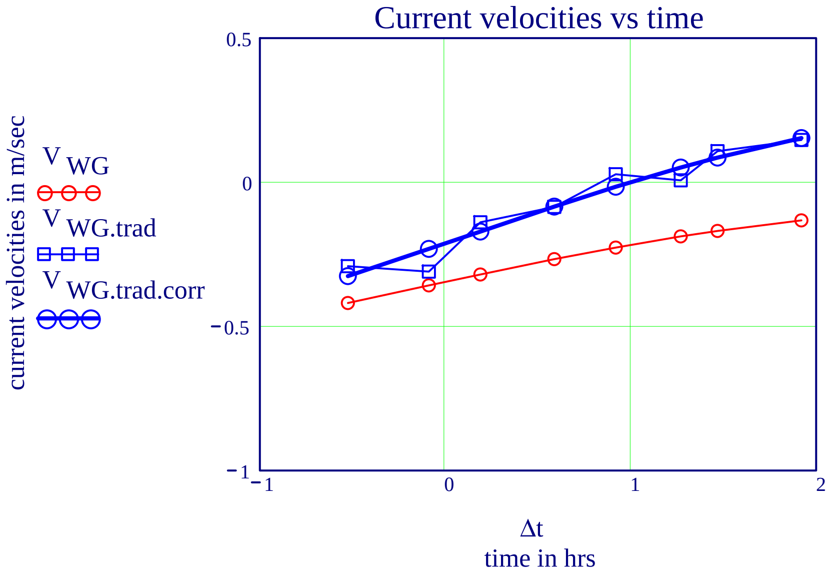
$$X_{WG.trad} := geninv\left(A_{WG.trad}\right) \cdot V_{WG.trad}$$

$$X_{WG.trad} = \begin{bmatrix} -0.195 \\ -0.017 \\ 0.433 \end{bmatrix}$$

$$V_{WG.trad.corr} := A_{WG.trad} \cdot X_{WG.trad}$$

$$\Delta V_{WG.trad} := V_{WG.trad} - V_{WG.trad.corr}$$

$$V_{HW.trad.corr_i} := V_{HG_i} + V_{WG.trad.corr_i} \cdot dir\left(\psi_{HG_i}\right)$$



Nominal mean currents and tidal amplitudes compared

Nominal mean currents in kts

Rational

$V_{WG.mean} \cdot \frac{m}{kts \cdot sec} = -0.725$

Traditional

$v_{trad} := X_{WG.trad}$

$V_{WG.trad.mean} := v_{trad_0}$

$V_{WG.mean} \cdot \frac{m}{kts \cdot sec} = -0.725$

Nominal tidal amplitudes in kts

$V_{WG.ampl} \cdot \frac{m}{kts \cdot sec} = 0.533$

$V_{WG.trad.ampl} := \sqrt{\left(v_{trad_1}\right)^2 + \left(v_{trad_2}\right)^2}$

$V_{WG.trad.ampl} \cdot \frac{m}{kts \cdot sec} = 0.842$

Difference of traditionally identified current

In view of the intricate current conditions in the East China Sea the comparison of the nominal tidal currents may be not particularly meaningful, but different from the evaluation PATE_01the mean difference in the currents identified is as meannigless in the present context.

$\Delta V_{WG} := V_{WG.trad} - V_{WG}$

$\Delta V_{WG.mean} := \text{mean}\left(\Delta V_{WG}\right)$

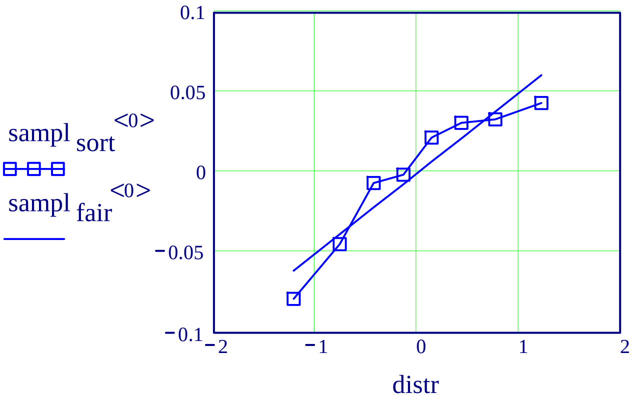
$\Delta V_{WG.mean} \cdot \frac{m}{kts \cdot sec} = 0.374$ kts

Thus the traditional evaluation results in a mean difference of 0.374 kts in the current identified, while in case of PATE_01 this value has been -0.27, i. e. of opposite sign, indicating an inconsistency in the traditional evaluation.

Check distribution of randon errors in current identified traditionally

$\Delta V_{WG.trad} := V_{WG.trad} - V_{WG.trad.corr}$

$\left[distr \;\; sampl_{sort} \;\; sampl_{fair} \;\; distr_{par} \right] := \text{norm\_distr}\left(\Delta V_{WG.trad}\right)$



$$distr_{par} = \begin{bmatrix} 0.000 \\ 0.050 \\ 0.018 \end{bmatrix}$$

According to the plot of differences in currents identified and the subsequent check of the distribution the differences are not quite normally distributed. Thus the following analysis is not quite justified.

95 % confidence radius

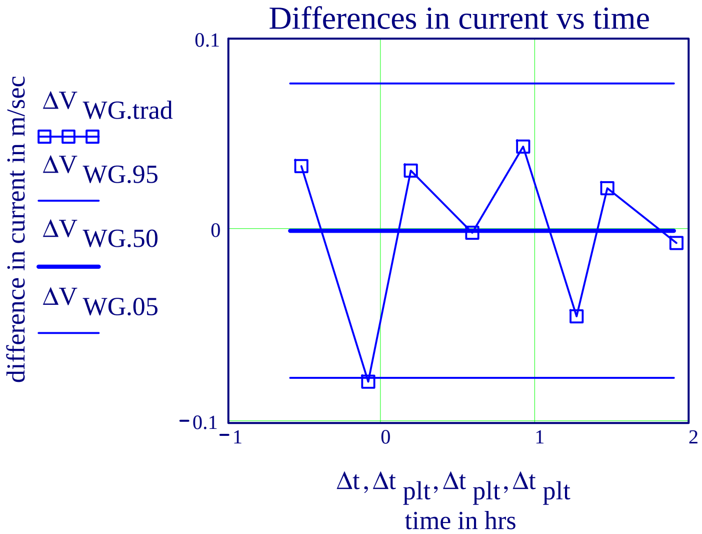
number of samples — of parameters — of degrees of freedom

$n_s := ni - 1$ $\quad n_p := 3$ $\quad f := n_s - n_p$

$\Delta V_{WG.95.rad} := C_{95}(\Delta V_{WG.trad}, f)$ $\quad \Delta V_{WG.95.rad} \cdot \frac{m}{kts \cdot sec} = 0.149$ kts

$k := 0..1$ $\quad \Delta t_{plt_0} := -0.6$ $\quad \Delta t_{plt_1} := 1.9$

$\Delta V_{WG.05_k} := -\Delta V_{WG.95.rad}$ $\quad \Delta V_{WG.50_k} := 0$ $\quad \Delta V_{WG.95_k} := \Delta V_{WG.95.rad}$



Shaft power ratios vs hull advance ratios

$$V_{HW.trad.corr_i} := V_{HG_i} - V_{WG.trad.corr_i} \cdot dir\left(\psi_{HG_i}\right)$$

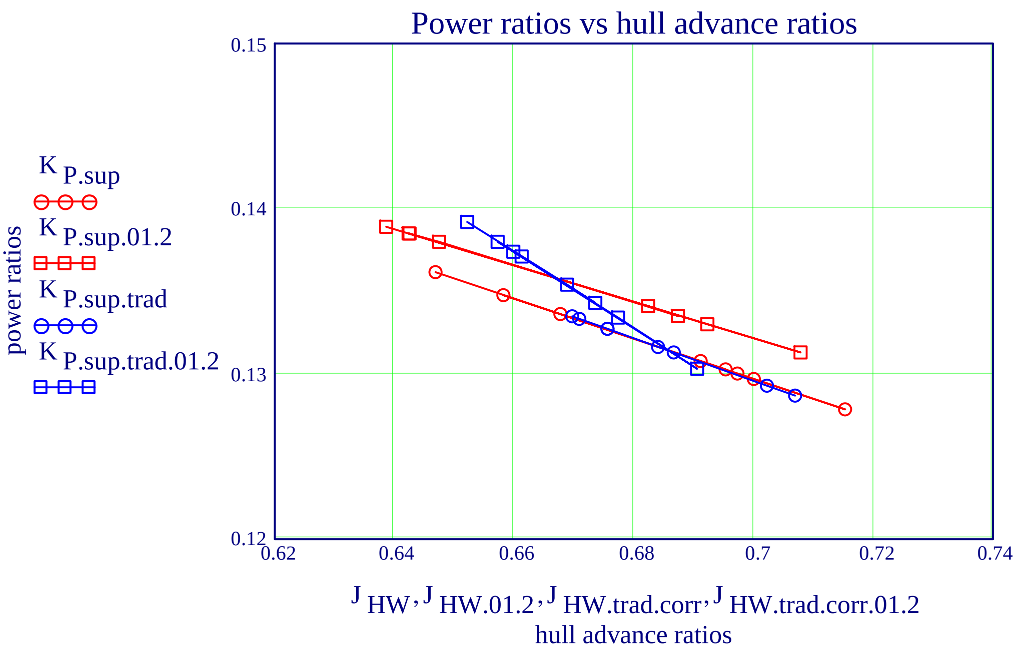
$$J_{HW.trad.corr_i} := \frac{V_{HW.trad.corr_i}}{D_P \cdot N_{S_i}}$$

Fairing power ratios

$$A_{KP_{i,k}} := \left(J_{HW.trad.corr_i}\right)^k$$

$$X_{KP} := geninv\left(A_{KP}\right) \cdot K_P$$

$$K_{P.sup.trad} := A_{KP} \cdot X_{KP}$$



In this case the hull speeds through the water identified differ only very little and thus the powering performance in the behind condition identifiied by the rational and traditional procedures 'coincide'!

While the rational procedure results nearly in the same powering performance for the sister ships at the same conditions except for the wave height, the traditional procedure results show considerable differences in tendency.

Scrutinise results of an undisclosed traditional evaluation

End of Part 1 concerning the hull speed through the water

Analyse power required

Specify relative environmental conditions

Relative wind from ahead

$V_{HA.x_i} := V_{HA_i} \cdot \cos\left(\psi_{HA_i}\right)$

$$V_{HA.x} = \begin{bmatrix} 8.019 \\ 8.670 \\ 9.852 \\ 7.094 \\ 5.952 \\ 9.458 \\ 10.693 \\ 6.283 \end{bmatrix}$$

Wind speed over ground

$V_{AG_i} := \left(V_{HA.x_i} - V_{HG_i}\right) \cdot dir\left(\psi_{HG_i}\right)$

Approximate wind speed

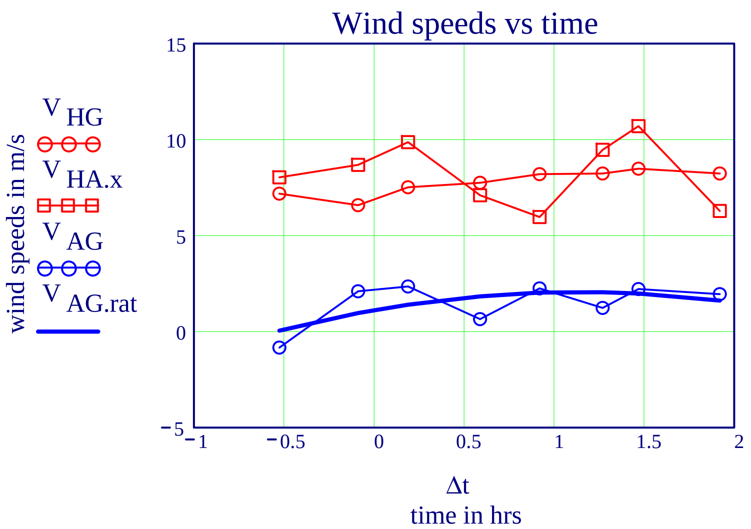
$k := 0 .. 2$

$A_{AG_{i,k}} := \left(\Delta t_i\right)^k$

$X_{AG} := geninv\left(A_{AG}\right) \cdot V_{AG}$

$$X_{AG} = \begin{bmatrix} 1.113 \\ 1.653 \\ -0.726 \end{bmatrix}$$

$V_{AG.rat} := A_{AG} \cdot X_{AG}$



$$V_{AG.rat} = \begin{bmatrix} 0.037 \\ 0.955 \\ 1.396 \\ 1.832 \\ 2.018 \\ 2.041 \\ 1.975 \\ 1.612 \end{bmatrix}$$

Relative wind speed corrected

$\Delta V_{AG} := V_{AG.rat} - V_{AG}$

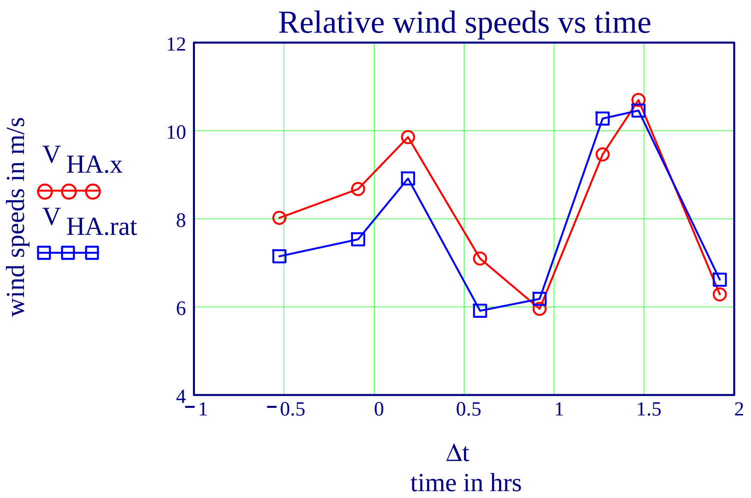
$$\Delta V_{AG} = \begin{bmatrix} 0.876 \\ -1.137 \\ -0.941 \\ 1.185 \\ -0.229 \\ 0.815 \\ -0.240 \\ -0.329 \end{bmatrix}$$

Evidently the differences depend on the direction of the runs relative the wind.

But as oscillations of the wind speed over ground are not expected to correlate with the varying directions of the runs, a correction of this systematic effect, in the measured relative wind speed, maybe due to the installation of the wind meter, is appropriate. But it is worth noting, that the corrected values remain nominal values!

$$V_{HA.rat_i} := V_{HG_i} + V_{AG.rat_i} \cdot dir\left(\psi_{HG_i}\right)$$

$$V_{HA.rat} = \begin{bmatrix} 7.143 \\ 7.533 \\ 8.911 \\ 5.909 \\ 6.181 \\ 10.273 \\ 10.452 \\ 6.611 \end{bmatrix}$$



Conventions adopted

First power' convention

$$P_{S.req.0}(q, V_{HW}) := q_0 \cdot V_{HW}^3$$

Second power convention

$$P_{S.req.1}(q, V_{HW}, V_{HA}) := q_1 \cdot V_{HA} \cdot |V_{HA}| \cdot V_{HW}$$

Evaluate power required

$$Res_{req} := Required(V_{HG}, P_{S.sup}, V_{HA.rat})$$

$$\begin{bmatrix} \Delta P_{S.req} & q & P_{S.req} & A_{req} & X_{req} \end{bmatrix} := Res_{req}$$

$$q = \begin{bmatrix} 0.023 \\ -1.078 \cdot 10^{-3} \\ 0.942 \\ 0.193 \end{bmatrix} \qquad q_{01.2} = \begin{bmatrix} 0.0182 \\ 1.5770 \cdot 10^{-3} \\ 0.4726 \\ 0.2040 \end{bmatrix}$$

Evidently in this case of nearly no wind the standard evaluation does not permit to identify meaningful parameters of the partial powers. Thus the power parameter of the first partial power identified for the sister ship in PATE_01.2 is being used. A similar procedure had already to be adopted in the analysis of the ANANYMA trials, though for a different reason!

Evaluation modified

$$X_{req.0} := q_{01.2_0} \qquad X_{req.0} = 0.0182$$

Evaluation

$$Res_{req} := Required_R(V_{HG}, P_{S.sup}, V_{HA.rat}, X_{req.0})$$

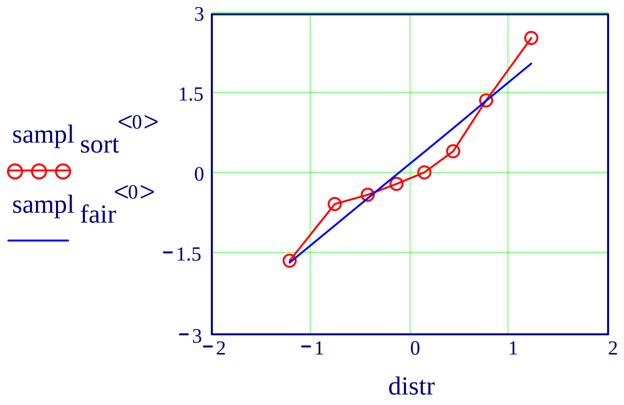
$$\begin{bmatrix} \Delta P_{S.req} & q & P_{S.req} & A_{req} & X_{req} \end{bmatrix} := Res_{req}$$

$$q = \begin{bmatrix} 0.0182 \\ 0.0026 \\ 1.2774 \\ 0.1927 \end{bmatrix} \qquad q_{01.2} = \begin{bmatrix} 0.0182 \\ 0.0016 \\ 0.4726 \\ 0.2040 \end{bmatrix}$$

Thus the procedure adopted results in the nearly the same value of parameter for the first partial power as expected for a sister ship at nearly the same conditions, although at much less wind.speed and wave height.

Check distribtution

$$\begin{bmatrix} distr & sampl_{sort} & sampl_{fair} & distr_{par} \end{bmatrix} := norm\_distr\left(\Delta P_{S.req}\right)$$



$$distr_{par} = \begin{bmatrix} 0.211 \\ 1.529 \\ 0.541 \end{bmatrix}$$

Evidently the distribution is not normal as is also shown in the following plot.
The following estimate of confidence is thus not quite justified.

95 % confidence radius

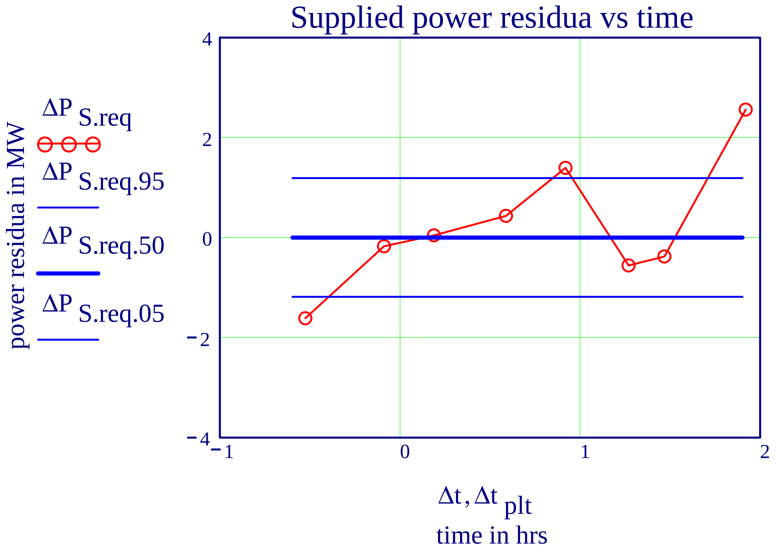
number of samples — of parameters — of degrees of freedom

$n_s := ni + 1$ $\qquad n_p := 2$ $\qquad f := n_s - n_p$

$P_{S.req.95} := C_{95}\left(\Delta P_{S.req}, f\right)$ $\qquad P_{S.req.95} = 1.188$ MW

$k := 0 .. 1$ $\qquad \Delta t_{plt_0} := -0.6$ $\qquad \Delta t_{plt_1} := 1.9$

$\Delta P_{S.req.95_k} := P_{S.req.95}$ $\qquad \Delta P_{S.req.50_k} := 0$ $\qquad \Delta P_{S.req.05_k} := -P_{S.req.95}$



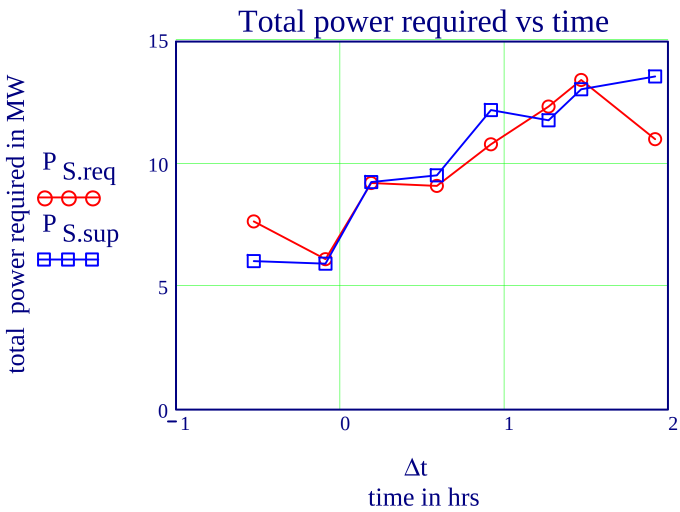
As usual the required power residua are much larger than in case of the supplied power due to the uncertainties in the wind measurements and the crude wave observations.

In view of the outliers the value of the relative confidence radius from 20 to 10 % is felt to be quite grossly distorted.

$$P_{S.req.95.rel_i} := \frac{P_{S.req.95}}{P_{S_i}} \qquad P_{S.req.95.rel} = \begin{bmatrix} 0.197 \\ 0.200 \\ 0.128 \\ 0.124 \\ 0.097 \\ 0.101 \\ 0.091 \\ 0.087 \end{bmatrix}$$

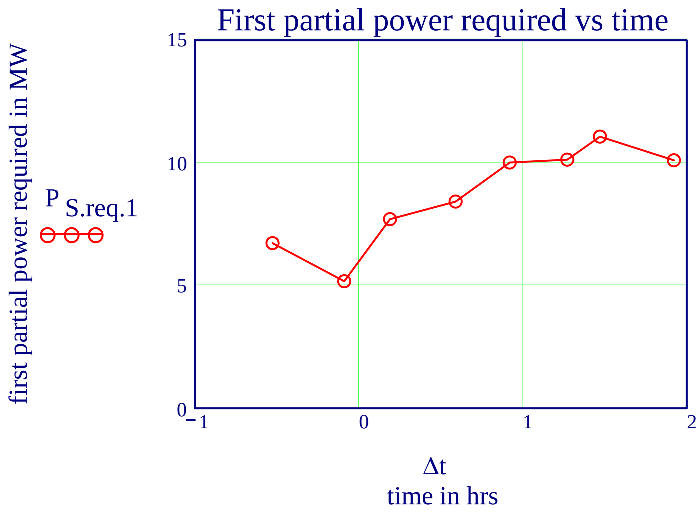
Powers required

Total power required



First partial power required

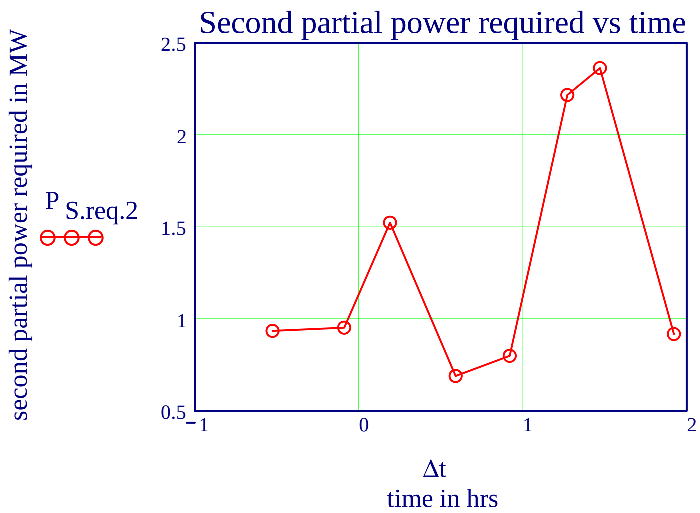
$$P_{S.req.1} := A_{req}^{\langle 0 \rangle} \cdot X_{req_0}$$



$$P_{S.req.1} = \begin{bmatrix} 6.724 \\ 5.168 \\ 7.707 \\ 8.423 \\ 10.008 \\ 10.129 \\ 11.062 \\ 10.101 \end{bmatrix}$$

Second partial power required

$$P_{S.req.2} := A_{req}^{\langle 1 \rangle} \cdot X_{req_1}$$



$$P_{S.req.2} = \begin{bmatrix} 0.935 \\ 0.952 \\ 1.522 \\ 0.689 \\ 0.799 \\ 2.216 \\ 2.362 \\ 0.917 \end{bmatrix}$$

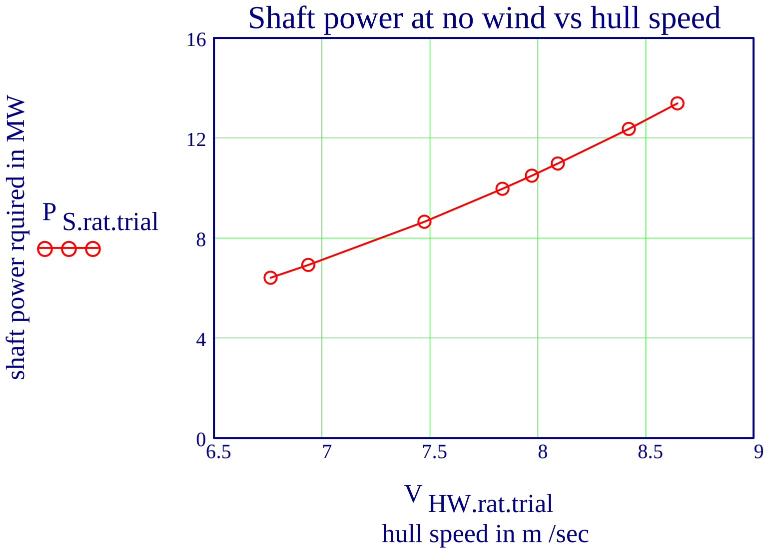
Re-order runs

$R_{i,0} := i + 4$ $\quad R^{\langle 1 \rangle} := V_{HW}$ $\quad R := csort(R, 1)$ $\quad Run := R^{\langle 0 \rangle}$

Nominal power vs hull speed
at the nominal no wind condition

$V_{HW.rat.trial} := R^{\langle 1 \rangle}$

$C_{PV} := q_0 + q_1$ $C_{PV} = 0.02071$ $P_{S.rat.trial_i} := C_{PV} \cdot \left(V_{HW.rat.trial_i}\right)^3$



$$P_{S.rat.trial} = \begin{bmatrix} 6.402 \\ 6.912 \\ 8.644 \\ 9.963 \\ 10.492 \\ 10.970 \\ 12.363 \\ 13.386 \end{bmatrix}$$

Nota bene: The power at the nominal no wind condition identified is that at the hull condition, the loading condition and the sea condition prevailing at the trials!

Powering performance
at the nominal no wind condition

Normalise power coefficient

$$C_{PV.n} := \frac{C_{PV} \cdot 10^6}{\rho \cdot D_P^{\ 2}}$$

Identify equilibrium

$J := 0.5$ $K := 0.15$ Initial values

Given

$K = p_{n_0} + p_{n_1} \cdot J$

$K = C_{PV.n} \cdot J^3$

Solve

$$\begin{bmatrix} J_{HW.noVAW} \\ K_{P.noVAW} \end{bmatrix} := \mathrm{Find}(J, K)$$

$J_{HW.noVAW} = 0.686$ $K_{P.noVAW} = 0.131$

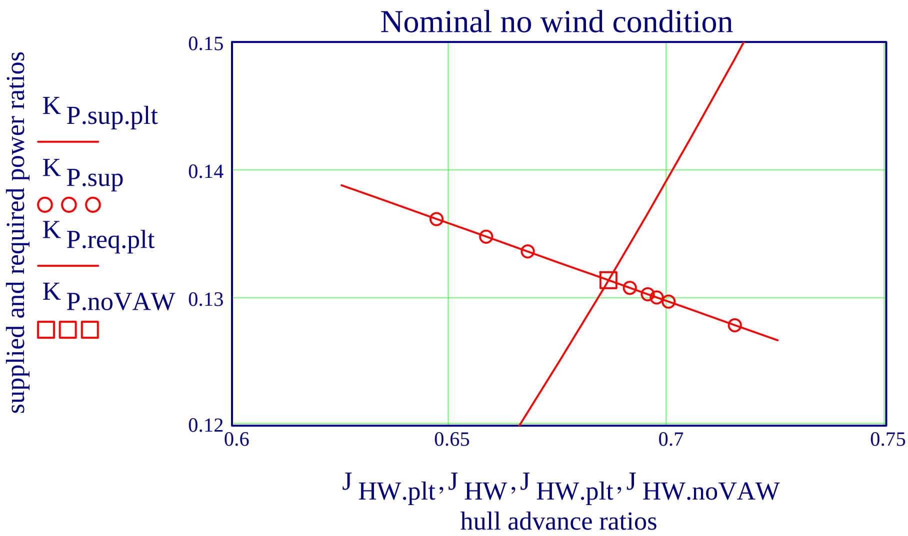
Results plotted

$k := 0 .. 10$

$J_{HW.plt_k} := 0.625 + 0.01 \cdot k$

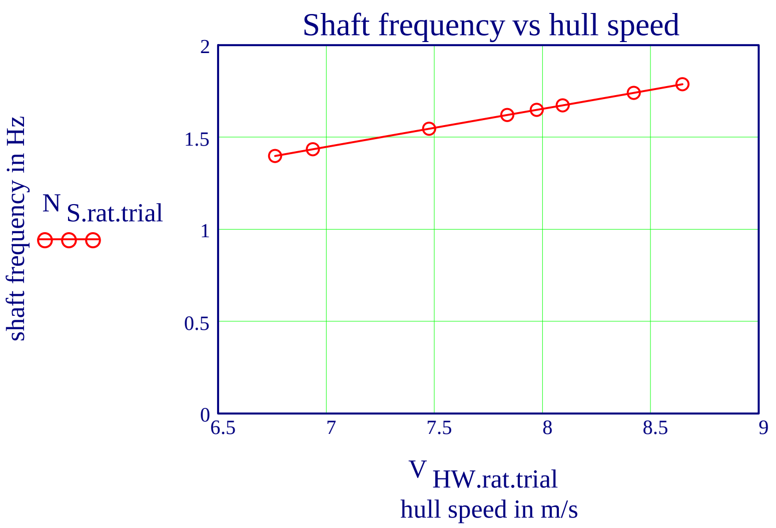
$K_{P.sup.plt_k} := p_{n_0} + p_{n_1} \cdot J_{HW.plt_k}$

$K_{P.req.plt_k} := C_{PV.n} \cdot \left(J_{HW.plt_k}\right)^3$



Frequency of shaft rev's
at the nominal no wind condition

$$N_{S.rat.trial_i} := \frac{V_{HW.rat.trial_i}}{J_{HW.noVAW} \cdot D_P}$$



$$N_{S.rat.trial} = \begin{bmatrix} 1.398 \\ 1.434 \\ 1.545 \\ 1.620 \\ 1.648 \\ 1.672 \\ 1.740 \\ 1.787 \end{bmatrix}$$

Scrutinise results of an undisclosed traditional evaluation

Part 2 concerning the powers supplied and required

The results of the traditional evaluation are those predicted for the reference condition, which differes only slightly from the trials condition.

Trials condition

$T_{aft.trial} := 7.42 \cdot m$

$T_{fore.trial} := 6.12 \cdot m$

$D_{Vol.trial} := 58894.1 \cdot m^3$

Reference condition

$T_{aft.ref} := 7.60 \cdot m$

$T_{fore.ref} := 6.10 \cdot m$

$D_{Vol.ref} := 59649.0 \cdot m^3$

Propeller power supplied (delivered) and shaft frequency at reference condition reported

$$V_{HW.trad} = \begin{bmatrix} 6.888 \\ 6.888 \\ 7.655 \\ 7.655 \\ 8.226 \\ 8.226 \\ 8.370 \\ 8.370 \end{bmatrix} \quad P_{S.trad} := \begin{bmatrix} 5.9284 \\ 5.9191 \\ 9.1332 \\ 9.4898 \\ 12.1716 \\ 11.7092 \\ 13.0222 \\ 13.5097 \end{bmatrix} \cdot MW \quad N_{S.trad} := \begin{bmatrix} 83.1 \\ 83.1 \\ 94.5 \\ 95.3 \\ 103.1 \\ 102.3 \\ 105.3 \\ 106.1 \end{bmatrix} \cdot rpm \quad \eta_D := \begin{bmatrix} 0.818 \\ 0.818 \\ 0.798 \\ 0.798 \\ 0.776 \\ 0.776 \\ 0.769 \\ 0.769 \end{bmatrix}$$

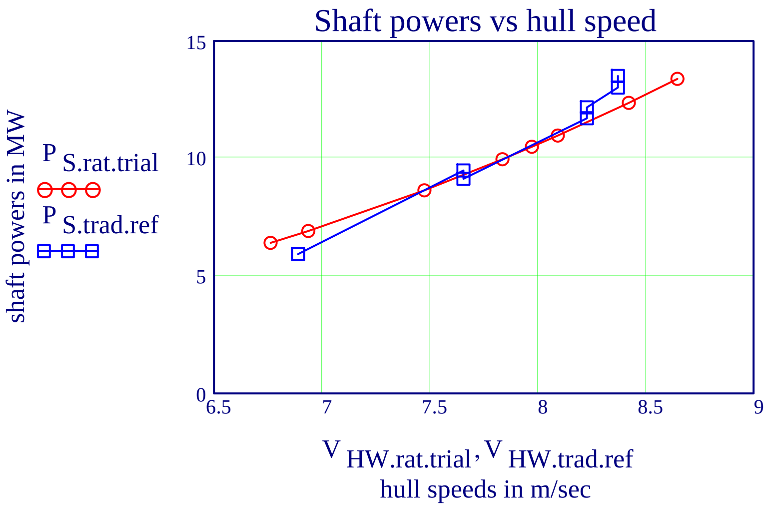
$$P_{S.trad} := \frac{P_{S.trad}}{MW} \qquad N_{S.trad} := \frac{N_{S.trad}}{Hz}$$

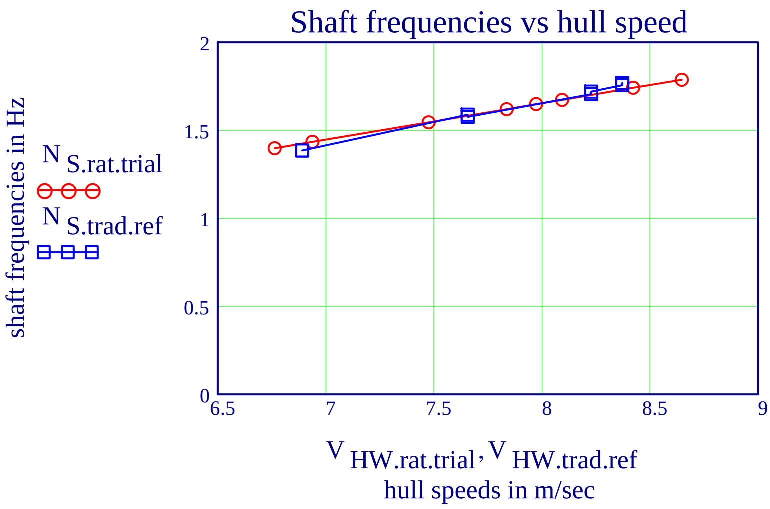
$$ref^{\langle 0 \rangle} := V_{HW.trad} \qquad ref^{\langle 1 \rangle} := P_{S.trad} \qquad ref^{\langle 2 \rangle} := N_{S.trad} \qquad ref^{\langle 3 \rangle} := \eta_D$$

$$ref := csort(ref, 0)$$

$$V_{HW.trad.ref} := ref^{\langle 0 \rangle} \quad P_{S.trad.ref} := ref^{\langle 1 \rangle} \quad N_{S.trad.ref} := ref^{\langle 2 \rangle} \quad \eta_{D.trad} := ref^{\langle 1 \rangle}$$

As far as has been disclosed the results of the traditional evaluation are based on the considerable number of nine small corrections and most importantly on the 'calculated propulsive efficiency values' reported, as has been explicitly stated in a remark.





Evidently the results of the rational evaluation at the trials condition, requiring no prior data, and the results of the traditional evaluation at the only slightly different reference condition, requiring very many prior data, last but not least the computed values of the propulsive efficiency, are very nearly the same, not to say 'identical'.

For the rational evaluation the change from the trials condition to the reference condition results in an increase in resistance due to the change in the displacement volume, and in an increase in the propulsive efficiency due to the larger nominal submergence of the propeller, maybe compensating each other.

But the result of the rational evaluation still includes the power required for moving in the sea state reported. **Thus the strictly accidental coincidence of the results remains as unexplained as the whole undisclosed traditional procedure. In fact any traditional procedure is doomed to fail in any case where no prior experience and data are available.**

Computed values of the propulsive efficiency analysed

$k := 0 .. 1$

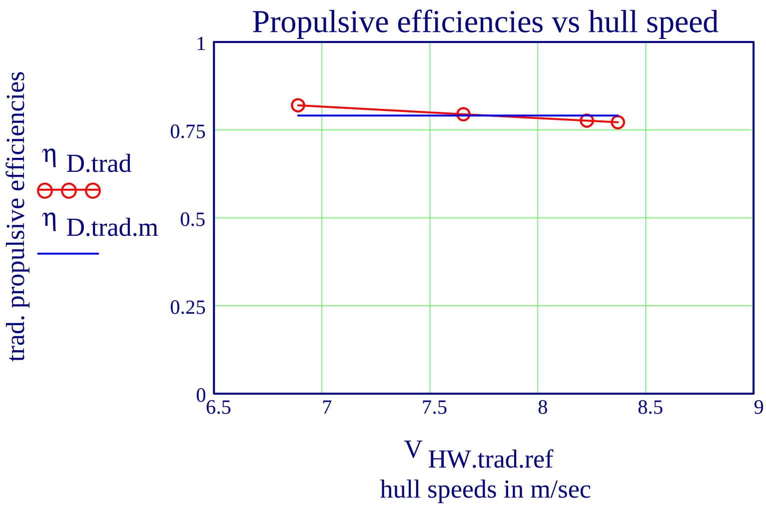
$A_{eta_{i,k}} := \left(V_{HW.trad.ref_i}\right)^k$

$X_{eta} := \text{geninv}\left(A_{eta}\right) \cdot \eta_D$

$\eta_{D.trad} := A_{eta} \cdot X_{eta}$

$\eta_{D.trad.mean} := \text{mean}\left(\eta_{D.trad}\right)$

$\eta_{D.trad.m_i} := \eta_{D.trad.mean}$



This analysis shows that the traditional evaluation is practically in accordance with the convention, implying that the propeller is permanently operating at the same normalised condition, resulting in the quadratic resistance law..

$C_{RV.tot} := \eta_{D.trad.mean} \cdot C_{PV}$

$R_{HW.trad.tot_j} := C_{RV.tot} \cdot \left(V_{HW.trad.ref_j}\right)^2$

How the computed values of the propulsive efficiency have been arrived at in the traditional evaluation remains undisclosed, while **the resistance and the propulsive efficiency can be identified in a rational way solely from data acquired at quasi-steady monitoring tests without any prior information what-so-ever being necessary,** as has been shown in a 'model' study published on my website and in the Festschrift 'From METEOR 1988 to ANONYMA 2013 and further' also to be found on the website.

Scrutinise results of an undisclosed traditional evaluation

End of Part 2 concerning the powers supplied and required

Recording results

of the rational evaluation at the trial condition
of the traditional evaluation at the reference condition

$\Delta t_{trad} := \Delta t$

$$Record := \begin{array}{|l} Internal_{rat} \leftarrow \begin{bmatrix} Res_{sup} & Res_{req} \end{bmatrix} \\ Final_{rat} \leftarrow \begin{bmatrix} Run & \Delta t & V_{HW.rat.trial} & P_{S.rat.trial} & N_{S.rat.trial} \end{bmatrix} \\ Internal_{trad} \leftarrow \begin{bmatrix} V_{WG.trad.corr} & J_{HW.trad.corr} & K_{P.sup.trad} \end{bmatrix} \\ Final_{trad} \leftarrow \begin{bmatrix} Run & \Delta t_{trad} & V_{HW.trad.ref} & P_{S.trad.ref} & N_{S.trad.ref} \end{bmatrix} \\ record \leftarrow \begin{bmatrix} Internal_{rat} & Final_{rat} & Internal_{trad} & Final_{trad} \end{bmatrix} \\ record \end{array}$$

$File := concat(\text{"Results\_"}, EID)$

$WRITEPRN(File) := Record$

Print final rational results

$final_{rat}^{\langle 0 \rangle} := Run$

$final_{rat}^{\langle 1 \rangle} := V_{HW.rat.trial} \cdot \frac{m}{kts \cdot sec}$

$final_{rat}^{\langle 2 \rangle} := P_{S.rat.trial}$

$final_{rat}^{\langle 3 \rangle} := N_{S.rat.trial} \cdot \frac{min}{sec}$

$$final_{rat} = \begin{bmatrix} 4.000 & 13.143 & 6.402 & 83.859 \\ 5.000 & 13.483 & 6.912 & 86.028 \\ 7.000 & 14.527 & 8.644 & 92.685 \\ 6.000 & 15.231 & 9.963 & 97.178 \\ 8.000 & 15.496 & 10.492 & 98.869 \\ 11.000 & 15.728 & 10.970 & 100.347 \\ 9.000 & 16.367 & 12.363 & 104.427 \\ 10.000 & 16.806 & 13.386 & 107.230 \end{bmatrix}$$

Conclusions

In this case of nearly ideal environmental trial conditions the (accidental) coincidence of the the final results of rational and traditional evaluations is not as perfect as in case of the sister ship at heavy wind and higher waves.

While the current and the propeller powering performance in the behind condition are in perfect agreement with the results of the rational evaluation, the somewhat erratic final results of the traditional evaluation remain unexplained.

While the identification of the propeller powering performance in the behind condition poses no problems at all, it does not come as a surprise, that the rational evaluation suffers from ill-conditioned equations for the identifcation of the parameters of the partial powers at ideal conditions. In the present case a reliable value for the first partial power happened to be available.

The rational procedure to overcome the problem is to perform quasi-steady tests as has been stated over and over again and as have been performed with the METEOR, CORSAIR and a model. The data acquired at the model test have recently being used to demonstrate the feasibility of the full scale identification of resistance and propulsive efficiency.

END
Powering performance
of a bulk carrier
during speed trials
in ballast condition
reduced to nominal
no wind condition

Prof. Dr.-Ing. M.Schmiechen

MS 1305081300
1401221400
1404121730

To whom it may concern

Powering performance of a bulk carrier during speed trials in ballast condition reduced to nominal no wind condition

MS 140910140
Correction of the labels of the plot of propulsive efficiencies reported, traditionally identified from model tests according to Dr. Hollenbach!

Preface

Preamble

The present analysis of a powering trial is **an upgraded version of the first of my 'post-ANONYMA trial evaluations' published earlier as PATE_01. For the whole context and for more details the Conclusions of PATE_01 should be referred to!**

Data provided

The powering trial analysed according to the rational procedure promoted is one of the reference cases of an ongoing research project. As usual only the anonymised data, just mean values of measured quantities and crude estimates of wind and waves, have been made available for the analysis.

Further, for comparison with the evaluation according to an unspecified, more or less traditional procedure, few results have been provided.

Rational evaluation

The following analysis is solely based on extremely simple propeller, current and environment conventions and on the mean data reported, though without their confidence ranges. No prior data and parameters will be used, particularly not those derived from corresponding model tests. Thus the procedure and its results are as transparent and observer independent as necessary for the rational resolution of 'conflicts' of any type!

Subsequent trustworthy predictions (!) of the powering performance at loading conditions and sea states differing from those prevailing during the trials are *not* subject of this exercise. But in the Conclusions at the end of PATE_01 serious doubts concerning any traditional convention based on prior data are being expressed and future solutions are being outlined.

'Disclaimer'

In spite of utmost care the following evaluation, in the meantime a document of more than thirty pages, may still contain mistakes. The author will gratefully appreciate and acknowledge any of those brought to his attention, so that he may correct them.

References

Reference:C:\PATEs\PATE_00.2.mcd

General remarks
Concepts
  Names
  Symbols
  Remarks
Units
Routines

Trial identification

Identify trial and evaluation

$TID := "01.3"$

$EID := concat("PATE\_", TID)$ $EID = "PATE\_01.3"$

'Constants'

$D_P := 7.05 \cdot m$ $D_P := D_P \cdot \frac{1}{m}$ diameter of propeller

$h_S := 3.85 \cdot m$ $h_S := h_S \cdot \frac{1}{m}$ height of shaft above base

Trials conditions

$T_{aft} := 7.42 \cdot m$ $T_{aft} := T_{aft} \cdot \frac{1}{m}$ draft aft

Nominal propeller submergence

$h_{P.Tip} := h_S + \frac{D_P}{2}$ $h_{P.Tip} = 7.375$

$s_{P.Tip} := T_{aft} - h_{P.Tip}$ $s_{P.Tip} = 0.045$

At this small nominal submergence and the sea state reported the propeller may have been ventilating even at the down wind conditions.

Wave

$$\psi_{WaveH} := \begin{bmatrix} 5 \\ 175 \\ 175 \\ 5 \\ 5 \\ 175 \\ 175 \\ 5 \end{bmatrix} \cdot deg$$

$H_{Wave} := 3.3 \cdot m$ wave height

$H_{Wave} := \frac{H_{Wave}}{m}$

Water depth

$d_{Water} := 65 \cdot m$

Mean values reported

For ready reference the matrices of the mean values of the measured magnitudes, alias 'quantities', are printed here and converted to SI Units. Further down intermediate results are printed as well to permit checks óf plausibility.

It is noted here explicitly, that no confidence radii of the mean values have been reported.

Day time

$$time := \begin{bmatrix} 5 & 21 \\ 5 & 48 \\ 6 & 04 \\ 6 & 28 \\ 6 & 44 \\ 7 & 7 \\ 7 & 25 \\ 7 & 46 \\ 8 & 10 \\ 8 & 29 \\ 8 & 41 \\ 9 & 5 \end{bmatrix}$$

Heading

$$\psi_{HG} := \begin{bmatrix} 180 \\ 0 \\ 0 \\ 180 \\ 180 \\ 0 \\ 0 \\ 180 \\ 180 \\ 0 \\ 0 \\ 180 \end{bmatrix} \cdot deg$$

Rel. wind velocity

$$V_{HA} := \begin{bmatrix} 35 \\ 11 \\ 11 \\ 35 \\ 41 \\ 10 \\ 10 \\ 42 \\ 44 \\ 8 \\ 7 \\ 45 \end{bmatrix} \cdot kts$$

Rel. wind direction

$$\psi_{HA} := \begin{bmatrix} 5 \\ 160 \\ 160 \\ 5 \\ 5 \\ 160 \\ 155 \\ 5 \\ 5 \\ 165 \\ 160 \\ 0 \end{bmatrix} \cdot deg$$

Shaft frequency

$$N_S := \begin{bmatrix} 52.47 \\ 52.47 \\ 66.58 \\ 66.60 \\ 82.26 \\ 82.27 \\ 94.85 \\ 94.86 \\ 102.81 \\ 102.88 \\ 104.89 \\ 104.87 \end{bmatrix} \cdot \frac{1}{min}$$

Measured shaft power

$$P_S := \begin{bmatrix} 1924 \\ 1758 \\ 3232 \\ 3639 \\ 6358 \\ 6038 \\ 9344 \\ 9730 \\ 12425 \\ 12055 \\ 12778 \\ 13248 \end{bmatrix} \cdot kW$$

Ship speed over ground

$$V_{HG} := \begin{bmatrix} 6.657 \\ 8.210 \\ 11.044 \\ 7.967 \\ 11.442 \\ 14.018 \\ 15.784 \\ 13.049 \\ 14.256 \\ 17.152 \\ 17.380 \\ 14.211 \end{bmatrix} \cdot kts$$

Further it is mentioned here, that in Mathcad the operational indices standardly start from zero as usual in mathematics and thus in the mathematical subroutines available in the Numericl Recipes subroutine package. Thus the possible change of the standard, resulting in intransparent code, is not a viable choice..

