To Chairmen and members of the
ITTC Propulsion Committee
ITTC Trials Committee
ITTC Procedures Committee
ITTC Quality Systems Group

Sub.: Evaluation of ship speed trials
and ship model powering tests
here:
Ref.: Recent material on my Website
under 'What's new?' and
'Recent papers: Propulsion'

Dear Colleagues,

it will not come as a surprise to you that I have further developed and promoted my ideas on
evaluating the powering performance of ships and their models since my last letter to you
nearly exactly two years ago; see enclosure for ready reference.

In my paper 'On Evaluating Ship Speed Trials: Identifying Parameters of Powering Models'
presented at the International Symposium on Ship Propulsion in St. Petersburg in June 19-21,
2001, and further advanced at the Colloquium in Hamburg on January 11, 2002, I have also
mentioned the latest developments in evaluating the powering performance of ships, becoming
possible if not only torque but thrust measurements are being taken at quasi-steady test
conditions.

On model scale, where external forces can be applied other than inertial forces, only two
steady states are sufficient for the complete performance analysis as has been shown in the
METEOR project and in response to a written contribution to the 2nd INTERACTION Berlin
'91, the 2nd International Workshop on the Rational Theory of Ship Hull Propeller Interaction
in Berlin at June 13-14, 1991. But this fact is of little interest in full scale applications.

At a seminar held at the Gdansk Ship Model Basin on January 16-18, 2002, I have further
elaborated on the new developments in the context of model testing and powering perform-
ance analysis. The important step forward, a real breakthrough is the 'discovery' or rather con-
struction of more adequate axioms or constitutive laws for wake and thrust deduction.

This 'discovery' has not only triggered the re-evaluation of the METEOR data, contained on
the document on 'Wake axioms', but the re-analysis of a quasi-steady model test performed in
1987, well before the METEOR tests, to 'prove', on model scale, the feasibility of the procedure. The results of this re-evaluation are attached as well to the e-mail sent to distribute this letter and are be to found together with all other pertinent material on my website.

The goals of this exercise were

- to incorporate all the insights gained over the past fifteen years and
- to provide a sound basis for the development of a 'rational' scaling procedure,

the latter felt still to be the missing link during discussions at the seminar at the Gdansk Ship Model Basin.

Truly missing in the present test case are the corresponding trials data. The ship model investigated in a research program was that of a barge carrier, which has not been built. But any establishment will have complete data sets of model and full scale trials data available for tests of the procedures proposed.

The author is prepared to assist in any undertaking to analyse and compare results with those of traditional evaluations. In any case establishments are invited to re-evaluate the trials data published as example in the draft standard ISO/DIS 15016.

The results of any such evaluation could be presented and discussed at a 3rd INTERACTION to be held in conjunction with a joint meeting of the ITTC Propulsion, Trials and Procedures Committees under the auspices of the ITTC Quality Group, maybe in 2004.

Subject of the sessions suggested are

- evaluating model powering performance,
- predicting ship powering performance,
- evaluating ship speed trials,
- designing (ducted) propellers.

Results can also be documented in the Reports of the Committees to the 24th ITTC to be held in 2005, comparable to a very similar exercise at the 4th ITTC Berlin 1937. This would also be a perfect occasion to commemorate the Versuchsanstalt für Wasserbau and Schiffbau, VWS, the Berlin Model Basin, founded in 1903, but since January 1, 2002, no longer 'existent', and to commemorate twenty five years of development of the rational theory of ship hull-propeller interaction.

Again looking forward to your kind consideration of my remarks and, maybe, after all your response I remain with best regards yours sincerely,

Michael Schmiechen.

PS: As usual I take the liberty to 'publish' this letter on my website and draw the attention of colleagues to this and other material of interest.

Appendix: Letter of March 04, 1999, see following pages
Attachment: Re-evaluation of 1987 model data
Sub.: Evaluation of ship speed trials
here: Further evaluation
Ref.: Examples and on my website,
in particular 21010_data_mod
       and 21010_eval_mod

Dear Colleagues,

it will not come as a surprise to you that I have continued the consideration of the results obtained so far and further developed my ideas. Written discussions with colleagues have been very helpful in clarifying some of the issues.

Apart of the notes in the programs I would like to offer the following observations and remarks as contributions to the discussion of a subject of great practical importance.