'Duration' of measurements

$s_{mean} := 1\ nm$ $s_{mean} := \frac{s_{mean}}{m}$ Distances sailed at each run

Sailing the same distance at different speeds, here one nautical mile, is in accordance with the name 'miles runs', in German 'Meilen-Fahrten', but has the disadvantage, that the average values derived from the sampled values have wider confidence ranges at the higher speeds.

'Non-dimensionalise' magnitudes

$V_{HA} := V_{HA}\cdot\frac{sec}{m}$ $N_S := N_S\cdot sec$ $P_S := P_S\cdot\frac{1}{MW}$ $V_{HG} := V_{HG}\cdot\frac{sec}{m}$

Times of measurements

$ni := last(time^{\langle 0\rangle})$ $i := 0 .. ni$

$dur_i := \frac{s_{mean}}{V_{HG_i}}$ $t := time^{\langle 0\rangle} + time^{\langle 1\rangle}\cdot\frac{min}{hr} + \frac{dur}{2}\cdot\frac{sec}{hr}$

$t_m := mean(t)$ $\Delta t := t - t_m$

Normalise data

At this stage for preliminary check of consistency only!

$J_{HG_i} := J\left(D_P, V_{HG_i}, N_{S_i}\right)$ $K_{P.o_i} := KP\left(\rho, D_P, P_{S_i}, N_{S_i}\right)$

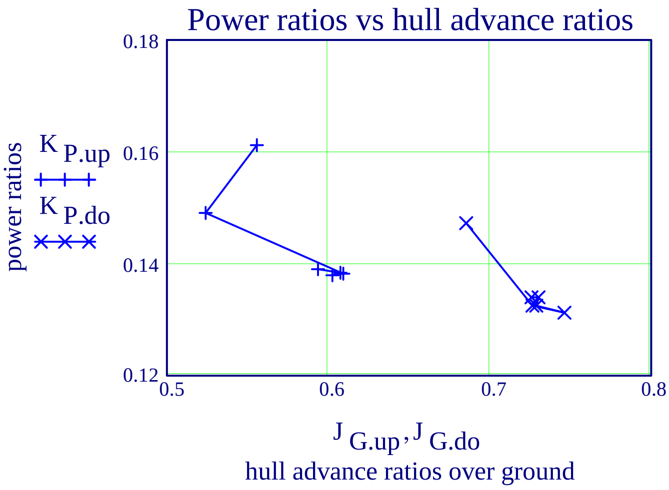
Sort runs

$S := Sort\_runs\left(J_{HG}, K_{P.o}, \psi_{HG}\right)$

$J_{G.up} := S^{\langle 0\rangle}$ $K_{P.up} := S^{\langle 1\rangle}$ $J_{G.do} := S^{\langle 2\rangle}$ $K_{P.do} := S^{\langle 3\rangle}$

$J_{G.up} = \begin{bmatrix} 0.555 \\ 0.524 \\ 0.609 \\ 0.602 \\ 0.607 \\ 0.593 \end{bmatrix}$ $K_{P.up} = \begin{bmatrix} 0.161 \\ 0.149 \\ 0.138 \\ 0.138 \\ 0.138 \\ 0.139 \end{bmatrix}$ $J_{G.do} = \begin{bmatrix} 0.685 \\ 0.726 \\ 0.746 \\ 0.729 \\ 0.730 \\ 0.725 \end{bmatrix}$ $K_{P.do} = \begin{bmatrix} 0.147 \\ 0.133 \\ 0.131 \\ 0.132 \\ 0.134 \\ 0.134 \end{bmatrix}$

Scrutinise data



Evidently the values at the first double run are outliers eliminated without further study of possible reasons in PATE_01.1. In the traditional evaluation the values at the first two double runs, i. e. the first four data sets have been ignored. For ready comparison of results the same data set has been used in PATE_01.2.

In order to study the effect of a further reduction of data, of smaller data sets in general, in practice typically only three double runs are being performed, the following analysis is based on the data of the third, the fourth and the sixth double run only.

Data eliminated

$ne := 6$ $\qquad ni := \mathrm{last}(t) - ne$

$i := 0 .. ni$

$$run := \begin{bmatrix} 4 \\ 5 \\ 6 \\ 7 \\ 10 \\ 11 \end{bmatrix}$$

$\Delta t_{red_i} := \Delta t_{run_i}$ $\qquad \Psi_{HG.red_i} := \Psi_{HGrun_i}$ $\qquad V_{HA.red_i} := V_{HArun_i}$

$\Delta t := \Delta t_{red}$ $\qquad \Psi_{HG} := \Psi_{HG.red}$ $\qquad V_{HA} := V_{HA.red}$

$N_{S.red_i} := N_{Srun_i}$ $\qquad P_{S.red_i} := P_{Srun_i}$ $\qquad V_{HG.red_i} := V_{HG}(run_i)$

$N_S := N_{S.red}$ $\qquad P_S := P_{S.red}$ $\qquad V_{HG} := V_{HG.red}$

Normalise reduced data

$J_{HG_i} := J\left(D_P, V_{HG_i}, N_{S_i}\right)$ $K_{P_i} := KP\left(\rho, D_P, P_{S_i}, N_{S_i}\right)$

$S := Sort\_runs\left(J_{HG}, K_P, \psi_{HG}\right)$

$J_{HG.up} := S^{\langle 0 \rangle}$ $K_{P.up} := S^{\langle 1 \rangle}$ $J_{HG.do} := S^{\langle 2 \rangle}$ $K_{P.do} := S^{\langle 3 \rangle}$

$J_{HG.up} = \begin{bmatrix} 0.609 \\ 0.602 \\ 0.593 \end{bmatrix}$ $K_{P.up} = \begin{bmatrix} 0.138 \\ 0.138 \\ 0.139 \end{bmatrix}$ $J_{HG.do} = \begin{bmatrix} 0.746 \\ 0.729 \\ 0.725 \end{bmatrix}$ $K_{P.do} = \begin{bmatrix} 0.131 \\ 0.132 \\ 0.134 \end{bmatrix}$

Read results of PATE_01.1
for ready comparison with the results
of the foregoing analysis of the trial
ignoring only the data of the first double run,
different from the traditional analysis!

$Record_{01.1} := READPRN(\text{"Results\_PATE\_01.1"})$

$\left[Internal_{rat.01.1} \;\; Final_{rat.01.1} \;\; Internal_{trad.01.1} \;\; Final_{trad.01.1} \right] := Record_{01.1}$

$\left[Res_{sup.01.1} \;\; Res_{req.01.1} \right] := Internal_{rat.01.1}$

$\begin{bmatrix} \Delta P_{S.sup.01.1} & v_{01.1} & V_{WG.01.1} \\ V_{HW.01.1} & p_{01.1} & P_{S.sup.01.1} \\ J_{HW.01.1} & p_{n.01.1} & K_{P.sup.01.1} \end{bmatrix} := Res_{sup.01.1}$

$\left[\Delta P_{S.req.01.1} \;\; q_{01.1} \;\; P_{S.req.01.1} \;\; A_{req.01.1} \;\; X_{req.01.1} \right] := Res_{req.01.1}$

$\left[Run_{01.1} \;\; \Delta t_{01.1} \;\; V_{HW.rat.trial.01.1} \;\; P_{S.rat.trial.01.1} \;\; N_{S.rat.trial.01.1} \right] := Final_{rat.01.1}$

$\left[V_{WG.trad.corr.01.1} \;\; J_{HW.trad.corr.01.1} \;\; K_{P.sup.trad.01.1} \right] := Internal_{trad.01.1}$

$\left[Run \;\; \Delta t_{trad.01.1} \;\; V_{HW.trad.ref.01.1} \;\; P_{S.trad.ref.01.1} \;\; N_{S.trad.ref.01.1} \right] := Final_{trad.01.1}$

Read results of PATE_01.2
for ready comparison with the results
of the foregoing analysis of the trial
ignoring the data of the first two double run,
different from the traditional analysis!

$Record_{01.2} := READPRN(\text{"Results\_PATE\_01.2"})$

$\left[Internal_{rat.01.2} \;\; Final_{rat.01.2} \;\; Internal_{trad.01.2} \;\; Final_{trad.01.2} \right] := Record_{01.2}$

$\left[Res_{sup.01.2} \;\; Res_{req.01.2} \right] := Internal_{rat.01.2}$

$$\begin{bmatrix} \Delta P_{S.sup.01.2} & v_{01.2} & V_{WG.01.2} \\ V_{HW.01.2} & p_{01.2} & P_{S.sup.01.2} \\ J_{HW.01.2} & p_{n.01.2} & K_{P.sup.01.2} \end{bmatrix} := Res_{sup.01.2}$$

$\left[\Delta P_{S.req.01.2} \;\; q_{01.2} \;\; P_{S.req.01.2} \;\; A_{req.01.2} \;\; X_{req.01.2} \right] := Res_{req.01.2}$

$\left[Run_{01.2} \;\; \Delta t_{01.2} \;\; V_{HW.rat.trial.01.2} \;\; P_{S.rat.trial.01.2} \;\; N_{S.rat.trial.01.2} \right] := Final_{rat.01.1}$

$\left[V_{WG.trad.corr.01.2} \;\; J_{HW.trad.corr.01.2} \;\; K_{P.sup.trad.01.2} \right] := Internal_{trad.01.2}$

$\left[Run \;\; \Delta t_{trad.01.2} \;\; V_{HW.trad.ref.01.2} \;\; P_{S.trad.ref.01.2} \;\; N_{S.trad.ref.01.2} \right] := Final_{trad.01.2}$

Analyse power supplied
including identification of tidal current

Conventions adopted

Propeller power convention

$$PS_{sup}(p, N, V) := p_0 \cdot N^3 + p_1 \cdot N^2 \cdot V$$

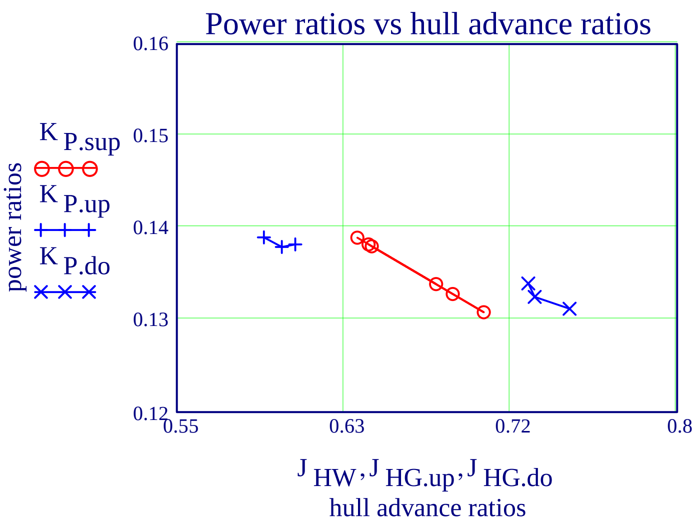
Tidal current velocity convention

$$VT(v, \omega_T, \Delta t) := v_0 + v_1 \cdot \cos(\omega_T \cdot \Delta t) + v_2 \cdot \sin(\omega_T \cdot \Delta t)$$

Evaluate

$$Res_{sup} := Supplied_T(\rho, D_P, \Delta t, V_{HG}, \psi_{HG}, N_S, P_S)$$

$$\begin{bmatrix} \Delta P_{S.sup} & v & V_{WG} \\ V_{HW} & p & P_{S.sup} \\ J_{HW} & p_n & K_{P.sup} \end{bmatrix} := Res_{sup}$$



$$p = \begin{bmatrix} 3.945 \\ -0.325 \\ 0.014 \\ 1.561 \cdot 10^{-3} \end{bmatrix}$$

$$p_n = \begin{bmatrix} 0.221 \\ -0.128 \end{bmatrix}$$

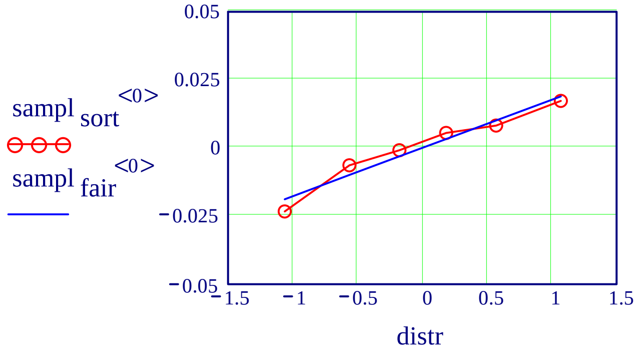
Nota bene: The propeller performance in the behind condition identified is that at the hull condition, the loading condition and the sea condition prevailing at the trials!

Supplied power residua

Check distribution of residua

Values of random variables need to be tested for normal distribution before using mean values and and standard deviations.

$$\begin{bmatrix} distr & sampl_{sort} & sampl_{fair} & distr_{par} \end{bmatrix} := norm\_distr\left(\Delta P_{S.sup}\right)$$



$$distr_{par} = \begin{bmatrix} 1.452 \cdot 10^{-4} \\ 0.018 \\ 7.226 \cdot 10^{-3} \end{bmatrix}$$

According to the result plotted the following error analysis is justified.

95 % confidence radius

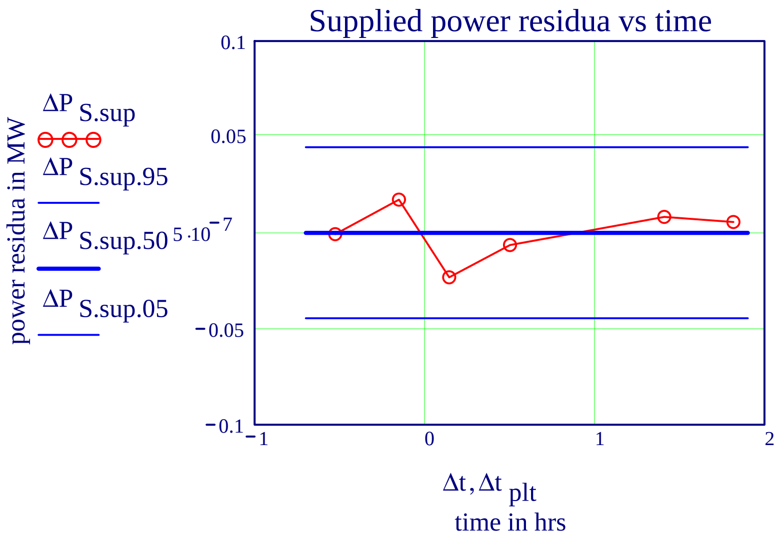
number of samples — of parameters — of degrees of freedom

$n_S := ni + 1$ $\quad n_p := 4$ $\quad f := n_S - n_p$

$P_{S.sup.95} := C_{95}\left(\Delta P_{S.sup}, f\right)$ $\quad P_{S.sup.95} \cdot \frac{MW}{kW} = 44.6$ kW

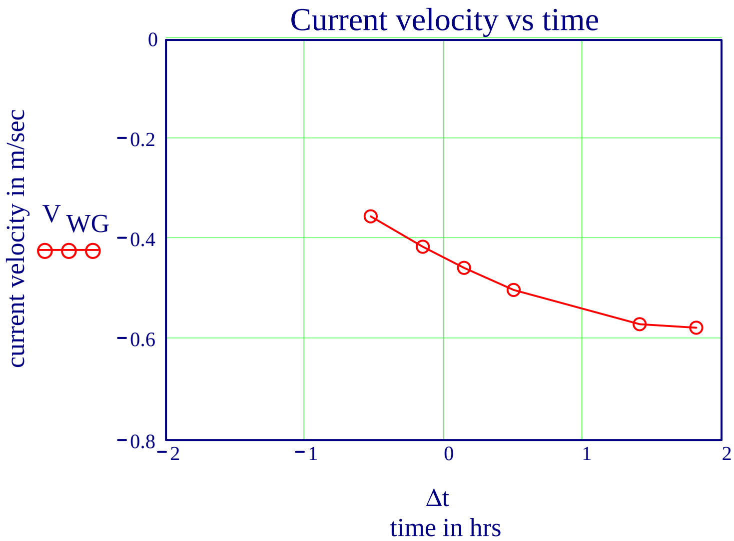
$k := 0..1$ $\quad \Delta t_{plt_0} := -0.7$ $\quad \Delta t_{plt_1} := 1.9$

$\Delta P_{S.sup.05_k} := -P_{S.sup.95}$ $\quad \Delta P_{S.sup.50_k} := 0$ $\quad \Delta P_{S.sup.95_k} := P_{S.sup.95}$



Accordingly the conventions adopted 'describe' the power data perfectly well! The relatively small value of the confidence radius cannot be judged objectively, as the confidence ranges of the mean values have not been provided as in case of the analysis of the ANONYMA trials.

Current velocity identified



During the trials the current changed more than half a knot!

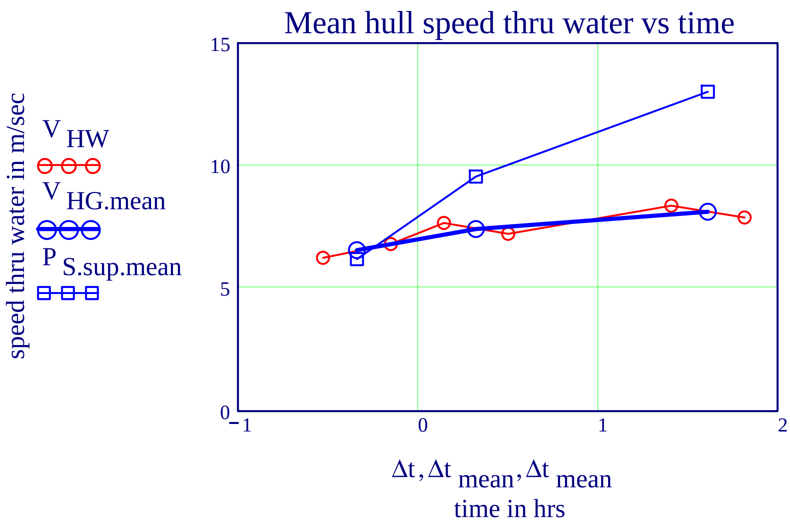
$V_{WG.mean} := v_0$ $\qquad V_{WG.mean} \cdot \frac{m}{kts \cdot sec} = -0.420$ Nominal mean current in kts

$V_{WG.ampl} := \sqrt{(v_1)^2 + (v_2)^2}$ $\qquad V_{WG.ampl} \cdot \frac{m}{kts \cdot sec} = 0.699$ Nominal tidal amplitude in kts

Mean velocity over ground and mean power

$nj := \frac{ni - 1}{2}$ $\qquad j := 0 .. nj$ $\qquad \Delta t_{mean_j} := \frac{\Delta t_{2 \cdot j} + \Delta t_{2 \cdot j + 1}}{2}$

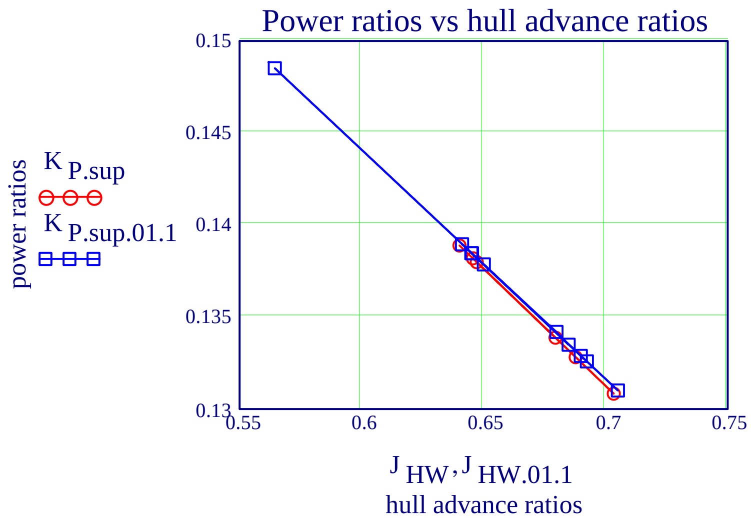
$V_{HG.mean_j} := \frac{V_{HG_{2 \cdot j}} + V_{HG_{2 \cdot j + 1}}}{2}$ $\qquad P_{S.sup.mean_j} := \frac{P_{S.sup_{2 \cdot j}} + P_{S.sup_{2 \cdot j + 1}}}{2}$



In the present case the mean speed over ground happens to be equal to the speed over ground at the mean time between the two corresponding runs.

Compare with results of PATE_01.1

Powering performances



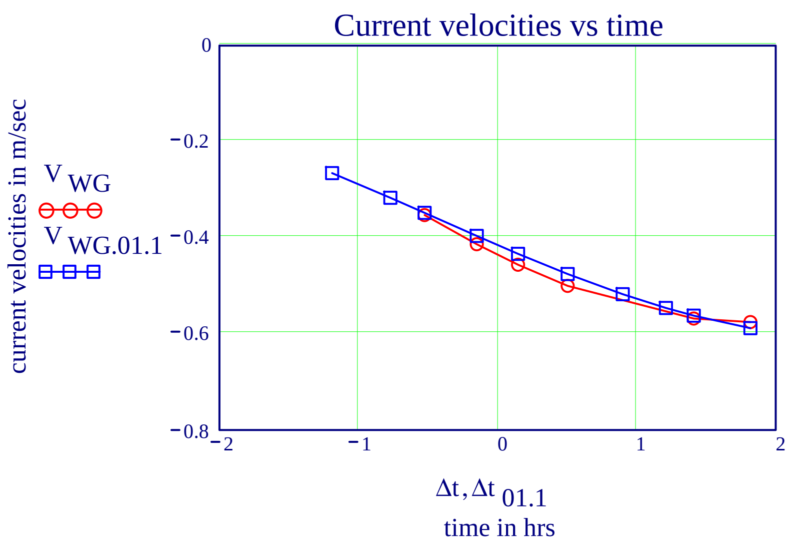
$$p_{01.1} = \begin{bmatrix} 3.914 \\ -0.317 \\ 0.027 \\ 2.402\cdot10^{-3} \end{bmatrix}$$

$$p = \begin{bmatrix} 3.945 \\ -0.325 \\ 0.014 \\ 1.561\cdot10^{-3} \end{bmatrix}$$

$$\Delta K_P := p_{n.01.1} - p_n \qquad \Delta K_P = \begin{bmatrix} -1.766\cdot10^{-3} \\ 2.974\cdot10^{-3} \end{bmatrix}$$

The powering performances in the behind conditon identified for the two different data sets are differing only very slightly in value and in tendency.

Currents



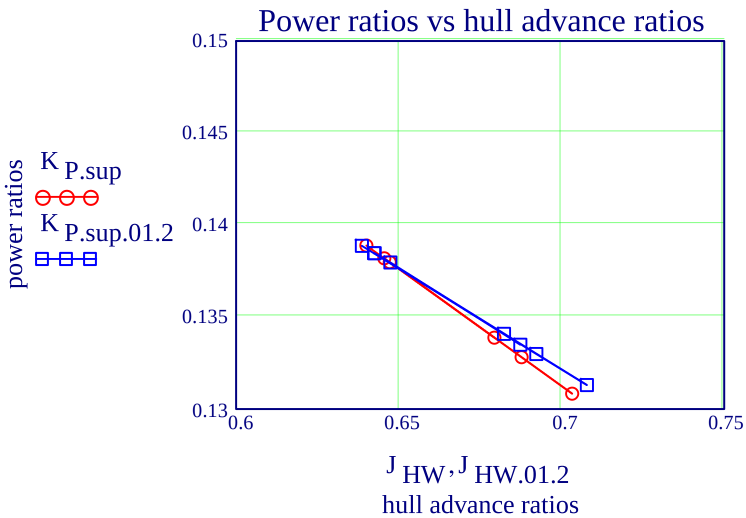
$$V_{WG.01.1.red_i} := V_{WG.01.1_{i+2}}$$

$$\Delta V_{WG} := V_{WG.01.1.red} - V_{WG} \qquad \text{mean}\left(\Delta V_{WG}\right)\cdot\frac{m}{kts\cdot sec} = 0.048 \quad kts$$

The currents identified for the two different data sets are also slightly differing .

Compare with results of PATE_01.2

Powering performances



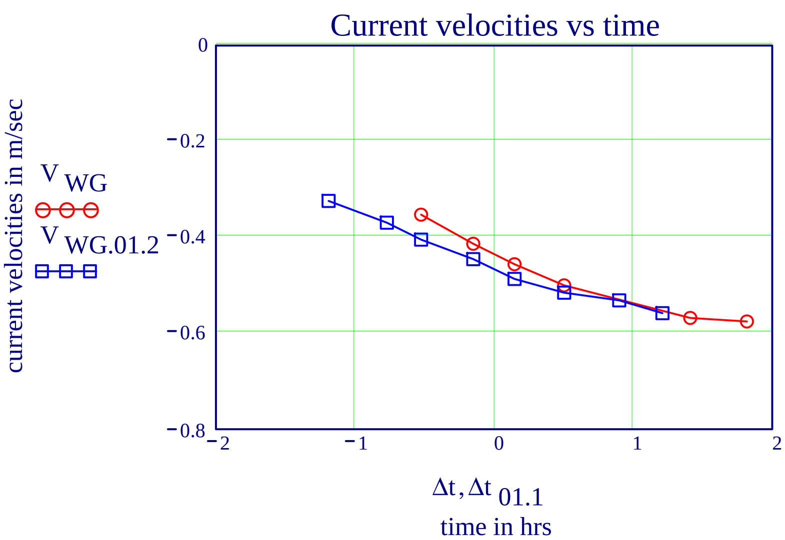
$$p_{01.2} = \begin{bmatrix} 3.744 \\ -0.281 \\ 0.029 \\ 1.306 \cdot 10^{-3} \end{bmatrix}$$

$$p = \begin{bmatrix} 3.945 \\ -0.325 \\ 0.014 \\ 1.561 \cdot 10^{-3} \end{bmatrix}$$

$$\Delta K_P := p_{n.01.2} - p_n \qquad \Delta K_P = \begin{bmatrix} -0.011 \\ 0.017 \end{bmatrix}$$

The powering performances in the behind conditon identified for the two different data sets are differing in value and in tendency slightly more than in the case before.

Currents



$$V_{WG.01.2.red_i} := V_{WG.01.2_{i+2}}$$

$$\Delta V_{WG} := V_{WG.01.2.red} - V_{WG} \qquad \text{mean}\left(\Delta V_{WG}\right) \cdot \frac{m}{kts \cdot sec} = -0.024 \text{ kts}$$

The currents identified for the two different data sets are also differing slightly more than in the case before.

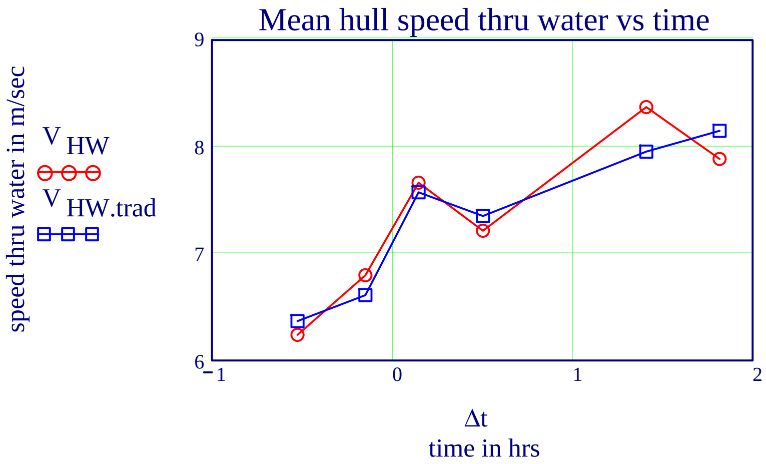
Scrutinise results of an undisclosed traditional evaluation

Part 1 concerning the speed through the water

Hull speed thru water reported

$$V_{HW.trad} := \begin{bmatrix} 12.38 \\ 12.85 \\ 14.72 \\ 14.29 \\ 15.46 \\ 15.84 \\ 16.23 \\ 15.80 \end{bmatrix} \cdot kts \qquad V_{HW.trad} := V_{HW.trad} \cdot \frac{sec}{m}$$

$$J_{HW.trad_i} := \frac{V_{HW.trad_i}}{D_P \cdot N_{S_i}} \qquad J_{HW.trad} = \begin{bmatrix} 0.659 \\ 0.684 \\ 0.679 \\ 0.660 \\ 0.645 \\ 0.661 \end{bmatrix}$$



**Current velocity identified
by traditional procedure**

$$V_{WG.trad_i} := \left(V_{HG_i} - V_{HW.trad_i}\right)\cdot dir\left(\psi_{HG_i}\right)$$

**Tidal approximation
as in the rational evaluation**

$$A_{WG.trad_{i,0}} := 1$$

$$A_{WG.trad_{i,1}} := \cos\left(\omega_T\cdot\Delta t_i\right)$$

$$A_{WG.trad_{i,2}} := \sin\left(\omega_T\cdot\Delta t_i\right)$$

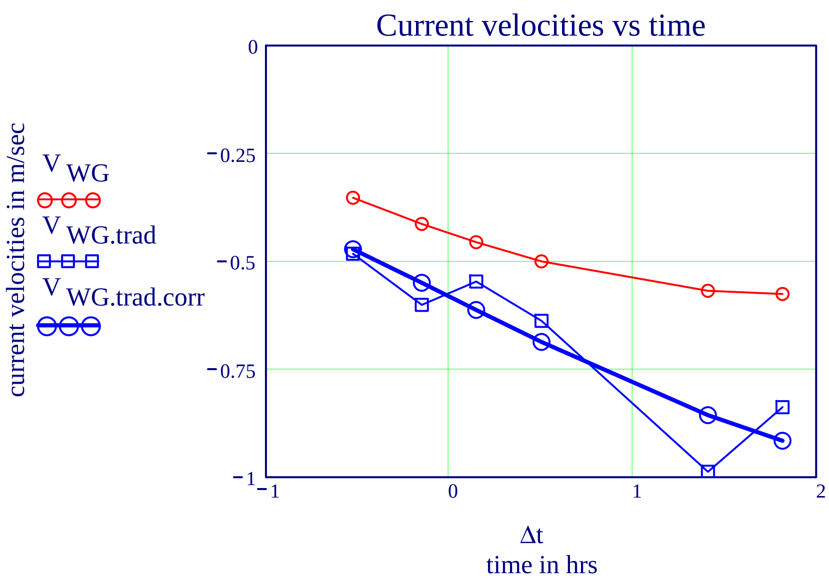
$$X_{WG.trad} := geninv\left(A_{WG.trad}\right)\cdot V_{WG.trad}$$

$$X_{WG.trad} = \begin{bmatrix} -0.586 \\ 4.124\cdot 10^{-3} \\ -0.418 \end{bmatrix}$$

$$V_{WG.trad.corr} := A_{WG.trad}\cdot X_{WG.trad}$$

$$\Delta V_{WG.trad} := V_{WG.trad} - V_{WG.trad.corr}$$

$$V_{HW.trad.corr_i} := V_{HG_i} + V_{WG.trad.corr_i}\cdot dir\left(\psi_{HG_i}\right)$$



Nominal mean currents and tidal amplitudes compared

Nominal mean currents in kts

Rational

$V_{WG.mean} \cdot \frac{m}{kts \cdot sec} = -0.420$

Nominal tidal amplitudes in kts

$V_{WG.ampl} \cdot \frac{m}{kts \cdot sec} = 0.699$

Traditional

$v_{trad} := X_{WG.trad}$

$V_{WG.mean.trad} := v_{trad_0}$

$V_{WG.ampl.trad} := \sqrt{\left(v_{trad_1}\right)^2 + \left(v_{trad_2}\right)^2}$

$V_{WG.mean.trad} \cdot \frac{m}{kts \cdot sec} = -1.140$

$V_{WG.ampl.trad} \cdot \frac{m}{kts \cdot sec} = 0.813$

Mean difference of traditionally identified current

In view of the intricate current conditions in the East China Sea the comparison of the nominal tidal currents is not particularly meaningful, while the results plotted suggest the comparison of the mean difference in the currents identified being more reasonable in the present context.

$\Delta V_{WG} := V_{WG.trad} - V_{WG}$

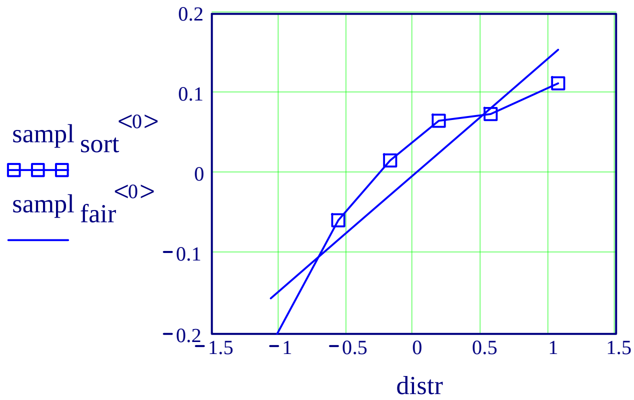
$\Delta V_{WG.mean} := mean\left(\Delta V_{WG}\right)$

$\Delta V_{WG.mean} \cdot \frac{m}{kts \cdot sec} = -0.398$ kts

Check distribution of differences in current

$\Delta\Delta V_{WG_i} := \Delta V_{WG_i} - \Delta V_{WG.mean}$

$\left[distr \quad sampl_{sort} \quad sampl_{fair} \quad distr_{par} \right] := norm\_distr\left(\Delta\Delta V_{WG}\right)$



$distr_{par} = \begin{bmatrix} 0.000 \\ 0.146 \\ 0.059 \end{bmatrix}$

According to the plot of differences in currents identified and the subsequent check of the distribution the differences are 'of cause' not quite normally distributed. Thus the following analysis is not quite justified.

95 % confidence radius

number of samples $n_s := ni - 1$

of parameters $n_p := 3$

of degrees of freedom $f := n_s - n_p$

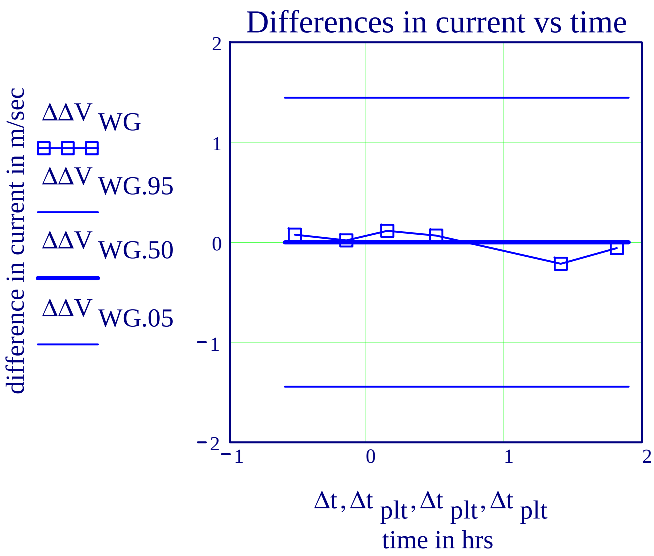
$\Delta\Delta V_{WG.95.rad} := C_{95}(\Delta\Delta V_{WG}, f)$

$\Delta\Delta V_{WG.95.rad} \cdot \frac{m}{kts \cdot sec} = 2.810$ kts

$k := 0..1$ $\quad \Delta t_{plt_0} := -0.6$ $\quad \Delta t_{plt_1} := 1.9$

$\Delta\Delta V_{WG.50_k} := 0$

$\Delta\Delta V_{WG.95_k} := \Delta\Delta V_{WG.95.rad}$ $\quad \Delta\Delta V_{WG.05_k} := -\Delta\Delta V_{WG.95.rad}$



Shaft power ratios vs hull advance ratios

$$V_{HW.trad.corr_i} := V_{HW_i} - \Delta V_{WG.mean} \cdot dir\left(\psi_{HG_i}\right)$$

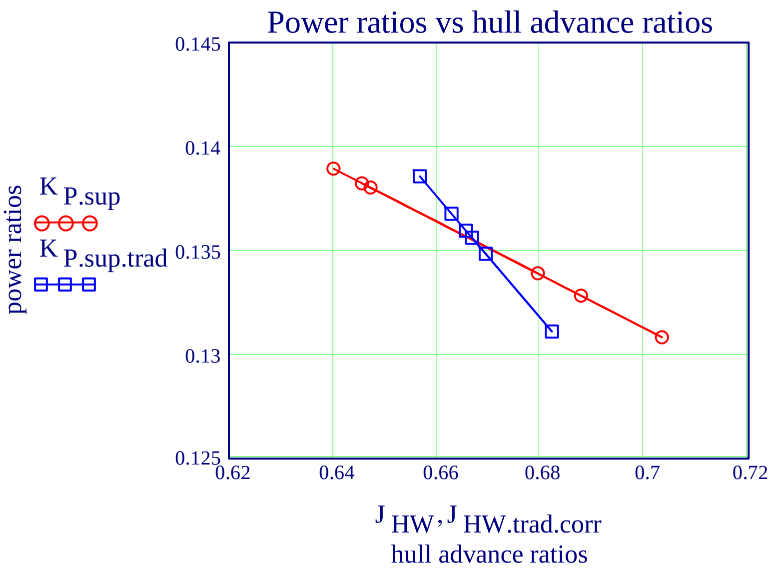
$$J_{HW.trad.corr_i} := \frac{V_{HW.trad.corr_i}}{D_P \cdot N_{S_i}}$$

Fairing power ratios

$$A_{KP_{i,k}} := \left(J_{HW.trad.corr_i}\right)^k$$

$$X_{KP} := geninv\left(A_{KP}\right) \cdot K_P$$

$$K_{P.sup.trad} := A_{KP} \cdot X_{KP}$$



Evidently the power ratios versus the advance ratios identified differ significantly in tendency. There may be many reasons, among them the surface effect due to the extremely small nominal propeller submergence not correctly being accounted for in the undisclosed traditional procedure.

Scrutinise results of an undisclosed traditional evaluation

End of Part 1 concerning the hull speed through the water

Analyse power required

Specify relative environmental conditions

Relative wind from ahead

$$V_{HA.x_i} := V_{HA_i} \cdot \cos\left(\psi_{HA_i}\right)$$

$$V_{HA.x} = \begin{bmatrix} 21.012 \\ -4.834 \\ -4.834 \\ 21.524 \\ 3.587 \\ -21.754 \end{bmatrix}$$

Check wind speed over ground

$$V_{AG_i} := \left(V_{HA.x_i} - V_{HG_i}\right) \cdot \mathrm{dir}\left(\psi_{HG_i}\right)$$

Approximate quadratically

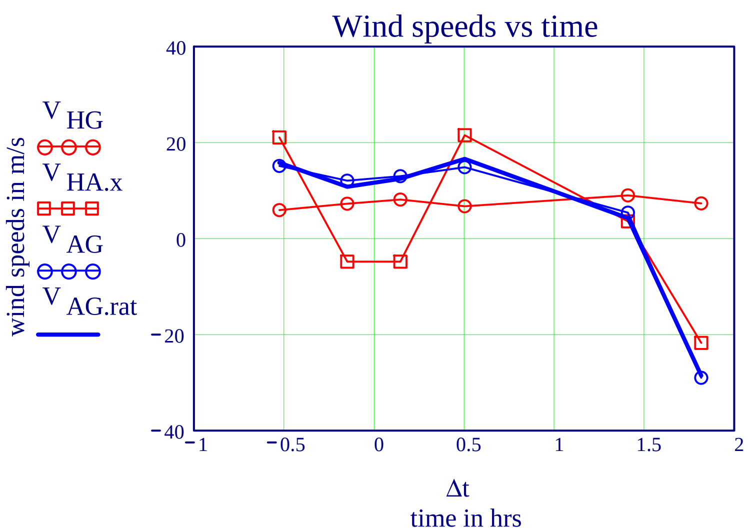
$$k := 0 .. 3$$

$$A_{AG_{i,k}} := \left(\Delta t_i\right)^k$$

$$X_{AG} := \mathrm{geninv}\left(A_{AG}\right) \cdot V_{AG}$$

$$X_{AG} = \begin{bmatrix} 11.237 \\ 6.226 \\ 18.211 \\ -18.599 \end{bmatrix}$$

$$V_{AG.rat} := A_{AG} \cdot X_{AG}$$



$$V_{AG.rat} = \begin{bmatrix} 15.752 \\ 10.777 \\ 12.454 \\ 16.583 \\ 4.217 \\ -28.556 \end{bmatrix}$$

Relative wind speed corrected

$$\Delta V_{AG} := V_{AG.rat} - V_{AG}$$

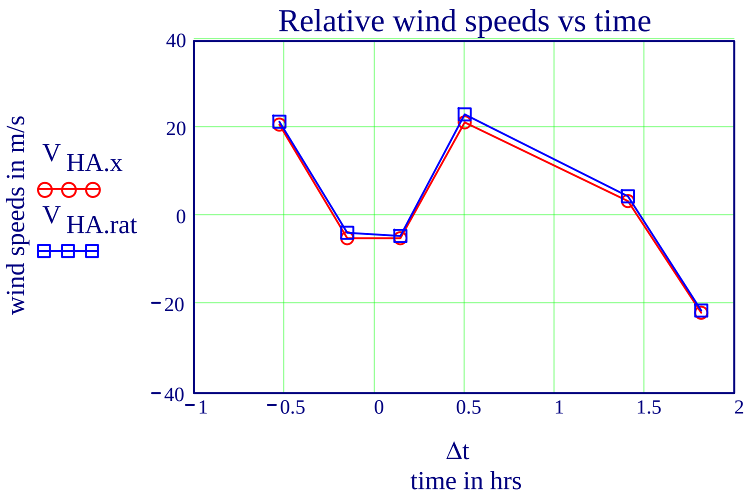
$$\Delta V_{AG} = \begin{bmatrix} 0.626 \\ -1.269 \\ -0.501 \\ 1.771 \\ -1.137 \\ 0.509 \end{bmatrix}$$

Evidently the differences depend on the direction of the runs relative the wind.

But as oscillations of the wind speed over ground are not expected to correlate with the varying directions of the runs, a correction of this systematic effect, in the measured relative wind speed, maybe due to the installation of the wind meter, is appropriate. But it is worth noting, that the corrected values remain nominal values!

$$V_{HA.rat_i} := V_{HG_i} + V_{AG.rat_i} \cdot dir\left(\psi_{HG_i}\right)$$

$$V_{HA.rat} = \begin{bmatrix} 21.638 \\ -3.566 \\ -4.334 \\ 23.296 \\ 4.724 \\ -21.245 \end{bmatrix}$$



Conventions adopted

First power' convention

$P_{S.req.0}(q, V_{HW}) := q_0 \cdot V_{HW}^3$

Second power convention

$P_{S.req.1}(q, V_{HW}, V_{HA}) := q_1 \cdot V_{HA} \cdot |V_{HA}| \cdot V_{HW}$

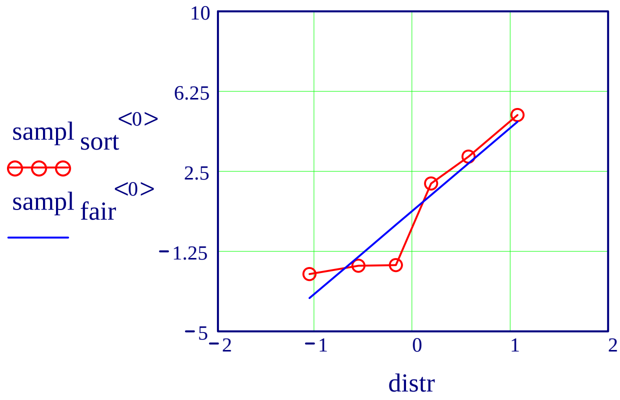
Evaluation

$Res_{req} := Required(V_{HG}, P_{S.sup}, V_{HA.rat})$

$[\Delta P_{S.req} \;\; q \;\; P_{S.req} \;\; A_{req} \;\; X_{req}] := Res_{req}$

Check distribtution

$[distr \;\; sampl_{sort} \;\; sampl_{fair} \;\; distr_{par}] := norm\_distr(\Delta P_{S.req})$



$distr_{par} = \begin{bmatrix} 0.699 \\ 3.872 \\ 1.581 \end{bmatrix}$

Evidently the first value is an outlier as is also shown in the following plot. The following estimate of confidence is thus not quite justified.

95 % confidence radius

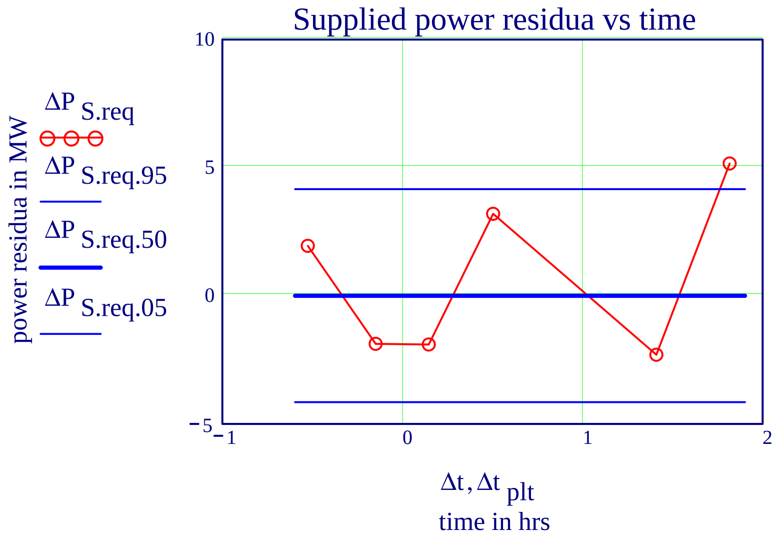
number of samples — of parameters — of degrees of freedom

$n_s := ni + 1$ $\quad n_p := 2$ $\quad f := n_s - n_p$

$P_{S.req.95} := C_{95}(\Delta P_{S.req}, f)$ $\quad P_{S.req.95} = 4.155$

$k := 0..1$ $\quad \Delta t_{plt_0} := -0.6$ $\quad \Delta t_{plt_1} := 1.9$

$\Delta P_{S.req.05_k} := -P_{S.req.95}$ $\quad \Delta P_{S.req.50_k} := 0$ $\quad \Delta P_{S.req.95_k} := P_{S.req.95}$



$$q = \begin{bmatrix} 0.0211 \\ 4.4130 \cdot 10^{-5} \\ 3.1656 \\ 0.1957 \end{bmatrix}$$

As usual the required power residua are much larger than in case of the supplied power due to the uncertainties in the wind measurements and the crude wave observations.

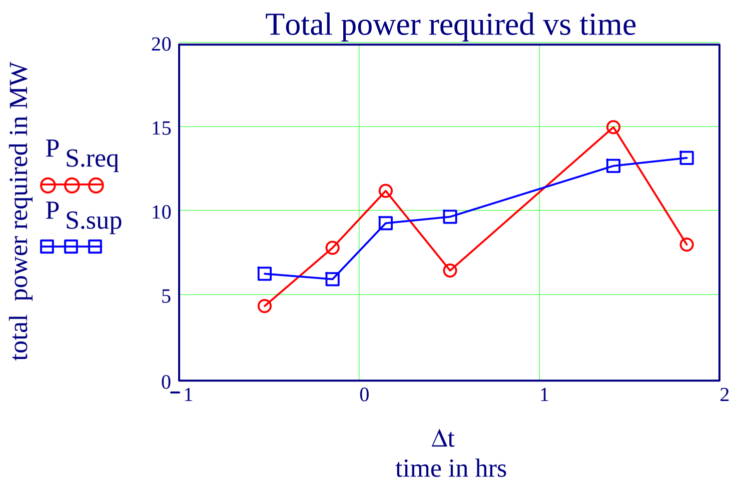
In view of the values of the powers measured the value of the confidence radius is felt to be quite realistic, the relative values ranging from 7.0 to 3.3 %.

$$P_{S.req.95.rel_i} := \frac{P_{S.req.95}}{P_{S_i}}$$

$$P_{S.req.95.rel} = \begin{bmatrix} 0.653 \\ 0.688 \\ 0.445 \\ 0.427 \\ 0.325 \\ 0.314 \end{bmatrix}$$

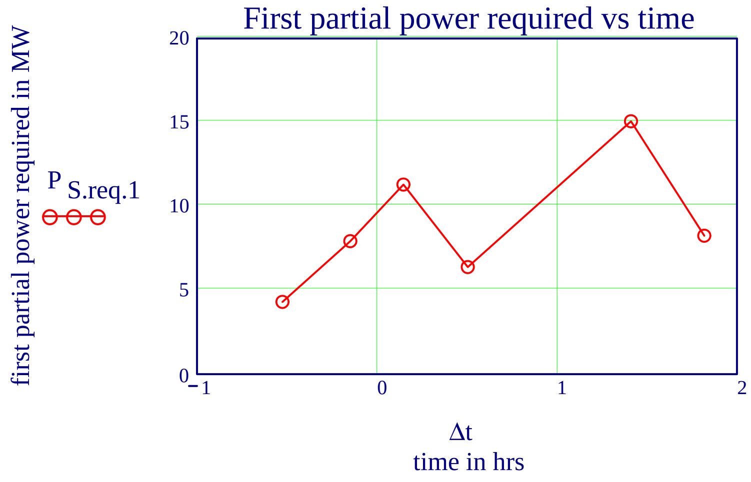
Powers required

Total power required



First partial power required

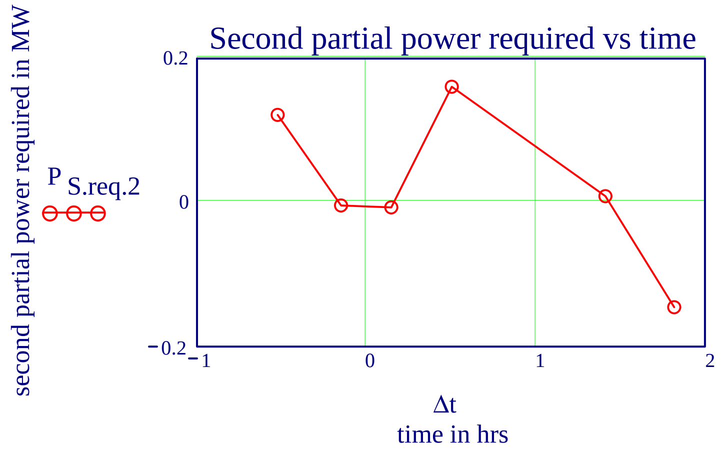
$$P_{S.req.1} := A_{req}^{\langle 0 \rangle} \cdot X_{req_0}$$



$$P_{S.req.1} = \begin{bmatrix} 4.299 \\ 7.905 \\ 11.285 \\ 6.377 \\ 15.066 \\ 8.236 \end{bmatrix}$$

Second partial power required

$$P_{S.req.2} := A_{req}^{\langle 1 \rangle} \cdot X_{req_1}$$



$$P_{S.req.2} = \begin{bmatrix} 0.122 \\ -4.046 \cdot 10^{-3} \\ -6.730 \cdot 10^{-3} \\ 0.161 \\ 8.807 \cdot 10^{-3} \\ -0.146 \end{bmatrix}$$

Re-order runs

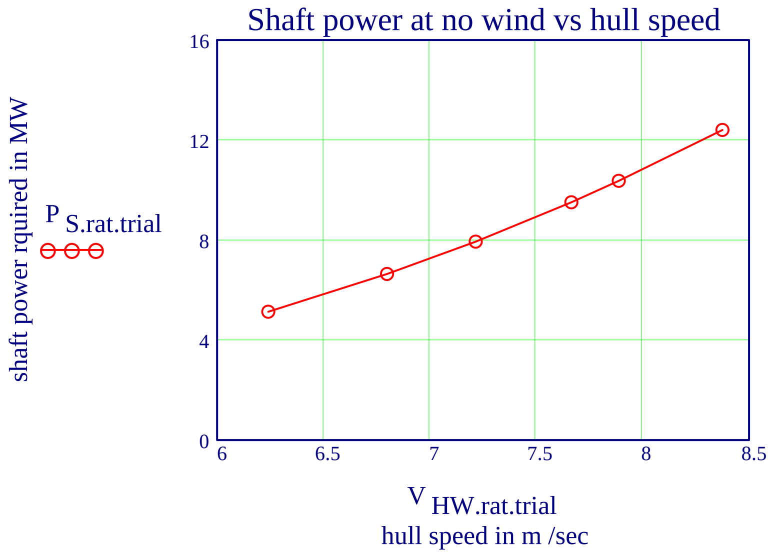
$R_{i,0} := run_i$ $\quad R^{\langle 1 \rangle} := V_{HW}$ $\quad R := csort(R, 1)$ $\quad Run := R^{\langle 0 \rangle}$

Run number re-ordered
according to increasing hull speed through speed
The natural count of runs is coveniently reduced by 1!

Nominal power vs hull speed
at the nominal no wind condition

$V_{HW.rat.trial} := R^{\langle 1 \rangle}$

$C_{PV} := q_0 + q_1$ $C_{PV} = 0.02112$ $P_{S.rat.trial_i} := C_{PV} \cdot \left(V_{HW.rat.trial_i}\right)^3$



$$P_{S.rat.trial} = \begin{bmatrix} 5.131 \\ 6.636 \\ 7.928 \\ 9.508 \\ 10.361 \\ 12.396 \end{bmatrix}$$

Nota bene: The power at the nominal no wind condition identified is that at the hull condition, the loading condition and the sea condition prevailing at the trials!

Powering performance
at the nominal no wind condition

Normalise power coefficient

$$C_{PV.n} := \frac{C_{PV} \cdot 10^6}{\rho \cdot D_P^{\,2}}$$

Identify equilibrium

$J := 0.5$ $K := 0.15$ Initial values

Given

$K = p_{n_0} + p_{n_1} \cdot J$

$K = C_{PV.n} \cdot J^3$

Solve

$$\begin{bmatrix} J_{HW.noVAW} \\ K_{P.noVAW} \end{bmatrix} := \mathrm{Find}(J, K)$$

$J_{HW.noVAW} = 0.685$ $K_{P.noVAW} = 0.133$

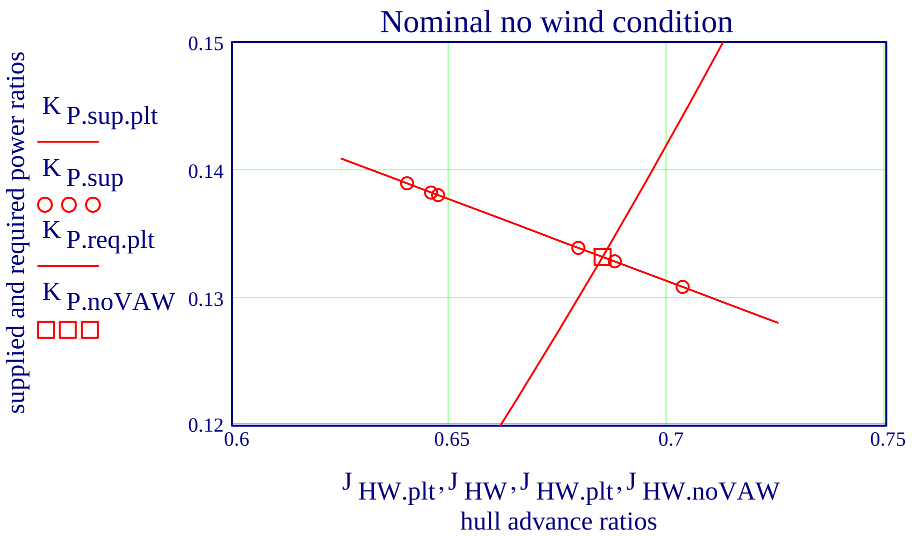
Results plotted

$k := 0 .. 10$

$J_{HW.plt_k} := 0.625 + 0.01 \cdot k$

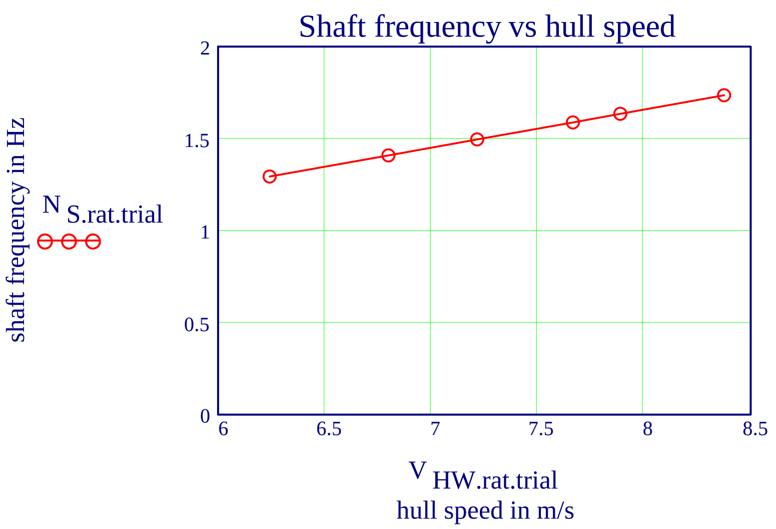
$K_{P.sup.plt_k} := p_{n_0} + p_{n_1} \cdot J_{HW.plt_k}$

$K_{P.req.plt_k} := C_{PV.n} \cdot \left(J_{HW.plt_k}\right)^3$



Frequency of shaft rev's at the nominal no wind condition

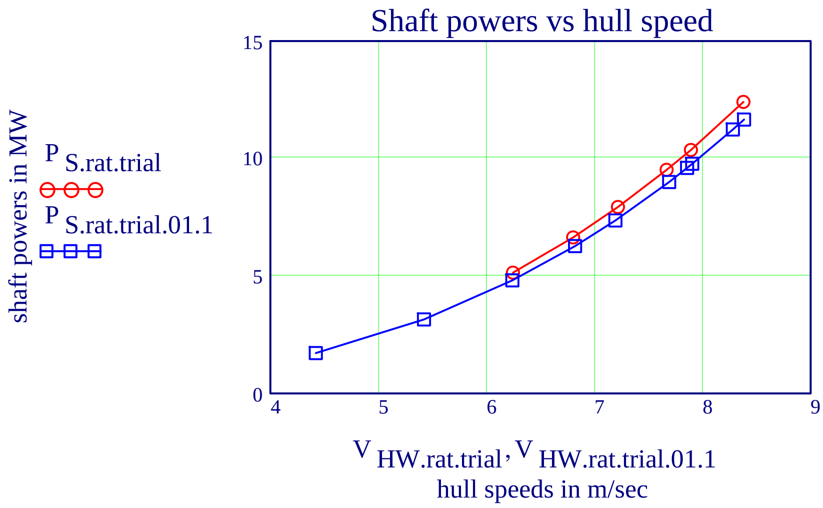
$$N_{S.rat.trial_i} := \frac{V_{HW.rat.trial_i}}{J_{HW.noVAW} \cdot D_P}$$

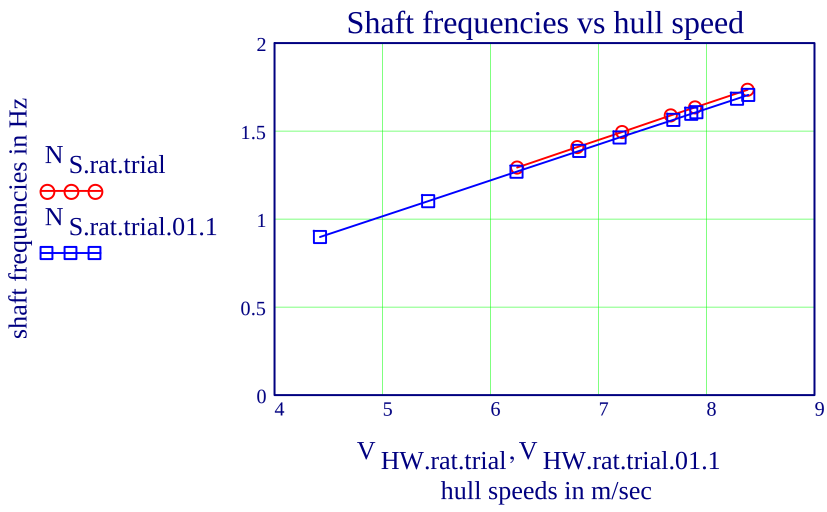


$$N_{S.rat.trial} = \begin{bmatrix} 1.292 \\ 1.408 \\ 1.494 \\ 1.587 \\ 1.633 \\ 1.734 \end{bmatrix}$$

Compare with results of PATE_01.1

Power

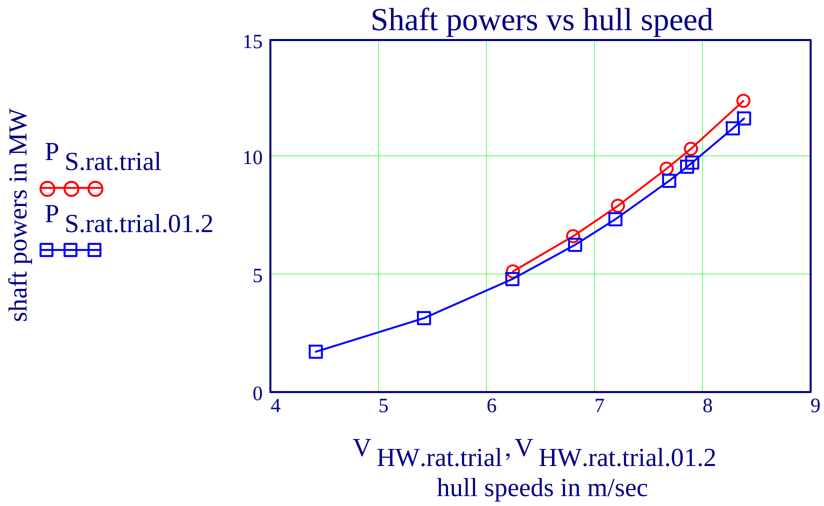


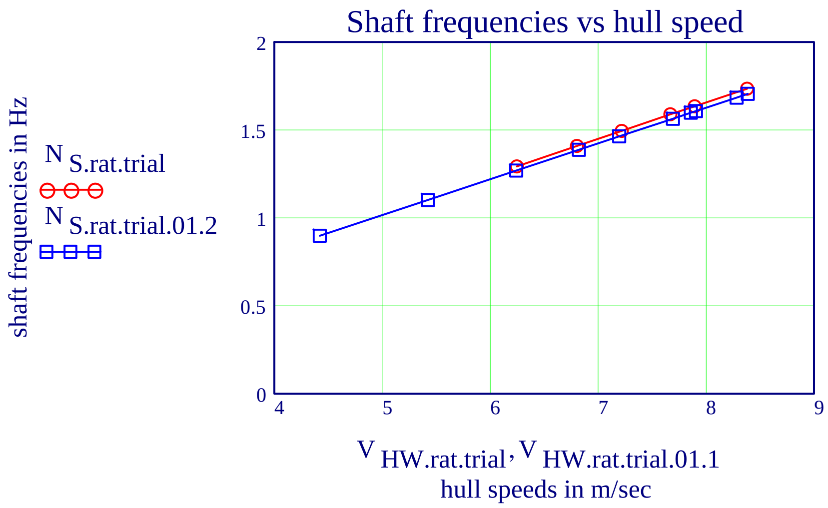


Evidently the final results do not differ for the two different data sets!

Compare with results of PATE_01.2

Power





Evidently the final results do not differ for the two different data sets!

Scrutinise results of an undisclosed traditional evaluation

Part 2 concerning the powers supplied and required

The results of the traditional evaluation are those predicted for the reference condition, which differes only slightly from the trials condition.

Trials condition	**Reference condition**
$T_{aft.trial} := 7.42 \cdot m$	$T_{aft.ref} := 7.60 \cdot m$
$T_{fore.trial} := 6.12 \cdot m$	$T_{fore.ref} := 6.10 \cdot m$
$D_{Vol.trial} := 58894.1 \cdot m^3$	$D_{Vol.ref} := 59649.0 \cdot m^3$

Propeller power supplied (delivered) and shaft frequency at reference condition reported

$$V_{HW.trad} = \begin{bmatrix} 6.369 \\ 6.611 \\ 7.573 \\ 7.351 \\ 7.953 \\ 8.149 \\ 8.349 \\ 8.128 \end{bmatrix} \quad P_{S.trad} := \begin{bmatrix} 4.4224 \\ 5.8975 \\ 9.2628 \\ 7.4969 \\ 9.8683 \\ 12.0176 \\ 12.7595 \\ 10.5436 \end{bmatrix} \cdot MW \quad N_{S.trad} := \begin{bmatrix} 75.8 \\ 81.8 \\ 94.6 \\ 89.4 \\ 97.5 \\ 102.7 \\ 105.0 \\ 99.7 \end{bmatrix} \cdot rpm \quad \eta_D := \begin{bmatrix} 0.828 \\ 0.824 \\ 0.801 \\ 0.808 \\ 0.788 \\ 0.780 \\ 0.770 \\ 0.781 \end{bmatrix}$$

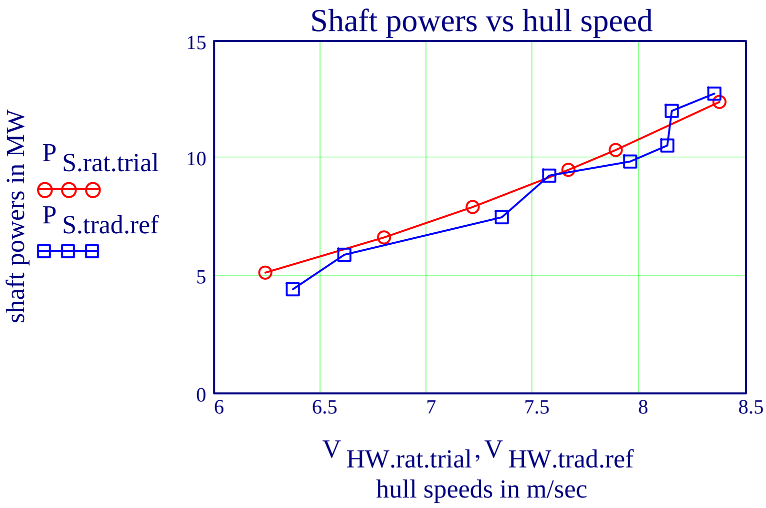
$$P_{S.trad} := \frac{P_{S.trad}}{MW} \qquad N_{S.trad} := \frac{N_{S.trad}}{Hz}$$

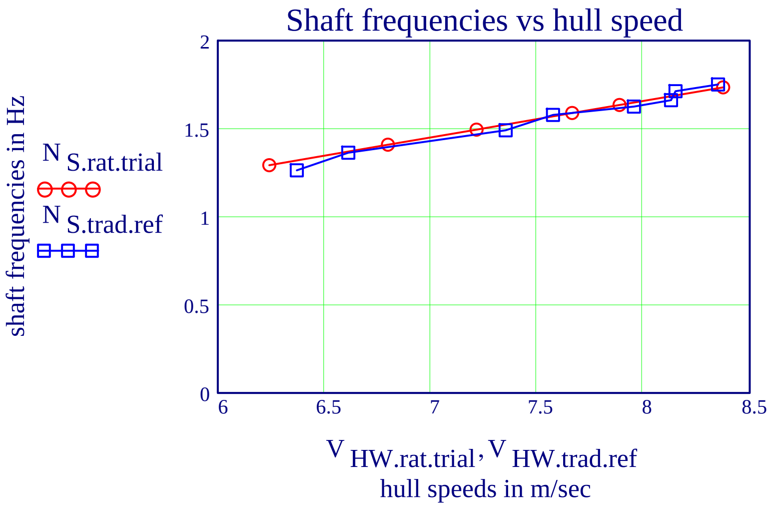
$$ref^{\langle 0 \rangle} := V_{HW.trad} \qquad ref^{\langle 1 \rangle} := P_{S.trad} \qquad ref^{\langle 2 \rangle} := N_{S.trad} \qquad ref^{\langle 3 \rangle} := \eta_D$$

$$ref := csort(ref, 0)$$

$$V_{HW.trad.ref} := ref^{\langle 0 \rangle} \quad P_{S.trad.ref} := ref^{\langle 1 \rangle} \quad N_{S.trad.ref} := ref^{\langle 2 \rangle} \quad \eta_{D.trad} := ref^{\langle 1 \rangle}$$

As far as has been disclosed the results of the traditional evaluation are based on the considerable number of nine small corrections and most importantly on the 'calculated propulsive efficiency values' reported, as has been explicitly stated in a remark.





Evidently the results of the rational evaluation at the trials condition, requiring no prior data, and the results of the traditional evaluation at the only slightly different reference condition, requiring very many prior data, last but not least the computed values of the propulsive efficiency, are very nearly the same, not to say 'identical'.

Computed values of the propulsive efficiency analysed

$i := 0 .. \mathrm{last}(\eta_D)$

$k := 0 .. 1$

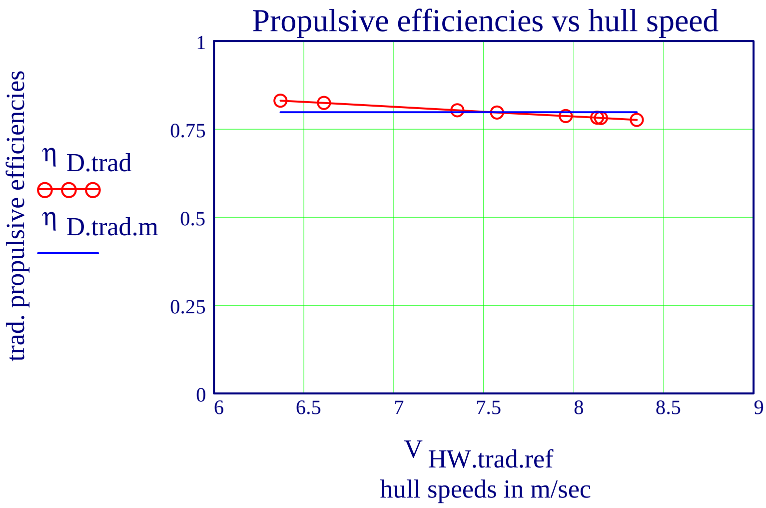
$A_{eta_{i,k}} := \left(V_{HW.trad.ref_i}\right)^k$

$X_{eta} := \mathrm{geninv}(A_{eta}) \cdot \eta_D$

$\eta_{D.trad} := A_{eta} \cdot X_{eta}$

$\eta_{D.trad.mean} := \mathrm{mean}(\eta_{D.trad})$

$\eta_{D.trad.m_i} := \eta_{D.trad.mean}$



This analysis shows that the traditional evaluation is practically in accordance with the convention, implying that the propeller is permanently operating at the same normalised condition, resulting in the quadratic resistance law..

$C_{RV.tot} := \eta_{D.trad.mean} \cdot C_{PV}$

$R_{HW.trad.tot_j} := C_{RV.tot} \cdot \left(V_{HW.trad.ref_j}\right)^2$

How the computed values of the propulsive efficiency have been arrived at in the traditional evaluation remains undisclosed, while **the resistance and the propulsive efficiency can be identified in a rational way solely from data acquired at quasi-steady monitoring tests without any prior information what-so-ever being necessary,** as has been shown in a 'model' study published on my website and in the Festschrift 'From METEOR 1988 to ANONYMA 2013 and further' also to be found on the website.

Scrutinise results of an undisclosed traditional evaluation

End of Part 2 concerning the powers supplied and required

Recording results

of the rational evaluation at the trial condition
of the traditional evaluation at the reference condition

$\Delta t_{trad} := \Delta t$

$$Record := \left| \begin{array}{l} Internal_{rat} \leftarrow \left[Res_{sup} \;\; Res_{req} \right] \\ Final_{rat} \leftarrow \left[Run \;\; \Delta t \;\; V_{HW.rat.trial} \;\; P_{S.rat.trial} \;\; N_{S.rat.trial} \right] \\ Internal_{trad} \leftarrow \left[V_{WG.trad.corr} \;\; J_{HW.trad.corr} \;\; K_{P.sup.trad} \right] \\ Final_{trad} \leftarrow \left[Run \;\; \Delta t_{trad} \;\; V_{HW.trad.ref} \;\; P_{S.trad.ref} \;\; N_{S.trad.ref} \right] \\ record \leftarrow \left[Internal_{rat} \;\; Final_{rat} \;\; Internal_{trad} \;\; Final_{trad} \right] \\ record \end{array} \right.$$

File := concat("Results_" , EID)

WRITEPRN(File) := Record

Print final rational results

$final_{rat}^{\langle 0 \rangle} := Run$

$final_{rat}^{\langle 1 \rangle} := V_{HW.rat.trial} \cdot \frac{m}{kts \cdot sec}$

$final_{rat}^{\langle 2 \rangle} := P_{S.rat.trial}$

$final_{rat}^{\langle 3 \rangle} := N_{S.rat.trial} \cdot \frac{min}{sec}$

$$final_{rat} = \begin{bmatrix} 4.000 & 12.129 & 5.131 & 77.536 \\ 5.000 & 13.214 & 6.636 & 84.477 \\ 7.000 & 14.022 & 7.928 & 89.638 \\ 6.000 & 14.897 & 9.508 & 95.237 \\ 11.000 & 15.330 & 10.361 & 98.005 \\ 10.000 & 16.275 & 12.396 & 104.042 \end{bmatrix}$$

Conclusions

For the whole context and for more details the Conclusions of PATE_01 should be referred to!

The rational evaluation produced nearly the same results for the two data sets 01.1 and 01.2 analysed. Now a data set further reduced to include only the data of three double runs as usually performed has been analysed.

This analysis PATE_01.3 shows that even based on the data of only three double runs the rational evaluation results in perfectly acceptable values.

For the rational evaluation the change from the trials condition to the reference condition results in an increase in the resistance due to the change in the displacement volume, and in an increase in the propulsive efficiency due to the larger nominal submergence of the propeller, maybe compensating each other.

But the result of the rational evaluation still includes the relatively small power required for moving in the sea state reported. **Thus the strictly accidental coincidence of the results in powers remains as unexplained as the whole undisclosed traditional procedure. In fact any traditional procedure is doomed to fail in any cases where no prior experience and data are available.**

END
**Powering performance
of a bulk carrier
during speed trials
in ballast condition
reduced to nominal
no wind condition**

Korrespondenz mit Dr.-Ing. Uwe Hollenbach of HSVA zu den ersten Post ANONYMA Trial Evaluations PATE_01.1 bis .3 u. PATE_02.1 bis .2 mit PATE_00.2

Die folgenden e-mails sind Originale der 'fortgesetzten' Korrespondenz, aber mit wenigen Ergänzungen und Korrekturen der wenigen orthographischen Fehler. Die vollständige Korrespondenz, die aktuellen Fassungen der genannten PATEs, der Ergebnisse intensiver weiterer Arbeiten zu den Details meiner Ansätze, finden sich auf meiner website www.m-schmiechen.de unter 'News on ship powering trials'.

From: Michael Schmiechen
Sent: Wednesday, June 4, 2014 3:12 PM
To: Uwe Hollenbach
Cc: Klaus Wagner ; Friedrich Mewis ; Stefan Krüger ; Bettar Moctar ; Som D. Sharma

Subject: Unsere Korrespondenz zu PATE_01 u. _02 cont'd

Lieber Herr Hollenbach,

bei weiteren, mehr körperlichen Haus-Arbeiten hatte ich inzwischen viel Muße über die Vergleiche unserer Auswertungen der Probefahrten mit zwei Schwester-Schiffen in der East China Sea weiter nachzudenken.

Vorab!

Meine Korrespondenz mit Herrn Dr. Wagner ist sehr viel umfangreicher und sehr viel detaillierter als unsere. Die ist so intensiv wie mein Arbeitsstil, bisher noch! Zwischen meinen Elaboraten und Ergebnissen und seinen Reaktionen vergehen nie zwei Monate!

Denn seit unserem ersten Treffen bei meiner 2nd INTERACTION Berlin '91 ist er nicht nur einer der wenigen Kollegen, die sich stets für die Entwicklung meiner Ansätze interessiert haben, sondern er hat oft auch aktiv daran mitgewirkt.

Und seit meinem Ausscheiden aus der Versuchsanstalt hat Herr Wagner vor allem die Rolle meines Lektors gespielt, stets sehr konstruktiv und prompt. Dafür bin ich ihm sehr dankbar! Denn vor der 'Herausgabe' aller meiner

Arbeiten habe ich sie bisher immer von Lektoren kritisch korrigieren lassen, so wie auch diese mail.

Statistik über alle double runs

Doch nun zur Sache. Zwei Welten können tatsächlich nicht verschiedener sein als unsere! Ohne auf Details einzugehen, fiel mir an Ihren Bemerkungen auf, dass Sie immer wieder einzelne double runs betrachten.

Auf ‘dieses Niveau’ kann ich mich aber nicht begeben, denn nach meinen langen, ‘einschlägigen’, also schmerzhaften Erfahrungen ist die Analyse einzelner double runs im Anbetracht aller möglichen zufälligen Fehler überhaupt nicht sinnvoll möglich.

Ich betrachte vielmehr immer alle zur Verfügung stehenden oder aus 'guten' Gründen ausgewählten double runs gemeinsam und analysiere die Residuen mit grösster Sorgfalt auf Abweichungen von Normal-Verteilungen. So prüfe ich, ob meine Konventionen den Problemen ‘angemessen’ sind und ob die Theorie der Stichproben überhaupt anwendbar ist.

Herr Mewis hat einmal gesagt, dass ich die Probefahrten wie ein Physiker auswerte. Und damit hatte er natürlich recht. Ich mache das nämlich als 'Mechaniker' dem Stand der Technik entsprechend, und nicht entsprechend der traditionellen Praxis der Schiffbauer. Auch wenn ich mich wiederhole: In den Versuchsanstalten gibt zu viele Schiffbauer.

Die ‘glauben’ nämlich zu wissen, was herauskommen ‘soll’, und es gibt zu wenige Theoretiker, die ‘wissen’, wie sie es professionell herausholen ‘können’. Die in Quality Manuals, auch dem der ITTC, rituell wiederholten, meistens unverstandenen Regeln der elementaren Theorie der Stichproben reichen für die anstehenden Probleme überhaupt nicht aus.

Analyse der Roh-Daten

Mein Vorgehen ist schon deshalb notwendig, weil ich die Rohdaten nicht selber analysiert habe, wie es z. B. im Fall der ANONYMA möglich war. ‘Mittelwerte’, von denen ich nicht weiss, wie sie ‘entstanden’ sind, benutze ich immer nur mit grösster Vorsicht.

Wie ich beim Auswerten der METEOR-Modell-Versuche erlebt habe und gerade jetzt wieder erlebe, sind im Zweifelsfall gar nicht irgendwelche mehr oder weniger obskuren Mittelwerte relevant, sondern stationäre Werte, also

Extrema! Selbst bei Probefahrten im Ballast verfälschen schon die geringsten Beschleunigungen die Energie-, alias Leistungs-Bilanzen 'vollständig'!

Partielle Energie-Bilanzen

Auch dazu die Wiederholung einer fundamentalen Feststellung: Ich betrachte nicht Impuls-, alias ‘Kräfte’-Bilanzen, sondern wie Lagrange die Bilanzen partieller Leistungen. Und damit fallen von Anfang an schon sehr viele Probleme ‘grundsätzlich’ weg; sie existieren bei diesem Ansatz gar nicht.

So ist der Gütegrad der Propulsion bei der Analyse traditioneller Probefahrten überhaupt nicht notwendig, während er in der jetzt 'universell' akzeptierten, von der Full Conference aber noch nicht akzeptierten 'ITTC 2012 Guideline' ein 'input' ist! Der Name 'direct power method' dafür ist m. E. die denkbar plumpste Desinformation.

Supplied power first

Wegen der gewöhnlich relativ geringen Variation der Propeller-Belastungen während der Probefahrten, lässt sich deren Analyse in zwei Teil-Probleme zerlegen, deren Lösungen sich jeweils einfach als Lösungen von Systemen linearer Gleichungen ergeben.

Zunächst habe ich wie immer die power supplied analysiert und damit den Propeller kalibriert, full scale (!) unter Probefahrts-Bedingungen (!), also auch bei extrem kleiner Tauchung und im Seegang. Bei der Durchsicht der PATE_01 stelle ich fest, dass die von mir identifizierten Propeller-Kennlinien und die Strömungen über Grund ‘praktisch’ unabhängig sind von der Zahl der berücksichtigten double runs.

Da Sie, wie auch immer, evtl. mit der bekanntlich (!) Fehler anfälligen traditionellen Methode, wesentlich andere Werte der Strömung identifiziert haben, weicht auch Ihre Propeller-Kennlinie in der Tendenz wesentlich von meiner ab. Im Falle PATE_02 haben Sie die Strömung ‘richtiger’ identifiziert und unsere Propeller-Kennlinien decken sich nicht nur, sondern 'praktisch' auch mit der von mir vorher identifizierten des Schwester-Schiffes (PATE_01).

Strömung: 'fundamentale' Lösung

Ihre Bemerkung , dass meine Methode, die Strömung zu bestimmen, 'eleganter' sei als die von Herrn Schenzle, ist ein typisches 'understatement' von Schiffbauern, die das Problem und seine Lösung nicht verstehen 'wollen'.

Ob sie es wollen oder nicht, meine axiomatische Interpretation des Begriffs ist tatsächlich die einzig sinnvolle und sie bedarf sogar keiner Kalibrierung (!) und funktioniert ohne irgendwelche teuren, 'empfindlichen' Logs und sogar bei jedem Wind und Wetter.

Selbst Herr Wagner und Herr Gennaro hielten meine Lösung im Grunde Ihres Herzens für ein Provisorium und haben mich immer wieder auf 'zukünftige' Logs verwiesen. Mit denen verhält es sich aber leider genau wie mit den immer wieder von Dilettanten erfundenen und in 'verschwenderischen' 'Forschungs'-Vorhaben entwickelten Schub-Mess-Geräten.

Selbst wenn sie denn jemals 'funktionieren' sollten, liessen sich weder die einen noch die anderen überhaupt kalibrieren. Was aber sind denn das für 'Mess'-Geräte, die sich nicht kalibrieren lassen? Würden Sie so eins kaufen 'wollen'?

Power required

Danach habe ich die power required analysiert, um auf den nominellen Zustand no wind and no waves reduzieren zu können. Dass mein Modell der power required nicht nur im vorliegenden Fall der Schwester-Schiffe in der East China Sea sehr ruppig ist, haben Herr Dr. Wagner und Herr Dr. Gennaro immer wieder bemängelt.

Beide geben aber zu, dass im Anbetracht der spärlichen Daten oft gar nichts anderes möglich ist, als das Ei auf die Schiene zu nageln, so wie Kolumbus es vorgemacht hat. Hier könnte man natürlich noch versuchen, aus den Vergleichen der Daten der Schwester-Schiffe bei verschiedenem Seegang ‘Honig zu saugen’, so wie ich das bei PATE_02 mit einem Parameter der required power gemacht habe.

Signifikanz-Analysen

Zur Beantwortung Ihrer Detail-Fragen muss ich mir gelegentlich erst einmal die von mir stets ermittelten und mitgeteilten Vertrauens-Grenzen genauer ansehen. Darauf beziehen sich die für Schiffbauer sicher viel zu ‘lockeren’ Bemerkungen eines 'Mechanikers' zu ‘praktischen’ Übereinstimmungen. Im Falle der beiden Probefahrten mit der ANONYMA hatte ich für solche Signifikanz-Analysen zunächst die Vertrauens-Grenzen der ursprünglichen Mittelwerte bestimmt und zur Verfügung. Auf Ihre Analysen bin ich gespannt, denn die müssen ja der wesentliche Bestandteil Ihres Projektes mit der SSPA sein.

MS 28.08.2014 08:00 h

Mit meinem Dank für die Genehmigung zur Veröffentlichung meiner Analysen und der Bitte um Entschuldigung für diesen wiederholten Versuch, die mir wesentlichen Dinge noch einmal zu erläutern, verbinde ich in aller gebotenen Bescheidenheit die Erwartung, dass Sie genau wie ich, alle Details Ihrer Auswertungen veröffentlichen. Nur so können sich alle interessierten Kollegen, unter anderen die Professoren Krüger und el Moctar, selber ein Urteil bilden.

Verblüffende Übereinstimmung

Ich habe immer wieder ausdrücklich festgestellt, dass die Werte der durch meine Konventionen konstituierten und interpretierten Begriffe prinzipiell nicht mit den Werten der entsprechenden traditionell interpretierten Begriffe übereinstimmen müssen. Für das 'Anknüpfen' an die bisherigen Erfahrungen ist die eventuelle Übereinstimmung aber natürlich 'nützlich', wie auch immer.

Die verblüffende, fast perfekte Übereinstimmung unserer End-Ergebnisse, bei meiner Beschränkung auf das Wesentliche, weg von der schiffbaulichen Folklore und den 'tausend' kleinen Korrekturen, muss selbst hartgesottenen Schiff-Bauern Anlass zum Nach-Denken geben.

Wie Sie von Ihren fehlerhaften Zwischen-Ergebnisse auf Ihr End-Ergebnis und auf die ‘rettende’ Idee kommen konnten, dass ich mein Verfahren mit Ihren Ergebnissen ‘getunet’ hätte, werden Sie mir und unseren Kollegen sicher gelegentlich noch erläutern.

Wer hat Angst vorm bösen Mann?

Auch Ihre früher geäusserte Meinung, dass die Klienten der HSVA schon durch die Erwähnung meines Namens, durch meinen nackten Pragmatismus ‘verschreckt’ werden, glauben Sie doch sicher selber nicht. Verschreckt sind aus verständlichen Gründen meine Kollegen in einigen Versuchsanstalten.

Den Klienten ist alles ‘gleichgültig’. Solange die nämlich noch akzeptieren, dass die selben Leute die Prognosen und [auch] deren Bestätigung ‘machen’, wollen sie offenbar noch 'betrogen' werden, oder die IMO beim Nachweis des EEDI betrügen?

Akzeptable Normen

Schon seit meinem Schiffstechnik-Aufsatz und meinem STG-Vortrag von 1980 ist bekannt, dass akzeptable, dauerhafte Konventionen nichts anderes sind als axiomatische Systeme. Und dass man deren Konstruktion zweckmässig nicht Schiff-Bauern überlässt, sondern möglichst Experten für formale Sprachen. Um deren Mitwirkung habe ich schon geworben, bisher aber leider vergeblich. Denn: 'Jeder denkt ['natürlich'] an sich [und seine Probleme], nur ich denke an mich [und meine Probleme]!'

Mein Verfahren ist vollkommen transparent und objektiv, also unabhängig vom Bearbeiter. Es kommt mit wenigen, 'selbst'-verständlichen Konventionen aus und, wie es sein muss (!), ohne weitere ‘Vorkenntnisse’. Und zwar auch ohne irgendwelche ad hoc (!) gewählten ‘Vor-Daten’ und Daten aus 'un-ähnlichen' Modell-Versuchen, insbesondere ohne den Gütegrad der Propulsion, den Joker aus dem Ärmel.

Mein Verfahren, soweit ich es bisher entwickelt habe, erfüllt damit die Voraussetzungen und den Zweck einer vernünftigen, akzeptablen Norm, so wie ich das nicht nur zuletzt in der HANSA festgestellt habe. Und deshalb bleibe ich bei meiner öffentlich vertretenen und jetzt noch besser begründeten Überzeugung, dass ITTC, ISO und IMO im ‘Gefolge’ von MARIN, des Kaisers in seinen neuen Kleidern, mit der unglaubwürdigen SATimo (!) Methode die dringend notwendige ‘Rationalisierung’ für mindestens das nächste Jahrzehnt blockieren.

Weitere Entwicklungen

Das Ende dieser Blockade werde ich persönlich also vermutlich gar nicht mehr erleben! Aber sicher greifen junge Kollegen meine effizienten rationalen Ansätze auf und führen sie konsequent fort. Das tun die Kollegen Verhulst und Hooijmans in Wageningen (!) mit ausdrücklichem (!) Dank für meine konsequenten Vor-Arbeiten schon lange.

Und zwar tun sie das im Hinblick auf extrem effiziente quasi-stationäre Probefahrten und Überwachungen der Propulsion, ohne Messungen des Schubes, also einfacher als in meinem sehr aufwändigen METEOR-Projekt von 1988. 'Aber Jesus sprach zu ihnen, da ein Prophet nirgend weniger gilt als in seinem Vaterland und seinem Hause' (Matthäus 13, 57), finden entsprechende, Erfolg versprechende Forschungs-Anstrengungen in Deutschland meines Wissens aber 'natürlich' nicht statt [, ausser meinen eigenen, deren aktuelle Ergebnisse ich gelegentlich der 27th ITTC in Kopenhagen veröffentlichen will].

MS 28.08.2014 08:00 h

Quasi-steady trials and monitoring

Wie man Werte des propulsive efficiency bei quasi-stationären Probefahrten ohne Schub-Messungen (!) sicher identifizieren kann, das habe ich schon an meinem 'Modell'-Versuch von 1986 gezeigt. [Der im ersten Band dieser Festschrift veröffentlichte erste, nur in Folge eines dummen Flüchtigkeits-Fehlers unbefriedigende Vergleich mit traditionellen Ergebnissen wurde inzwischen auf meiner website durch die korrigierte Fassung ersetzt.] Man muss also in Zukunft den Joker gar nicht aus dem Ärmel ziehen, wenn man ihn z. B. für die Betriebs-Überwachung braucht!

Das zu lösende Problem ist auch hier die sichere Bestimmung der Strömung. Die gelingt wie beschrieben, wenn nur die während der quasi-stationären Versuche 'passierten' stationären Zustände ermittelt und der Analyse zu Grunde gelegt werden. [Wenn das Deplacement und damit die Trägheit des untersuchten Fahrzeugs klein sind, wie im Falle des CORSAIR-Projektes, dann müssen Phasen-Beziehungen berücksichtigt werden!]

Kritische Diskussionen

Ich habe nicht vierzig Jahre lang Vorlesungen über das professionelle Lösen von Problemen beim ‘Behandeln’ hydromechanischer Systeme gehalten, um die dilettantische ITTC Guideline jetzt kommentarlos ‘passieren’ zu lassen. Bei Lerbs, Grim und Krappinger und auch bei Horn, Amtsberg und Schuster wäre so ein schlampiger ‘Bericht’ niemals 'raus'-gegangen.

Und Hans Edstrand, der vormalige Direktor von SSPA, hätte die Specialists des Committees on Powering of Ships in Service (SC PSS) alle einzeln zum Teufel gejagt. Er war m. E. zu Recht der Überzeugung, dass Spezialisten in der Konferenz der Tankleiter (!), die die Probleme noch selber kannten, von denen die Rede war, überhaupt nichts zu suchen haben.

Das Gleiche habe ich auch dem Chairman des Executive Committee empfohlen, nachdem das Specialists Committee auf einem seiner (teuren!) Treffen ausdrücklich für ihn (!) festgestellt hatte, dass mein Verfahren für die Analyse traditioneller Probefahrten Schub-Messungen erfordert. Trotz der seit 1998 vorliegenden detaillierten, für jeden 'Geschmack' wiederholten Dokumentationen des genauen Gegenteils hat offenbar kein einziges Mitglied, auch Sie nicht, die eklatante Fehl-Information des Chairmans verhindert.

Glaubwürdigkeit ahoi!

Mit Interesse habe ich danach verfolgt, dass die gegen die Regeln der ITTC an die IMO weitergeleitete 'haltlose' ITTC 2012 Guideline nach meinem (!) Hinweis auf den ‘Skandal’ von der website der ITTC zunächst verschwand, bald aber wieder dort auftauchte. Und inzwischen hat die ITTC ‘plötzlich’ einen neuen Chairman! Ich bin gespannt wie der die Karre aus der Dreck zieht, in die das SC PSS und sein Vorgänger sie gefahren haben.

Dass die von MARIN inspirierte ITTC 2012 Guideline auch Grundlage der Neu-Ausgabe der Norm ISO 15016 werden soll, wurde vermutlich inzwischen so wie 2002 von allen nationalen Gruppen 'abgenickt', auch von der deutschen (?), bestehend aus Ihnen allein. Meine Bitte, mir das Beispiel zu der Norm, so wie 1998, für die Analyse zur Verfügung zu stellen, konnte leider nicht erfüllt werden, weil es so ein Beispiel angeblich nicht gab!

'Spiel'-Regeln

Nach meinen detaillierten Entwurf für ein Neu-Ausgabe der fundamentalen Norm DIN 1313 'Grössen' und dessen emotionaler, unqualifizierter Ablehnung durch die Autoren der aktuellen Ausgabe, einige von ihnen Logiker in meinem Alter, weiss ich jetzt nicht nur, wie Normen auch anderen Orts 'gemacht' werden, sondern ich habe sogar verstanden, warum das so geschieht.

Die 'Spiel'-Regeln von DIN, und auch ISO, den Konsens von Interessen-Gruppen herzustellen, führen aber leider dazu, den Stand der Praxis (!) zu konservieren und damit Innovationen zu verzögern oder gar zu verhindern. Experten sind ausdrücklich ausgeschlossen und jede Korrespondenz ist beim DIN z. B. streng vertraulich!

Das führte sogar soweit, dass meine website vom DIN laufend auf unerlaubte Veröffentlichungen überwacht wurde. Ich musste nicht nur links zu files, sondern auch die files selber löschen! Aber sowohl mein Entwurf als auch die Diskussionen zu dem sehr interessanten, fundamentalen Projekt und die Dokumentation der ganzen 'Geschichte', alles was DIN nicht 'verbieten' konnte, befindet sich natürlich auf meiner website.

Mit freundlichen Grüssen zu Pfingsten, dem 'lieblichen Fest', so Goethe am Anfang seines 'ziemlich' obszönen 'Reinicke Fuchs',
Ihr Michael Schmiechen.

From: Michael Schmiechen
Sent: Wednesday, May 28, 2014 10:29 PM
To: Hollenbach@hsva.de
Cc: Klaus Wagner

Subject: Re: Unsere Korrespondenz

Lieber Herr Hollenbach,

vielen Dank für Ihre detaillierten Anmerkungen zu meinen Auswertungen, die mich sicher noch eine Weile beschäftigen werden.

Bei der dadurch angeregten Durchsicht meiner files und der darin enthaltenen, verblüffenden Vergleiche fiel mir aber sofort das Datum meiner Ausdrucke auf. ‘Zuhause’ habe ich immer noch die Fassung vom 03.03.2014, während auf der website schon die Fassung vom 01.04.2014 steht, die Sie benutzt haben. Hier hinke ich also selber nach!

Trotz intensiver Reparatur- und Putz-Arbeiten in Folge eines Mieter-Wechsels habe ich neulich bei dem quasi-stationären ‘Modell’-Versuch durch systematische Änderungen von Parametern schon wieder eine wichtige Entdeckung gemacht.

Bis auf Weiteres mit freundlichen Grüssen zu Christi Himmelfahrt
Ihr Michael Schmiechen.

From: Hollenbach@hsva.de
Sent: Wednesday, May 28, 2014 5:56 PM
To: Michael Schmiechen
Cc: Klaus Wagner
Subject: Re: Unsere Korrespondenz

Hallo Herr Schmiechen, Hallo Herr Wagner,

Ich war die letzten beiden Tage auf Reisen und hatte in der Bahn Zeit, mir die Auswertung unserer beiden gemeinsam Testfälle anzusehen.

Ich weiss nicht, in wie weit Herr Wagner unseren bisherigen Schriftverkehr verfolgt hat, daher die folgende kurze Info zu den Schiffen / Probefahrten: Bei den beiden Probefahrten handelt es sich um zwei Schwesterschiffe einer Serie von 118k Bulk Carriern, die in China auf dem Ballast Tiefgang auf Probefahrt gewesen sind.

Das erste Schiff (PATE_01) war bei vergleichsweise schlechtem Wetter auf Probefahrt. Die signifikannte Wellenhöhe während der Probefahrt war mit 3.3 m angegeben, der Wind mit Bft. 6-7. Das zweite Schiff (PATE_02) war bei deutlich besserem Wetter auf Probefahrt. Die signifikannte Wellenhöhe während der Probefahrt war mit 1 m angegeben, der Wind mit Bft. 4.

Meine folgenden Kommentare beziehen sich auf die Dokumente mir Stand vom 01.04.2014, die ich mir von Schmiechens Webseite heruntergeladen habe.

Die Auswertung von PATE_01 mit 10 Speed Runs (PATE 01.1) und mit 8 Speed Runs (PATE 01.2) ergibt praktisch deckungsgleiche Kurven. Demgegenüber liegt die Kurve ausgewertet mit nur 6 Speed Runs (PATE 01.3) deutlich nach oben verschoben mit einer resultierenden geringeren Geschwindigkeit von immerhin 0.15 kn (bei 8000 kW Leistung). Das scheint mir wenig plausibel.

Vergleicht man in der Auswertung PATE 01.1 die gemessene Leistung PS mit den korrigierten Leistungswerten PS.rat.trial findet man Korrekturen, wie man sie auch in einer "traditionellen" Auswertung erwarten würde. Die gemessenen Leistung in der "head wind head sea condition" werden deutlich nach unten korrigiert, in der "stern wind stern sea condition" sind die Korrekturen klein. Für mich wenig plausibel sind die beiden 16 kn Geschwindigkeitspunkte (Punkt 9 und 10), beides Geschwindigkeitspunkte mit Wind und Seegang von achtern, die beide ebenfalls in ihrer Leistung reduziert werden, wie ich es allenfalls für Gegenwindbedingungen erwarten würde, nicht jedoch wenn Wind und Seegang von achtern wirken.

Die Auswertung von PATE_02 mit 10 speed Runs (PATE_02.1) und mit 8 Speed Runs (PATE_02.2) ergeben sehr ähnliche Kurvenverläufe wie die Auswertung des ersten Falls, sie sind gegenüber PATE_01 nur nach oben verschoben.

Vergleicht man in der Auswertung PATE 02.1 die gemessene Leistung PS mit den korrigierten Leistungswerten PS.rat.trial findet man Korrekturen, die für mich völlig unplausibel sind. Mit Ausnahme eines einzigen Messpunktes werden im Fall PATE_02.1 alle gemessenen Leistungen in "head wind head sea conditions" (Punkte 3, 6, 7, 10 und 11) nach oben korrigiert, als ob Wind und Seegang von achtern geschoben hätten, und alle gemessenen Leistungen in "stern wind stern sea conditions" (Punkte 4, 8, 9 und 12) werden nach unten korrigiert, so als ob Wind und Seegang gebremst hätten.

MS 28.08.2014 08:00 h

In der Auswertung haben Sie geschrieben, dass "evidently in this case of nearly no wind the rational evaluation does not permit to identify meaningful parameters". Ich finde nicht, dass Bft. 4 "nearly no wind" sein soll, aber die Verwendung der Parameter des Schwesterschiffes führt anscheinend zu völlig unsinnigen und praktisch nicht nachvollziehbaren Korrekturen.

Ich bin neugierig, Ihre Meinung dazu zu hören.

Mit freundlichen Grüßen
Uwe Hollenbach.

From: "Michael Schmiechen" <m.schm@t-online.de>
To: "Uwe Hollenbach" <hollenbach@hsva.de>
Cc: "Klaus Wagner" <IKWAG@web.de>
Date: 26.05.2014 10:57

Subject: Unsere Korrespondenz

Hallo Herr Hollenbach,

anbei sende ich Ihnen meine Dokumentation unserer Korrespondenz zu den PATEs. Wie immer werden auch hier noch eine Weile Korrekturen und Ergänzungen notwendig werden. Aber für heute ist dies 'gut genug'.

Wenn Sie übrigens meinen. dass ich Sie hintergangen habe, dann haben Sie mein Anliegen überhaupt nicht verstanden! Glauben Sie denn im Ernst, dass ich mich selbst belüge und meine Jahrzehnte dauernde Arbeit für eine rationale Theorie der Propulsion, mein Lebenswerk durch einen kleinen, dummen Micky Mouse Betrug zerstöre?

Die weitgehende Übereinstimmung unserer Ergebnisse ist, wie ich betont habe, 'rein' zufällig. Denn ich habe nur das Verhalten bei den Bedingungen der Probefahrt (!) auf einen nominellen Zustand no wind and no waves reduziert, während Sie meines Wissens noch weitere Korrekturen verwenden, um auf die Kontrakt (!) -Bedingungen zu kommen. Wie ich immer wieder festgestellt habe, ist diese 'Umrechnung' in meinen Augen ein völlig separates, auch konventionelles Problem, das ich überhaupt (noch?) nicht behandelt habe.

Völlig schleierhaft ist für mich, wie Sie im Falle PATE_01 trotz Ihrer fehlerhaften Bestimmung der Strömung zu Ihren Ergebnissen gekommen sind. Dabei spreche ich noch nicht von dem Gütegrad der Propulsion, dem 'Joker aus dem Ärmel'. Woher haben Sie denn den, full scale bei der geringen nominellen Tauchung im Seegang? Ich brauche überhaupt keine vorherigen Erfahrungen, welche auch immer, mein Verfahren funktioniert deshalb trotz seiner Mängel 'immer', unabhängig von der Versuchsanstalt und dem Bearbeiter!

Bei dem quasi-stationären 'Modell'-Versuch bin in ich schon wieder eine grossen Schritt weiter. Ich konnte nämlich mit meiner Methode auch die sehr geringe Strömung im Tank ermitteln. Denn full scale ist das robuste Bestimmen der Strömung gerade bei quasi-stationären Probefahrten natürlich das 'entscheidende' Problem. Da ich den 'Modell'-Versuch inzwischen so ausgiebig analysiert habe, entsteht gerade eine Dokumentation aller meiner Ergebnisse.

Mit freundlichen Grüssen zu dieser schönen Sommerzeit
Ihr Michael Schmiechen.

MS 28.08.2014 08:00 h

An explanatory reply to Dr.-Ing. Hollenbach at HSVA concerning the first Post ANONYMA Trial Evaluations PATE_01.1 to .3 and PATE_02.1 to .2 with PATE_00.2

The following e-mail is the translation of an extended reply and explanation of my independent evaluations of traditional powering trials with two sister-ships in the East China Sea. The provision of the basic mean values, being subjects of a joint HSVA/SSPA project, and the permission to publish the results granted by Dr. Hollenbach at HSVA are gratefully acknowledged.

As usual a translation is instrumental in clarifying arguments, though in this case only marginal changes and few additions have been necessary. The 'final' versions of the PATEs under discussion together with my complete related correspondence with Dr. Hollenbach, of 'cause' in German, are to be found on my website www.m-schmiechen.de under 'News on ship powering trials'.

From: Michael Schmiechen
Sent: Wednesday, June 4, 2014 3:12 PM
To: Uwe Hollenbach
Cc: Klaus Wagner ; Friedrich Mewis ; Stefan Krüger ;
Bettar Moctar ; Som D. Sharma
Subject: Our correspondence on PATE_01 and _02 cont'd

Dear Dr. Hollenbach,

during further, more 'physical' home work I had plenty of time to ponder the comparisons of our evaluations of the powering trials with two sister ships in the East China Sea.

In advance!

My correspondence with Dr. Klaus Wagner at Rostock is much more extended and detailed than ours. It is as intense as my style of working, at least so far. Between my drafts and results and his responses delays of two months never occur!

Since our first meeting on occasion of my 2nd INTERACTION Berlin '91 he is not only one of the few colleagues always interested in the development of my ideas, but he has often taken active part in that development.

And since my retirement from VWS, the Berlin Model Basin, Dr. Wagner has played the role of my lector, always creative and prompt. And for this service I am most thankful. During all my professional life and later I have always had my drafts scrutinised by lectors before ‘delivery’, thus this mail.

Statistics over all double runs

But now to the subject itself. Two worlds can in fact not differ more than ours! Without referring to details I noticed in your remarks, that you always consider individual double runs. But I will not, I cannot follow you onto this ‘level’. According to my long, pertinent, painful experience the analysis of single runs is not meaningful due to the omnipresent random disturbances of ‘any’ type.

Therefore I always jointly consider all double runs available, or selected for ‘good’, qualified reasons. And I analyse the residua with utmost care concerning deviations from normal distributions. This way I check the adequacy of my conventions adopted and at the same time the applicability of the elementary theory of samples.

Friedrich Mewis occasionally mentioned that I am evaluating trials like a physicist. And of course he was right! I am in fact doing it as a ‘mechanist’ according to the current state of the art and not according to the traditional practice of naval architects. Referring to this 'difference I have repeatedly stated that there are too many naval architects in ship model basins.

They ‘believe’ to know, what the output ‘should’ be, and there are too few theoreticians, who ‘know’ how to ‘arrive’ professionally at the output. The ritual repetition of the misunderstood rules of the elementary theory of samples is not sufficient for the difficult problems at hand.

Analysis of ‘raw’ data

My procedure is already necessary in view of the fact, that I myself could not scrutinise and analyse the basic data, as has been possible in case of the ANONYMA trials. ‘Mean’ values of unknown origin I am always using only with extreme care.

As I have experienced during the evaluation of the METEOR model test results, and just now during the continued analysis of my quasi-steady ‘model’ test of 1986, in cases of doubt not more or less obscure mean values are relevant, but stationary values, extrema! Even at ballast conditions the smallest accelerations upset the energy, alias power balances.

MS 28.08.2014 08:00 h

Balances of partial energies

Here comes the repetition of another fundamental statement: I am not considering momentum, alias ‘force’ balances, but following Lagrange I consider balances of partial energies, alias power balances. As a consequence a number of problems encountered in the traditional approach do ‘principally’ not exist in this approach! In particular the propulsive efficiency is not at all necessary for the analysis of traditional trials data.

This is in contrast to the ‘ITTC 2012 Guideline’, not yet approved by the Full Conference, but already ‘universally’ accepted. In this Guideline the propulsive efficiency ‘figures’ as a fundamental ‘input’, surprisingly not even occurring in the list of symbols and ‘forgetting’ about its ‘origin’, evidently playing the role of a joker pulled out of the sleeve. As I have explained earlier in my view the name ‘direct power method’ for this procedure is the most blatant des-information possible.

Supplied power first

Due to the usually relatively small variation of the propeller loading during trials the analysis of the data can be separated into two partial problems. The stable solution of each of them is simply obtained as solution of a system of linear equations, provided one uses numerical methods adequate for solving more or less ill-conditioned systems of equations.

As appropriate I have first analysed for the power supplied and thus jointly identified the current and ‘calibrated’ the propeller, full scale (!) under trials conditions (!), i. e. at the extremely small nominal submergence at the ballast condition and in the sea state prevailing during the trials.

Checking my results PATE_01_1 to _3, based on three different sub-jsets of double runs, I notice, that the propeller power characteristics and currents I have identified are ‘practically’ independent of the number of double runs accounted for. Using a traditional method, known to be error prone, you have identified considerably different values of the current, and thus the propeller characteristic you identified also differs considerably from mine.

In case of PATE_02 at more favourable environmental conditions the current values we have identified are nearly identical and thus the propeller characteristics. And the latter are in very close agreement with the characteristic I have identified before for the sister ship (PATEs_01).

Current: ’fundamental’ solution

Your remark that my method to identify the current is more elegant than that of Peter Schenzle, HSVA is still using, is a typical ’under-statement’ of naval architects, who do not ‘want’ to understand the problem and its solution. You may want it or not, my axiomatic interpretation of the concept is in fact the only meaningful. It ‘works’ without any expensive and delicate devices and without any extra calibration at any wind and waves condition.

Even Dr. Klaus Wagner and Dr. Giulio Gennaro at Genova in the depths of their hearts felt that my solution was provisional, some day to be replaced by 'real' logs to be developed using ‘advanced’ technologies available. But any of these logs suffers from the same fundamental deficiency as any of the ‘simple’ thrust meters invented by dilettantes and developed in wasteful ‘research’ projects. Even if they would ‘function’ some day, neither the thrust meters, nor the logs could be calibrated! But are they ‘measuring’ systems, if they cannot be calibrated? Would you consider buying any of them?

Power required

After having jointly identified the current and the propeller power characteristic in behind condition I have analysed the power required, in order to reduce the data to the nominal (!) no wind and no waves condition defined.

That my very crude model of the power required used in the case under consideration and others has repeatedly been felt inadequate by Dr. Wagner and Dr. Gennaro. But both admitted that the few [crudely ‘estimated’] data often only available do not permit more than ‘to nail the egg onto the rail’, as Columbus did before.

Further detailed comparison of the data acquired during the trials with the two two sister ships may provide deeper insights and further ‘results’. Thus in case of PATE_02 I have used a parameter of the required power identified before in PATE_01; see below.
Analyses of significance

To answer your detailed questions I will have to study the confidence ranges, which I have always determined and reported. I admit that my loose, qualitative, marine engineers remarks concerning the quality of results and their agreement based on those ranges are certainly too vague to meet the ‘standards’ and claims (!) of naval architects.

MS 28.08.2014 08:00 h

In case of the ANONYMA trials I have determined the confidence ranges of the average values, based on the raw data scrutinised before. I am looking forward to your analyses, that must be basic constituents of your joint research project with SSPA.

With my thanks for the permit to publish my analyses and their results I kindly ask you, to excuse this repeated attempt to explain aspects I consider essential and also to publish all details of your evaluations. Only this will permit all interested colleagues, among them Professors Stefan Krüger and Bettar el Moctar, to arrive at their own judgements.

Surprising coincidence

Again and again I have explicitly stated, that the values of the concepts constituted and interpreted by my conventions need in principle not to coincide with the values of the corresponding, traditionally interpreted concepts. For linking up with prior experience an accidental (!) coincidence is of course 'useful', but maybe misleading as in our case.

The surprising, nearly perfect coincidence of our final results, despite my restraint on the essentials, avoiding naval architectural folklore and 'thousands' of little corrections, will cause and require even hard-boiled naval architects to think twice.

How you arrived from your defective intermediate values [in case of PATE_01] at you final results and came up with the idea that I have tuned my results with your results, you will certainly explain to me and our colleagues occasionally.

Who is afraid of the wicked guy?

Your opinion expressed earlier, that clients of HSVA may be shied away by mentioning my name, frightened by my naked pragmatism, is hard to believe, maybe even for yourself. Frightened for well understood reasons are my colleagues at some model basins.

For clients everything is 'the same'. As long as they accept the same 'people' to provide the predictions and their confirmations 'as well', they want to be cheated or want to cheat IMO in proving to conform to the required EEDI.

Acceptable standards

Since my Schiffstechnik and STG papers of 1980 it is known that acceptable and lasting conventions are nothing else but axiomatic systems. And that their construction should not be left to naval architects, but experts in theory and practice of formal languages.

Consequently I have asked such experts, also in connection with the fundamental standard DIN 1313, but so far without success. The simple reason is, that 'everybody is thinking of himself and his problems, only I am thinking of myself and my problems.'

But everybody interested will admit, that my procedure is very transparent and, as the examples show, is objective, i. e. independent of the 'observer', of the person in charge of the evaluation. It depends on very few, 'self'-evident conventions, and, as it must (!) be, it does *not* depend on any further prior knowledge, any prior data selected *ad hoc* (!) and data derived from model tests, suffering from the lack of similarity of flow conditions, and thus in particular without values of the propulsive efficiency.

My procedure, as far as I have developed it so far, thus meets the prerequisites and requirements of a reasonable, acceptable standard, as I last noted in my HANSA paper of 2013. And for that reason I repeat my publicly stated and now even more solidly founded conviction, that ITTC, ISO and IMO in the 'wake' of MARIN, the emperor in his new clothes, the 'unbelievable' STAimo method, obstruct the urgently necessary rationalisation for at least the next decade.

Further developments

Personally I shall most likely not witness the end of this obstruction. But I am confident that young colleagues will follow my efficient rational approaches and develop them further. Jan Holtrop, Michiel Verhulst and Patrick Hooijmans at Wageningen (!) are doing that already for a long time, explicitly acknowledging my pioneering work.

They do that in view of extremely efficient trials and monitoring requiring no thrust measurements, much 'simpler' than my very ambitious METEOR project in 1988. 'But [as] Jesus said unto them: A prophet is not without honour, save in his own country, and in his own house' (Matthew 13, 57), 'thus' no such research and development efforts take place in Germany [except for my own, the recent results of which I am about to publish at the forthcoming 27th ITTC at Copenhagen].

MS 28.08.2014 08:00 h

Quasi-steady trials and monitoring

How the propulsive efficiency can reliably be identified solely based on quasi-steady trials without thrust measurements (!) I have already demonstrated using the data of my 'model' test of 1986. [The first comparison with traditional results, unsatisfactory due to a stupid mistake, published in the first volume of this 'Festschrift', has in the meantime been replaced on my website by the correct comparison.] So in future there will no longer be the need to pull the joker out of the sleeve, if *e. g.* necessary for monitoring purposes!

The problem to be solved in this case is the reliable identification of the current. The solution is possible as before, if only the 'steady' states 'passed' during the quasi-steady test are determined and analysed. [If the displacement and hence the inertia of the vessel subject to the trial are small, as has been the case in the CORSAIR project, phase relations have to be accounted for!]

Critical discussions

I did not lecture over forty years on professional problem solving in 'treating' hydro-mechanical systems to let the dilettante ITTC 2012 Guideline 'pass' without comment. Under Hermann Lerbs, Otto Grim, Odo Krappinger at HSVA, as well as Fritz Horn, Hans Amtsberg and Siegfried Schuster at VWS such a sloppy 'report' would never have left their model basins.

And Hans Edstrand, former director of SSPA, would have fired each of the members of the ITTC Specialists Committee on Powering of Ships in Service (SC PSS) individually. His credo was that Specialists had nothing to do at the Conference of Tank Superintendents (!), who still knew the problems under discussion and to be solved by themselves!

I have proposed the same 'procedure' to the Chairman of the Executive Committee after the members of the PSS Specialists Committee on occasion of one of their expensive meetings came up with the finding for him (!), that my procedure for the evaluation of traditional trials requires thrust measurements.

Despite the detailed, unmistable documentation of the opposite, repeated over and over again since 1998 to meet any taste, none of the members, including yourself, has prevented the blatant des-information of the [then] Chairman of the Executive Committee.

Credibility ahoy!

Subsequently I have observed with interest, that the untenable ITTC 2012 Guideline, prematurely forwarded to IMO contrary to the Rules of ITTC, vanished from the website of ITTC for a while and to reappear only shortly later. And that in the meantime ITTC suddenly had a new Chairman! I wonder how he will sort out the complete mess, which the SC PSS and his predecessor have produced.

That the MARIN inspired ITTC 2012 Guideline will not only be adopted by IMO, but will be integrated into the revised standard ISO 15016 will in the meantime have been approved by all national groups, including the German group consisting of you alone (?). My request to provide the example included in the revised standard for independent scrutiny as I have performed and published on the previous, evidently defective example in 1998, has not been granted by the convener due to the alleged lack of such an example at that time.

Rules of the game

Subsequent to my detailed draft of a new edition of the fundamental standard DIN 1313 'Grössen' ('Magnitudes', alias 'Quantities') and its emotional, unqualified rejection by the authors of the current version, some of them logicians at my age, I now not only understand, how standards are 'made', but why it is done that way.

The rules of DIN and of ISO, to establish a consensus of representatives of 'interested' groups, imply the fatal tendency to perpetuate the current state of practice, [not of research,] and thus to delay or even to inhibit progress. Individual experts are explicitly excluded and my correspondence with DIN is strictly confidential!

'Accordingly' my website has been regularly checked for 'illegal' publications. I even had to delete from my website not only the links, but the files referred to. But my draft as well as related discussions of the interesting, fundamental project and the documentation of the whole 'history', whatever DIN could not 'prohibit', is to be found on my website.

With my best wishes for Pentecost, 'Pfingsten, das liebliche Fest', as Goethe started his 'pretty' obscene 'Reinicke Fuchs',
yours, Michael Schmiechen.

MS 28.08.2014 08:00 h

Correpondence with Dott. Giulio Gennaro:
Subject: Letter to Dr. Hollenbach: Discussion cont'd

From: Giulio Gennaro
Sent: Thursday, July 10, 2014 5:06 PM
To: Michael Schmiechen
Cc: Klaus Wagner

Dear Prof. Schmiechen,

very well, I shall wait four your draft volume two.

'Little', or not, is just a matter of scale!

Kind regards
Giulio Gennaro.

From: Michael Schmiechen
Sent: Thursday, July 10, 2014 5:01 PM
To: Giulio Gennaro
Cc: Klaus Wagner

Dear Dottore,

many thanks for your response sent at the 'irrational' time July 10, 12:11 AM. I am not too sure, whether I decoded it correctly. But I just notice, that all my own mails (still) carry time stamps the same old fashioned way.

As far as I can see, we agree again, at least for the time being. Thus I shall now continue to write all the necessary 'little' introductions to the work I intend to document in 'volume two'. 'Little' is of course quite euphemistic in view of the time it takes me, to phrase any single paragraph.

Further I have to complete my final programme for the evaluation of quasi-steady trials without thrust measurements, including the identification of the current, the resistance and the propulsive efficiency!

With kind regards until further battles and rebuttels
yours, Michael Schmiechen.

From: Giulio Gennaro
Sent: Thursday, July 10, 2014 12:11 AM
To: Michael Schmiechen
Cc: Klaus Wagner

Dear Professor,

what is necessary or unnecessary depends on the goals.

"Starting with my papers of 1980, based on my understanding of the theory and history of knowledge, I claim to have developed maybe the simplest language meeting the requirements. And all my work has been to prove, that this language not only meets the epistemological and philosophical requirements, but serves the practical purposes, and thus is worth to be agreed upon."

I agree

"If now even you prefer to speak another language, I may have lost another battle. But I continue to fight! Reading your following statement, I simply do not understand what you are saying: 'I perfectly understand that the propeller is a self calibrated tachometer (if we dismiss the change in wake with draft, trim and speed).' My model is completely free of all the funny restrictions occurring in your brackets! As I stated explicitly, I am calibrating the propeller at any loading and environmental condition anew, jointly identifying the current. So the powering characteristic of the propeller and the current at the prevailing conditions are always 'coherent', as I require."

I mean that, if I have understood correctly, the characteristics of the propeller, (been based on the ship speed of advance and not on the propulsor speed of advance) will shift if performing the evaluation in ballast or in loaded conditions, since the wake fraction will also change.

"And this is achieved without any extra instrumentation. But if I read your remarks correctly, that instrumentation is essentially required only for the identification of parameters of the sea state."

There is a need of an objective, and reliable measurement of the sea state, and this device provides it.

"All models are wrong. Some are useful."

I perfectly agree.

The question is to start from the most simple and coherent model as possible (and yours is) and flesh it out to achieve more. Some additions can be useful, some not so useful, some cumbersome, some light.

Good night and kind regards
Giulio Gennaro.

From: Michael Schmiechen
Sent: Wednesday, July 9, 2014 1:58 PM
To: SINMsrl
Cc: Klaus Wagner

Dear Dottore,

many thanks for another of your informative and stimulating mails.

The fact that you are trained as a mechnical engineeer explains and has the 'advantage', that you are among the few colleagues to understand, what I am talking about. The 'disadvantage' is, that naval architects, talking in another 'language', will not really 'appreciate' your affirmative comments.

I agree, that propeller designers have priorities very different from mine. So I cannot really contribute to your problems, although I have identified the mean wake full scale for the METEOR and on model scale. Let me thus continue on the point of disagreement in terms of our rational language.

As I have pointed out since 1980 and repeated over and over again in various guises for every taste, rational conventions are nothing else but axiomatic systems, i. e. 'coherent', properly constructed formal languages. Thus the concepts used 'derive' their meaning in the context of these languages only.

As an example, adressed to a mechanical engineer, I refer to the concept of 'force'. As you know the 'meaning', i. e. the operational interpretation of this concept makes sense only in the context of Newton's and Euler's conventions. Every other, 'independent' interpretation opens the door for systematic 'errors', if not blatant nonsense, or 'plain' bla-bla.

Coming back to my first sentence: naval architects do not have a formal language, so their concepts are not well defined, to say it politely, and their incoherent interpretations following Froude, their values definitely differ from mine. Any coincidence is strictly accidental! That naval architects do not adhere to the same standardised conventions, as you mention, is another source of hopeless confusion.

After this long introduction my question is simply: In what, hopefully coherent context are you measuring the speed through the water under operational conditions, in the sea state prevailing at the trials? My interpretation is based on the joint 'calibration' of the propeller, even in ballast, at extremely small nominal submergence, maybe giving rise to ventilation as in case of the ANONYMA, a phenomenon not even noticed in the evaluation by Germanischer Lloyd.

With kind regards yours,
Michael Schmiechen.

From: Giulio Gennaro
Sent: Tuesday, July 8, 2014 11:12 PM
To: Michael Schmiechen
Cc: Klaus Wagner

Dear Prof. Schmiechen

I am not a naval architect, I am a mechanical engineer!

We can measure the speed through water of the ship.

We cannot measure the speed through water of the propulsor, which is of course different.

What is good is that the ratio between the speed through water of the ship and of the propulsor does not vary much with the speed (but it can vary in a more substantial manner with the draft and trim)

I can agree that the speed through water of the propulsor is not of interest for evaluating the ship performance. But, from the propulsor designer point of view, it is very important for the correct design of the propulsor itself.

BTW, please note that the biggest source of uncertainty for the propeller designer is the wake. Model basins (and ITTC) prescribe empirical methods for the scaling of the effective wake. However the 3D nominal wake, which is measured at model field, is NEVER scaled by any model basin. This is plainly outrageous.

Another matter is CP propellers, BTW, people keep on performing tests of ships equipped with CP propellers along the combinator curve instead of doing it a fixed design pitch! Therefore there results are, in principle, rubbish.

As far as your quasi steady trials, this is something that I need to go back and study. If I remember correctly you use the entire quasi steady data set for estimating the propeller curve, and the "steady" ones to get rid of inertial terms.

I agree that trials and monitoring is a matter of conventions, but let me add physics to the party.

BTW: is there a single model basin conducting model test 100% according to ITTC recommendations? I would say no. Form factor is seldom used. In one of the last model tests I attended it was decided not to scale the wake fraction nor the propeller OWT.

Kind regards
Giulio Gennaro.

From: Michael Schmiechen
Sent: Tuesday, July 8, 2014 10:38 PM
To: Giulio Gennaro
Cc: Klaus Wagner

Dear Dottore,

many thanks for your quick response and support. As before I shall prepare our discussion for publication together with my explanatory mail to Dr. Hollenbach.

One point of disagreement I want to stress right now. Concerning the speed through the water you, as a naval architect, still have not understood my argument, while Dr. Wagner finally did. Even if you could develop an expensive log, which everybody would have to buy, maintain and operate (!), your only chance to calibrate it, is to calibrate 'against' my method!

Think about it! And about thrust meters, suffering from the same deficiency! And be aware of my quasi-steady trials and monitoring without thrust measurements, trials [and monitoring] under service conditions without anybody noticing that such 'trials' [necessary to identify the phenomenological parameters of my model] are 'taking place'!

After having identified the model resistance and propulsive efficiency I am currently finishing the routine to identify the current as well, as necessary on full scale, maybe even on model scale not only in cases of 'tank storms'.

In case of the sea state the situation is only slightly different. I agree that the usually very crude 'estimates' should be replaced by something more adequate. But you still need conventions to reduce the data as I have done in a number of cases, when more detailed data have been available. The whole business of trials and monitoring is not a matter of hydrodynamics but of conventions!

So much in a hurry for tonight!
Yours Michael Schmiechen.

From: Giulio Gennaro
Sent: Tuesday, July 8, 2014 5:39 PM
To: Michael Schmiechen
Cc: Klaus Wagner

Dear Prof. Schmiechen
Dear Dr. Wagner

I have read with great interest your email to Mr. Hollenbach and I substantially concur with what you have stated.

Just some comments:

1) Double runs are already bad enough during sea trails, but they are absolutely not possible for in service monitoring, runs should be evaluated as a whole, not in pairs, in doing so one might need to discard one, not necessarily the pair.

2) The comment that you are evaluating trials like a physicist was a good laugh. How else should one proceed? like a fortune teller?!?

3) I do consider that your method / solution in respect of the identification of the current is provisional, I think it can be ameliorated. Your method is very good for examining quasi contemporary measurements, since the characteristic curve of the propeller evolves slowly over time. But if the goal is also to check the ageing of the propeller (essentially due to fouling) and to do it on the basis of the data that can be obtained while the ship is in service (as opposed to dedicated short trials) than I fear that some other mean for the measurement of the current is in order (and, as I have explained, the use of 3D imaging of the X-band radar clutter can help a lot).

4) As far as your power model I don't consider it inadequate, but I consider that it can be ameliorated. The fact is that wind and waves motions are not necessarily coupled, moreover it is possible to have an objective maesurement od the wave state (by means of 3D imaging of the X-band radar clutter). My idea would be to separate the wind and waves corrections by means of separate axioms. If and when possible, if not I am more than happy with your method.

5) If people are scare by pragmatism then they should better not mess with science and engineering.

6) I completely agree that the sea trials measurements and evaluations must be objective, independent from the people involved, and totally severed from any model test data.

7) However I consider that model tests can be used, as a whole (as whole, not specific ones), better to formulate the axioms.

8) I completely agree that the example included in the revised standard should be publicly available for independent scrutiny, anything less than that is anti-scientific. We need no Delphi Oracle, not in the third millennium a.c.

Kind regards
Giulio Gennaro.

From: Michael Schmiechen
Sent: Monday, July 7, 2014 11:23 AM
To: Giulio Gennaro
Cc: Klaus Wagner
Subject: Re: CLT propeller news

Dear Dottore,

many thanks for your very informative news letter. And congratulations on your continued successful development of the CLT propeller.

Concernning trials evaluation I admit that for 'the time being', the next decade or 'forever' I have lost my battle against 'the enemies of the open society'. My friend Gerhard Strasser, Chairman of the ITTC Advisory Council, knew all my work, but could and/or did not prevent the incredible acceptance of the MARIN inspired stupid STAimo method by ITTC, ISO and IMO.

In order not to repeat what I have said many times I attach the translation of my 'last', explanatory letter to Dr. Uwe Hollenbach at HSVA concernnig my PATEs, our competing evaluations of trials with two sister ships in the East China Sea. Currently I am working on the second volume of my 'Festschrift' commemorating my tests with the METEOR, to be published on occasion of the 27th ITTC at Copenhagen early in September.

Despite my agressive correspondence with the colleagues of the 'Specialists', Propulsion and Executive Committees I have been invited to attend the Full Conference, which has been dwarfed to acclaim the premature decision of the Chairman, who suddenly has left 'the bridge' and left the mess, he has caused following the 'Specialists' and MARIN's pressure, to his successor.

For now, so much, as always (still) in a hurry
yours, Michael Schmiechen.

From: Giulio Gennaro
Sent: Sunday, July 6, 2014 6:40 PM
To: Michael Schmiechen
Subject: CLT propeller news

Dear Prof. Schmiechen

I hope all is well and fine in Berlin.

I am happy to inform you of the following:

1) We have recently performed at SVA, Wien, back to back model tests on a 20K DWT tanker alternatively fitted with CLT and Kappel propellers.The results showed the superior efficiency of the CLT propeller over the Kappel propeller.We already knew this fact from our calculations but this is the first time that we were able to measure and to prove it by means of experiments. This is the confirmation that today CLT propellers are the dominant option for the powering of ships.

2) and 3) deleted

Finally please be informed that, while at SVA, I talked with Dr. Strasser about sea trial measurements and the like, he told me that he and his ITTC colleagues have just completed a revision of ISO for sea trials. According to him this new version will be able to increase the meaning and congruency of full scale measurements. I have asked him if he could kindly send me copy of this new draft for my evaluation.

Please, let me have your comments.
Kind regards
Giulio Gennaro.

Evaluations of the quasi-steady 'model'-test
performed before the METEOR tests in 1986

Quasi-steady trials and monitoring
Rational evaluation of powering performance
Preliminary evaluation ignoring the thrust data

On quasi-steady trials model and full scale

Problem

Traditional trials, still 'standardly' performed and evaluated according to various traditional 'Codes' although very inefficient, expensive and unsatisfactory, are hopelessly inadequate for monitoring of the powering performance of ship in service.

Solution

The theoretical solution to overcome the deficiencies has been proposed in 1980 and the quasi-steady trials with METEOR in 1988 have demonstrated that, based on reliable measurements of thrust and torque with a calibrated shaft, the powering performance can be analysed in every detail.

Lack of interest

Although reliable measurements of thrust are *not* prohibitively expensive, evidently *nobody* is 'interested' to perform them. The 'simple' reason is that traditional evaluations would require hull towing and propeller open water tests, definitely not possible at service conditions.

Model technique

And the rational approach is still 'ignored', even on model scale, although the model technique has been developed to maturity using the data of a quasi-steady 'model' test, performed before the METEOR test in 1986.

Thrust data ignored

In view of the fact, that measurements of thrust are 'never' performed, I have analysed the 'model' data, ignoring the thrust data. And I have identified the total resistance and the propulsive efficiency in perfect agreement with the results of 'complete' rational and the traditional evaluations. 'Streamlining' all programs for routine applications remains an ongoing task.

Current identified

And finally I have identified the current in the model basin and the propeller powering characteristic in the behind condition, based on the quasi-*stationary* conditions passed during the quasi-*steady* trial, a method already applied in 1989 and mentioned in the Proceedings of my 2nd INTERACTION Berlin '91, thus paving the road for full scale applications.

Full scale applications

If applied on full scale the powers required due to the motion through the water and due to wind and waves can also be identified and thus, with the propulsive efficiency identified before, even the hull resistance and the wind and wave resistance! *Nota bene*: No thrust measurements being required!

MS 28.08.2014 08:00 h

Correspondence on quasi-steady trials and monitoring with my fans at Wageningen

----- Original Message -----
From: "Michael Schmiechen" <m.schm@t-online.de>
To: "Patrick Hooijmans" <p.hooijmans@marin.nl>
Sent: Thursday, February 20, 2014 3:25 PM
Subject: Fw: Rational evaluation of another traditional trial

Hallo Herr Hooijmans,

as you see, my work goes on after the ANONYMA trials. Although the current evaluation of a traditional trial is not directly related to quasi-steady trials, the results may be of 'considerable' interest to you.

Talking to young colleagues I understand that they are upset, not to say disgusted, by the 'practices' of IMO, ISO, DIN, ITTC and, last but not least, MARIN in 'settling' problems of common concern. They do not want jokers out of sleeves and majority votes of ignorants, but power tools adequate for the problems at hand and providing solutions lasting at least for the coming decades of their professional lives.

With kind regards to my fans at Wageningen
yours, Michael Schmiechen.

----- Original Message -----
From: "Michael Schmiechen" <m.schm@t-online.de>
To: "Didier Frechou" <didier.frechou@dga.defense.gouv.fr>;
"Chenjun Yang" <wangxuef@sjtu.edu.cn>;
"Emin Korkut" <korkutem@itu.edu.tr>;
"Moon Chan Kim" <kmcprop@pusan.ac.kr>;
"Rainer Grabert" <grabert@sva-potsdam.de>;
"Steve Ceccio" <ceccio@engin.umich.edu>;
"Takuya Ohmori" <takuya_omori@ihi.co.jp>;
"Tom Dinham-Peren " <tperen@bmtdsl.co.uk>;
"V. Borusevich" <borusevich64@mail.ru>
Cc: "Anton Minchev" <ami@force.dk>;
"Aage Damsgaard" <aad@force.dk>;
"Gerhard Strasser" <prof.dr.g.strasser@sva.at>

Sent: Thursday, February 20, 2014 10:28 AM

Subject: Fw: Rational evaluation of another traditional trial

Dear Colleagues,

attached please find an open letter and the rational evaluation of another traditional trial, both of which I have forwarded to your colleagues at the Specialists Committee on the Powering of Ships in Service.

There is not much to be added, except for the fact, that since I wrote the letter to your colleagues I happened to check the website of ITTC again. And to my surprise the ITTC 2012 Guidelines for the evaluation of trials has popped up again, although contrary to the repeated claim, it has not (!!!) been approved by the ITTC.

The introductory text states, that "in order to support the efforts at IMO in relation to the introduction of EEDI regulations, ITTC has updated the speed and power sea trial procedures outside the normal sequence of work. The updated procedures submitted to IMO may be found here".

Evidently "outside the normal sequence of work" is an euphemistic, purposely misleading description of the fact, that this important Guideline has not (!!!) been approved by the 27th ITTC, Date 2012, as the Full Conference, the body to approve or rather not to approve, will take place at Copenhagen only in September 2014.

Futher studying the 'new' Guideline I noticed, that hardly anything has been corrected, since I have critically scrutinised its first version in great detail and pointed out the serious deficiencies in the Chapter '4.3.4 The Emperor's New Clothes' of my paper on 'Future Ship Powering Trials and Monitoring Now!'

This paper has first been published early in 2013 and again in the volume 'From METEOR 1988 to ANONYMA 2013 and further!', published on occasion of the 108th Annual Meeting of Schiffbautechnische Gesellschaft held at Berlin in November 2013 (VWS Mitt 62 (2013), pages 1 thru 44).

The crucial paragraphs in the first sections of the ITTC 2012 Guideline are pin-pointed here again, but I shall not repeat all the details discussed earlier.

'1. Purpose' remained without change. "The descriptions for the calculation methods of the resistance increase due to winds, due to waves and the analysis procedure for speed corrections based on relevant research results are modified from ITTC recommended procedures and guidelines (7.5-04-01-01.2/2005), and to fit IMO purposes." 'To fit IMO purposes' is of course a very 'strong' point!

'2. Terms and definitions' remained without change, although completely inadequate for the purposes at hand as my evaluations have shown, most recently in the example attached; see below.

'3. Responsibilities' remained without change. "Agreement should be obtained concerning the methods used to correct the trial data. The measured data, analysis process and the results should be transparent and open to the trial team." The procedure following does not meet the basic requirements of observer independence and transparency, while the rational procedure evidently does, as has been demonstrated over and over again.

'4. ANALYSIS PROCEDURE
4.1 General Remarks' remained without change. "The recommended procedure for the analysis of speed trials is the direct power method and requires displacement / power / rate of revolutions / etaD and etaS as input values." As I have explained earlier, the term 'direct power method' is plain 'des-information'. Although the concept of propulsive efficiency is fundamental for that method, it still does show up among the 'Terms and Definitions' in the completely inadequate Section 2.

This is in fact the crucial point. To solve this fundamental problem by introducing a joker (!) is a trick, seriously endangering the reputation of model basins and their ITTC. As I have shown in the first exercise of an ongoing project on quasi-steady trials and monitoring the full scale resistance and propulsive efficiency may be identified without any prior data and, nota bene, without thrust measurements!

Evidently the traditional evaluation, referred to in the evaluation PATE_01, has been based on the unsatisfactory 'direct power method'. Please do not misinterprete the strictly accidental coincidence of the final results for different (!) conditions. The rational procedure is not only extremely transparent, but it works even in cases, where no experience and/or prior information are available, typically for ballast conditions.

Having contributed to the work of ITTC for twenty years, two terms as Secretary of the Executive Committee and five terms on the Symbols and Terminology Group, I continue to work for and continue to try and protect the reputation of the ITTC.

Sorry! My introductory remark 'There is not much to be added' was evidently premature.

With many thanks for your kind attention
yours, Michael Schmiechen.

----- Original Message -----
From: "Michael Schmiechen" <m.schm@t-online.de>
To: "Wojciech Gorski" <wojciech.gorski@cto.gda.pl>;
"Solia Werner" <sofia.werner@sspa.se>;
"Uwe Hollenbach" <hollenbach@hsva.de>;
"Michio Takai" <mic_takai@shi.co.jp>;
"Masaru Tsujimoto" <m-tsuji@nmri.go.jp>;
"Jinbao Wang" <wang_jb@maric.com.cn>;
"Heungwon Seo" <hwseo@hhi.co.kr>;
"G. Grigoropoulos" <Gregory@central.ntua.gr>;
"Anton Minchev" <ami@force.dk>;
"Angelo Olivieri" <a.olivieri@insean.it>;
"Henk van den Boom" <H.v.d.Boom@marin.nl>
Sent: Tuesday, February 18, 2014 4:24 PM

Subject: Fw: Rational evaluation of another traditional trial

Dear colleagues,

as you see, my work is going on. Following the publication of my evaluation of the ANONYMA trials there is a widely growing interest in the rational approach I am promoting.

Thus, please find attached an open letter and the very detailed rational evaluation of another traditional trial, 'essentially a particularly simple and instructive example of my rational procedure', as stated in my letter to Mr. Ishiguro, who is in charge of the 'harmonised' standard ISO 15016.

'After all' I am looking forward to your Report for the forthcoming 27th ITTC and to the vote of the Full Conference on your Guidelines concerning the evaluation of trials. As this will take place only in September I wonder how Mr. Ishiguro can possibly finish his work by the end of March.

In the meantime an organisation called STAimo (!) again claims that the ITTC 2012 Guidelines have been adopted by the ITTC, although those vanished from the ITTC website, in accordance with the rules of ITTC being replaced by the former Guidelines approved by the 24th ITTC in 2005.

With kind regards yours,
Michael Schmiechen.

----- Original Message -----
From: "Michael Schmiechen" <m.schm@t-online.de>
To: "Tsuyoshi Ishiguro" <ishiguro-tsuyoshi@jmuc.co.jp>
Cc: "Ken Takagi" <takagi@k.u-tokyo.ac.jp>;
"Kosei Hasegawa" <hasegawa@jstra.jp>;
"Kuniharu Nakatake" <nakatake@ja3.so-net.ne.jp>;
"Kinya Tamura" <tamurak@jf6.so-net.ne.jp>;
"Naoji Toki" <toki.naoji.mz@ehime-u.ac.jp>
Sent: Monday, February 17, 2014 6:37 PM

Subject: Rational evaluation of another traditional trial

Dear Ishiguro San,

referring to my earlier request for the example of your DIS 15016, after all I 'found out' to my great surprise, that the DIS does not contain any example to be scrutinised! Why did you yourself not let me know this incredible deficiency?

Further, being an 'authority' on trials I am no longer attempting 'to be authorised' (at the incredible costs of over one thousand Euros per anno and per project, not to mention travel expenses etc) to contribute to the work of the German DIN NSMT groups concerned with ISO 15016 and ISO 19030.

But as it happens, subsequently to the presentation of the evaluation of the ANONYMA trials another set of trials data, one of the reference cases of an ongoing research project, has been made available for independent analysis, and the permit to publish the results, together with some results of an undisclosed traditional procedure, has been granted.

For ready reference I attach the resulting paper PATE_01.pdf, essentially a particularly simple and instructive example of my rational procedure, in its present status. But if you like to refer to the paper, updated whenever necessary and/or requested by anybody, please note that its up-to-date version is to be found on the website www.m-schmiechen.de under 'News on ship powering trials' " or via the link http://www.m-schmiechen.homepage.t-online.de/HomepageClassic01/PATE_01.pdf .

The name of this and the following exercises in 'Post ANONYMY Trial Evaluations' has purposely been chosen in accordance with the explanation in 'Webster's New World Dictionary of the American Language':

pate (pät). n. [ME.; prob. orig. euphemistic (like Fr. tête, G. kopf, etc.); ? < or associated with L. patina (cf. PATEN)]. 1. the head. 2. the top of the head. 3. intelligence. A humorous or derogatory* term. (* taking away, showing disrespect).

Namely, 'taking away' all the superfluous parameters to be sucked from thumbs and 'showing disrespect' for all traditional procedures.

In view of the efficiency of my rational procedure, requiring no prior data whatsoever, I wonder who will possibly vote for your clumsy, hopelessly in-transparent DIS as explained in your presentation at the 7th Asian Ship-building Experts' Forum, November 7th to 8th, 2013 in Kobe?

In this context please also note the final paragraph in the Conclusions of my paper, triggered by the incredible 'STAimo' press release and website, reducing IMO and ISO to mere appendices of MARIN, and based on claims, the most basic ones still not (yet?) substantiated!

MS 28.08.2014 08:00 h

To repeat my earlier remark: To continue the 'procession' [ignoring basic requirements and the state of research in favour of MARIN's business] is no viable choice [for serious professionals and a responsible community]!

With kind regards yours,
Michael Schmiechen.

PS: In view of the current interest in the subject and the standardisation 'developments' this is an open letter, published on my website and personally addressed to colleagues worldwide.

----- Original Message -----
From: "Michael Schmiechen" <m.schm@t-online.de>
To: "Tsuyoshi Ishiguro" <ishiguro-tsuyoshi@jmuc.co.jp>
Cc: "Kosei Hasegawa" <hasegawa@jstra.jp>; "Kuniharu Nakatake" <nakatake@ja3.so-net.ne.jp>
Sent: Monday, January 20, 2014 1:56 PM
Subject: Contributing to work on ISO DIS 15016 and ISO CD 19030

Dear Ishiguro San,

since two months now I am waiting for any response on my request for the data of the example in the DIS 15016 for independent analysis. According to the rules of the game no answer is a well understood answer as well.

Thus, knowing the rules of ISO, I am currently applying to be authorised member of the DIN NSMT Working Groups contributing to the revision of the standard ISO 15016: 2003-06 and to the standard to-be ISO 19030.

This will give me the chance to perform the exercise outlined and necessary for the benefit of the standard ISO 15016 and contribute to the work on the evolving standard ISO 19030 on monitoring of the powering performance along the lines of my preliminary exercise documented in the 'Festschrift'.

In the meantime I have updated my 'Festschrift', (and I will continue to do so as appropriate,) distributed on the occasion of the Annnual Meeting of the Schiffbautechnische Gesellschaft, the current version always to to be found on my website www.m-schmiechen.de under 'News on ship powering trials'.

With season's greetings and kind regards
yours, Michael Schmiechen.

Michael Schmiechen, apl. Prof.
for Hydromechanical Systems,
retired Deputy Director of VWS,
the Berlin Model Basin.

To: "Patrick Hooijmans" <p.hooijmans@marin.nl>,
"Michiel Verhulst" <m.verhulst@marin.nl>
Cc: "Klaus Wagner" <IKWAG@web.de>
Subject: Quasi-steady trials and monitoring
Date: Tue, 28 Jan 2014 19:59:49 +0100

Dear colleagues,

only today I have received a copy your earlier paper PRADS2010-12087.pdf from Dr. Klaus Wagner of Rostock, with whom I am in close contact concerning research and development on quasi-steady trials and monitoring. And having read yet just the acknowledgements I would like to thank you warmly for referring to my pioneering work. This is in fact one of the rare acknowledgements I have received over the past decades and thus it is most gratefully appreciated. Many thanks!

[***Acknowledgement***
The authors would like to express their special thanks to Prof. M. Schmiechen for stimulating publications and to convey him their appreciation. He has, as a pioneer in this area, ventured with unbelievable perseverance to advocate and introduce these novel methods in the field of propulsion research. The authors are grateful for Jan Holtrop's contributions to this paper. Jan introduced the quasi-steady method at MARIN and has been working on it for several decades].

You will certainly be aware of my various recent activities, triggered by diverse developments, not least by the 'aggressive' activities of 'your' Henk van den Boom. My recent work originated essentially in 2013 and most of it is to be found in my 'Festschrift' published and distributed on occasion of the 108th Annual Meeting of Schiffbautechnische Gesellschaft here at Berlin in November 2013. For ready reference you find the pdf file of the 'Festschrift' together with other pertinent material on my website in the Section 'News on ship powering trials'.

As a matter of fact I have just completed the evaluation of another 'anonymous' traditional trial and I was ready to evaluate the example in the current DIS 15016. But to my surprise I found out that such an example does not exist! As you will see or have seen I am strongly opposed to repeat the mistakes of ISO 15016: 2002-06. Accordingly I continue to alert colleagues worldwide to start thinking themselves instead of following the emperor in his new clothes.

You know that there is another standard, ISO 19030 under way, concerning monitoring in particular and to my knowledge MARIN is 'of course' involved. I just defined a goal and conceived a plan how to solve that problem in a rational, generally acceptable fashion, knowing that monitoring systems are already being successfully marketed, but the details are proprietory.

With kind regards to the colleagues at Wageningen
yours, Michael Schmiechen.

-----Ursprüngliche Nachricht-----
From: Verhulst, Michiel
Sent: Tuesday, January 5, 2010 2:32 PM
To: Michael Schmiechen
Subject: RE: Quasi-steady propulsion test technique

Dear Mr. Schmiechen,

Thank you for your message. Jan Holtrop told me about your work on the quasi-steady propulsion testing.

We hope to be able to write a paper for the upcoming PRADS on the QS technique for complex propulsion systems. We will for sure refer to your work here.

Best regards, Michiel Verhulst

ir. Michiel Verhulst
Project Manager Ships Powering
Principal Researcher Extrapolation & Correlation
mailto:M.Verhulst@marin.nl
T +31 317 49 34 70

-----Original Message-----
From: Michael Schmiechen
Sent: Monday, January 04, 2010 10:38 AM
To: Verhulst, Michiel; Holtrop, Jan
Cc: Mailbox R&D; Boom, Henk van den; Neil Bose; Klaus Wagner
Subject: Quasi-steady propulsion test technique

Dear Michiel Verhulst,
dear Jan Holtrop,
dear Hans von der Kam,

with great interest I have read your advertising contribution on your quasi-steady propulsion test technique in the recent MARIN report (no.98, page 20) and I found it most gratifying and satisfying, that you describe its advantages in exactly the same words, I have repeatedly used for many years, two decades at least.

As I have pointed out at different occasions, at last in my paper presented at Trondheim in June 2009, a disadvantage of the constrained model test technique is, that it picks up more noise than necessary, and its most severe handicap is, that it is not applicable full scale. For your convenience I attach a direct links to the paper and its presentation: http://www.m-schmiechen.de/HomepageClassic01/prop_50_pap.pdf and http://www.m-schmiechen.de/HomepageClassic01/prop_50_pre.pdf .

It was a pity that the organisers at Trondheim missed to notice that the contributions of Bose and of myself are directly related and that my paper provides answers to a number of questions raised in Bose's paper. 'Consequently' both presentations and discussions have been 'disrupted' by presentations of unrelated papers.

In the five minutes allotted for discussion 'having covered my topic in exactly twenty-five minutes' has been praised as my great achievement. But the fifty years of fundamental research and development, the problems I have addressed and solved, impossible to be solved in the traditional context, have not been touched, no serious discussion took place, could take place. And no written discussions have been received either, although I have invited them well ahead of the presentation. I consider this letter as the first entry and put it on my website for ready reference.

As I have demonstrated more than twenty years ago in the METEOR Project the unconstrained technique cannot only be applied on model, but on full scale as well, getting along without hull towing and propeller open water tests. It is thus not only conceptually much more advanced than the constrained method, but also commercially, permitting to save even more time and money, as I have pointed out over and over again.

On my website you find the proceedings the 2nd INTERACTION Berlin '91, devoted to the results of the METEOR Project. In the meantime I have of course further developed the method, all the details of the evaluation of a 'model' test to be found on my website. For ready reference here is the direct link to the final re-evaluation of 2008 according to an update following the observation of Wagner that something was 'wrong', in fact missing in my algorithm: http://www.m-schmiechen.de/HomepageClassic01 /mod_evaf.pdf . The results, in case of a rather traditional configuration tested excellently comparing with results of the traditional approach based on hull towing and propeller open water tests, have been published and referred to many times.

The equivalent 'open water' performance identified accounts for the non-uniform inflow to the propeller, a problem Horn and van Lammeren before the war, van Manen and others after the war tried to solve in an intellectually satisfactory fashion and which since has not been solved, but simply forgotten. 'Thus not surprisingly', Bose, although having known my results for years, has not even mentioned them in his book recently published. My written question concerning his reason not to refer to the results and the advantages of my approach has not yet been answered.

Of course the work I have done so far does not solve all the problems at hand. But I wonder why nobody takes up my line of development, which offers so many more dramatic advantages than those you claim for yours.

There must be many creative young people at MARIN eager to solve the demanding problems I have pointed out explicitly at various occasions. As in case of MARIN's trials and monitoring projects I feel that a personal discussion might help to overcome problems in understanding and taking advantage of my approach.

Looking forward to an eventual cooperation with kind regards and my best wishes for the new year
yours, Michael Schmiechen.

PS. As a commercial company MARIN is of course aware of the 'Copyright Law', the 'Doctrine of Fair Use' and the 'Rules of Conduct'. Just in case of doubt, pertinent quotations and discussions are to be found in the 'Conventions' under 'Copyright' repeated in each of the three volumes of my opus magnum 'Newton's Principia revisited', now to be ordered at book stores.

As in case of HSVA, introducing 'their' method of trials evaluation with my words, 'ascribed' to Schenzle, any plagiarism becomes public faster than we think or, Lügen haben kurze Beine, as we Germans say. This is the reason that in my work I have always been extremely careful in trying to quote and thus acknowledge the sources of all ideas and phrases I borrowed.

Prof. Dr.-Ing.
Michael Schmiechen
Bartningallee 16
D-10557 Berlin (Tiergarten)
Germany

Phone: +49-(0)30-392 71 64
E-mail: m.schm@t-online.de
Website: http://www.m-schmiechen.de

Berlin, May 18, 2008

Sub:	**Ship Powering Performance Prediction**	MS 0805191800
here:	**Up-date of the procedure of March 14, 2002**	MS 0805281600
	on Model Powering Performance Evaluation	MS 0806111400
	An explanation added on page 13	**MS 0810201430**
	Output added and layout adapted	MS 1308202000
	Further output added for comparison with results of quasi-steady 'model' trial, ignoring measured thrust values (mod_trial.mcd)	MS 1404211700

Ref.: Second appendix of a paper by Michael Schmiechen, formerly Versuchsanstalt für Wasserbau und Schiffbau, VWS: the Berlin Model Basin, 'On eval uating the propulsive performance of ship models, predicting the propulsive performance of and evaluating traditional steady speed trials with full scale ships' prepared after discussions at a seminar on 'Evaluating ship and model powering performance' held at Gdansk Ship Model Basin in January, 16-18, 2002. and published on occasion of the 23rd ITTC held at Venice in September 08-14, 2002.

Preface

The basis of the 'rational' full scale ship powering performance prediction based on model tests to be developed are 'rational' procedures of model testing and of evaluating the model powering performance. Such procedures based on quasi-steady propulsion tests with ship models have been described and demonstrated to be feasible using VWS ship model 2491.0 and propeller model 1340 in the final report VWS Bericht Nr. 1105/88 on the project and in the preliminary report:

Schmiechen, M.: Wake and Thrust Deduction from Quasi-steady Ship Model Propulsion Tests Alone. VWS Report No. 1100/87. Published on occasion of a visit to Korean and Japanese ship research institutes and the 18th ITTC at Kobe in October 1987 and in commemoration of the 4th ITTC at Berlin in May 1937.

The essential parts of this report, including body plan and the contours of stem and stern, will constitute the first appendix of the paper. They are to be found on the website of the author as well. Warning: the file is large, nearly 1 MB!

The subject of this document is to re-re-evaluate the sample model data in that report based on the insight and experience gained over the past fifteen years and during the months of April and May 2008. In particular the local axioms or constitutive laws of wake and thrust deduction have been scrutinised again, triggered by questions of Dr.-Ing. habil. Klaus Wagner of Rostock.

The following exercise shows that nearly all the unsolved problems have finally been solved, the solution of the energy wake problem still open. The test case shows that the model powering performance in a wide range of hull advance ratios can be derived from the data of only one run down the model basin, may be using freely moving models, not requiring a towing carriage. Evidently the same technique can be applied on full scale. Thus in both cases a dramatic gain in reliability and cost effectivity can be obtained.

The Mathcad document and the data file will be made available on request. Despite extreme care in every detail the evaluation may still contain inconsistencies and/or errors. The author will be most grateful for any communication, not only concerning such mistakes, but maybe concerning lack of clarity in the exposition, questions arising and experience gained in applications.

'Unneccesary' to mention that in routine applications the programming will be quite different, typically in terms of subroutines, which have been used only occasionally in this document. But in view of the sensitivty of the problem at hand colleagues are warned: there will be 'no plug and play' program. In any case careful scrutiny of data and intermediate results is absolutely mandatory.

And to repeat: The method proposed offers dramatic technological and commercial advantages. No propeller open water and hull towing tests are necessary and the extremely short propulsion tests provide a wealth of consistent data and results.

Preliminaries

**Mathcad permits to handle physical quantities,
but all data are being used without their SI units**
in view of further use in mathematical subroutines,
which by definition cannot handle arguments with units.

Constants

Gravity field $g := 9.81 \cdot m \cdot sec^{-2}$ $g := g \cdot m^{-1} \cdot sec^{2}$

Units

Force $N := newton$

$kp := g \cdot N$

Torque $Nm := newton \cdot m$

Power $W := watt$

Routines

Left inverse

$$\text{LeftInv}(A) := \left| \begin{array}{l} r \leftarrow \text{rows}(A) \\ c \leftarrow \text{cols}(A) \\ s \leftarrow \text{svds}(A) \\ \text{for } i \in 0..c-1 \\ \quad ISV_{i,i} \leftarrow (s_i)^{-1} \\ UV \leftarrow \text{svd}(A) \\ U \leftarrow \text{submatrix}(UV, 0, r-1, 0, c-1) \\ V \leftarrow \text{submatrix}(UV, r, r+c-1, 0, c-1) \\ A_{inv.left} \leftarrow V \cdot ISV \cdot U^T \\ A_{inv.left} \end{array} \right.$$

Filter

$$\text{Filter}(t, x, ord_{max}) := \left| \begin{array}{l} n \leftarrow \text{last}(t) \\ \text{for } i \in 0..n \\ \quad \text{for } j \in 0..3 \\ \quad\quad A_{i,j} \leftarrow (t_i)^j \\ X \leftarrow \text{LeftInv}(A) \cdot x \\ x_{0.trend} \leftarrow A \cdot X \\ x_{0.red} \leftarrow x - x_{0.trend} \\ \Delta t \leftarrow t_n - t_0 \\ \Delta x_{0.red} \leftarrow x_{0.red_n} - x_{0.red_0} \\ \text{for } i \in 0..n \\ \quad x_{0.red_i} \leftarrow x_{0.red_i} - i \cdot \dfrac{\Delta x_{0.red}}{n} \\ x_{0.red.F} \leftarrow \text{cfft}(x_{0.red}) \\ \text{for } k \in ord_{max} + 1 .. n - ord_{max} \end{array} \right.$$

$x_{0.red.F_k} \leftarrow 0$

$\omega \leftarrow \frac{2\cdot\pi}{\Delta t}$

for $k \in 1 .. ord_{max}$

$x_{1.red.F_k} \leftarrow x_{0.red.F_k} \cdot (-k\cdot\omega\cdot i)$

$x_{1.red.F_{n+1-k}} \leftarrow x_{0.red.F_{n+1-k}} \cdot (k\cdot\omega\cdot i)$

$x_{2.red.F_k} \leftarrow x_{0.red.F_k} \cdot (-k\cdot\omega\cdot i)^2$

$x_{2.red.F_{n+1-k}} \leftarrow x_{0.red.F_{n+1-k}} \cdot (k\cdot\omega\cdot i)^2$

$x_{0.red} \leftarrow Re\left(icfft\left(x_{0.red.F}\right)\right)$

$x_{1.red} \leftarrow Re\left(icfft\left(x_{1.red.F}\right)\right)$

$x_{2.red} \leftarrow Re\left(icfft\left(x_{2.red.F}\right)\right)$

for $i \in 0 .. n$

$x_{0_i} \leftarrow x_{0.red_i} + i\cdot\frac{\Delta x_{0.red}}{n} + x_{0.trend_i}$

$x_{1.trend} \leftarrow \sum_{k=1}^{3} k\cdot X_k\cdot A^{\langle k-1\rangle}$

$x_1 \leftarrow x_{1.red} + \frac{\Delta x_{0.red}}{\Delta t} + x_{1.trend}$

$x_{2.trend} \leftarrow \sum_{k=2}^{3} k!\cdot X_k\cdot A^{\langle k-2\rangle}$

$x_2 \leftarrow x_{2.red} + x_{2.trend}$

$\begin{bmatrix} x_0 & x_1 & x_2 \end{bmatrix}$

Evaluation of model data VWS 2491/1340
according to rational method proposed

Test identification	TID := "VWS 2491 /1340"
Date of test	Date := 860909
Test No.	Test := 8

Basic data

Ship model VWS Mod. 2491.0

Barge Carrier, which has not been built, body plan and contours of stem and stern to found in the first appendix.

Length	$L := 6.5 \cdot m$	$L := L \cdot m^{-1}$
Breadth	$B := 1.00 \cdot m$	$B := B \cdot m^{-1}$
Draught	$Tg := 0.255 \cdot m$	$Tg := Tg \cdot m^{-1}$
Displacement	$V := 1.431 \cdot m^3$	$V := V \cdot m^{-3}$
Block coefficient	$\phi := \frac{V}{L \cdot B \cdot Tg}$	$\phi = 0.8633$
Density of tank water	$\rho := 1.00 \cdot 10^3 \cdot kg \cdot m^{-3}$	$\rho := \rho \cdot kg^{-1} \cdot m^3$
Mass, model	$M_{nom} := \rho \cdot V$	$M_{nom} = 1431.0000$
Mass, added	$V_{half\_ellips} := \frac{2 \cdot \pi}{3} \cdot \frac{L}{2} \cdot \frac{B}{2} \cdot Tg$	$V_{half\_ellips} = 0.8679$
	$\phi_{half\_ellips} := \frac{V_{half\_ellips}}{L \cdot B \cdot Tg}$	$\phi_{half\_ellips} = 0.5236$

Thus the ship is much fuller than the equivalent
half-ellisoid
and added mass data of ellipsoids provide only very crude estimates. The following value has been 'read' from figure 67 on pages 244-245 in the monograph of W.G. Price and R.E.D. Bishop: Probabilistic Theory of Ship Dynamics. London: Chapman and Hall, 1974.

$m_x := \frac{0.5}{58} \cdot 3$ $\qquad m_x = 0.0259$

$M_{hyd} := M_{nom} \cdot m_x$

$M_{hyd.S} := \rho \cdot 0.15 \cdot \pi \cdot B \cdot Tg^2$ $\qquad$ According to Sainsbury (Ship and Boat Builder 1963/12)

$$m_{x.nom} := \frac{M_{hyd.S}}{M_{hyd}} \cdot m_x \qquad m_{x.nom} = 0.0214$$

Model scale $\lambda := 37.23$

Location of trip wire $x_{wire} := 19.25$

Surface $S := 8.967 \cdot m^2$ $\quad S := S \cdot m^{-2}$

Propeller model VWS Prop. 1340

CP propeller, right handed

Diameter of propeller $D := 0.195 \cdot m$ $\quad D := D \cdot m^{-1}$

Disc area $A_D := \frac{\pi}{4} \cdot D^2$ $\quad A_D = 0.0299$

Pitch ratio, design $P_{D.des} := 0.825$

Pich ratio, actual $P_{D.act} := 0.813$

Number of blades $Z := 4$

Rate of revolutions at open water test $n_{open} := 12 \cdot Hz$

Model test conditions

Carriage velocity $F_n := 0.168$

$v_{carr} := F_n \cdot \sqrt{g \cdot L}$ $\quad v_{carr} = 1.3415$

Frictional deduction $C_F := 0.183$

$F_F := C_F \cdot \rho \cdot D^2 \cdot v_{carr}^{\ 2}$ $\quad F_F = 12.5234$

Input: Digitized .jpg files

Fig's 6, 7, 8, 9 in
VWS Report No. 1100/87
to found in the first appendix.

Data := READPRN("mod_data.dat")

$nr := \text{last}\left(Data^{\langle 0 \rangle}\right)$ $\quad ns := 0$ $\quad r := 0 .. nr - ns$

time

$t_r := Data_{ns+r,0} \cdot sec$

$t := t \cdot sec^{-1}$

rate of revolutions

$n_{raw_r} := Data_{ns+r,1} \cdot Hz$

$n_{raw} := n_{raw} \cdot Hz^{-1}$

Data are taken over four full periods.

relative shift of model

$s_{raw_r} := Data_{ns+r,4} \cdot m$

$s_{raw} := s_{raw} \cdot m^{-1}$

thrust

$T_{raw_r} := Data_{ns+r,3} \cdot N$

$T_{raw} := T_{raw} \cdot N^{-1}$

torque

$Q_{raw_r} := Data_{ns+r,2} \cdot Nm$

$Q_{raw} := Q_{raw} \cdot Nm^{-1}$

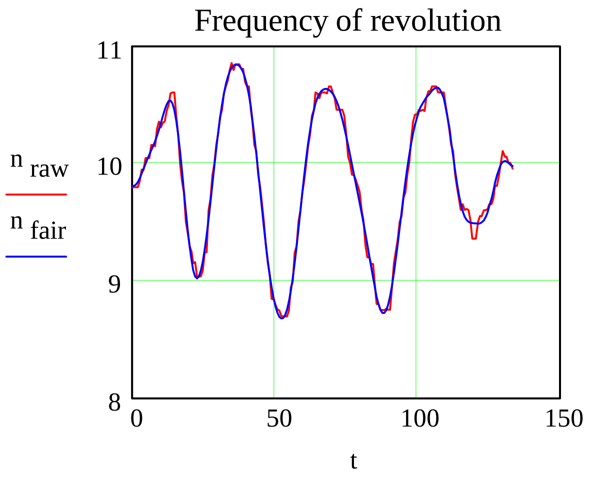
Rate of revolution faired

This value has been chosen as 'optimal', closest to the steady conditions.

$ord_{max} := 15$

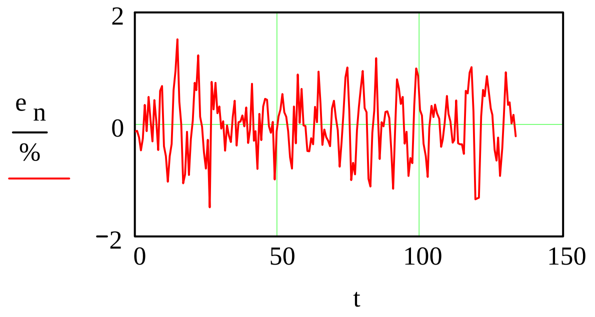
$\left[n_{fair} \;\; n_1 \;\; n_2 \right] := Filter\left(t, n_{raw}, ord_{max}\right)$

$E_n := n_{raw} - n_{fair}$ $\qquad e_n := \dfrac{E_n}{mean\left(n_{fair}\right)}$ $\qquad stdev\left(E_n\right) = 0.0541$



$n_m := mean\left(n_{raw}\right)$

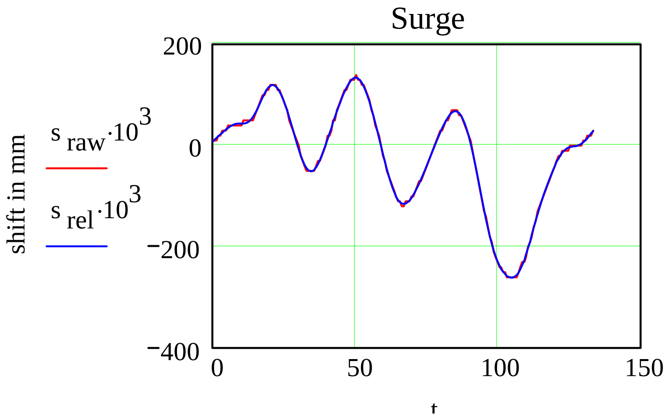
$n_m = 9.8880$

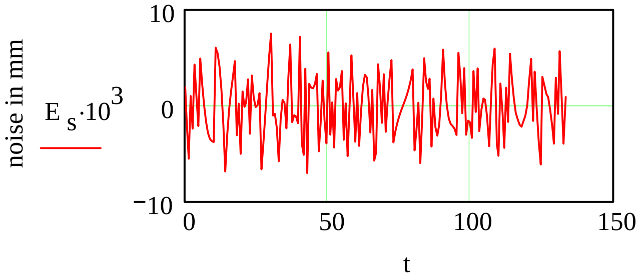


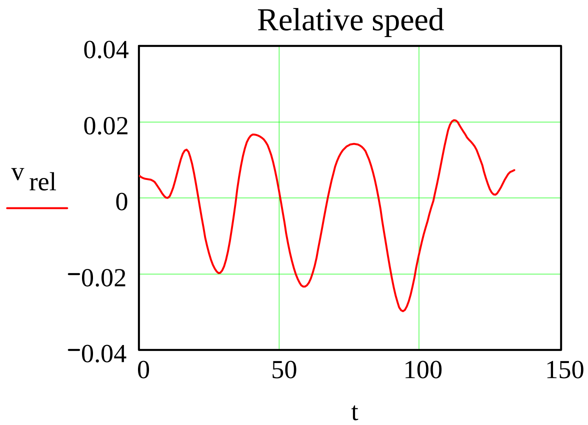
Velocity and acceleration

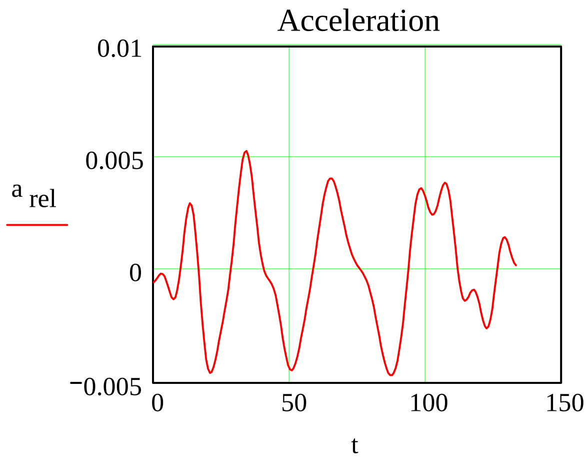
$\left[s_{rel} \;\; v_{rel} \;\; a_{rel} \right] := Filter\left(t, s_{raw}, ord_{max}\right)$

$E_s := s_{raw} - s_{rel}$ $\qquad stdev\left(E_s\right) = 0.0032$


Surge
shift in mm
s raw·10^3
s rel·10^3
200
0
−200
−400
0
50
100
150
t


noise in mm
E s·10^3
10
0
−10
0
50
100
150
t


Relative speed
v rel
0.04
0.02
0
−0.02
−0.04
0
50
100
150
t

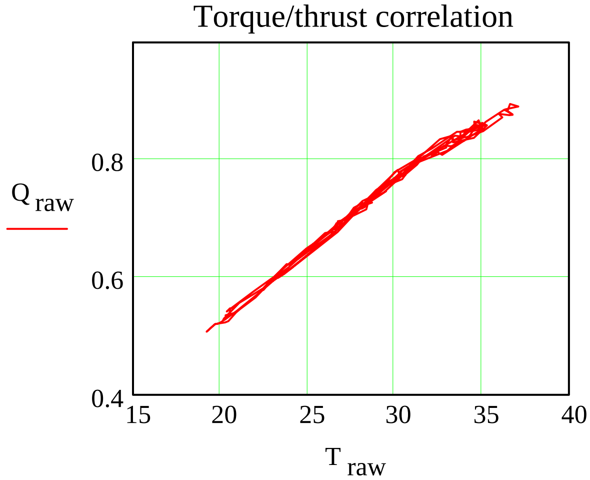

Acceleration
a rel
0.01
0.005
0
−0.005
0
50
100
150
t

'Final' values

$v_{fair} := v_{carr} + v_{rel}$ $a_{fair} := a_{rel}$

Scrutinize data

Correlate torque and thrust



Something has happened in the measurements of the higher torque values? Was there a problem with the dynamometer or did the flow pattern at the model propeller suddenly change?

The **systematic problems** above T = 32 N, Q = 0.8 Nm have been observed earlier and have already been mentioned explicitly in the basic VWS report No. 1100/87. There may have been many reasons for this behaviour, which has not been observed in the other runs. After much deliberation torque data are being corrected according to 'initial' linear correlation.

'Correct' torque values

$$
\begin{aligned}
\text{Red}(T, Q, T_{lim}) := \;& j \leftarrow 0 \\
& k \leftarrow 0 \\
& \text{for } i \in 0..\text{last}(T) \\
& \quad T_{red_j} \leftarrow T_i \;\text{ if }\; T_i < T_{lim} \\
& \quad Q_{red_j} \leftarrow Q_i \;\text{ if }\; T_i < T_{lim} \\
& \quad j \leftarrow j + 1 \;\text{ if }\; T_i < T_{lim} \\
& \quad T_{res_k} \leftarrow T_i \;\text{ if }\; T_i \ge T_{lim} \\
& \quad Q_{res_k} \leftarrow Q_i \;\text{ if }\; T_i \ge T_{lim} \\
& \quad k \leftarrow k + 1 \;\text{ if }\; T_i \ge T_{lim} \\
& \left[T_{red} \;\; Q_{red} \;\; T_{res} \;\; Q_{res} \right]
\end{aligned}
$$

$T_{lim} := 32$

$\begin{bmatrix} T_{red} & Q_{red} & T_{res} & Q_{res} \end{bmatrix} := Red\left(T_{raw}, Q_{raw}, T_{lim}\right)$

Correlation of reduced sets

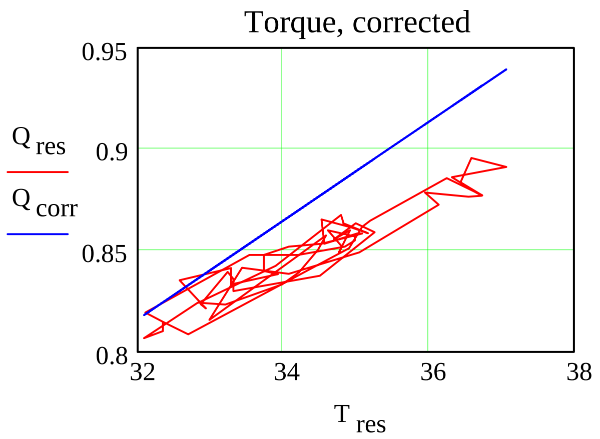
$j := 0..\,last\left(T_{red}\right)$ $\quad A_{red_{j,0}} := 1 \quad A_{red_{j,1}} := T_{red_j}$

$X_{red} := LeftInv\left(A_{red}\right) \cdot Q_{red}$

'Correct' torque values

$k := 0..\,last\left(T_{res}\right)$ $\quad A_{res_{k,0}} := 1 \quad A_{res_{k,1}} := T_{res_k}$

$Q_{corr} := A_{res} \cdot X_{red}$



'Correct' torque values replaced

$$Rep\left(T, Q, Q_{corr}, T_{lim}\right) := \left| \begin{array}{l} k \leftarrow 0 \\ \text{for } i \in 0..\,last(T) \\ \quad \left| \begin{array}{l} Q_i \leftarrow Q_{corr_k} \ \text{ if } T_i \geq T_{lim} \\ k \leftarrow k+1 \ \text{ if } T_i \geq T_{lim} \end{array} \right. \\ Q \end{array} \right.$$

$Q_{corr} := Rep\left(T_{raw}, Q_{raw}, Q_{corr}, T_{lim}\right)$

Fair torque, thrust and force values

$A_{fair_{r,0}} := \left(n_{fair_r}\right)^2$ $\quad A_{fair_{r,1}} := n_{fair_r} \cdot v_{fair_r}$ $\quad A_{fair_{r,2}} := \left(v_{fair_r}\right)^2$

$X_T := \mathrm{LeftInv}\left(A_{fair}\right) \cdot T_{raw}$ $\quad X_Q := \mathrm{LeftInv}\left(A_{fair}\right) \cdot Q_{corr}$

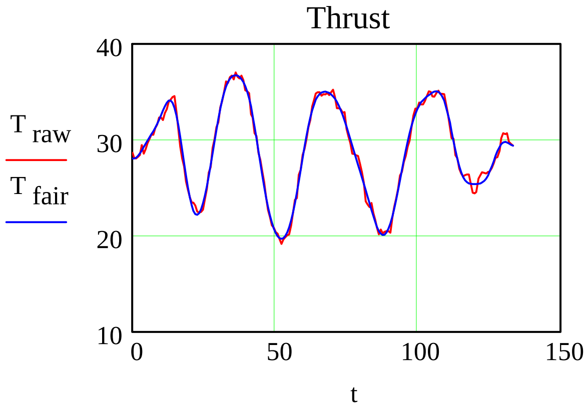
$T_{fair} := A_{fair} \cdot X_T$ $\quad Q_{fair} := A_{fair} \cdot X_Q$

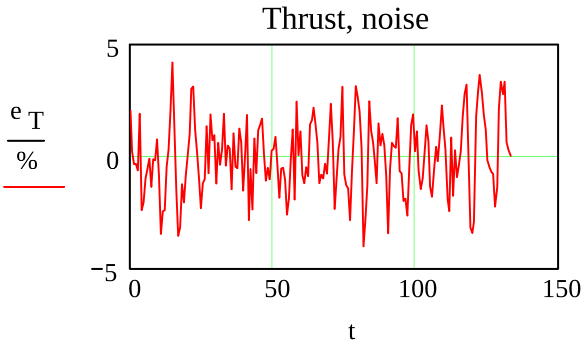
$E_T := T_{raw} - T_{fair}$ $\quad E_Q := Q_{corr} - Q_{fair}$

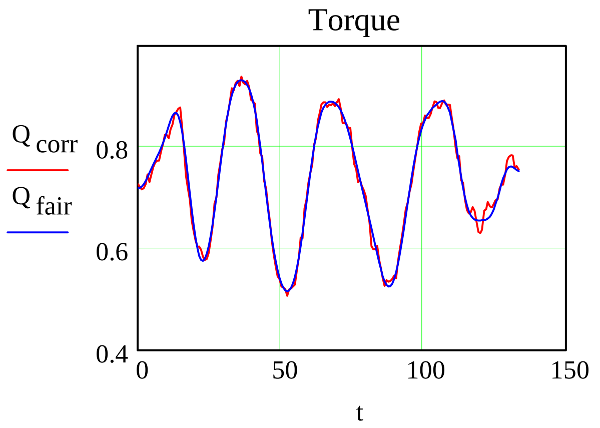
$\mathrm{stdev}\left(E_T\right) = 0.4704$ $\quad \mathrm{stdev}\left(E_Q\right) = 0.0117$

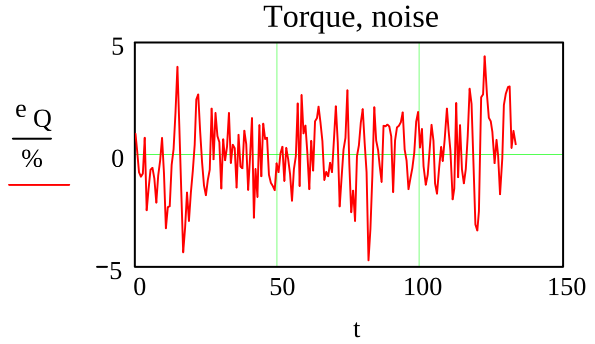
$e_T := \dfrac{E_T}{\mathrm{mean}\left(T_{raw}\right)}$ $\quad e_Q := \dfrac{E_Q}{\mathrm{mean}\left(Q_{corr}\right)}$

Faired thrust and torque data









Normalize polynomial

$j := 0 .. 2$

$$X_{KTH_j} := \frac{X_{T_j}}{\rho \cdot D^{4-j}} \qquad X_{KPH_j} := \frac{2 \cdot \pi \cdot X_{Q_j}}{\rho \cdot D^{5-j}}$$

Thrust and power ratios as functions of hull advance ratio

$$k_{TH}(j_H) := \sum_j X_{KTH_j} \cdot j_H{}^j \qquad k_{PH}(j_H) := \sum_j X_{KPH_j} \cdot j_H{}^j$$

Recording of raw and faired values **MS 201308**

$Dat_{raw}^{<0>} := t$

$Dat_{raw}^{<1>} := n_{raw}$ $Dat_{raw}^{<2>} := v_{fair}$ $Dat_{raw}^{<3>} := a_{fair}$ $Dat_{raw}^{<4>} := Q_{raw}$

WRITEPRN("dat_raw.dat") := Dat_{raw}

$Dat_{fair}^{<0>} := t$

$Dat_{fair}^{<1>} := n_{fair}$ $Dat_{fair}^{<2>} := v_{fair}$ $Dat_{fair}^{<3>} := a_{fair}$ $Dat_{fair}^{<4>} := Q_{corr}$

WRITEPRN("dat_fair.dat") := Dat_{fair}

Identify nominal wake fraction

MS 0805112230

Problem solved
As the detailed numerical exercises have shown the problem of the performance evaluation solely based on the results of quasi-steady propulsion tests is singular.
The only way to solve the problem is to provide an additional axiom or convention permitting to identify the nominal wake fraction, the phenomenological parameter in the wake axiom.
The additional axiom postulated before is that the hydraulic or pump efficiency of the propeller has a maximum at the centre of the range of interest.
In earlier evaluations this axiom has been applied without appropriate scrutiny to randomly available samples. The following procedure the 'range of interest' is changed until the postulate is met.

MS 0810201430

Explanation added
The axiom, a condition limiting the complexity of the model, has been adopted to get along with only two parameters to be identified in a robust procedure. Consequently this condition has to be provided for by appropriate selection f the range investigated.
After all the procedure is meeting the standards originally envisaged.
The detailed analysis reveals that the excellent results obtained earlier have been strictly accidental. The hydraulic efficiency happened to be stationary in the sample randomly selected!
According to the above explanation all attempts to identify the two parameters from randomly chosen propulsion data, may be at only two conditions, are doomed to fail 'by definition', due to the model purposely simplified.

Determine range of data

$$J_{H.fair_r} := \frac{v_{fair_r}}{D \cdot n_{fair_r}}$$

$J_{H.fair.mean} := \text{mean}\left(J_{H.fair}\right)$ $\qquad J_{H.fair.mean} = 0.6984$

$J_{H.fair.min} := \min\left(J_{H.fair}\right)$ $\qquad J_{H.fair.min} = 0.6370$

$J_{H.fair.max} := \max\left(J_{H.fair}\right)$ $\qquad J_{H.fair.max} = 0.7871$

Determine jet efficiency

Based on axiom of jet efficiency and on thrust identity!

$j_H := J_{H.fair.mean}$

$\omega_{TJ} := 0.5$

$h_{TJ} := 0.7$

Given

$$\frac{2 \cdot k_{TH}\left(j_H\right)}{\pi \cdot j_H^{\,2} \cdot \left(1 - \omega_{TJ} \cdot h_{TJ}\right)^2} = \frac{1}{h_{TJ}^{\,2}} - \frac{1}{h_{TJ}}$$

$H_T\left(\omega_{TJ}, j_H\right) := \text{Find}\left(h_{TJ}\right)$

$$H_{TJ.T}\left(\omega_{TJ}, j_H\right) := \left| \begin{array}{l} \text{for } i \in 0..\,\text{last}\left(j_H\right) \\ \quad \eta_{TJ_i} \leftarrow H_T\left(\omega_{TJ}, j_{H_i}\right) \\ \eta_{TJ} \end{array} \right.$$

Based on axiom of constant hydraulic efficiency!

$h_{TP} := 0.8$

Given

$$h_{TJ} = \frac{h_{TP}}{\eta_{JP}} \cdot \left(1 - \omega_{TJ} \cdot h_{TJ}\right)$$

$$H_P\left(\omega_{TJ}, \eta_{JP}, h_{TP}\right) := \mathrm{Find}\left(h_{TJ}\right)$$

$$H_{TJ.P}\left(\omega_{TJ}, h_{JP.m}, h_{TPH}, j_H\right) := \left| \begin{array}{l} \text{for } i \in 0 .. \mathrm{last}\left(j_H\right) \\ \quad \eta_{TJ_i} \leftarrow H_P\left(\omega_{TJ}, h_{JP.m}, h_{TPH_i}\right) \\ \eta_{TJ} \end{array} \right.$$

Solve for nominal wake
and mean hydraulic efficiency

$\omega_{TJ} := 0.57$ $\qquad h_{JP.m} := 0.76$

Given

$$H_{TJ.P}\left(\omega_{TJ}, h_{JP.m}, h_{TPH}, j_H\right) = H_{TJ.T}\left(\omega_{TJ}, j_H\right)$$

$$\mathrm{JetEff}\left(\omega_{TJ}, h_{JP.m}, h_{TPH}, j_H\right) := \mathrm{MinErr}\left(\omega_{TJ}, h_{JP.m}\right)$$

Determine maximum hydraulic efficiency

$n := 5$

$\Delta j := 0.001$

$j_{H.c} := J_{H.fair.min}$

$$\mathrm{Index}\left(v, v_m\right) := \left| \begin{array}{l} j \leftarrow 0 \\ \text{while } v_j \neq v_m \\ \quad j \leftarrow j + 1 \\ j \end{array} \right.$$

$$\Delta J\left(j_{H.c}, \Delta j\right) := \left| \begin{array}{l} \text{for } i \in 0..2 \cdot n \\ \quad \left| \begin{array}{l} j_{H_i} \leftarrow j_{H.c} + \Delta j \cdot (i - n) \\ k_{T_i} \leftarrow k_{TH}\left(j_{H_i}\right) \\ k_{P_i} \leftarrow k_{PH}\left(j_{H_i}\right) \\ h_{TPH_i} \leftarrow \dfrac{k_{T_i} \cdot j_{H_i}}{k_{P_i}} \end{array} \right. \\ \Omega \leftarrow \text{JetEff}\left(\omega_{TJ}, h_{JP.m}, h_{TPH}, j_H\right) \\ \omega_{TJ} \leftarrow \Omega_0 \\ h_{TJ} \leftarrow H_{TJ.T}\left(\omega_{TJ}, j_H\right) \\ \text{for } i \in 0..2 \cdot n \\ \quad \left| \begin{array}{l} \omega_i \leftarrow \omega_{TJ} \cdot h_{TJ_i} \\ h_{JP_i} \leftarrow h_{TPH_i} \cdot \dfrac{\left(1 - \omega_i\right)}{h_{TJ_i}} \end{array} \right. \\ h_{JP.max} \leftarrow \max\left(h_{JP}\right) \\ m \leftarrow \text{Index}\left(h_{JP}, h_{JP.max}\right) \\ \Delta j_H \leftarrow j_{H_m} - j_{H.c} \\ \Delta j_H \end{array} \right.$$

$$J_{H.c} := \text{root}\left(\Delta J\left(j_H, \Delta j\right), j_H\right)$$

$J_{H.c} = 0.6984$

This result 'explains' why the former evalution with the value 0.7 has been *accidentally* correct!

$$SampRange\left(j_{H.c}, \Delta j\right) := \left| \begin{array}{l} \text{for } i \in 0..2 \cdot n \\ \quad \left| \begin{array}{l} j_{H_i} \leftarrow j_{H.c} + \Delta j \cdot (i - n) \\ k_{T_i} \leftarrow k_{TH}\left(j_{H_i}\right) \\ k_{P_i} \leftarrow k_{PH}\left(j_{H_i}\right) \\ h_{TPH_i} \leftarrow \dfrac{k_{T_i} \cdot j_{H_i}}{k_{P_i}} \end{array} \right. \\ \Omega \leftarrow JetEff\left(\omega_{TJ}, h_{JP.m}, h_{TPH}, j_H\right) \\ \begin{bmatrix} j_H \\ k_T \\ k_P \\ h_{TPH} \\ \Omega \end{bmatrix} \end{array} \right.$$

$$S := SampRange\left(J_{H.c}, \Delta j\right)$$

$w_{TJ} := \left(S_4\right)_0$ $\qquad$ $w_{TJ} = 0.5913$

$\eta_{JP.m} := \left(S_4\right)_1$ $\qquad$ $\eta_{JP.m} = 0.7590$

Evaluate over a wide range

$J_{H.c} := \dfrac{round\left(10 \cdot J_{H.fair.mean}\right)}{10}$ $\qquad$ $J_{H.c} = 0.7000$

$\Delta j := \dfrac{round\left[10 \cdot \left(J_{H.fair.max} - J_{H.fair.min}\right)\right]}{10 \cdot n}$ $\qquad$ $\Delta j = 0.0400$

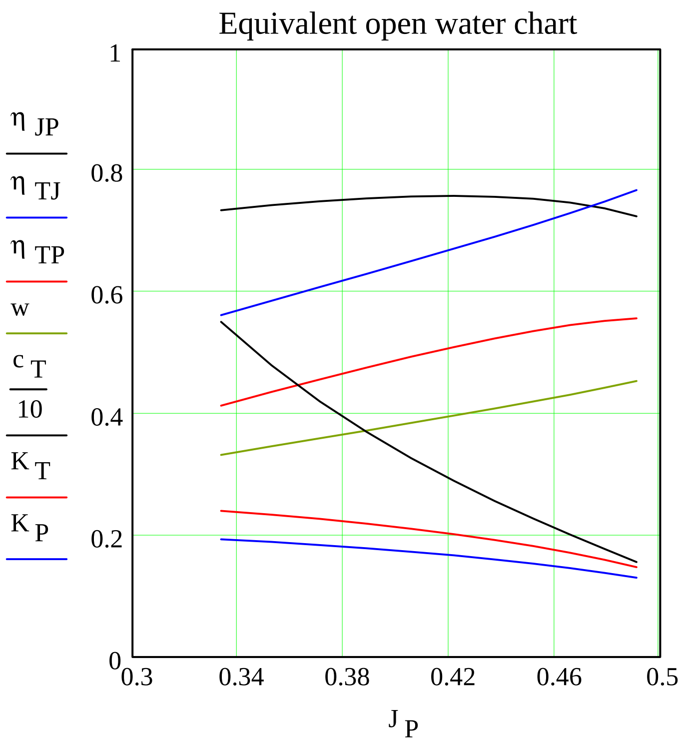
$$\begin{bmatrix} J_H \\ K_T \\ K_P \\ \eta_{TPH} \\ \Omega \end{bmatrix} := \mathrm{SampRange}\left(J_{H.c}, \Delta j\right)$$

Determine derived magnitudes

$i := 0 .. \mathrm{last}\left(J_H\right)$

$\eta_{TJ} := H_{TJ.T}\left(w_{TJ}, J_H\right)$ $\quad w_i := w_{TJ} \cdot \eta_{TJ_i}$ $\quad J_{P_i} := J_{H_i} \cdot \left(1 - w_i\right)$

$\eta_{TP_i} := \dfrac{K_{T_i} \cdot J_{P_i}}{K_{P_i}}$ $\quad \eta_{JP_i} := \dfrac{\eta_{TP_i}}{\eta_{TJ_i}}$ $\quad c_{T_i} := \dfrac{8 \cdot K_{T_i}}{\pi \cdot \left(J_{P_i}\right)^2}$



'Equivalent' open water chart of CP propeller model in the behind condition according to rational procedure proposed.

Compare with traditional evaluation based on propeller open water test results

Data

$$Data_{prop} := \begin{bmatrix} 0.35 & 48.0 & 63.5 \\ 0.40 & 43.0 & 59.5 \\ 0.45 & 38.0 & 53.0 \\ 0.50 & 33.0 & 48.0 \\ 0.55 & 28.0 & 43.0 \\ 0.60 & 22.5 & 37.5 \\ 0.65 & 17.5 & 32.0 \end{bmatrix}$$

KT and 10 KQ values read in mm
from Fig. 0.2 in
VWS Bericht Nr. 1126/88

$scale := 200$

$$J_{P.open} := Data_{prop}^{\langle 0 \rangle}$$

$$K_{T.raw} := \frac{Data_{prop}^{\langle 1 \rangle}}{scale}$$

$$K_{P.raw} := \frac{2 \cdot \pi \cdot Data_{prop}^{\langle 2 \rangle}}{10 \cdot scale}$$

$$k := 0 .. last\left(J_{P.open}\right)$$

$$A_{JP.open_{k,j}} := \left(J_{P.open_k}\right)^j$$

$$X_{KT.open} := LeftInv\left(A_{JP.open}\right) \cdot K_{T.raw} \qquad X_{KPo} := LeftInv\left(A_{JP.open}\right) \cdot K_{P.raw}$$

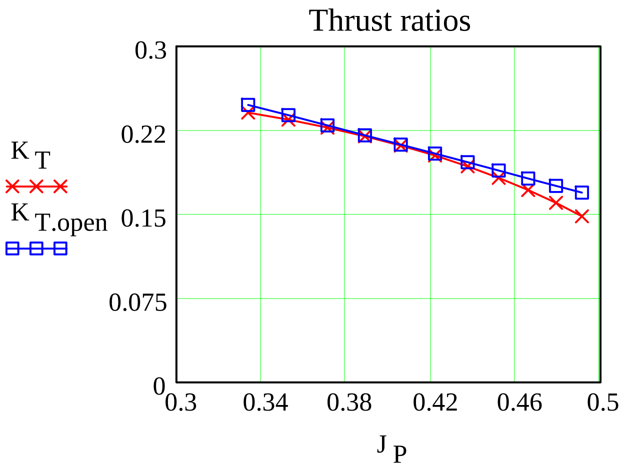
$$K_{TP} := A_{JP.open} \cdot X_{KT.open} \qquad K_{PP} := A_{JP.open} \cdot X_{KPo}$$

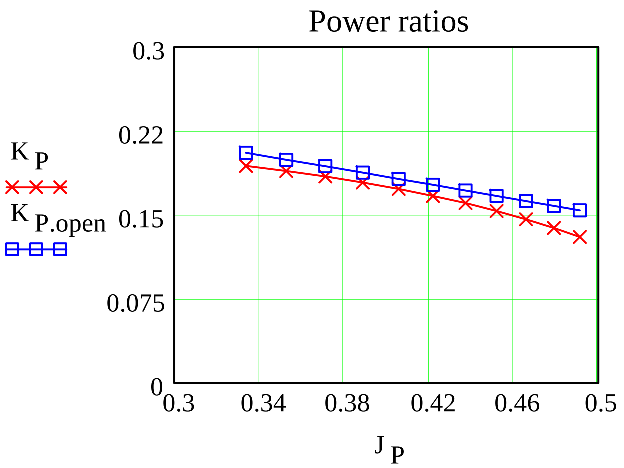
Thrust and power ratios as functions of propeller open water advance ratio

$$k_{T.open}\left(j_P\right) := \sum_j X_{KT.open_j} \cdot j_P^{\,j} \qquad k_{P.open}\left(j_P\right) := \sum_j X_{KPo_j} \cdot j_P^{\,j}$$

$$K_{T.open_i} := k_{T.open}\left(J_{P_i}\right) \qquad K_{P.open_i} := k_{P.open}\left(J_{P_i}\right)$$

Compare with open water values





Wake fractions based the model propeller open water performance

Thrust identity

$j_{PT} := 1$

Given

$k_{T.open}(j_{PT}) = \kappa_{TH}$

$\iota_{PT}(\kappa_{TH}) := \text{Find}(j_{PT})$

$J_{PT_i} := \iota_{PT}(K_{T_i})$

$w_{T_i} := 1 - \frac{J_{PT_i}}{J_{H_i}}$ $w_{trad} := w_T$

$j := 0 .. 1$

$A_{JH_{i,j}} := \left(J_{H_i}\right)^j$

$X_{WT} := \text{LeftInv}\left(A_{JH}\right) \cdot w_T$

$k_{WT}\left(j_H\right) := \sum_j X_{WT_j} \cdot j_H^{\,j}$

Power identity

$j_{PP} := 1$

Given

$k_{P.open}\left(j_{PP}\right) = \kappa_{PH}$

$\iota_{PP}\left(\kappa_{PH}\right) := \text{Find}\left(j_{PP}\right)$

$J_{PP_i} := \iota_{PP}\left(K_{P_i}\right)$

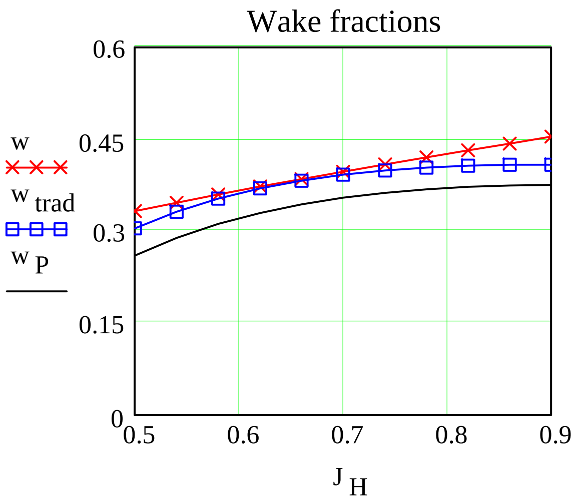
$w_{P_i} := 1 - \dfrac{J_{PP_i}}{J_{H_i}}$

$j := 0 .. 1$

$A_{JH_{i,j}} := \left(J_{H_i}\right)^j$

$X_{WT} := \text{LeftInv}\left(A_{JH}\right) \cdot w_T$

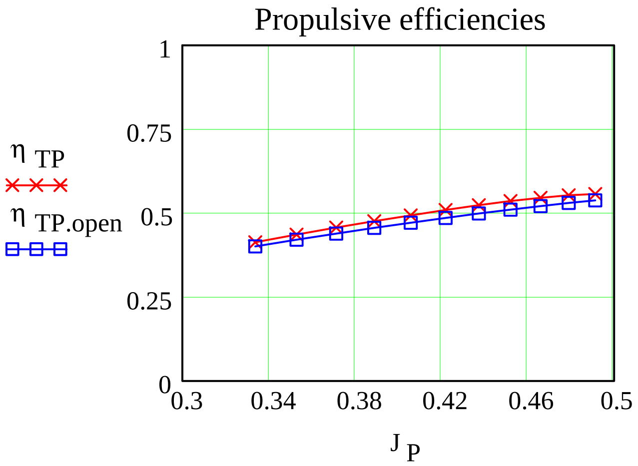
$k_{WT}\left(j_H\right) := \sum_j X_{WT_j} \cdot j_H^{\,j}$

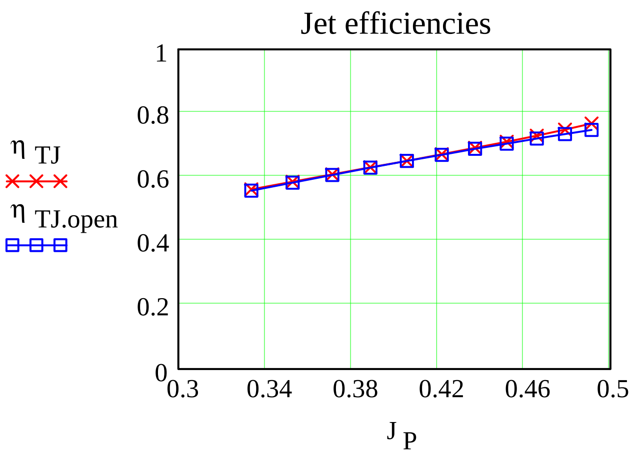


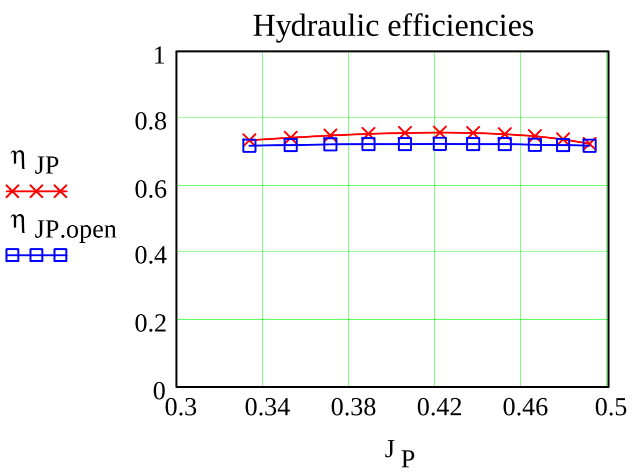
Determine propeller effiencies: open condition

$$\eta_{TP.open_i} := \frac{K_{T.open_i} \cdot J_{P_i}}{K_{P.open_i}} \qquad c_{T.open_i} := \frac{8 \cdot K_{T.open_i}}{\pi \cdot \left(J_{P_i}\right)^2} \qquad \eta_{TJ.open_i} := \frac{2}{1 + \sqrt{1 + c_{T.open_i}}}$$

$$\eta_{JP.open_i} := \frac{\eta_{TP.open_i}}{\eta_{TJ.open_i}}$$







Determine resistance and thrust deduction fraction

MS0805181630

Problem solved

As has been observed earlier the thrust deduction axiom in accordance with the global approximation of the thrust deduction theorem is too crude to permit the identification of reasonable energy wake fractions.

Accordingly further attempts have been made to replace that axiom but without success. By the way it has been noticed that the value of the longitudinal hydrodynamic inertia is crucially affecting the momentum balance and the final results.

Further it has been observed that the maximum order of the filter selected has considerable impact on the inertia identified. Accordingly a procedure has been developed to extrapolate from quasi-steady to steady conditions.

Determine time range

$t_m := \text{mean}(t)$ $\quad t_m = 66.5759$ $\quad \Delta t_r := t_r - t_m$

Determine velocity range

$v_m := \text{mean}(v_{fair})$ $\quad v_m = 1.3417$ $\quad \Delta v_{fair_r} := v_{fair_r} - v_m$

$\min(v_{fair}) = 1.3118$ $\quad \max(v_{fair}) = 1.3621$

Determine thrust deduction fraction
**based on simple axiom in accordance
with global approximation
of thrust deduction theorem**

$$J_{H.fair_r} := \frac{v_{fair_r}}{D \cdot n_{fair_r}}$$

$$\eta_{TJ.fair_r} := H_T\left(w_{TJ}, J_{H.fair_r}\right)$$

$$w_{fair_r} := w_{TJ} \cdot \eta_{TJ.fair_r}$$

$$F_{fairR_r} := F_F \cdot \left(1 - \frac{a_{fair_r}}{g}\right) - M_{nom} \cdot \left(1 + m_{x.nom}\right) \cdot a_{fair_r}$$

$$A_{MR_{r,0}} := \eta_{TJ.fair_r} \cdot T_{fair_r}$$

$k := 0 .. 1$

$A_{MR_{r,k+1}} := \left(\Delta v_{fair_r}\right)^k$

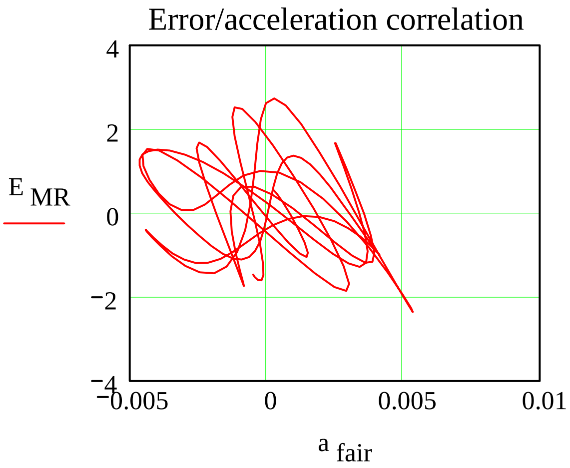
$A_{MR_{r,3}} := \Delta t_r$

$B_{MR_r} := T_{fair_r} + F_{fairR_r}$

$X_{MR} := \mathrm{LeftInv}\left(A_{MR}\right) \cdot B_{MR}$

$E_{MR} := B_{MR} - A_{MR} \cdot X_{MR}$

$$X_{MR} = \begin{bmatrix} 0.399 \\ 33.715 \\ 74.445 \\ -0.016 \end{bmatrix}$$



$$\frac{\left|E_{MR}\right|}{\left|B_{MR}\right|} = 0.0272$$

$$M_{hyd.id} := \frac{E_{MR} \cdot a_{fair}}{a_{fair} \cdot a_{fair}}$$

$M_{hyd.id} = -129.6873$

$t_{TJ} := X_{MR_0}$

$thd := t_{TJ} \cdot \eta_{TJ}$

$$R_r := \sum_k \left(\Delta v_{fair_r}\right)^k \cdot X_{MR_{k+1}}$$

Determine total inertia

$$F_{fairI_r} := F_F \cdot \left(1 - \frac{a_{fair_r}}{g}\right) - R_r$$

$A_{MI_{r,0}} := \eta_{TJ.fair_r} \cdot T_{fair_r}$

$A_{MI_{r,1}} := a_{fair_r}$

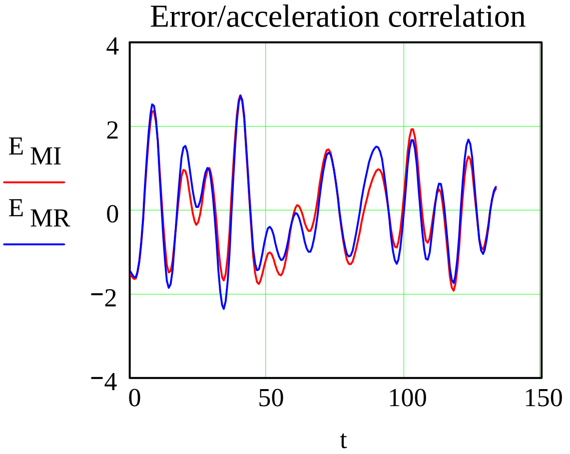
$A_{MI_{r,2}} := \Delta t_r$

$B_{MI_r} := T_{fair_r} + F_{fairI_r}$

$X_{MI} := \mathrm{LeftInv}(A_{MI}) \cdot B_{MI}$

$E_{MI} := B_{MI} - A_{MI} \cdot X_{MI}$

$$X_{MI} = \begin{bmatrix} 0.4015 \\ 1329.2432 \\ -0.0158 \end{bmatrix}$$



$t_{TJ} := X_{MI_0}$

$thd := t_{TJ} \cdot \eta_{TJ}$

$\Delta M := M_{nom} \cdot (1 + m_{x.nom}) - X_{MI_1}$ $\Delta M = 132.3991$

$m_{x.meas} := \dfrac{X_{MI_1}}{M_{nom}} - 1$ $m_{x.meas} = -0.0711$

Extrapolation from quasi-steady to steady conditions

inertia :=

16	1300.70	-0.091
12	1376.69	-0.03795
10	1385.36	-0.03189
8	1393.59	-0.02614
7	1423.06	-0.00555
6	1432.24	0.00087
5	1437.10	0.00426
4	1435.18	0.00292

k.max, M.tot.meas, m.x.meas
determined by repeated computations with
varying maximum order of the filter

$ord_{max} := inertia^{\langle 0 \rangle}$ $M_{tot.meas} := inertia^{\langle 1 \rangle}$ $m_{x.meas} := inertia^{\langle 2 \rangle}$

$j_{max} := \text{last}(ord_{max})$

$j := 0 .. j_{max}$

$A_{O_{j,0}} := 1$

$A_{O_{j,1}} := (ord_{max_j})^2$

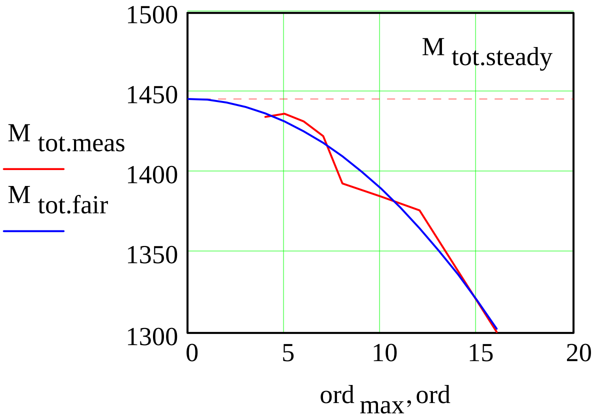
$X_M := \text{LeftInv}(A_O) \cdot M_{tot.meas}$

$M_{tot.steady} := X_{M_0}$ $\qquad$ $M_{tot.steady} = 1446.3679$

Plot of extrapolation

$\text{inert}(ord) := X_{M_0} + X_{M_1} \cdot ord^2$

$jj := 0 .. 16$ $\qquad$ $ord_{jj} := jj$ $\qquad$ $M_{tot.fair_{jj}} := \text{inert}(ord_{jj})$



Scrutinise result

$M_{steady} := \dfrac{M_{tot.steady}}{1 + m_x}$ $\qquad$ $M_{steady} = 1409.9049$ $\qquad$ $M_{nom} = 1431.0000$

Difference in 'observed' and nominal model mass

$\Delta M := M_{steady} - M_{nom}$ $\qquad$ $\Delta M = -21.0951$

Of course this result is strictly accidental. But it may also be speculated that the model was not fully ballasted, two 10 kg 'weight pieces' missing for whatever reason. In view of the uncertainty there is no chance to identify the coefficient of the hydrodynamic inertia.

'Ship efficiencies'

$$\eta_{RT_i} := \frac{1 - thd_i}{1 - w_i}$$

Hull efficiency, 'Rumpfeinflussgrad'

$$\eta_{RJ_i} := \eta_{RT_i} \cdot \eta_{TJ_i}$$

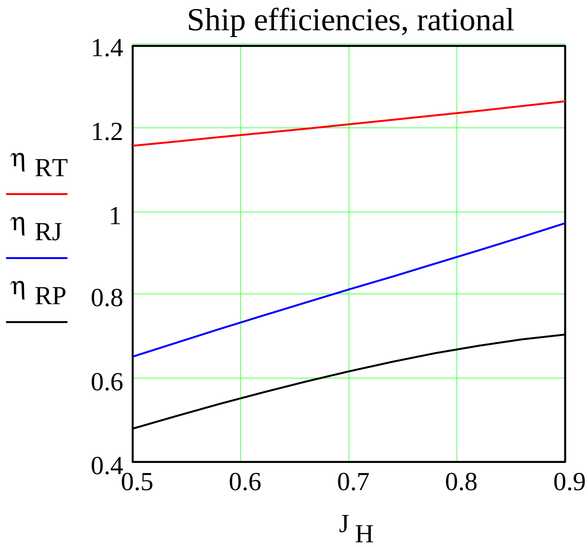
Configuration efficiency, 'Konfigurationsgütegrad'

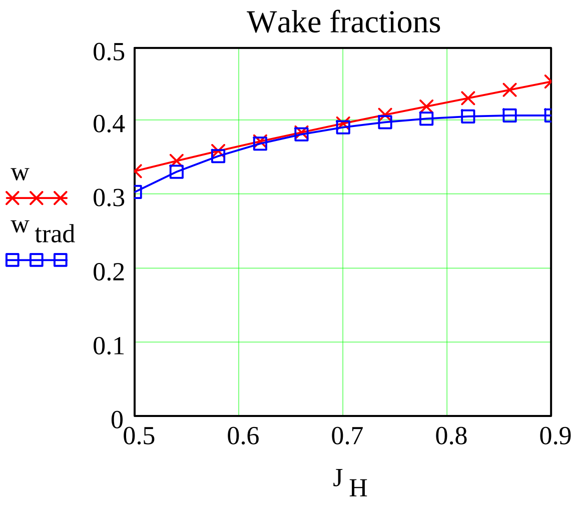
$$\eta_{RP_i} := \eta_{RJ_i} \cdot \eta_{JP_i}$$

Propulsive efficiency, 'Gesamtgütegrad'

$$\eta_{rot_i} := 1$$

Rotative efficiency, equals 1 by definition in the rational theory!





Compare with traditional evaluation based on hull towing test

Resistance, traditional: hull towing

Scrutiny of data

$$\mathrm{Data}_{tow} := \begin{bmatrix} 0.90 & 13.6 \\ 1.00 & 16.8 \\ 1.10 & 20.7 \\ 1.20 & 25.2 \\ 1.30 & 30.4 \\ 1.35 & 33.2 \end{bmatrix}$$

Values v in m/s, of R in N read from Fig. 3.4 in VWS Bericht Nr. 1126/88. They conicide with those in VWS Report No. 1100/87.

$v_{tow} := \mathrm{Data}_{tow}^{\langle 0 \rangle} \cdot m \cdot sec^{-1}$ $\quad v_{tow} := v_{tow} \cdot m^{-1} \cdot sec$

$R_{tow} := \mathrm{Data}_{tow}^{\langle 1 \rangle} \cdot N$ $\quad R_{tow} := R_{tow} \cdot N^{-1}$

Fair data

$j := 0 .. \mathrm{last}(v_{tow})$ $\quad k := 0 .. 3$ $\quad A_{R.trad_{j,k}} := \left(v_{tow_j}\right)^k$

$X_{R.trad} := \mathrm{LeftInv}(A_{R.trad}) \cdot R_{tow}$

$v_{plt_j} := 1.31 + j \cdot 0.01$

$A_{R.plt_{j,k}} := \left(v_{plt_j}\right)^k$

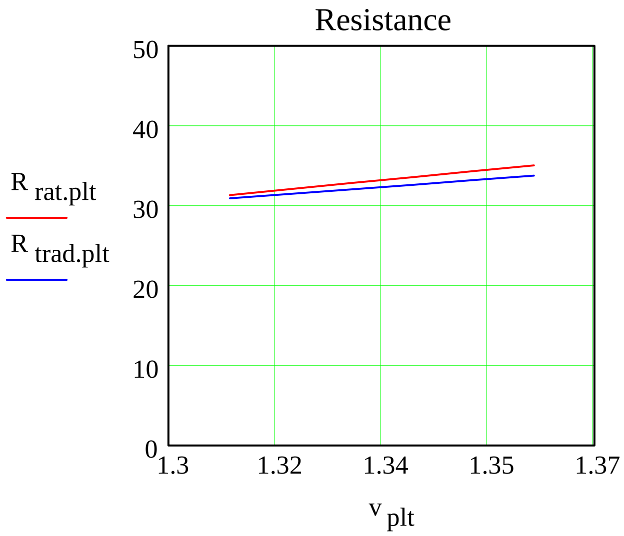
$R_{trad.plt} := A_{R.plt} \cdot X_{R.trad}$

Resistance, rational

$j := 0 .. \mathrm{last}(v_{fair})$ $\quad k := 0 .. 3$ $\quad A_{R.rat_{j,k}} := \left(v_{fair_j}\right)^k$

$X_{R.rat} := \mathrm{LeftInv}(A_{R.rat}) \cdot R$

$R_{rat.plt} := A_{R.plt} \cdot X_{R.rat}$



$A_{R.tow_{r,k}} := \left(v_{fair_r}\right)^k$

$R_{tow} := A_{R.tow} \cdot X_{R.trad}$

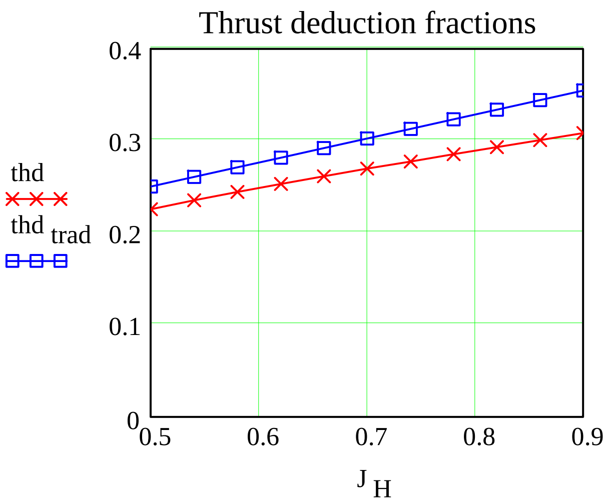
Thrust deduction fraction, traditional

$k := 0 .. 1$ $\qquad A_{thd_{r,k}} := \left(J_{H.fair_r}\right)^k \cdot T_{fair_r}$

$B_{thd} := T_{fair} + F_{fairR} - R_{tow}$

$X_{thd} := \text{LeftInv}\left(A_{thd}\right) \cdot B_{thd}$ $\qquad X_{thd} = \begin{bmatrix} 0.1200 \\ 0.2612 \end{bmatrix}$

$$thd_{trad_i} := \sum_k \left(J_{H_i}\right)^k \cdot X_{thd_k}$$



'Ship efficiencies', traditional

$\eta_{RP.trad_i} := \left(1 - thd_{trad_i}\right) \cdot \dfrac{K_{T_i} \cdot J_{H_i}}{K_{P_i}}$ — Propulsive efficiency, 'Gesamtgütegrad'

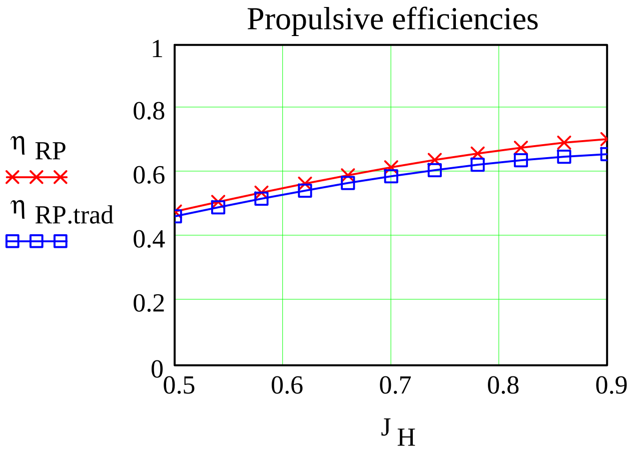
$\eta_{RT.trad_i} := \dfrac{1 - thd_{trad_i}}{1 - w_{trad_i}}$ — Hull efficiency, 'Rumpfeinflussgrad'

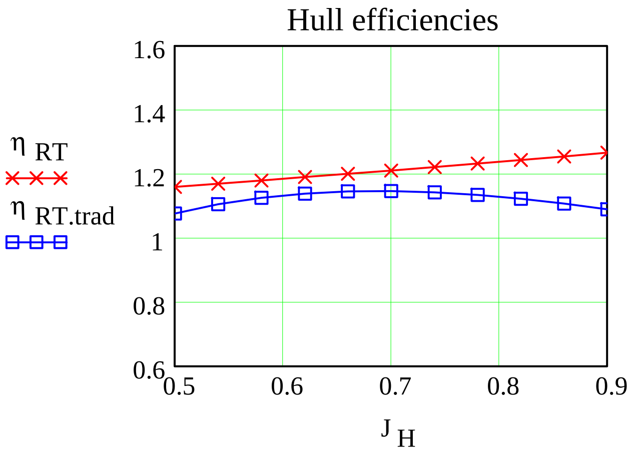
$\eta_{TP.trad_i} := \dfrac{\eta_{RP.trad_i}}{\eta_{RT.trad_i}}$ — Behind efficiency

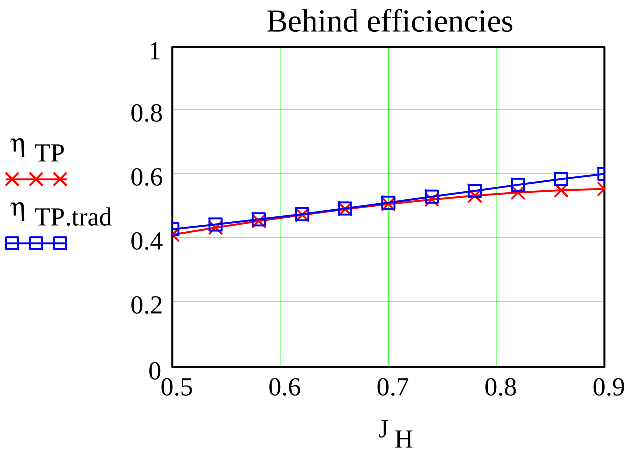
$\eta_{rot.trad_i} := \dfrac{\eta_{TP.trad_i}}{\eta_{TP.open_i}}$ — Rotative efficiency, Anordnungsgütegrad

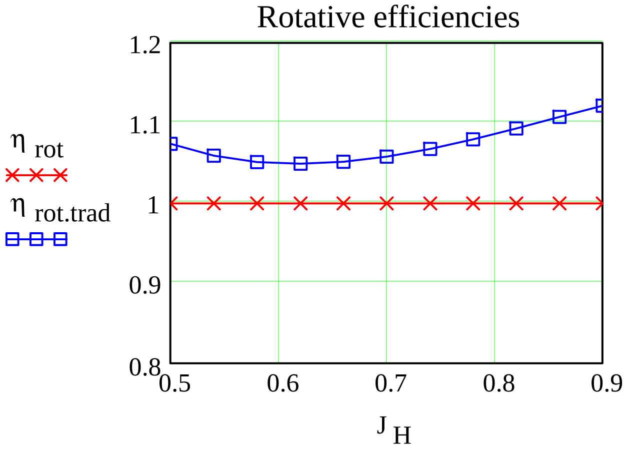
$\eta_{RJ.trad_i} := \eta_{RT.trad_i} \cdot \eta_{TJ.open_i}$ — Configuration efficiency, 'Konfigurationsgütegrad'

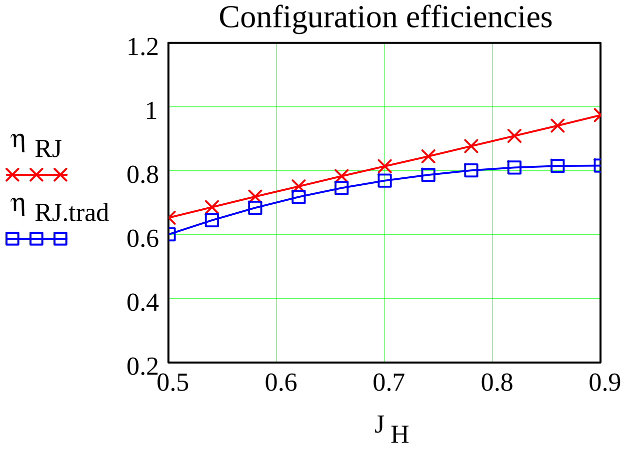
Compare with results of rational evaluation











Output of results for comparison with the results of quasi-steady 'model' trial (mod_trial.mcd)

$$res\_mod\_eval := \begin{bmatrix} v_{plt} & R_{rat.plt} & R_{trad.plt} \\ J_H & \eta_{RP} & \eta_{RP.trad} \end{bmatrix}$$

WRITEPRN("Res_mod_eval") := res_mod_eval

Some conclusions

This rigorous re-evaluation of the model test has confirmed the results of the former re-evaluation
and shown why that evaluation accidentally happened to be correct concerning the determination of the nominal wake fraction etc.

Concerning the determination of the resistance and thrust deduction fraction numerical studies have shown that the momentum balance is crucially affected by the value of the hydrodynamic inertia assumed and thus the final values of the resistance and the thrust deduction fraction.

Further the analysis has shown that the values of the inertia identified strongly depend on the maximum order of the filter applied to the raw data. Accordingly a procedure has been developed to extrapolate from quasi-steady conditions to the steady condition.

In view of the remaining uncertainties the small value of the hydrodynamic inertia cannot be identified. A nominal value has been assumed according to Sainsbury.

Concerning the determination of the energy wake fraction the problems observed earlier have not yet been resolved, maybe they cannot be resolved in the context developed so far.

For the time being further analysis has to be delayed.

(The file had to be reprinted due to problems with the pdf-writer. MS 090626)

END
Model data VWS 2491/1340 re-evaluated

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To whom it may concern

Preface

The following analysis of a quasi-steady model test demonstrates the feasibility of extremely efficient trials and monitoring at any service condition, without anybody noticing that such tests, requiring no thrust measurements, are being performed

The Commandment of programming
"Thou shalt not touch a working programme."
2 Moses 20, 1 - 17. Paraphrase: MS.

This paradigmatic exercise is based on the data of the 'model' test of only two minutes duration with models VWS 2491/1340 performed on 09.09.1986 to demonstrate the feasibility of the more ambitious quasi-steady tests including thrust measurements performed with the research vessel METEOR in the Greenland Sea in November 1988. The same data have since extensively been used further to develop the rational technique proposed, details to be found in the file directly accessible on my website.

The following series of programmes is the first result of my work

- to harmonise all my earlier evalutions of the quasi-steady model' test performed in 1986, before the METEOR tests, in order to prove the feasibility of the quasi-steady approach,
- to demonstrates the feasibility of extremely efficient trials and monitoring at any service condition, without anybody noticing that such tests, requiring no thrust measurements, are being performed and
- to 'streamline' all programmes for future routine applications model and full scale.

Due to 'offence' of the Commandment of programming this work could not yet be completed. Thus the previous programme mod_eval, providing a complete analysis as performed for the METEOR and its model, had to be reproduced in the latest original version and in the programm mod_trial the earlier results had to be referred to.

While on model scale reliable thrust measurements can be and are routinely performed, this is not possible full scale. Thus the complete, detailed analysis of the powering performance from quasi-steady tests full scale under service conditions, as demonstrated in the METEOR tests, is only possible on model scale as demonstrated in the evaluation mod_eval of the quasi-steady 'model' test.

But as has been demonstrated in the preliminary evaluation mod_trial ignoring the thrust data, it is possible to identify the total resistance and the propulsive efficiency of the model from data of the quasi-steady test. But even in the towing tank the assumption of vanishing current is not quite correct, full scale it is definitly 'useless'.

Thus, in view of full scale applications a the programme mod-curr has been developed to identify the current as well. The basic idea, already utilised in 1989 and mentioned in the Proceedings of my 2nd INTERACTION Berlin '91, is to apply the routine developed for traditional 'steady', ideally stationary trials to the (quasi-)stationary conditions 'passed' during the quasi-steady trials.

The limits of this approach are well understood and have been discussed elsewhere. Some of the details originated due to the pecularities of the rather small 'tidal' curent in the tank induced by seven preceeding tests.

All programmes are also directly accessible via the following links:
http://www.m-schmiechen.homepage.t-online.de/HomepageClassic01 ...
/mod_eval.pdf, mod_prel.pdf, mod_rout.pdf, mod_data.pdf, mod_trial.pdf and mod_curr.pdf .

Of course all the programmes and evaluations are 'preliminary', results of work in progress, open for discussion and necessary corrections in the course of further, hopefully joint developments, getting away from the foolish doctrine 'Not invented here'.

Preliminaries of a quasi-steady ship 'model' powering trial

Units, Constants

**Mathcad permits to handle physical quantities,
but all data are being used without their SI units**
in view of further use in mathematical subroutines,
which by definition cannot handle arguments with units.

Concerning this fundamental matter please refer to my
detailed draft of of a proposed a new edition of the
standard DIN 1313 'Grössen', to be found on my
website in the Section 'News on general subjects' under
the title 'Concepts. manitudes and quantities'.

Units

Force $N := newton$ $kp := g \cdot N$

Torque $Nm := newton \cdot m$

Power $W := watt$

Constants

'Gravity field' $g := 9.81 \cdot m \cdot sec^{-2}$ $g := g \cdot m^{-1} \cdot sec^{2}$

Model data VWS 2491/1340

Test identification	TID := "VWS 2491 /1340"	
Date of test	Date := 860909	
Test No.	Test := 8	

Basic data

Ship model VWS Mod. 2491.0

Barge Carrier, which has not been built,
body plan and contours of stem and stern
to be found in the first appendix.

Length	$L := 6.5 \cdot m$	$L := L \cdot m^{-1}$
Breadth	$B := 1.00 \cdot m$	$B := B \cdot m^{-1}$
Draught	$Tg := 0.255 \cdot m$	$Tg := Tg \cdot m^{-1}$
Displacement	$V := 1.431 \cdot m^3$	$V := V \cdot m^{-3}$
Block coefficient	$\phi := \frac{V}{L \cdot B \cdot Tg}$	$\phi = 0.86335$
Density of tank water	$\rho := 1.00 \cdot 10^3 \cdot kg \cdot m^{-3}$	$\rho := \rho \cdot kg^{-1} \cdot m^3$
Mass, model	$M_{nom} := \rho \cdot V$	$M_{nom} = 1431.00000$
		$I_{eff} := 1.024 \cdot M_{nom}$
Model scale	$\lambda := 37.23$	
Location of trip wire	$x_{wire} := 19.25$	
Surface	$S := 8.967 \cdot m^2$	$S := S \cdot m^{-2}$

Propeller model VWS Prop. 1340

CP propeller, right handed

Diameter of propeller	$D := 0.195 \cdot m$	$D := D \cdot m^{-1}$
Disc area	$A_D := \frac{\pi}{4} \cdot D^2$	$A_D = 0.02986$
Pitch ratio, design	$P_{D.des} := 0.825$	
Pich ratio, actual	$P_{D.act} := 0.813$	
Number of blades	$Z := 4$	
Rate of revolutions at open water test	$n_{open} := 12 \cdot Hz$	

Model test conditions

Carriage velocity	$F_n := 0.168$	
	$v_{carr} := F_n \cdot \sqrt{g \cdot L}$	$v_{carr} = 1.34153$
Frictional deduction	$C_F := 0.183$	
	$F_F := C_F \cdot \rho \cdot D^2 \cdot v_{carr}^{\ 2}$	$F_F = 12.52337$
'Course', nominal	$\psi_{HG} := 0.0$	
Tank dimensions	$h := 4.2$	
	$l := 240$	

END
Preliminaries of a quasi-steady ship 'model' powering trial

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To whom it may concern

Routines of a quasi-steady ship 'model' powering trial

Filter raw data

$$
\mathrm{Filter}\left(t, x, ord_{max}\right) := \left|
\begin{array}{l}
n \leftarrow \mathrm{last}(t) \\
\text{for } i \in 0..n \\
\quad \text{for } j \in 0..3 \\
\quad\quad A_{i,j} \leftarrow \left(t_i\right)^j \\
X \leftarrow \mathrm{geninv}(A)\cdot x \\
x_{0.trend} \leftarrow A\cdot X \\
x_{0.red} \leftarrow x - x_{0.trend} \\
\Delta t \leftarrow t_n - t_0 \\
\Delta x_{0.red} \leftarrow x_{0.red_n} - x_{0.red_0} \\
\text{for } i \in 0..n \\
\quad x_{0.red_i} \leftarrow x_{0.red_i} - i\cdot\dfrac{\Delta x_{0.red}}{n} \\
x_{0.red.F} \leftarrow \mathrm{cfft}\left(x_{0.red}\right) \\
\text{for } k \in ord_{max} + 1 .. n - ord_{max} \\
\quad x_{0.red.F_k} \leftarrow 0 \\
\omega \leftarrow \dfrac{2\cdot\pi}{\Delta t} \\
\text{for } k \in 1 .. ord_{max}
\end{array}
\right.
$$

$$x_{1.red.F_k} \leftarrow x_{0.red.F_k} \cdot (-k \cdot \omega \cdot i)$$

$$x_{1.red.F_{n+1-k}} \leftarrow x_{0.red.F_{n+1-k}} \cdot (k \cdot \omega \cdot i)$$

$$x_{2.red.F_k} \leftarrow x_{0.red.F_k} \cdot (-k \cdot \omega \cdot i)^2$$

$$x_{2.red.F_{n+1-k}} \leftarrow x_{0.red.F_{n+1-k}} \cdot (k \cdot \omega \cdot i)^2$$

$$x_{0.red} \leftarrow \mathrm{Re}\left(\mathrm{icfft}\left(x_{0.red.F}\right)\right)$$

$$x_{1.red} \leftarrow \mathrm{Re}\left(\mathrm{icfft}\left(x_{1.red.F}\right)\right)$$

$$x_{2.red} \leftarrow \mathrm{Re}\left(\mathrm{icfft}\left(x_{2.red.F}\right)\right)$$

for $i \in 0..n$

$$x_{0_i} \leftarrow x_{0.red_i} + i \cdot \frac{\Delta x_{0.red}}{n} + x_{0.trend_i}$$

$$x_{1.trend} \leftarrow \sum_{k=1}^{3} k \cdot X_k \cdot A^{\langle k-1 \rangle}$$

$$x_1 \leftarrow x_{1.red} + \frac{\Delta x_{0.red}}{\Delta t} + x_{1.trend}$$

$$x_{2.trend} \leftarrow \sum_{k=2}^{3} k! \cdot X_k \cdot A^{\langle k-2 \rangle}$$

$$x_2 \leftarrow x_{2.red} + x_{2.trend}$$

$$\left[x_0 \;\; x_1 \;\; x_2 \right]$$

Various functions

$$J(D,V,N) := \frac{V}{D \cdot N} \qquad KP(\rho,D,P,N) := \frac{P}{\rho \cdot D^5 \cdot N^3}$$

$$Fn(V,L) := \frac{V}{\sqrt{g \cdot L}} \qquad CP(\rho,D,P,V) := \frac{P}{\rho \cdot D^2 \cdot V^3}$$

$$VT(\omega_T, v, t) := v_0 + v_1 \cdot \cos(\omega_T \cdot t) + v_2 \cdot \sin(\omega_T \cdot t)$$

$$dir(\psi_{HG}) := if\left(\psi_{HG} > \frac{\pi}{2}, 1, -1\right)$$

Check distributions

```
norm_distr(sampl) := | r ← rows(sampl)
                     | c ← cols(sampl)
                     | for i ∈ 0 .. r − 1
                     |   | fract ← 2·(i + 1)/(r + 1) − 1
                     |   | dst ← fract
                     |   | distr_i ← √2·root(erf(dst) − fract, dst)
                     |   | for j ∈ 0 .. 1
                     |   |   A_distr_(i,j) ← (distr_i)^j
                     | for j ∈ 0 .. c − 1
                     |   sampl_sort^<j> ← sort(sampl^<j>)
                     | distr_par ← geninv(A_distr)·sampl_sort
                     | sampl_fair ← A_distr·distr_par
                     | for j ∈ 0 .. c − 1
                     |   distr_par_(2,j) ← distr_par_(1,j) / √r
                     | [distr  sampl_sort  sampl_fair  distr_par]
```

Analyse power supplied at (quasi-)stationary conditions

$$\mathrm{Supplied}\left(\omega,\rho,D,\Delta t,V_{HG},\psi_{HG},N_{S},P_{S}\right) :=$$

$$\text{for } i \in 0..\,\mathrm{last}(\Delta t)$$

$$\quad A_{sup_{i,0}} \leftarrow \left(N_{S_i}\right)^3$$

$$\quad A_{sup_{i,1}} \leftarrow \left(N_{S_i}\right)^2 \cdot V_{HG_i}$$

$$\quad A_{sup_{i,2}} \leftarrow -\left(N_{S_i}\right)^2 \cdot \mathrm{dir}\left(\psi_{HG_i}\right)$$

$$\quad A_{sup_{i,3}} \leftarrow A_{sup_{i,2}} \cdot \cos\left(\omega \cdot \Delta t_i\right)$$

$$\quad A_{sup_{i,4}} \leftarrow A_{sup_{i,2}} \cdot \sin\left(\omega \cdot \Delta t_i\right)$$

$$X_{sup} \leftarrow \mathrm{geninv}\left(A_{sup}\right) \cdot P_{S}$$

$$P_{S.sup} \leftarrow A_{sup} \cdot X_{sup}$$

$$\Delta P_{S.sup} \leftarrow P_{S} - P_{S.sup}$$

$$\text{for } k \in 0..\,1$$

$$\quad p_k \leftarrow X_{sup_k}$$

$$\quad p_{n_k} \leftarrow \frac{10^6 \cdot p_k}{\rho \cdot D^{(5-k)}}$$

$$p_2 \leftarrow \mathrm{Stdev}\left(\Delta P_{S.sup}\right)$$

$$c \leftarrow \mathrm{svds}\left(A_{sup}\right)$$

$$p_3 \leftarrow \frac{c_4}{c_0}$$

$$\text{for } k \in 0..\,2$$

$$\quad v_k \leftarrow \frac{X_{sup_{2+k}}}{X_{sup_1}}$$

$$\text{for } i \in 0..\,\mathrm{last}(\Delta t)$$

$$\quad V_{WG_i} \leftarrow \mathrm{VT}\left(\omega, v, \Delta t_i\right)$$

$$\quad V_{HW_i} \leftarrow V_{HG_i} - V_{WG_i} \cdot \mathrm{dir}\left(\psi_{HG_i}\right)$$

$$J_{HW_i} \leftarrow J\left(D, V_{HW_i}, N_{S_i}\right)$$

$$K_{P.sup_i} \leftarrow KP\left(\rho, D, P_{S.sup_i}, N_{S_i}\right)$$

$$\begin{bmatrix} \Delta P_{S.sup} & v & V_{WG} \\ V_{HW} & p & P_{S.sup} \\ J_{HW} & p_n & K_{P.sup} \end{bmatrix}$$

Determine mean current

$$C0\left(\omega, \rho, D, \Delta t, V_{HG}, \psi_{HG}, N_S, P_S\right) :=$$

$$\begin{aligned}
&\text{for } j \in 0..\text{last}(\Delta t)\\
&\quad A_{sup_{j,0}} \leftarrow \left(N_{S_j}\right)^3\\
&\quad A_{sup_{j,1}} \leftarrow \left(N_{S_j}\right)^2 \cdot V_{HG_j}\\
&\quad A_{sup_{j,2}} \leftarrow -\left(N_{S_j}\right)^2 \cdot \text{dir}\left(\psi_{HG_j}\right)\\
&\quad A_{sup_{j,3}} \leftarrow A_{sup_{j,2}} \cdot \cos\left(\omega \cdot \Delta t_j\right)\\
&\quad A_{sup_{j,4}} \leftarrow A_{sup_{j,2}} \cdot \sin\left(\omega \cdot \Delta t_j\right)\\
&X_{sup} \leftarrow \text{geninv}\left(A_{sup}\right) \cdot P_S\\
&P_{S.sup} \leftarrow A_{sup} \cdot X_{sup}\\
&\Delta P_{S.sup} \leftarrow P_S - P_{S.sup}\\
&\text{for } k \in 0..2\\
&\quad v_k \leftarrow \frac{X_{sup_{2+k}}}{X_{sup_1}}\\
&V_{WG.mean} \leftarrow v_0\\
&V_{WG.mean}
\end{aligned}$$

END
Routines of a quasi-steady ship 'model' powering trial

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Raw and faired data of a quasi-steady ship 'model' powering test

Reference

Reference:C:\model_test\mod_prel.mcd

Reference:C:\model_test\mod_rout.mcd

Raw data

Based on digitized .jpg files of Fig's 6, 7, 8, 9 in VWS Report No. 1100/87 to found in the first appendix.

Data are taken over four full 'periods.

Data input

$Data := READPRN("mod\_data.dat")$

$ni := last\left(Data^{<0>}\right)$ $ns := 0$

$ni := ni - ns$ $i := 0..ni$

time

$t_i := Data_{ns+i,0}$

$t_m := mean(t)$

shaft frequency

$n_{raw_i} := Data_{ns+i,1}$

$\Delta t := t - t_m$

shaft torque

$Q_{raw_i} := Data_{ns+i,2}$

shaft thrust

$T_{raw_i} := Data_{ns+i,3}$

relative surge of model

$s_{raw_i} := Data_{ns+i,4}$

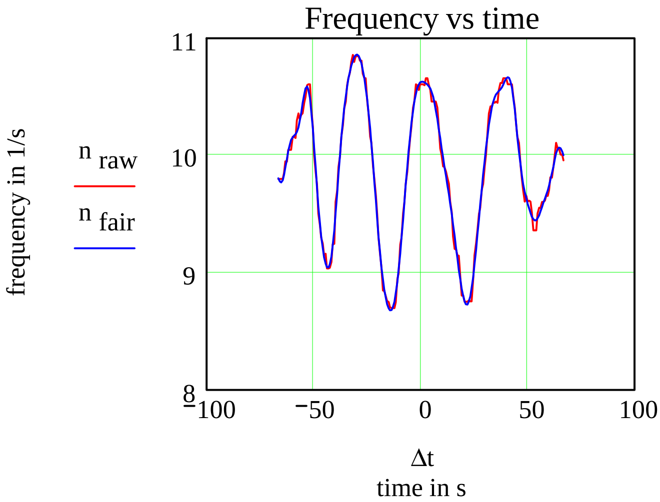
Data faired

$ord_{max} := 18$

Shaft frequency values faired

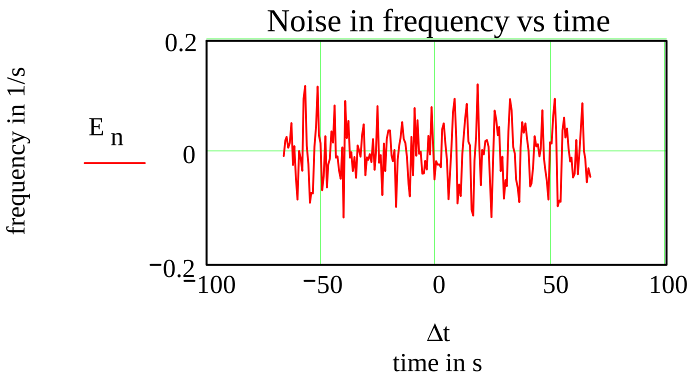
$\left[n_{fair} \quad n_1 \quad n_2\right] := \text{Filter}\left(t, n_{raw}, ord_{max}\right)$

$E_n := n_{raw} - n_{fair}$ $\qquad$ $\text{stdev}\left(E_n\right) = 0.04909$ $\qquad$ $e_n := \dfrac{E_n}{\text{mean}\left(n_{fair}\right)}$

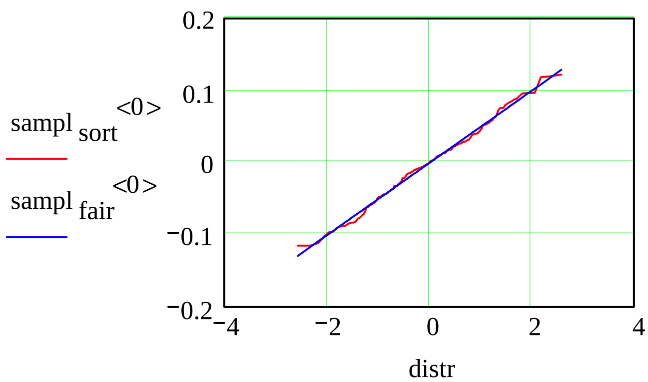


$n_m := \text{mean}\left(n_{raw}\right)$

$n_m = 9.88797$



$\left[distr \quad sampl_{sort} \quad sampl_{fair} \quad distr_{par}\right] := \text{norm\_distr}\left(E_n\right)$

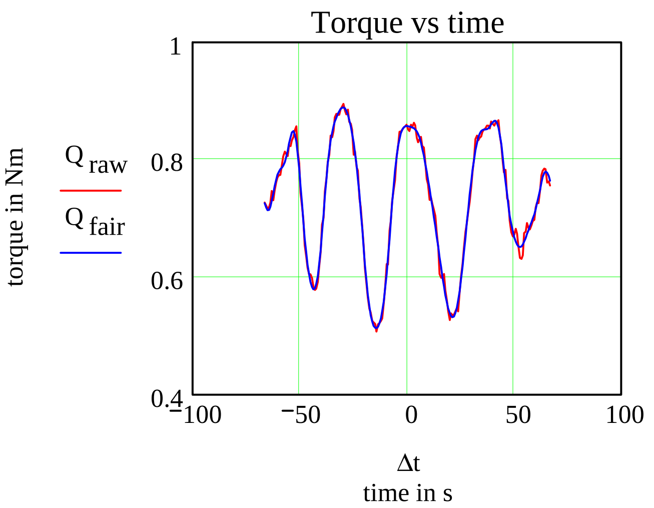


$distr_{par} = \begin{bmatrix} 0.00000 \\ 0.05010 \\ 0.00354 \end{bmatrix}$

Shaft torque values faired

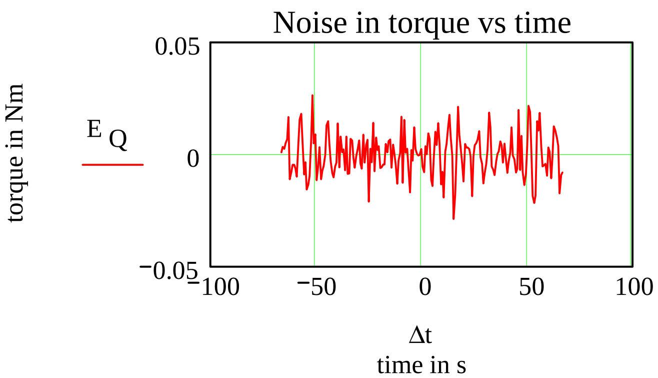
$$\left[Q_{fair} \;\; Q_1 \;\; Q_2 \right] := \text{Filter}\left(t, Q_{raw}, ord_{max}\right)$$

$E_Q := Q_{raw} - Q_{fair}$ $\qquad$ $\text{stdev}\left(E_Q\right) = 0.00938$ $\qquad$ $e_Q := \dfrac{E_Q}{\text{mean}\left(Q_{fair}\right)}$

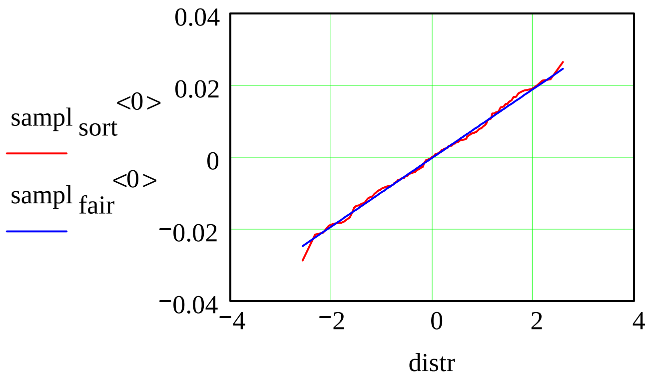


$Q_m := \text{mean}\left(Q_{raw}\right)$

$Q_m = 0.73287$



$$\left[distr \;\; sampl_{sort} \;\; sampl_{fair} \;\; distr_{par} \right] := \text{norm\_distr}\left(E_Q\right)$$

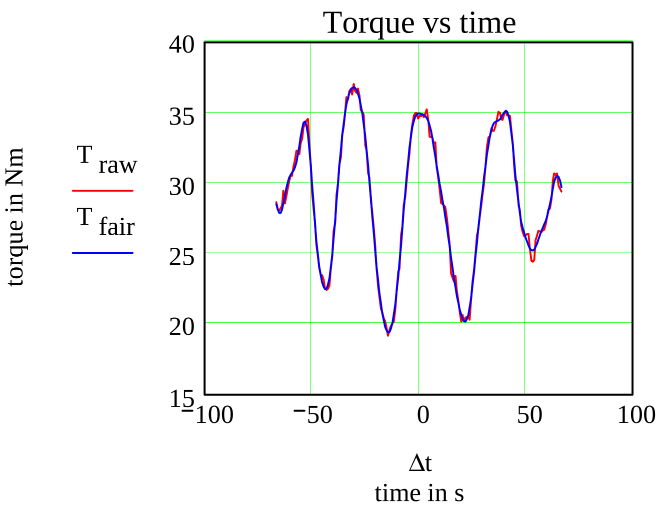


$$distr_{par} = \begin{bmatrix} 0.00000 \\ 0.00958 \\ 0.00068 \end{bmatrix}$$

Shaft thrust values faired

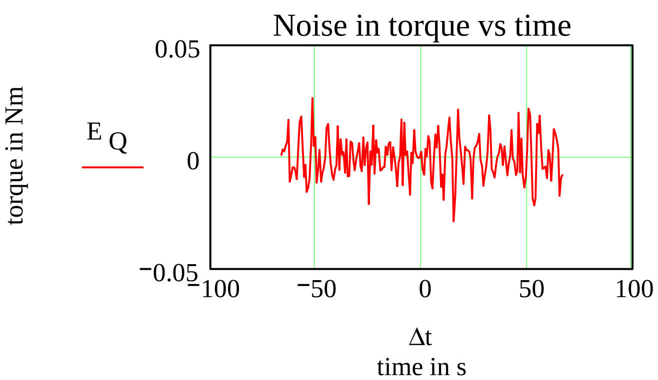
$$\left[T_{fair} \;\; T_1 \;\; T_2\right] := \mathrm{Filter}\left(t, T_{raw}, ord_{max}\right)$$

$E_T := T_{raw} - T_{fair}$ $\qquad$ $\mathrm{stdev}\left(E_T\right) = 0.40161$ $\qquad$ $e_T := \dfrac{E_T}{\mathrm{mean}\left(T_{fair}\right)}$

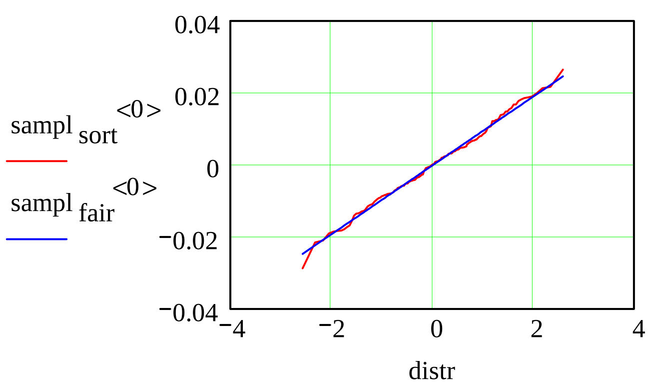


$T_m := \mathrm{mean}\left(T_{raw}\right)$

$T_m = 28.91575$



$$\left[distr \;\; sampl_{sort} \;\; sampl_{fair} \;\; distr_{par}\right] := \mathrm{norm\_distr}\left(E_Q\right)$$

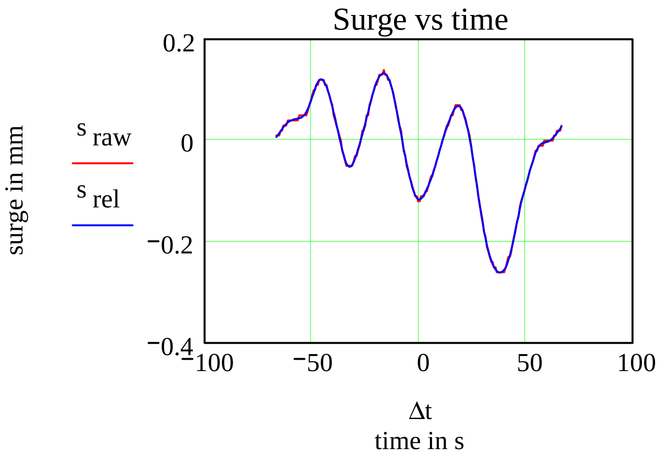


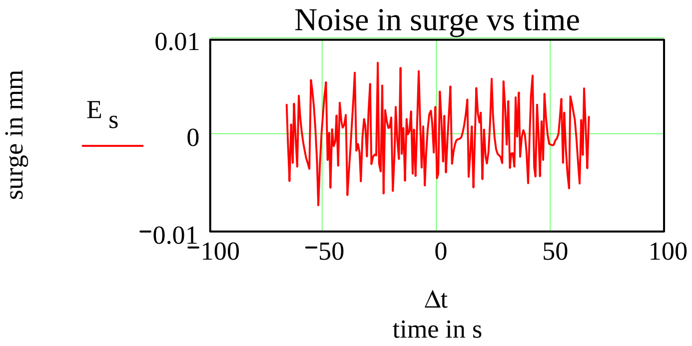
$$distr_{par} = \begin{bmatrix} 0.00000 \\ 0.00958 \\ 0.00068 \end{bmatrix}$$

Relative surge values faired

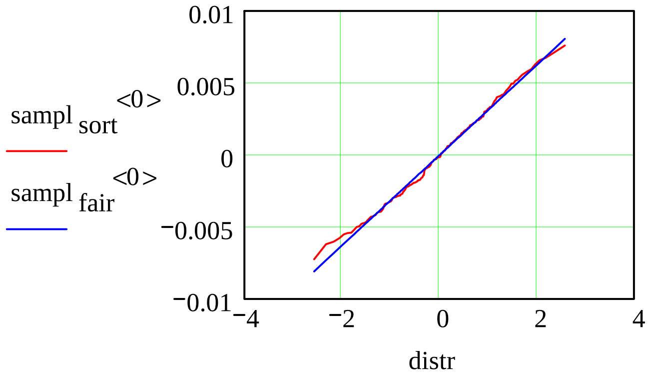
$$\left[s_{rel} \;\; v_{rel} \;\; a_{rel} \right] := \mathrm{Filter}\left(t, s_{raw}, ord_{max}\right)$$

$$E_s := s_{raw} - s_{rel} \qquad \mathrm{stdev}\left(E_s\right) = 0.00307$$



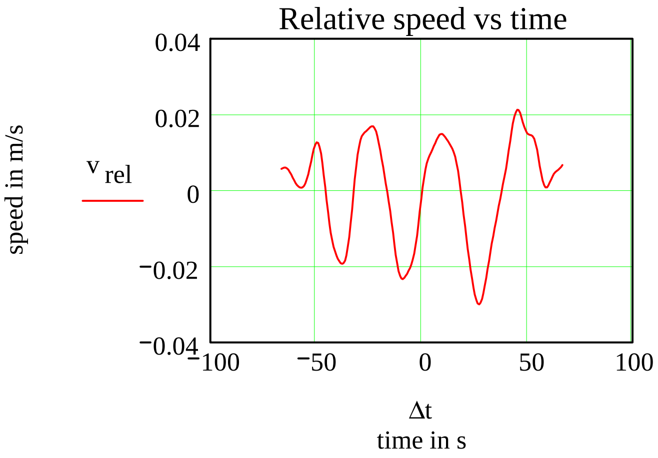


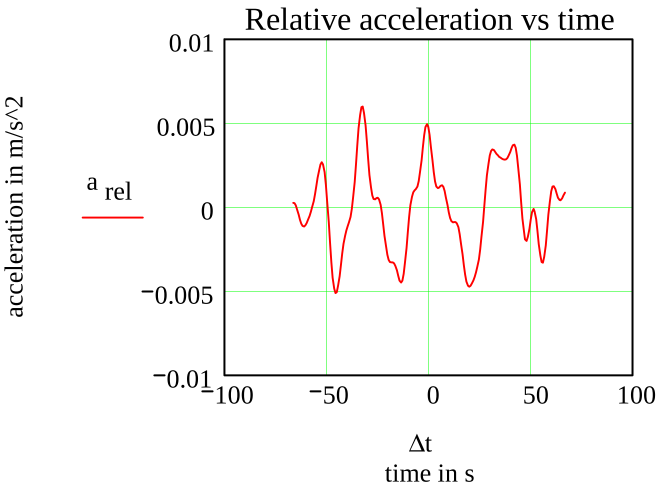
$$\left[distr \;\; sampl_{sort} \;\; sampl_{fair} \;\; distr_{par} \right] := \mathrm{norm\_distr}\left(E_s\right)$$



$$distr_{par} = \begin{bmatrix} 0.00000 \\ 0.00313 \\ 0.00022 \end{bmatrix}$$

Relative hull velocity and acceleration derived





'Final' faired values

Shaft frequency

$N_{S.fair} := n_{fair}$

Shaft power derived

$P_{S.fair_i} := 2 \cdot \pi \ n_{fair_i} \cdot Q_{fair_i}$

Shaft thrust

$T_{S.fair} := T_{fair}$

The thrust data are used only in the complete analysis mod_evalf of the powering performance based on the quasi-steady 'model' test, in the trials analyses mod_trl_xx they are ignored!

Hull speed and acceleration over ground

$V_{HG.fair} := v_{carr} + v_{rel}$

$A_{HG.fair} := a_{rel}$

Store faired data

$dat\_fair := \left[\Delta t \ \ N_{S.fair} \ \ P_{S.fair} \ \ V_{HG.fair} \ \ a_{rel} \ \ T_{S.fair} \right]$

WRITEPRN("Dat_fair") := dat_fair

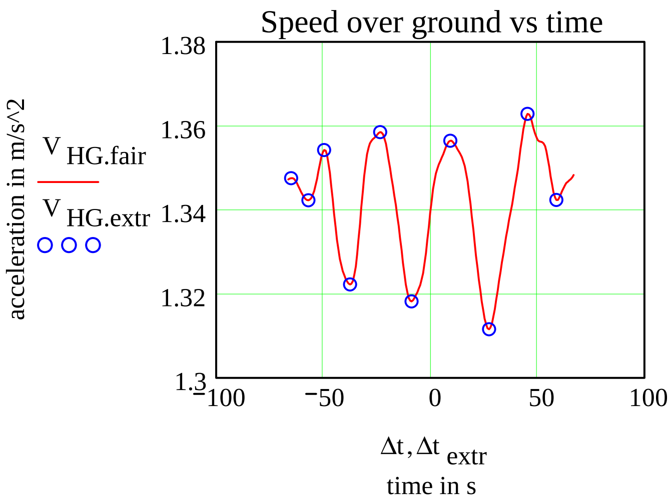
Identify extremal and stationary conditions

This simple minded operation necessary for the identification of the current
has to be performed already at this stage to avoid rounding errors
encountered in writing the faired data to the file Dat_fair.

Extremal speeds

```
extremal(t,v) := | k ← 0
                 | r ← sign(v_1 − v_0)
                 | for i ∈ 2 .. last(t)
                 |   | continue if sign(v_i − v_{i−1}) = r
                 |   | ind_k ← i − 1
                 |   | t_extr_k ← t_{i−1}
                 |   | v_extr_k ← v_{i−1}
                 |   | k ← k + 1
                 |   | r ← sign(v_i − v_{i−1})
                 | [ind  t_extr  v_extr]
```

$$\left[ind_{extr} \;\; \Delta t_{extr} \;\; V_{HG.extr} \right] := \text{extremal}\left(\Delta t, V_{HG.fair}\right)$$



Store stationary data

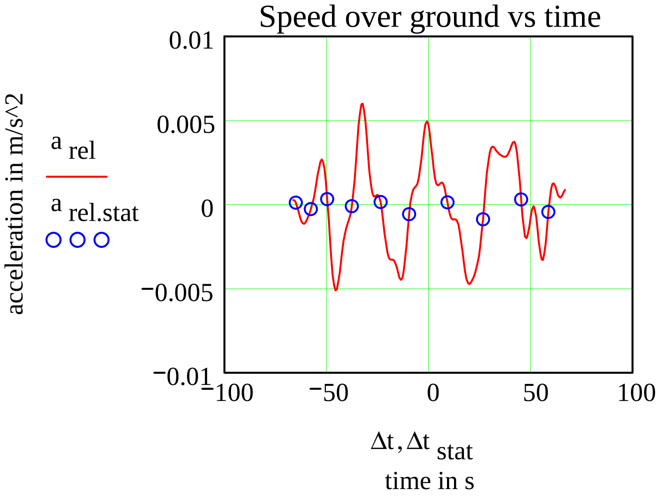
$dat\_stat := \begin{bmatrix} ind_{extr} & \Delta t_{extr} & V_{HG.extr} \end{bmatrix}$

WRITEPRN("Dat_stat") := dat_stat

'Cross' check not only of stationarity

```
stationary(t, a) := | k ← 0
                    | r ← sign(a_1)
                    | for i ∈ 1 .. last(t)
                    |   | continue if sign(a_i) = r
                    |   | ind_k ← i − 1
                    |   | t_stat_k ← t_(i − 1)
                    |   | a_stat_k ← a_(i − 1)
                    |   | k ← k + 1
                    |   | r ← sign(a_i)
                    | [ind  t_stat  a_stat]
```

$\begin{bmatrix} ind_{stat} & \Delta t_{stat} & a_{rel.stat} \end{bmatrix} := stationary(\Delta t, a_{rel})$



$$ind_{extr} - ind_{stat} = \begin{bmatrix} 0.00000 \\ 1.00000 \\ 0.00000 \\ 0.00000 \\ 0.00000 \\ 1.00000 \\ 0.00000 \\ 1.00000 \\ 0.00000 \\ 0.00000 \end{bmatrix}$$

Thus the extremal speed conditions are in fact stationary conditions,
i. e. conditions of vanishing accelerations.

END
Raw and faired data of a quasi-steady ship 'model' powering test

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To whom it may concern

Resistance and propulsive efficiency identifued at a quasi-steady ship 'model' powering trial

Reference

Reference:C:\model_test\mod_prel.mcd

Data input

Based on digitized .jpg files of Fig's 6, 7, 8, 9 in VWS Report No. 1100/87 to found in the first appendix.

In the fundamental 'model' test mod_eval.mcd the raw data have been scutinzed, faired and recorded for ready reference.

Although at a later stage the small corrections applied to some torque data were found not be 'necessary', no to say 'wrong', the earlier results are used here again, as the results of the present exercise are compared with the results of the earlier analysis, including the thrust data.

While the symbols have been updated, it has been felt, that completely 'streamlining' the former documents would be neither adequate nor necessary.

$Dat_{fair} := READPRN("dat\_fair.dat")$

$t := Dat_{fair}^{\langle 0 \rangle}$ $\quad ni := last(t)$ $\quad i := 0 .. ni$ $\quad t := t \cdot \frac{sec}{min}$

$t_m := mean(t)$

$\Delta t := t - t_m$

$N_S := Dat_{fair}^{\langle 1 \rangle}$ $\quad V_{HG} := Dat_{fair}^{\langle 2 \rangle}$ $\quad A := Dat_{fair}^{\langle 3 \rangle}$ $\quad Q_S := Dat_{fair}^{\langle 4 \rangle}$

Parameters identified

Hull speed

$V_{WG} := READPRN("Dat\_Curr")$

$V_{WG.mean} := mean(V_{WG})$ $V_{WG.mean} = 0.0258$

$V_{WG_i} := V_{WG.mean}$ Mean current in the tank
assumed for lack of more precise information

$V_{HW} := V_{HG} - V_{WG}$ $V_{HW.mean} := mean(V_{HW})$ $V_{HW.mean} = 1.3159$

$\Delta V_{HW_i} := V_{HW_i} - V_{HW.mean}$

Hull advance ratio

$$J_{HW_i} := \frac{V_{HW_i}}{D \cdot N_{S_i}}$$

$J_{HW.mean} := mean(J_{HW})$ $J_{HW.mean} = 0.6849$

$\Delta J_{HW_i} := J_{HW_i} - J_{HW.mean}$

Shaft power

$P_{S_i} := 2 \cdot \pi \cdot N_{S_i} \cdot Q_{S_i}$ $P_{S.mean} := mean(P_S)$ $P_{S.mean} = 46.4870$

$\Delta P_{S_i} := P_{S_i} - P_{S.mean}$

Energy balance analysed

Set up energy balance

$A_{P_{i,0}} := -V_{HW_i}$

$A_{P_{i,1}} := A_{P_{i,0}} \cdot \Delta V_{HW_i}$

Partial linearised towing power with unknown total resistance parameters

$A_{P_{i,2}} := P_{S_i}$

$A_{P_{i,3}} := A_{P_{i,2}} \cdot \Delta J_{HW_i}$

Partial linearised propulsive power with unknown propulsive efficiency parameters

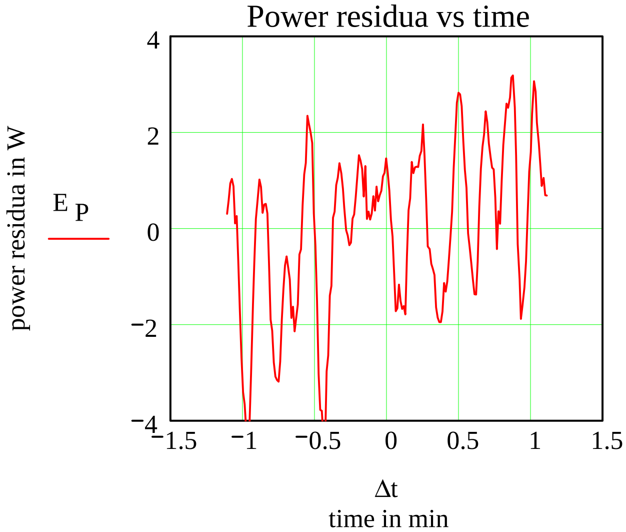
$B_{P_i} := (I_{eff} \cdot A_i - F_F) \cdot V_{HW_i}$ Towing power due to known 'forces'

Solve equations

$X_P := \mathrm{geninv}(A_P) \cdot B_P$

$$X_P = \begin{bmatrix} 29.1550 \\ 58.8342 \\ 0.4708 \\ -0.0709 \end{bmatrix}$$

$E_P := B_P - A_P \cdot X_P$



The power residua are exhibiting a pronounced linear tendency.

Results of evaluations including measured thrust values

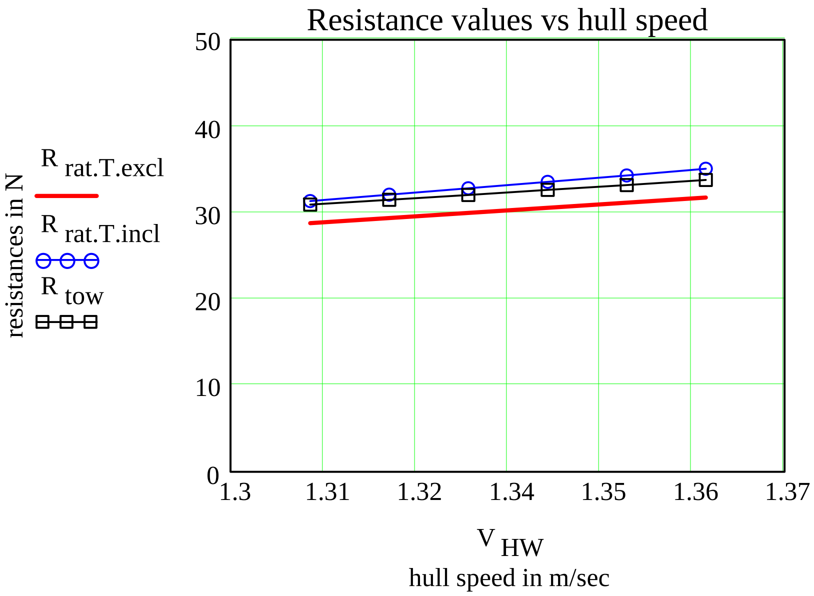
$$\begin{bmatrix} V_{HW} & R_{rat.T.incl} & R_{tow} \\ J_{HW} & \eta_{TEP.rat.T.incl} & \eta_{TEP.trad.T.incl} \end{bmatrix} := \mathrm{READPRN}(\text{"Res\_mod\_eval"})$$

Resistance values
identified excluding measured thrust values

$j := 0 .. \mathrm{last}(V_{HW})$

$\Delta V_{HW.plt_j} := V_{HW_j} - V_{HW.mean}$

$R_{rat.T.excl_j} := X_{P_0} + X_{P_1} \cdot \Delta V_{HW.plt_j}$

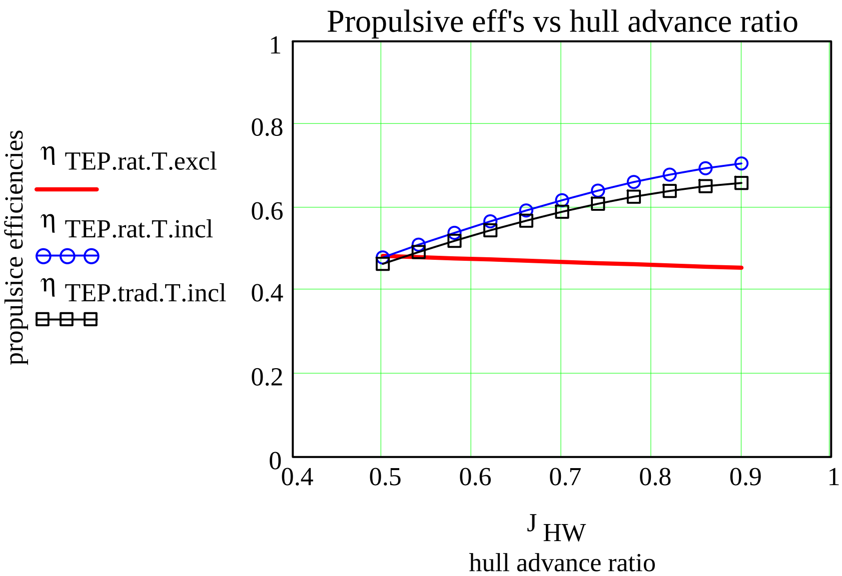


Propulsive efficiency values
identified excluding measured thrust values

$j := 0 .. \mathrm{last}(J_{HW})$

$\Delta J_{HW.plt_j} := J_{HW_j} - J_{HW.mean}$

$\eta_{TEP.rat.T.excl_j} := X_{P_2} + X_{P_3} \cdot \Delta J_{HW.plt_j}$



Evidently the results are quite unsatisfactory,
the energy balance not accounting
for unknown effects of the towing tank environment,
e.g. drift due to previous tests and tidal waves.

Identify trend of power residua

$t_m := \text{mean}(t)$ $\Delta t := t - t_m$

$A_{E_{i,0}} := 1$

$A_{E_{i,1}} := \Delta t_i$

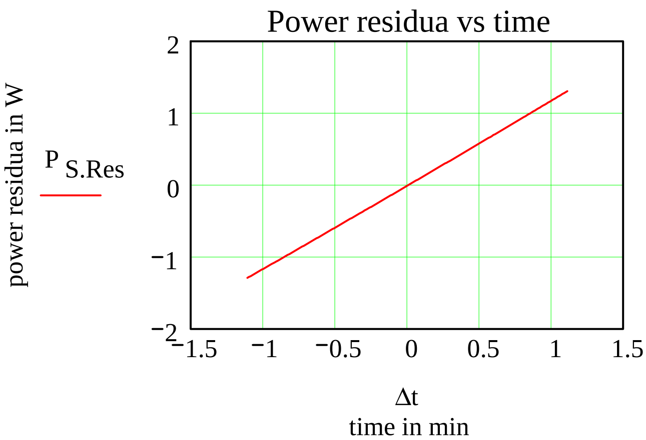
$A_{E_{i,2}} := \left(\Delta t_i\right)^2$

$X_E := \text{geninv}\left(A_E\right) \cdot E_P$

$$X_E = \begin{bmatrix} -0.005223 \\ 1.170122 \\ 0.012651 \end{bmatrix}$$

The analysis shows that the trend is in fact linear.

$P_{S.Res} := A_E \cdot X_E$



Modify power balance

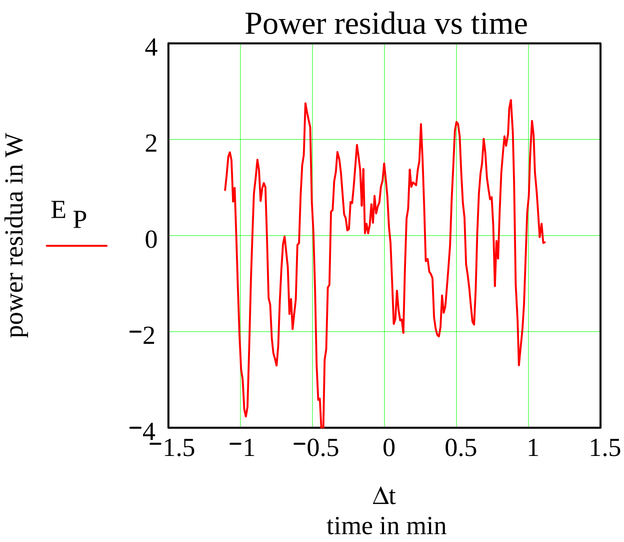
$$A_{P_{i,2}} := P_{S_i} + P_{S.Res_i}$$

Solve modified equations

$$X_P := \mathrm{geninv}(A_P) \cdot B_P$$

$$X_P = \begin{bmatrix} 32.4847 \\ 66.6099 \\ 0.5695 \\ 0.4242 \end{bmatrix}$$

$$E_P := B_P - A_P \cdot X_P$$



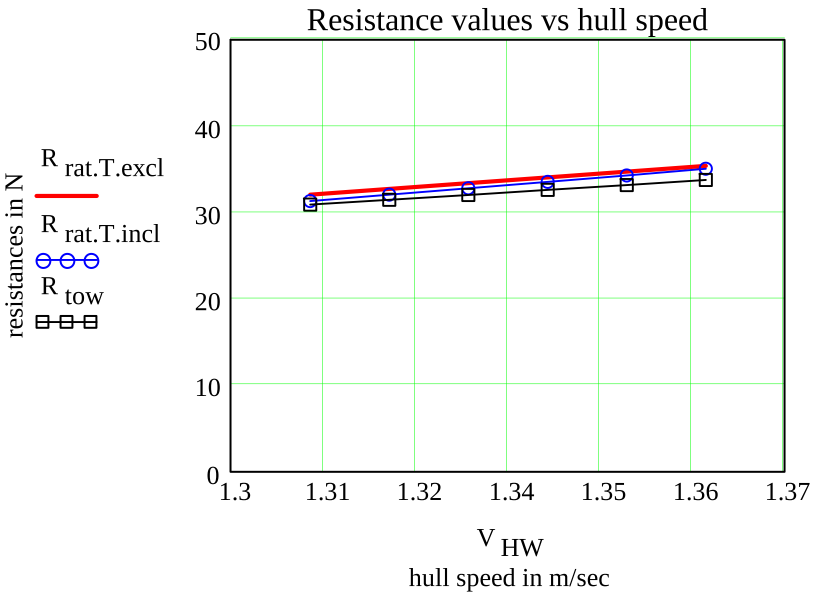
Resistance values

identified excluding measured thrust values

$$j := 0 .. \mathrm{last}(V_{HW})$$

$$\Delta V_{HW.plt_j} := V_{HW_j} - V_{HW.mean}$$

$$R_{rat.T.excl_j} := X_{P_0} + X_{P_1} \cdot \Delta V_{HW.plt_j}$$



The model resistance identified excluding the measured thrust values is thus nearly identical to the towing resistance.

$$V_{HW} = \begin{bmatrix} 1.3100 \\ 1.3200 \\ 1.3300 \\ 1.3400 \\ 1.3500 \\ 1.3600 \end{bmatrix} \qquad R_{rat.T.excl} = \begin{bmatrix} 32.0942 \\ 32.7603 \\ 33.4264 \\ 34.0925 \\ 34.7586 \\ 35.4247 \end{bmatrix} \qquad R_{tow} = \begin{bmatrix} 30.9400 \\ 31.5000 \\ 32.0600 \\ 32.6300 \\ 33.2100 \\ 33.7900 \end{bmatrix}$$

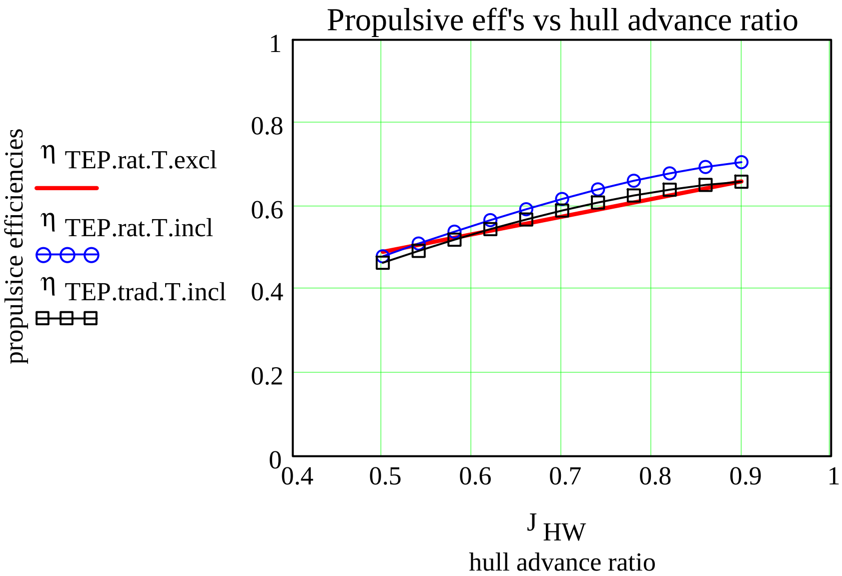
Similarly the values of the model propulsive efficiency identified excluding the measured thrust values are nearly identical to the values based on the model propeller open water performance.

Propulsive efficiency values
identified excluding measured thrust values

$$j := 0 .. \text{last}\left(J_{HW}\right)$$

$$\Delta J_{HW.plt_j} := J_{HW_j} - J_{HW.mean}$$

$$\eta_{TEP.rat.T.excl_j} := X_{P_2} + X_{P_3} \cdot \Delta J_{HW.plt_j}$$



J_{HW} =	$\eta_{TEP.rat.T.incl}$ =	$\eta_{TEP.trad.T.incl}$ =
0.5000	0.4804	0.4652
0.5400	0.5108	0.4937
0.5800	0.5398	0.5206
0.6200	0.5676	0.5458
0.6600	0.5938	0.5691
0.7000	0.6184	0.5905
0.7400	0.6411	0.6096
0.7800	0.6617	0.6264
0.8200	0.6799	0.6405
0.8600	0.6951	0.6517
0.9000	0.7069	0.6593

Conclusions

After correction of the mistake in the data transmission from the preceding basic programme mod_eval.mcd to the present programme all the earlier subsequent speculations concerning the reasons of the discrepancies observed in the propulsive efficiencies are obsolete.

Accounting for the trend of the observed power residua, without caring for their possible reasons, the results are in perfect agreement with the traditionl results not only in case of the resistance, but also in case of the propulsive efficiency.

Thus, from the preceding **basic exercise**, the evaluation of data acquired at a quasi-steady 'model' test of only two minutes duration, ignoring the thrust data (!), it is concluded that quasi-steady trials of about one half to one hour full scale will be possible for detailed monitoring of the powering performance of ships at the conditions prevailing during the test.

Towing tanks can easily test this procedure, as they did in 936/37 with Horn's proposal, and can ask for such tests at the next full scale trials they are involved in. Of course in evaluating full scale data others of my procedures developed to identify current and environmental parameters have to be accounted for. The pertinent development may be subject of a master's or even a doctoral thesis.

'Unneccesary' to mention that in routine applications the programming will be quite different, typically in terms of subroutines, which have been used only occasionally in this document. But in view of the sensitivity of the problem at hand colleagues are warned: there may be 'no plug and play' programs. In any case careful scrutiny of data and intermediate results is absolutely mandatory.

And to repeat: The method proposed offers dramatic technological and commercial advantages. No hull towing tests and propeller open water are necessary and the extremely short propulsion tests provide a wealth of consistent data and results.

END
Resistance and propulsive efficiency identified at a quasi-steady ship 'model' powering trial

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Current at a quasi-steady ship 'model' powering trial

References

Reference:C:\model_test\mod_prel.mcd

Reference:C:\model_test\mod_rout.mcd

Reference:C:\model_test\mod_data.mcd

Input of filtered and stationary data

dat_filt := READPRN("Dat_filt")

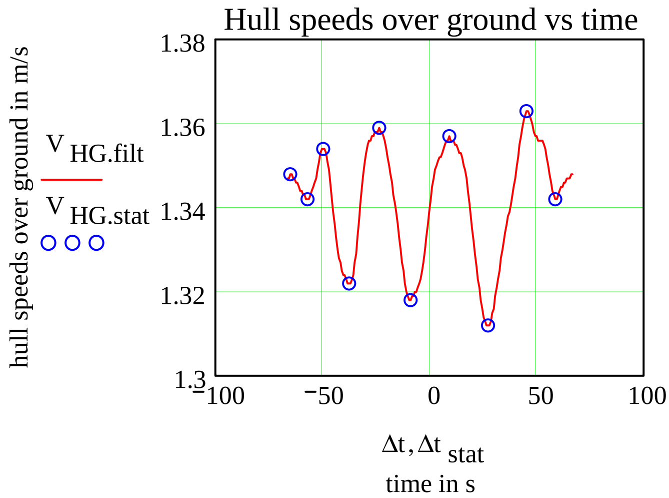
$\left[\Delta t \;\; N_{S.filt} \;\; P_{S.filt} \;\; V_{HG.filt} \;\; a_{rel} \;\; T_{S.filt}\right] := \text{dat\_filt}$

dat_stat := READPRN("Dat_stat")

$\left[ind \;\; \Delta t_{stat} \;\; V_{HG.stat}\right] := \text{dat\_stat}$

$k := 0 .. \text{last}\left(\Delta t_{stat}\right)$

$N_{S.stat_k} := N_{S.filt}\left(ind_k\right)$ $\quad P_{S.stat_k} := P_{S.filt}\left(ind_k\right)$ $\quad \Psi_{HG.stat_k} := \pi$



Identify 'tidal' period in the tank

The criterion adopted

In view of the small current amplitude to be expected the minimum of the mean current has been adopted as criterion for the selection of the current period.

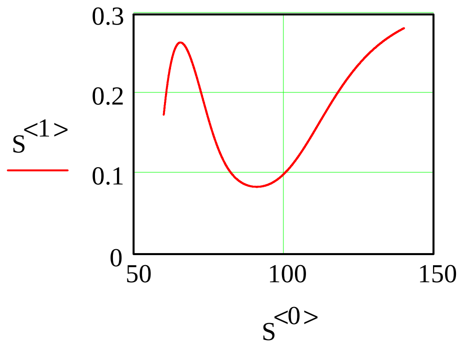
A check has shown, that the mean current identified equals the mean current identified with the harmonic component assumed to be non-existent.

Survey of mean current as function of the tidal period

$$C_m(n, T_i, \Delta T) := \left| \begin{array}{l} \text{for } j \in 0..n \\ \quad \left| \begin{array}{l} S_{j,0} \leftarrow T_i + j \cdot \Delta T \\ \omega \leftarrow \dfrac{2 \cdot \pi}{S_{j,0}} \\ V_{WG.m} \leftarrow C0\left(\omega, \rho, D, \Delta t_{stat}, V_{HG.stat}, \psi_{HG.stat}, N_{S.stat}, P_{S.stat}\right) \\ S_{j,1} \leftarrow V_{WG.m} \end{array} \right. \\ S \end{array} \right.$$

$n := 8000 \qquad T_{ini} := 60 \qquad \Delta T := 0.01$

$S := C_m(n, T_{ini}, \Delta T)$



Find minimum

$SS := \mathrm{csort}(S, 1)$

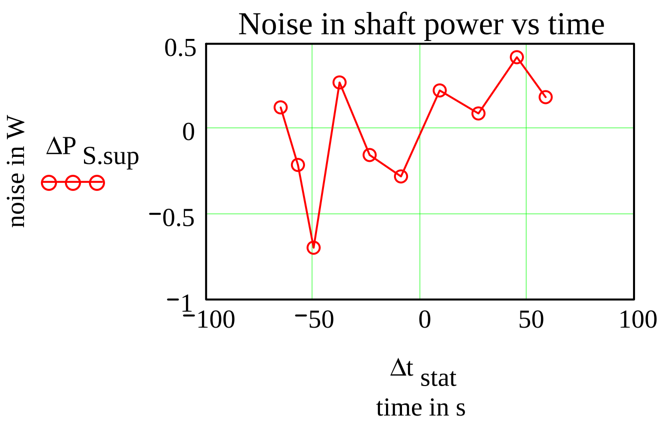
$s := \left(SS^{T}\right)^{\langle 0 \rangle}$ $s = \begin{bmatrix} 90.96000 \\ 0.08439 \end{bmatrix}$

$\omega := \frac{2 \cdot \pi}{s_0}$ $\omega = 0.06908$

All results identified at the quasi-stationary conditions

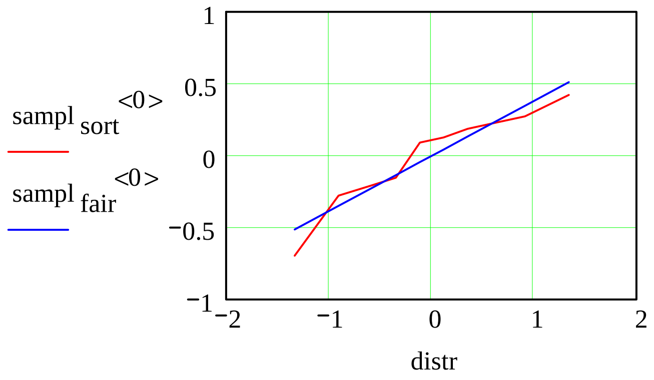
$$\begin{bmatrix} \Delta P_{S.sup} & v & V_{WG.stat} \\ V_{HW} & p & P_{S.sup} \\ J_{HW} & p_{n} & K_{P.sup} \end{bmatrix} := \mathrm{Supplied}\left(\omega, \rho, D, \Delta t_{stat}, V_{HG.stat}, \psi_{HG.stat}, N_{S.stat}, P_{S.stat}\right)$$

Residua scrutinised



Check of distribution

$$\begin{bmatrix} distr & sampl_{sort} & sampl_{fair} & distr_{par} \end{bmatrix} := \mathrm{norm\_distr}\left(\Delta P_{S.sup}\right)$$



$$distr_{par} = \begin{bmatrix} -0.00025 \\ 0.38311 \\ 0.12115 \end{bmatrix}$$

Current identified

$i := 0 .. last(\Delta t)$

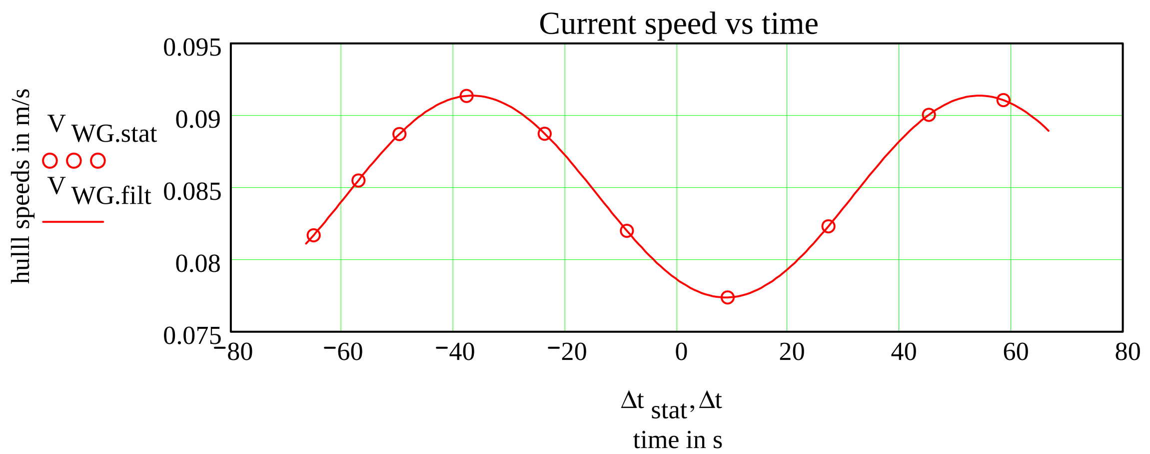
$V_{C.mean} := v_0$ $\quad V_{C.mean} = 0.08439$ mean current

$T_C := s_0$ $\quad T_C = 90.96000$ tidal period

$V_{C.ampl} := \sqrt{(v_1)^2 + (v_2)^2}$ $\quad V_{C.ampl} = 0.00700$ tidal current amplitude

'Tidal' current at quasi-steady states

$V_{WG.filt_i} := VT(\omega, v, \Delta t_i)$

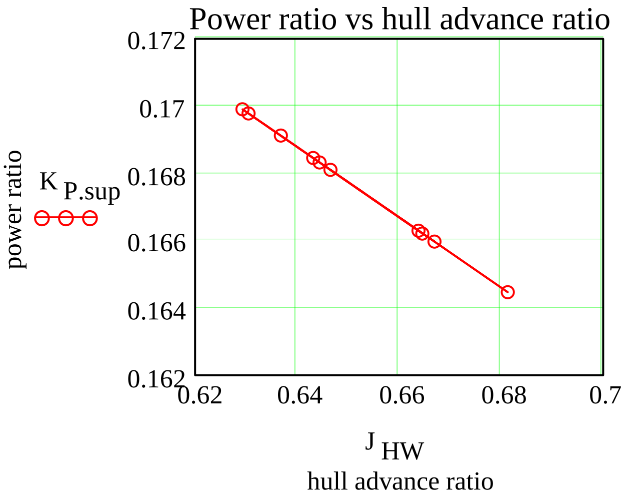


Store current values at quasi-steady conditions

$dat\_curr := V_{WG.filt}$

WRITEPRN("Dat_curr") := dat_curr

Propeller powering characteristic identified



Store parameters of powering charracteristics

$$dat\_pow := \begin{bmatrix} p & p_n \end{bmatrix}$$

WRITEPRN("Dat_pow") := dat_pow

Conclusions

Identifying the current in the model basin and the propeller powering characteristic in the behind condition, based on the quasi-*stationary* conditions passed during the quasi-*steady* trial, is a method already applied in 1989 and mentioned in the Proceedings of my 2nd INTER-ACTION Berlin '91, thus paving the road for full scale applications.

The investigation of the current in the tank, 'usually' performed only in cases of doubt, of 'tank storms', poses special problems not to be expected on full scale.

The tidal current model adopted maybe considered as inadequate, even 'wrong' on model scale, in 'towing' tanks. But 'according' to the motto, it turned out to be 'particularly' useful.

The mean current identified in the present case is 'considerable', but not unlikely, as the test analysed has been the eighth in a series of quasi-
steady tests.

On full scale also the powers required due to the motion through the water and due to wind and waves can be identified separately and thus, with the propulsive efficiency identified before, even the hull resistance and the wind and wave resistance! *Nota bene*: No thrust measurements being required!

For the standard ISO 19030 under development the rational procedures successfully developed on model scale will be fundamental.

Altogether this completes the triumph of Fritz Horn's vision and proposals tested before and discussed during the 4th ITTC at VWS Berlin 1937.
At that time it 'only' suffered from inadequate conceptual, experimental and computational tools and further developments were disrupted by the second world war.

END
Current etc at a quasi-steady ship 'model' powering trial

News on steady and quasi-steady trials and monitoring

-----Original message-----
including some [addenda]

From: Michael Schmiechen
Sent: Wednesday, April 30, 2014 5:23 PM
To: Angelo Olivieri ; Anton Minchev ; G. Grigoropoulos ; Henk van den Boom ; Heungwon Seo ; Jinbao Wang ; Masaru Tsujimoto ; Michio Takai ; Solia Werner ; Uwe Hollenbach ; Wojciech Gorski

Subject: News on steady and quasi-steady trials and monitoring

Dear colleagues of the ITTC Specialists Committee on the Powering of Ships in Service, dear friends and fans of my rational theory of propulsion, after all I have finished my studies PATE_01 and 02 of the trials with two sister ships in the East China Sea with an analysis based on three double runs only, as usually performed. The results confirm the stability and objectivity of the rational procedure for the evaluation of traditional steady trials I am promoting. The pertinent file PATE_01.3 including all the details is to be found on my website www.m-schmiechen.de under 'News on ship powering trials'.

Subsequently I have revisited my first analysis of a quasi-steady 'model' trial documented in my 'Festschrift' commemorating the quasi-steady propulsion tests with the research vessel METEOR in the Greenland Sea in November 1988, published on occasion of the 108th Annual Meeting of Schiffbautechnische Gesellschaft at Berlin in November 2013 and to be found under 'News on ship powering trials' as well.

As it turned out, the unsatisfactory results of the first analysis, excluding (!) the measured thrust data, had been caused by a simple, not to say stupid mistake in data transmission from the earlier rational and traditional analyses of [one of] the model test, performed on 09.09.1986 before the full scale METEOR tests [in order] to check the feasibility of the quasi-steady procedure.

The re-analysis of the data of the quasi-steady propulsion test of only two minutes duration without thrust data and any other prior data (!) permitted to identify the resistance and the propulsive efficiency [of the model, 'accidentally'] in perfect agreement with the results of the hull towing test and the traditional evaluation based on the propeller open water tests.

All details of the analysis and some conclusions concerning further developments] are documented in the file mod_trial 21.pdf attached and to be found under 'News on ship powering trials' together with the basic analyses mod_evaf.pdf as well.

My results [based on the simplest possible, [the traditional] energy balance] permit the conclusion that the basic routine developed will permit to identify the resistance and the propulsive efficiency at full scale quasi-steady trials and monitoring of less than an hour duration under service conditions without anybody even noticing that such tests are being performed.

Thus there will in future be no need to base the evaluation of powering performance on [values of] the propulsive efficiency pulled as joker out of the sleeve as proposed in the STAimo method promoted by MARIN and (to be?) adopted by ITTC, ISO and IMO, following the emperor in his new clothes.

Looking forward to future joint developments of trials and monitoring systems based on my extremely simple routine meeting the requirements [of transparency and objectivity and thus] (and) the purposes of generally acceptable, lasting standards ISO 15016 and ISO 19030 [in particular].

I remain with my best regards yours,
Michael Schmiechen.

-----Ursprüngliche Nachricht-----
From: Michael Schmiechen
Sent: Tuesday, January 28, 2014 7:59 PM
To: Patrick Hooijmans ; Michiel Verhulst
Cc: Klaus Wagner
Subject: Quasi-steady trials and monitoring

Dear colleagues,

only today I have received a copy your earlier paper PRADS2010-12087.pdf from Dr. Klaus Wagner of Rostock, with whom I am in close contact concerning research and development on quasi-steady trials and monitoring. And having read yet just the acknowledgements I would like to thank you warmly for referring to my pioneering work. This is in fact one of the rare acknowledgements I have received over the past decades and thus it is most gratefully appreciated. Many thanks!

You will certainly be aware of my various recent activities, triggered by diverse developments, not least by the 'aggressive' activities of 'your' Henk van den Boom. My recent work originated essentially in 2013 and most of it is to be found in my 'Festschrift' published and distributed on occasion of the 108th Annual Meeting of Schiffbautechnische Gesellschaft here at Berlin in November 2013. For ready reference you find the pdf file of the 'Festschrift' together with other pertinent material on my website in the Section 'News on ship powering trials'.

As a matter of fact I have just completed the evaluation of another 'anonymous' traditional trial and I was ready to evaluate the example in the current DIS 15016. But to my surprise I found out that such an example does not exist! As you will see or have seen I am strongly opposed to repeat the mistakes of ISO 15016: 2002-06. Accordingly I continue to alert colleagues worldwide to start thinking themselves instead of following the emperor in his new clothes.

You know that there is another standard, ISO 19030 under way, concerning monitoring in particular and to my knowledge MARIN is 'of course' involved. I just defined a goal and conceived a plan how to solve that problem in a rational, generally acceptable fashion, knowing that monitoring systems are already being successfully marketed, but the details are proprietory.

With kind regards to the colleagues at Wageningen
yours, Michael Schmiechen.

-----Ursprüngliche Nachricht-----
--------with an [addendum]-------
From: Michael Schmiechen
Sent: Monday, August 4, 2014 9:26 AM
To: Anton Minchev ; Uwe Hollenbach
Cc: Aage Damsgaard ; Gerhard Strasser
Subject: Fw: ITTC Procedure 7.5-04-01-01.2, example data

Good morning Dr. Minchev,

as you see from the following correspondence I now have a list of procedures proposed for adoption by the Full Conference. But when I tried to download the procedure in question, I was not successful for reasons unknown. In order not to bother Aage Damsgaard any further I wanted to ask Dr. Hollenbach for a copy, but he is on summer vacation until August 18. So I dare to ask you to send me a copy.

Further, I have only started (!) to study the Report of your Specialists Committee and I noticed, that under 1.3 you mention a practical example included in Sections 8 and 9. If you let me have the basic data I can produce an independent evaluation, thus providing for a 'substantial' Written Contribution. As you know, I did similar studies in case of the standard ISO 15016: 2002-06 and, more recently, in case of the ANONYMA trials for Dr. Hochkirch and in case of the PATEs for Dr. Hollenbach.

Surprisingly, or rather not (!), I noticed that, different from the established practice followed by all other Committee Reports, yours does not cover all pertinent publications, at least over the past conference period. 'Instead' I find, after all our detailed correspondence, the repetition of the incorrect (!) statement:

"With the acceptance of these new procedures, the ITTC and IMO have established a transparent, straightforward best practice and a level playing field for the delivery of new ships for all stakeholders."

With 'best practice' and 'level playing field' even in bold print (!). As your Report shows, the procedure is neither straightforward nor transparent and, most important, the ITTC has not yet accepted this procedure! According to the 'News from the Advisory Council', which I attach for ready reference, ITTC is not the playground of MARIN, and not a kindergarten!

[Most 'surprising' in your Report is the incredibly naive discussion of the identification of the currents prevailing at the trials. Already in 1998 I have shown how this can be done objectively and reliably without any prior data, without any jokers to be pulled out of the sleeves. I have explained the reason for my approach meeting the simple 'facts' of the theory of knowledge in my letter to Prof. Ikehata, the convener of ISO 15016, and in my ISO '98 Proposal, meeting the minimum standards of a students exercise.

Both documents have been filed by JISC/JMSA as 'Prof. Schmiechen's comments to ISO/TC8/SC9/WG2/N20, Informative' under ISO/TC8/SC9 /WG2/N28, dated 1998-06-23. Detailed evaluations and the whole correspondence up to 2002, when the DIS became a standard despite its serious defects I had explicitly demonstrated, are to be found on my website.

The reason for my comments and proposals being qualified as 'informative' only is, that as a private person, not 'authorised' by the German group, I was formally not 'permitted' to approach the Convener. And for the same reason I have already been excluded formally from future, long overdue revisions of ISO 15016, finally being felt necessary, and related discussions of the German group, as it happens consisting of Dr. Hollenbach alone!

How long are we going to follow, to afford this and other incredibly inefficient 'bureaucratic' procedures and the stupid doctrine 'not invented here'? The first of your chapters are full of such 'procedures'! And what is a 'verifier' supposed to do, that has no experience (page12)? Are you sure, that this statement and the procedure described are meaningful.

Or is it just plain nonsense you should have rejected, instead of bowing, as has been done in case of ISO 15016: 2002-06! I hope that we will not end up again with a similar disaster, with the same stone age methods again promoted by the Japanese Convener!]

MS 28.08.2014 08:00 h

A Written Discussion with related correspondence

Correspondence with 'considerable' consequences

The central part of this final section is my Written Discussion to the Report and Recommendations of the Specialists Committee on the [Powering] Performance of Ships (SC PSS) in Service submitted to the 27th ITTC. This contribution has been preceded by an extended intense correspondence with the Chairman and the Members of SC PSS and (of) other 'bodies'.

The very small, random selection from the vast correspondence with colleagues worldwide included is intended to provide additional background for the criticism expressed and essentially shared by the Advisory Council, as clearly stated in the 'News from the Advisory Council' included.

Also included for ready reference is the plot of Hans Christian Andersen's Tale of 'The Emperor's New Clothes', published at Copenhagen in 1837, as it perfectly describes what happened in the SC PSS and currently on larger scale concerning the revision of the ITTC Guideline and of the standard ISO 15016 for the evaluation of traditional powering trials.

MS 28.08.2014 08:00 h

A small 'random' selection from my correspondence with the Specialists Committee on the Performance of Ships in Service and other 'bodies'

> " ... always remember that it is impossible to speak in such a way that you cannot be misunderstood: ... If greater precision is needed, it is needed because the problem to be solved demands it."
>
> *Karl Popper: Unended Quest (1978/30).*

-----Ursprüngliche Nachricht-----
From: Michael Schmiechen
Sent: Wednesday, July 24, 2013 11:42 PM
To: Stig Sand
Cc: Anton Minchev ; Gerhard Strasser

Subject: Fundamental considerations

Dear Dr. Sand,

recently I read some reviews of Ronald Dworkin's fundamental work 'Justice for Hedgehogs' and I immediately noticed, that the work generalises ideas concerning scientific theories discussed by Bertrand Russell, (I am referring to in my opus magnum, a rational reconstruction of classical mechanics,) to cover all aspects of human affairs, politics in particular.

And today, before ordering the book, I read a keynote address given by Dworkin at a very prominent conference on his book, held years before it has been published! The nine pages (notice the link at the end) provides a very vivid introduction to his ideas, linking up with many aspects I have mentioned in my draft paper, which the members of the specialists Committee did not (!) care to read.

You may find the philosophical text not related to your situation, even rather far-fetched, but I find the following two paragraphs towards the end pertinent, more or less directly applicable.

"Even if we agree, as I argue, that the skeptical view about moral truth is based on a misunderstanding, and that moral and political judgments can be true or false, we must still recognize that arguments about which are true and which false cannot easily be resolved. People who disagree about

whether justice requires a universal health care system may be unable to persuade one another: neither side may have a lever of persuasion it can press. On the contrary, if the view I suggested is right about the nature of such disagreements, any argument can continue only by fanning out into greater.and more distant areas of moral and ethical, perhaps aesthetic, theory. We will continue to disagree and our disagreement will become even more profound.

So we must consider another important moral virtue: not accuracy but responsibility. Though we cannot demand agreement from our fellow citizens, we can demand responsibility and we must therefore develop a theory of responsibility in sufficient detail so that we can say to some people, "I disagree with you, but I recognize the integrity of your argument. I recognize your responsibility." Or, "I agree with you, but you've thrown a coin or you've listened only to Fox News, and therefore you've acted irresponsibly in forming your opinion."

According to my standards of responsibility the Specialists Committee has 'again acted irresponsibly in forming its opinion' and the Executive Committee is responsible to draw the consequences.

Of course I shall buy the book tomorrow, 'digest' it and try to apply the insights to my, to our problems.

With kind regards yours,
Michael Schmiechen.

-----Ursprüngliche Nachricht-----
From: Michael Schmiechen
Sent: Monday, July 8, 2013 8:58 AM
To: Wojciech Gorski ; Solia Werner ; Uwe Hollenbach ; Michio Takai ; Masaru Tsujimoto ; Jinbao Wang ; Heungwon Seo ; G. Grigoropoulos ; Anton Minchev ; Angelo Olivieri ; Henk van den Boom
Cc: Aage Damsgaard ; Gerhard Strasser ; Stig Sand

Subject: Evidence ignored, nonsense discussed, cont'd

Dear colleagues,

when I told Dr. Wagner about the incredible result of your discussions on trials he instantly expressed doubts in your 'read-ability', while my guess is that you have read and understood, though only up to my pertinent warning "Reading [my draft paper] endangers Your principles", along with Mark Twain's precise observation in his speech on the´'Disappearance of Literature': "You cannot have a theory without principles.'Principles' is another name for 'prejudices'."

After that you evidently decided, that it is more profitable for you to delay progress for the next decade(s), to follow up the ISO 15016 disaster and thus to sacrifice the reputation of the PSS SC, of the EC and of the ITTC, than to endanger your inherited prejudices and your related 'Booming' business. 'It's the economy, stupid!' Bill Clinton taught his people.

If that has been your decision, than you should honestly state this publicly and not try to cover it up, purposely spreading grossly misleading, evidently false information. As every child knows, lies have very short legs. From Peter Janich's 'Was ist Wahrheit?' I have learned that the most efficient tool developed by mankind jointly (!) to solve problems is reliability, is thruth.

And always remember, that the work of your committee concerning a fundamental problem of ship theory is at the focal point of the current interest and of public discussions among experts worldwide. In view of this fact I, as a senior, experienced colleague, have friendly alerted your chairman to be extremely careful.

How then could your nonsensical discussion happen to take place? Are you all blindly following the emperor in his new clothes? Sapere aude! Care and dare to read and think yourselves!

With kind regards yours,
Michael Schmiechen.

----- Original Message -----
From: "Michael Schmiechen" <m.schm@t-online.de>
To: "Henk van den Boom" <H.v.d.Boom@marin.nl>; "Angelo Olivieri" <a.olivieri@insean.it>; "Anton Minchev" <ami@force.dk>; "G. Grigoropoulos" <Gregory@central.ntua.g>; "Heungwon Seo" <hwseo@hhi.co.kr>; "Jinbao Wang" <wang_jb@maric.com.cn>; "Masaru Tsujimoto" <m-

tsuji@nmri.go.jp>; "Michio Takai" <mic_takai@shi.co.jp>; "Uwe Hollenbach" <hollenbach@hsva.de>; "Solia Werner" <sofia.werner@sspa.se>; "Wojciech Gorski" <wojciech.gorski@cto.gda.pl>
Cc: "Stig Sand" <ss@force.dk>; "Gerhard Strasser" prof.dr.g.strasser@sva.at>; "Aage Damsgaard" <aad@force.dk>
Sent: Saturday, July 06, 2013 5:20 PM

Subject: Evidence ignored, nonsense discussed

Dear colleagues, members
of the ITTC PSS SC,

in order to speed up preparations for an urgent decision I am forwarding to you my latest correspondence with your chairmann Dr. Minchev, while he and Dr. Sand are out of office for the time being.

When Dr. Sand, Chairman of the EC, informed me, that he has asked your SC finally to 'address' alternatives of the STA procedure, your SC has incorporated in the ITTC 2012 Guidelines for the evaluation of powering trials, I have been wondering expressis verbis how he could seriously believe that the same committee, that has caused the problems for the EC, can possibly help the EC out of the terrible mess. In my opinion this is as 'naive' as the current practice to ask the same people, who have provided the powering predictions, to perform and analyse the powering trials 'as well'.

At that time I have also been wondering how your SC might use its last chance to recover its reputation. But to my big surprise Dr. Minchev's mail tells me, that you did not notice your chance and thus 'simply' missed it. How else could you yourselves possibly have 'avoided' to take any notice of my publications and of the latest evidence in particular, personally brought to your attention with my cover letter as early as May 19, well ahead of your recent meeting, thus permitting its careful preparation. For ready reference a hyperlink to all pertinent material is provided in the PS.

Instead you have chosen to discuss the nonsense ignorants told you and you bluntly state the opposite of what I have done and written since more than fifteen years. What would you do with a scientific officer you have sent (at considerable costs) to a meeting like that? And what with a committee coming up with this type of unqualified result?

As I have explained to Dr. Sand in detail the 'only' reason for my approach to come in is, that it happens to be the only alternative, extremely simple and transparent approach purposely and professionally developed to maturity to overcome the deficiencies of all the unsatisfactory traditional approaches, including the incredibly naive STA procedure.

That my approach is better 'known', if at all, in Europe and less well in Eastern countries is not quite true. Many of my Japanese colleagues have been and are very well aware of my activities. And as documented in detail on my website I have given series of lectures over the years at various institutes in Korea, in China and in India. And I have delivered some lectures at Gdansk as well, not to forget presentations of papers at St. Petersburg.

With kind regards yours,
Michael Schmiechen.

PS. All the recent material is to be found in the section 'From METEOR 1988 to ANONYMA 2013' under the 'News on ship powering trials' on my website:
http://www.m-schmiechen.homepage.t-online.de/HomepageClassic01/news_trl.htm

----- Original Message -----
From: "Michael Schmiechen" <m.schm@t-online.de>
To: "Anton Minchev" <ami@force.dk>
Cc: "Stig Sand" <ss@force.dk>; "Gerhard Strasser" <prof.dr.g.strasser@sva.at>; "Aage Damsgaard" <aad@force.dk>
Sent: Friday, July 05, 2013 4:00 PM

Subject: Re: Presentation drafted

Dear Dr. Minchev,

many, many thanks for your prompt and detailed response.

But I am very sorry to say, that evidently none of your members took the time to try and understand my approach, to read my recent draft paper in particular. You cannot possibly and publicly state exactly the opposite of what I have done and written for more than fifteen years.

As I have again and again explained in great detail, most recently in section '4 Balance of powers promoted' of my draft paper, and as I have demonstrated in many evaluations, even published on my website, not only the most recent, most delicate ones, my analysis of traditional trials does definitely not (!) need thrust measurements and does definitely not (!) need any model test results[, as it must be].

How now brown cow? As I have explained to your boss in great detail I am afraid your SC and the EC are in very big trouble! Face these problems honestly and do not try to spread false and des-information. 'Lies' have very short legs! Be sure, the 'tricks' you try to overcome the problems do not 'work'! Not even until next September! You better hurry up!

With kind regards yours
Michael Schmiechen.

PS 1. If you need any further explanations please read my discussion with Dott. Giulio Gennaro on my website.

PS 2. As substantial discussions are no longer documented elsewhere, I shall publish our correspondence, as any others, on my website as well.

PS 3. I suggest that you distribute this mail to all your members.

----- Original Message -----
From: "Anton Minchev" <ami@force.dk>
To: "Michael Schmiechen" <m.schm@t-online.de>
Cc: "Stig Sand" <ss@force.dk>; "Gerhard Strasser" <prof.dr.g.strasser@sva.at>; "Aage Damsgaard" <aad@force.dk>
Sent: Friday, July 05, 2013 1:55 PM
Subject: RE: Presentation drafted

Dear Prof. Schmiechen,

Thank you for your latest update. Yes, during our last PSS Committee meeting in Rome we did spent some time discussing your work. Some of the colleagues (mostly European) were very well familiar with your long term contributions; some (mostly from Far East) not so much familiar.

Among other things, we focused our discussion on your proposed approach for conduct and analysis of the speed/power trials. It became clear that one of the key issues (requirements) for the successful implementation of your method is the requirement to measure the propeller thrust (hence the insertion of a specialized shaft line piece with thrust gauge for your "Meteor" trials).

This requirement we found as the weakest link in your approach, as we all know that with present technology, measuring propeller thrust during sea trials is not a standard procedure and is therefore considered not practical. Furthermore, you claim that the analysis could be done without any reference to model test results (including propeller open water hydrodynamic characteristics). This fact also limits the possibility to "assess" the propeller thrust making use of its open water data.

Considering the above points, we wonder what could be the major "selling" advantages of your approach, provided you may not rely on any propeller thrust measurements during practical sea trials. This is in brief the common opinion of our Committee. During the limited period until the full ITTC (August 2014), we will be mostly focused on refining (mostly editorial) the present two procedures (conduct and analysis), as well as sampling and editing the final report to the Conference. In the near future ITTC will cooperate with ISO in producing mutually agreed speed/power procedure, which will be recommended (by IMO) for common use in the EEDI verification process. In that sense we anticipate that the PSS committee will continue its work for at least another ITTC term.

With best regards
Anton Minchev

-----Original Message-----
From: Michael Schmiechen [mailto:m.schm@t-online.de]
Sent: Wednesday, July 03, 2013 2:16 PM
To: Anton Minchev
Cc: Stig Sand

Subject: Presentation drafted

Dear Dr. Minchev,

since the mail attached another month passed 'away'. Along with my extended correspondence on the subject I have prepared a draft presentation of my paper. As all the other related material it is to be found in the 'News on ship powering trials'.

Next week this draft will be the basis of a talk I have been invited to deliver at a seminar of the naval architects here at the Technical University in Berlin. In that connection I wonder whether any news has been released by your PSS SC, which I may refer to.

And no wonder that I would love to know details of the discussions during your past meeting. Among others, how is your evaluation of my test case progressing?

With kind regards yours,
Michael Schmiechen.

----- Original Message -----
From: "Michael Schmiechen" <m.schm@t-online.de>
To: "Anton Minchev" <ami@force.dk>
Cc: "Uwe Hollenbach" <hollenbach@hsva.de>
Sent: Friday, May 31, 2013 7:53 PM

Subject: First discussion edited

Dear Dr. Minchev,

before leaving for a few days at the River Neckar I have edited my discussion with Giulio Gennaro, mostly eliminating misprints, and have put the collection on my website under 'News on ship powering trials'.

For the convenience of your Committee I have appended the file to this mail and here is also the direct link http://www.m-schmiechen.homepage.t-online.de/HomepageClassic01/METEOR_25 _disc_01.pdf

I think the arguments exchanged will help to understand the problems to be solved and the solutions not only proposed, but demonstrated to serve the purpose.

Although Dr. Gennaro understood most of what I have explained at length, all the time, even in his last response he tried to leave the micro-universe of discourse clearly and distinctly limited.

With my best wishes for the success of your meeting and best regards to all colleagues
yours, Michael Schmiechen.

-----Ursprüngliche Nachricht-----
From: Michael Schmiechen
Sent: Friday, June 21, 2013 10:06 AM
To: Stig Sand

Subject: Good news from the Court at Copenhagen!

Dear Stig Sand,

this years Musikfestspiele Potsdam Sanssouci are devoted to Scandinavia.

Following the 'Proserpin' by Joseph Martin Kraus based on an idea of Gustav III and performed not in Italian, but in perfect Swedish, yesterday night we enjoyed a Programme dedicated to the music John Dowland at the Ovid-Galerie of the Neue Kammern.

The booklet nicely explains the situation. Christian IV of Denmark was the most powerful man in the North before his Swedish opponent Gustav Adolf took over. Since the Danish monarch's sister Anne was married to the future king of England, exquisite English music artists soon found their way to the music-loving king's court. So Christian's court orchestra is not only shining in Venetian splendour, the Golden Age of English music also lets its brightest star glitter in Denmark: John Dowland. His 'tear pavane' alias 'flow my tears' captured an epoch's 'Weltschmerz', turned it into sounds and was heard all across Europe. In 1604 Dowland put together seven self-made cover versions of his greatest hit with other dances for an instrumental con-

sort and dedicated it to England's new Queen Ann. Some of this music was created in her hometown of Copenhagen.

And on Saturday there is another Programme dedicated to Dowland's music under the title 'The King of Denmark's Delight' (!): John Dowland was one of the greatest masters of writing music for the lute. When he reached the pinnacle of his career he was Christ/an IV's court lutenist in Copenhagen for eight years. He was rumoured to be an English spy, or maybe people envied his annual salary of 500 thalers. Indeed, Tobias Hume could only dream of making such an amount. He earned his money as a mercenary and nearly had to go with Gustav Adolf's army when they marched into Mecklenburg. So captain Hume could only be a part-time viola da gamba genius. Nevertheless, in 1607 he also arranged his 'Poeticall Musicke' for lutes clearly thinking of the orpharion. Listening to an orpharion is a rare treat. Listening to a duet of orpharions is practically unheard of. Don't miss the opportunity.

With kind regards yours,
Michael Schmiechen.

PS. I just read an article on 'misuse in science' claiming the advantage of peer reviews. After having been 'victim' of peer reviews all my professional life I do not agree. The way the old gentlemen dealt with approaches diverting from the trodden pathes was truly wise.

-----Ursprüngliche Nachricht-----
From: Michael Schmiechen
Sent: Thursday, June 13, 2013 9:24 PM
To: Stig Sand
Cc: Gerhard Strasser ; Anton Minchev

Subject: Wer A sagt, muss nicht B sagen!

Dear Stig Sand,

as it happens, this morning I stumbled over the literary version of my suggestion, forwarded yesterday, by Bertold Brecht, the German dramatist (1896-1956): "Wer A sagt, muss [!] nicht B sagen. Er kann auch erkennen [und zugeben], dass A falsch war:"

Please do not mistake my remarks and my style to aim at offending anybody, but at frankly pinpointing deplorable states of affairs and attempting to assist rationally to resolve the conflicts at hand.

As I have stated in the draft of my paper, to be published under the unmistakable title 'Future Ship Powering Trials and Monitoring Now', conventions are, as their name says, not one-man-shows, but joint agreements among people knowing, what they are talking about.

The conventions, we have to look for, are not majority votes of practioners in model basins and ship yards, left alone with one of the most difficult problems of ship theory, since decades totally ignored by theoreticians at the universities.

Somethings are rotten in these 'institutions' as well, as I have explicitly pointed out on various occasions, with the result, that my papers 'tend' not to be published! Perfectly convincing 'arguments' in favour of my argument!

With kind regards yours,
Michael Schmiechen.

-----Ursprüngliche Nachricht-----
From: Michael Schmiechen
Sent: Monday, June 3, 2013 2:42 PM
To: Anton Minchev
Cc: Stig Sand ; Gerhard Strasser ; Jürgen Friesch ; Klaus Wagner

Subject: Something is rotten ...

Dear Dr. Minchev,

originally I just wanted to notify you, that the first discussion of my draft paper has undergone some (minor) face-lifting, as did my hompage and the preliminaries. But further studying the ITTC Homepage and the ITTC Newsletter I noticed, that the EC has an even bigger problem than your SSP SC.

Many colleagues worldwide are realising, that following the emperor in his new clothes, the incredibly naive STA procedure, intended to protect the profitable businesses of MARIN, HSVA et alii, 'but' delaying progress for further decades.as did ISO 15016: 2002-06, will not only damage their own reputation, but that of the ITTC as well.

And, you may like it or not, once again I am referring you to another, in many respects particularly suitable, and as it happens again Denmark related classiscal 'tale', this time to Shakespears 'Hamlet' (Act 1, at the end of Scene 4): "Marcellus: Something is rotten in the state of Denmark".

In the explanations it is stated: "This is one time when the popular misquotation - "Something's rotten in Denmark" - is a real improvement on the original. But you ought to be careful around purists, who will also remember that the minor character Marcellus, and not Hamlet, is the one who coins the phrase. There's a reason he says 'state of Denmark' rather than just Denmark: the fish is rotting from the head down - all is not well at the top of the political hierarchy."

As I mentioned earlier, business as usual and polite bowing was yesterday. And 'consistently' to ignore the state of research for decades was definitely not a very smart policy.

With kind regards yours,
Michael Schmiechen.

----- Original Message -----
From: "Michael Schmiechen" <m.schm@t-online.de>
To: "Andreas I. Chrysostomou" <info@imo.org>
Cc: "Stig Sand" <ss@force.dk>; "Gerhard Strasser" <prof.dr.g.strasser@sva.at>; "Anton Minchev" <ami@force.dk>
Sent: Friday, May 31, 2013 11:49 AM
Subject: MEPC: Ship powering trials

Prof. Dr.-Ing.
Michael Schmiechen
Bartningallee 16
10557 Berlin
Germany

MS 28.08.2014 08:00 h

To Andreas I. Chrysostomou
Chairman, MEPC of IMO

Dear Colleague,

attached please find the cover letter with which I have drawn the attention of my colleagues and students to the draft paper on 'Future Ship Powering Trials and Monitoring Now!'.

My paper, triggered among others by my recent evaluations of trials with a bulk carrier in ballast at two different trim settings, is my profound contribution to the controversial discussion of the subject at the focus of attention among experienced experts worldwide.

Section 4.3.4 of my draft provides a detailed analysis of the 'ITTC 2012 Guidelines', not even permitting to evaluate trials performed at ballast conditions, 'but' claimed to be approved by the Conference, although this will take place only in 2014!

After the ISO 15016: 2002-06 'disaster' only a solidly founded up-to-date procedure for the trustworthy, transparent assessments of trials will find general acceptance in the community.

Ideally the procedure should be and can be independent of observers and any prior data, model test results in particular, as I have demonstrated repeatedly, recently in a particularly delicate case.

The goal of ITTC, founded as the International Conference of Towing Tank Superintendents, originally themselves personally at the forefront of research, has never been to perpetuate the procedures originated more then hundred years ago and to protect related profitable businesses.

The goal of ITTC and its reputation have always been to meet the urgent requirements of researchers and clients, now including the MEPC of IMO, based on the current state of rersearch.

For ready reference the following hyperlink will lead you to the recent addition in the pertinent section on my website: http://www.m-schmiechen.homepage.t-online.de/HomepageClassic01/news_trl.htm

With many thanks for your kind attention and looking forward to your response

yours, Michael Schmiechen.

Copies to:

Dr. Stig Sand, FORCE Technology
Chairman, Executive Committee of ITTC

Prof. Gerhard Strasser, SVA Vienna
Chairman, Advisory Council of ITTC

Dr. Anton Minchev, FORCE Technology
Chairman, PSS Specialists Committee of ITTC

MS 28.08.2014 08:00 h

Written Discussion of the Report and Recommendations of the Specialists Committee on the Performance of Ships in Service (SC PSS)

In view of my extended correspondence with the SC I am amazed at the *Report and Recommendations*. The Report and the References attached deal to a large extent with subjects to be treated by the Propulsion Committee proper, while the SC has decided not to consider, not even to mention my pertinent critical remarks and published results. After all, I had expected a convincing argument for *not* adopting at least the mature routines of the rational procedures I am promoting in the interest and for the benefit of our clients.

The *Terms of Reference* are extremely vague, lacking a clear-cut structure, though (maybe?) not the fault of the SC. But 'consequently' the Report suffers from the same deficiencies. The Terms start with the misleading statement: "The purpose of the Committee is to improve the performance predictions …". But the purpose of the Specialists Committee and of the Procedure 7.5-04-01-01-2, Rev. 1, proposed for adoption by ITTC and subsequently by ISO and IMO is to provide generally acceptable standards for trials and monitoring, permitting to prove that the performance under service conditions meets the predicted and/or contracted values.

The basic *rules of fair-play* require that the same 'people', who have produced the prediction, should not produce the proof 'as well'. I have always been wondering how long ship owners will accept this practice and I claim, that ITTC can only save its credibility, abandoning this practice as soon as possible, resorting to truly transparent, objective procedures.

And according to my experience this can be achieved by clearly distinguishing between the analysis of the performance at the trials condition and 'reduction' to the nominal no wind and waves condition, without reference to any prior data as it must be, and the 'extrapolation' (!) to the performance at the contracted condition, if different from the trials condition, avoiding reference to prior data wherever possible. Both problems are not problems of hydro-mechanics, but of simple, generally intelligible and thus acceptable conventions.

The *Terms of Reference proposed* for the next SC, if any, tend to perpetuate this state of affairs, unless the Advisory Council successfully enforces the goals it has set forth in the 'ittc news' no. 64. These goals have evidently been conceived in view of the failure of the SC and the deplorable consequences, I have pinpointed repeatedly. Among the randomly listed 'aspects' to be investigated I am missing among other important items the influence of the propeller submergence at trials in ballast, the most common condition. As my evaluation of the ANONYMA trials has shown reference to the performance of deeply submerged model propellers in open water is evidently nonsensical.

The 'Direct Power Method', a blatant misnomer, is still kept alive by many prior data to be sucked from thumbs, and the propulsive efficiency in particular, the joker to be drawn out of the sleeve. I have not found, wherefrom else it comes! According to the 'commandment of objectivity' the goal must be to introduce highly aggregate models, the few parameters of which can be identified from the few data usually acquired. For an independent check I am still trying to obtain the data of the example claimed to be included. As the members of the SC know, I have published such studies in every detail in case of the standard ISO 15016: 2002-06 and, more recently, in case of the ANONYMA trials for Dr. Hochkirch of DNV-GL and in case of my PATEs for Dr. Hollenbach of HSVA.

Most 'surprising' in the *Report and the Procedure* is the naive identification of the current prevailing at the trials. In view of the omnipresent random disturbances the analysis of individual double runs is not acceptable, as I have explained to Dr. Hollenbach in detail. Already in 1998 I have demonstrated how the current can be identified objectively and reliably, including all double runs and without reference to any prior data. (Filed by JISC/JMSA as 'Prof. Schmiechen's comments to ISO/TC8/SC9/WG2 /N20, Informative' under ISO/TC8/SC9 /WG2/N28, dated 1998-06-23).

And what is a 'verifier' supposed to do, that has no experience (page12)? If his sole purpose is to check (✓) formal compliance with more or less obscure 'regulations', the SC should have rejected his 'institution'! How long are we going to afford this and other incredibly inefficient 'bureaucratic' procedures, instead of caring for the essentials and forgetting about the doctrine 'not invented here'? The first of the chapters of the report are full of such 'procedures'!

Surprisingly, or rather not (!), I noticed that, different from the established practice followed by all other Committees, the SC PSS does not cover all pertinent publications, at least over the past conference period. 'Instead' I find, after all our correspondence, the ritual repetition of the incorrect (!) statement: "With the acceptance of these new procedures, the ITTC and IMO have established a transparent, straightforward best practice and a level playing field for the delivery of new ships for all stakeholders."

Most amusing and revealing 'best practice' and 'level playing field' are in bold print! As the Report shows, the procedure is neither straightforward nor transparent and, most important, the ITTC has not yet accepted this procedure! And according to the 'News from the Advisory Council', ITTC is not a playground!

MS 28.08.2014 08:00 h

The term Recommendations occurs in the Heading and further only twice in the Report, a concise list is missing. If the Procedure 7.5-04-01-01-2, Rev. 1 proposed for the evaluation of traditional trials will be approved by the Full Conference, not only progress will be prevented for decades, but ITTC will have lost its reputation based on serving clients at the forefront of research. The EC needs Experts understanding the nature of the difficult problems to be solved and being familiar with the advanced conceptual, statistical and numerical methods necessary for their professional solution, being 'naturally' standard' in other fields of science and technology, and, last but not least, responsible Experts producing reliable Reports and Procedures meeting explicitly stated and clearly understood goals and resulting requirements.

Plot of Hans Christian Andersen's Tale of 'The Emperor's New Clothes' published at Copenhagen in 1837

A detailed discussion of the 'ITTC 2012 Guideline', prematurely and contra legem forwarded to the MEPC of IMO, has been published in Volume 1 of this 'Festschrift' under the unmistakeable title 'The Emperor's New Clothes' in subsection 4.3.4, pages 34 thru 37.

For ready reference only the plot of the tale is quoted here from the Wikipedia:

"A vain Emperor who cares for nothing except wearing and displaying clothes hires two swindlers who promise him the finest, best suit of clothes from a fabric *invisible to anyone who is unfit for his position or 'hopelessly stupid'*. The Emperor's ministers cannot see the clothing themselves, but *pretend that they can for fear of appearing unfit for their positions* and the Emperor does the same. Finally the swindlers report that the suit is finished, they mime dressing him and the Emperor marches in procession before his subjects. *The townsfolk play along with the pretense not wanting to appear unfit for their positions or stupid*. Then a child in the crowd, *too young to understand the desirability of keeping up the pretense, blurts out* that the Emperor is wearing nothing at all *and the cry is taken up by others*. *The Emperor cringes, suspecting the assertion is true, but continues the procession*." *Italics: MS.*

Analogies of the various aspects addressed are self-evident, and thus need no explicit explanation. Evidently, to continue the procession is not a viable choice as it will further delay progress for decades as did ISO 15016: 2002-06. Evidently the Advisory Council is aware of this fact as the following News explicitly states.

[Good] News from the Advisory Council

ittc-news (March 2014) no.62, page 2

Since the last ITTC Newsletter the Advisory Council has considered some issues regarding the future of ITTC. A master plan shall be developed by a special group or committee to be established in the 28th ITTC. The main aim of this master plan is to achieve that ITTC is more proactive. All ITTC member organisations are invited to make suggestions for long term issues of ITTC and send them to the AC Secretary Aage Damsgaard.

After it has been possible to achieve at IMO to get the ITTC Recommended Procedures for Model Manufacture, Resistance, Propulsion, Open Water Test and ITTC Standard Prediction adopted as standard for the prediction of the EEDI (Energy Efficiency Design Index), the legal position of ITTC has changed. The consequence will be that the ITTC procedures (at least the ones which are concerned) in future will have to be even more unambiguous, precise, and offer less choices.

With regard to the EEDI a specialist committee on 'Ships in Service' has been established which was mainly to deal with the conduct and evaluation of ship power/ speed sea trial. As it was not possible in the committee under the time pressure to come to a common solution, the chairman of AC who has been delegated by the AC to represent ITTC in the IMO, in agreement with the AC and the committee's chairman interfered and presented a procedure for the evaluation of the speed sea trial which is based on the use of etad and load variation tests.

ISO, after a voting, could not maintain their standard 15016 and has asked ITTC to co-operate in order to come to a common procedure.

"In the ISO WG, the group agreed that revised ISO15016 should be reliable, simple, user-friendly, consistent and less ambiguous. In this regard, the group agreed to use the 2012 ITTC Guidelines for speed power trials as a starting point. ITTC has been willing to contribute to the revision work of ISO15016, and the ISO revision process was focused on improving relevant elements of the 2012 ITTC Guidelines for speed power trials.
In this way, based on the 2012 ITTC Guidelines, the harmonized ISO15016 draft has been developed owing to the collaborative efforts between ISO and ITTC."

MS 28.08.2014 08:00 h

The ISO standard is now subject to a voting again.

After the common informative submission of the ISO 15016 to IMO discussions started again, with contributions of several stake-holders who want to lobby their particular interest in ITTC as well as in ISO. ITTC is only open for clear physical explanations and improvements, which need to be validated without any doubt. It is clear to ISO as well as to ITTC that further improvements of their 'sea trial procedures' are possible and necessary within the next three years.

The experience with IMO and ISO showed that the organisation of the ITTC is not suitable for dealing with issues under time pressure. The AC has taken notice of that and will suggest a way out of this situation.

Well received

As the following correspondence documents I have read the 'News from the Advisory Council' after all my work for more rationality with very great satisfaction. According to my understanding the 'News' requests intellectual discipline and honesty, the 'best' strategies or, as we Germans say, 'lasting longest'.

Correspondence triggerd by the 'News from the Advisory Council'

-----Ursprüngliche Nachricht-----
From: Michael Schmiechen
Sent: Wednesday, July 16, 2014 3:57 PM
To: Kuniharu Nakatake
Cc: Tsuyoshi Ishiguro ; Kosei Hasegawa ; Kinya Tamura ;
Naoji Toki ; Mitsuhiro Abe

Subject: My battle has not been lost !!!

Dear Kuniharu,

attached please find a 'news' [, the 'News from the Advisory Council'], which I found and read only yesterday, admittedly to my greatest pleasure and satisfaction.

According to that report of the Chairman of the AC, my friend Prof. Gerhard Strasser, owner (!) of SVA Vienna, my fight on many fronts against the enemies of the open society has not been lost, quite to the contrary!!! Evidently I succeeded to convince the governing bodies of ITTC, that they lost their credibility and that they should better urgently try very hard to re-establish it.

Particularly satisfying is the fact, that the 'incredible' Japanese (!) standard DIS 15016 this time did not pass the vote, as it did twelve years ago, even four years after my explicit demonstration of its inherently 'faulty design'. And to be sure, these deficiencies cannot be repaired by the same 'people', who produced the faulty draft, as now reportedly takes place.

It is completely unacceptable just to repeat the old mistakes and the old Japanese references. The recent work of Toki referred to is based on outdated and/or misunderstood concepts and on stone-age methods. And the informatively quoted 'direct power method' of MARIN is based on the propulsive efficiency to be pulled as joker out of the sleeve. ITTC is evidently finally going to abandon this unacceptable procedure.

The community can no longer afford to let 'specialists' of past practice continue to fumble around and conduct research into the differences of incompatible, incoherent procedures, as in a current joint project of HSVA and SSPA.

With kind regards
yours, Michael.

-----Ursprüngliche Nachricht-----
From: Horst Nowacki
Sent: Tuesday, July 15, 2014 8:22 PM
To: Michael Schmiechen

Subject: Re: Schlacht gewonnen!!! Gratuliere!

Lieber Michael,

ich freue mich und gratuliere.

Nun ist wenigstens Licht am Ende des Tunnels zu erkennen.

Mit besten Grüßen
Dein Horst

Am 15.07.2014 19:14, schrieb Michael Schmiechen:

Hallo Horst,

anbei eine Nachricht, die ich erst heute fand und [mit dem allergrössten Vergnügen und ebensolcher Genugtuung] las.

Nach dem Bericht des Chairman des AC, Gerhard Strasser, habe ich meinen Mehr-Fronten-Krieg gegen die Feinde der offenen Gesellschaft offenbar nicht verloren, sondern ganz im Gegenteil!!!

Jetzt haben auch die 'Ersten' gemerkt, dass es 'so' nicht weitergehen kann.

Mit freundlichen Grüssen
Dein Michael.

References

Volume 1

The present, second volume of my 'Festschrift' commemorating my quasi-steady propulsion tests with the research vessel METEOR is a continuation of the first volume:

Schmiechen, M. From METEOR 1988 to ANONYMA 2013. Future Ship Powering Trials and Monitoring Now! Principles of rational conventions further clarified, consistently applied in a particularly delicate case and lessons (to be) learned, various subsequent presentations and written discussions added. Published on occasion of the 108th Annual Meeting of STG, the Schiffbautechnische Gesellschaft, Berlin, November 20-22, 2013. VWS Mitteilungen Heft 62, post mortem, Berlin 2013. In memoriam Versuchsanstalt für Wasserbau und Schiffbau, Berlin.

For ready reading and reference the pdf-file may be printed as DIN A5 brochure, in view of the 'volume' conveniently at a copy shop, and in view of the costs in black and white as the volumes distributed at the Annual Meeting of STG. Evident mistakes in the layout have since been 'repaired' and some remarks concerning related work on monitoring have been added.

Survey papers

Complete references to my work on propulsion and trials is to be found on the 'Bibliography on propulsion in general' and the 'Bibliography on ship powering trials' including links to papers and presentations on my website www.m-schmiechen.de, of which only the introductory sections containing survey papers are documented here.

Schmiechen, M.: Future Ship Powering Trials and Monitoring Now! Principles of rational conventions further clarified, consistently applied in a particularly delicate case and lessons (to be) learned. VWS Mitteilungen Heft 62, post mortem, Berlin 2013. See also 'Festschrift' Volume 1, pages 1-44.

Schmiechen, M.: Beiträge der VWS zur Erforschung der Propulsion und Bewegungen von Schiffen. STG-Nr. 3010, VWS Mitteilungen Heft 60, post mortem, Berlin 2003, 139-202.

Schmiechen, M.: 25 Jahre Rationale Theorie der Propulsion. Fritz Horn zum 125. Geburtstag. Prepared for the STG Summer Meeting at Magdeburg 17.-19.05.2005, which had to be cancelled. The paper has been presented at the 100th STG Annual Meeting at Berlin, held November 16 to 18, 2005. With many references to files containing detailed derivations of results. Jahrbuch STG (2005). Closely related is the following theme lecture.

Schmiechen, M.: Propulsor Hydrodynamics. Theme lecture. Presented at the International Conference on Marine Hydrodynamics, MAHY 2006, held January 05 to 07 at the Naval Science and Technological Laboratory at Visakhapatnam, India. Proc. Int'l Conference in Marine Hydrodynamics 2006, Vol.2, 611-631. See also Paper, Handout and Presentation.

MS 28.08.2014 08:00 h

Schmiechen, M.: 50 Years Rational Theory of Propulsion. Recent Results and Perspectives. Paper presented at the International Symposium on Marine Propulsors smp 2009, Trondheim, Norway, June 22-24, 2009. Proceedings 1st SMP (2009) 117-128. See also Paper and Presentation.

Propulsion 'mechanics'

Further, the rational theory of propulsion has been treated as an example of global mechanics in Chapter 22 'Propulsion mechanics' of Volume 3 'Global and propulsion mechanics' of my opus magnum:

Schmiechen, M.: Newton's Principia and related 'principles' revisited. Classical dynamics reconstructed in the spirits of Goethe, [Aristotle,] Euler and Einstein. Elementary Mechanics from an advanced standpoint and vice versa. Second edition of work in progress in three volumes. Berlin, Summer 2009.

Various 'Standards'

Schmiechen (1998), Michael and Bruce Johnson: Some Fundamental Considerations Concerning the History and Recent Development of the ITTC SaT List, the International Towing Tank Conference Symbols and Terminology List. Proceedings First International Conference on Maritime Terminology, (ISTI Brussels, May 15-16, 1998) 126-144. Brussels: Editions du Hazards, 1999.

Schmiechen, M.: Vorschlag für eine Neu-Ausgabe von DIN 1313: 1998-12: 'Grössen' [Concepts and Magnitudes, alias 'Quantities]. [Detaillierter und annotierter] Vor-Entwurf für die Diskussion im FBR des DIN NA 152-01 und in anderen interessierten Gruppen. Berlin: Anfang März 2011.

My latter, detailed and annotated proposal concerning fundamental issues is mentioned here as another example of handling scientific and political aspects in standards organisations. It has been treated in exactly the same way as my arguments concerning the need of a fundamental revision of ISO 15016: 2002-06. Although claimed to promote progress standards organisations according to their rules tend to perpetuate past practice. ITTC should be careful not to join this club.

Without any open discussion of my arguments, presented at a meeting at Braunschweig on 07.04.2011, explaining the need for a fundamental revision of DIN 1313: 1998-12, the author has been informed in a letter of 11.04.2011 that his proposal has been rejected by DIN NA 152-01 FBR; [according to my knowledge the same group of professors, − mostly at my age, some of them logicians, but to my surprise not familiar with the usage of mathematics in science and technology −, that had produced the version scrutinised].

Archives

My website contains complete bibliographies in eight Sections. All work in these Sections since about 1990 has been annotated under 'Papers' and 'News' and can readily be accessed via links. Earlier work can be accessed along 'Various Routes' described in the 'Preliminaries'.

In accordance with the Law of Deutsche Nationalbibliothek of June 22, 2006 the website is a publication proper and will in future be permanently archived at the Nationalbibliothek Leipzig. In view of my age an intermediate solution is under development.

Unpublished work and documents will be referred to in the Bibliographies, marked TUB/UA. The material will be left to the Archive of Technische Universität Berlin and will in due course be made available for inspection, as will be my own files on my hard disc, containing among others complete correspondences.

MS 28.08.2014 08:00 h

Continued from front end-paper

SCOPE

The first PATEs, Post ANONYMA Trial Evaluations of two sister ships demonstrate once again the extreme transparency and provide sound confirmation of the objectivity of the rational method promoted for the evaluation of traditional trials, requiring no prior data, as it must be. In order to limit the 'volume' only the evaluations based on the reduced sets of data used in the HSVA/SSPA project are reproduced along with the 'final' explanatory reply to Dr. Hollenbach at HSVA, who gratefully granted the provision of data and the publication of the results. The section closes with my in-depth discussion with Dott. Gennaro at Genova.

Complete analysis of the propulsive performance of a model based on the quasi-steady test of only two minutes duration and comparison with traditional results demonstrate the extreme efficiency and reliability, respectively, of the rational procedure proposed. The recent analyses published show, that even if the model thrust data are ignored, current, resistance and propulsive efficiency have been identified reliably, thus indicating the course to be held in developing the standard ISO 19030 aiming at efficient, reliable trials and monitoring of the powering performance full scale under service conditions.

The final section is devoted to my Written Discussion of the Report and Recommendations of the Specialists Committee on Performance of Ships in Service submitted to the 27th ITTC and related correspondence. Further, notes on References, concerning fundamental standards in particular, and Archives, are provided for ready reference.

READERS

This second volume on the rational theory of ship propulsion and its application to trials and monitoring is another 'letter' addressed to my colleagues and my students, as well as to whom it may or must concern, governing bodies and pertinent committees of the ITTC, ISO and IMO in particular.

AUTHOR

In 1997 Dr.-Ing. Michael Schmiechen retired as Deputy Director, Head of Research and Development, from Versuchsanstalt für Wasserbau und Schiffbau (VWS), the Berlin Model Basin. As ausserplanmässiger (apl.) Professor he has at the same time been released from the duty to lecture on Hydro-mechanical Systems at the Institut für Schiffs- und Meeres-Technik (ISM), Technische Universität Berlin (TUB). But since then he has continued to lecture on professional problem solving at ISM until 2011 and he is still continuing to promote his ideas around the world.

Warning!
Reading these papers endangers Your principles!

"You cannot have a theory without principles.
'Principles' is another name for 'prejudices'."
Mark Twain: 'The Disappearance of Literature'
Speech, 20 November 1900.