Motivation

The stimulus for my recent activities has been the Japanese ISO / Committee Draft (CD) 15016. My first reaction was a different draft proposal together with a cover letter and two examples, all published on my website. My reservations were, and are even stronger now, that an ISO standard should not just continue to refine past practice, but should meet the highest 'standards' and take advantage of the latest state of the art and technology of systems identification, not only in view of the legal implications, but the requirements of ISO 9001 as well. And it must be the result of a joint effort of the whole community concerned, including theoreticians.

My reservations, though not my principles and procedures, are shared by my German colleagues on the DIN/NSMT WG 1.1.1.2 on Ship Speed Trials. In the meantime I have received a copy of the fax JSMA 98-217 by the Japan Marine Standards Association addressed to the corresponding German DIN / NSMT to the effect that voting for approval of ISO / CD 15016 as a Draft ISO Standard (DIS) has been cancelled because of the importance of the suggestions of the NMST/WG, the final version to be submitted soon.
Principles
My principles or goals are to keep the models as simple and the method as transparent as possible in order to make the results as trustworthy as possible. Consequently I adhered to the rule: keep separate problems separate as far as possible and keep the exposition as simple as possible.

Procedure
The resulting procedure is:

1. identification the current and the powering performance in the behind condition at the given load condition from measured data only,
2. comparison with the predicted performance at that condition,
3. comparison with the contracted performance at that condition,
and, for the purposes of my study,
4. comparison with the final results of traditional evaluations, whichever has been used by the yard or institution supplying the data.

The first task has been solved in terms of a powering model and a current model as shown already in the draft proposal and in the accompanying examples and in the new examples. The usual, rather involved iterative solution of a problem with at least five unknowns is replaced by the straightforward solution of a system of linear equations. The second and third tasks could not be performed in the examples due to lack of data. Task 4 has been performed as far as data have been made available.

One observation concerns the best choice of the shaft power to be used in the evaluation. I my opinion the shaft power measured, according to my understanding the brake power, is the correct reference. In proving the conformance with contract conditions it does not require further assumptions on top of those necessary for the strain gauge measurements in the usual absence of calibrations proper. Consequently in the examples I will have to change the data and the evaluation, resulting a small shifts only, where applicable. Care has to be taken in introducing model data, being mostly in terms of delivered power.

'Evaluation'
The advantage of this procedure is that a minimum of assumptions, i.e. conventions to be agreed upon, are necessary. No references to model or resistance data are necessary.

Further, even with moderate deviations from the contract conditions the powering performance does not change, provided the submergence of the propeller does not change. Changes of salinity can be accounted for computationally.

If the submergence of the propeller changes with load conditions, especially from partially submerged to fully submerged, trials have to be conducted at all relevant conditions anyway. Subsequently the powering performance can to identified at all these conditions.

Reduction to no wind etc
The objection to this procedure was and is that the traditional procedure goes further and establishes powering performance at certain service conditions. My response is: by doing so, a Pandora's box of problems is being opened. But if one wants to do this, for whatever reason, one should look for a solution following the principles stated.

After having reached this point I suspected that any educated guess, i.e. systems identification of the wind effects and reduction to the no wind condition, might be more convincing and consistent than the traditional procedures followed so far. Consequently I have, as
a first attempt, developed the very simple procedure, which you find in the 21010_eval_mod file, the data being provided in the 21010_data_mod file. And you will find that the results agree perfectly with those obtained by the yard!

The model used in the program is a linear to cubic interpolation of the power due to water resistance and a cubic interpolation of the power due to wind resistance. This model is of course open for discussion as are the extensions to account for other deviations from contract conditions. In order to identify these effects correctly the conduct of the trials has to be changed as I have proposed earlier.

The idea can be extended to phenomena as e. g. changes of trim etc, as soon as the corresponding changes are being performed during the trials and the parameters are available for purposes of correlation. And in due course the effects of waves, shallow water etc will have to be considered consistently with the procedure developed so far. Of course this will lead in many cases to the use of data, which have been used up to now as well.

In that sense the whole exercise is to be considered as a necessary rationalisation of the traditional procedure, if one wants to adhere to it. I repeat my former appeal: naval architects should do this better themselves before other people tell them what to do better.

I wonder how contract conditions are being phrased. According to my present knowledge this is being done differently from yard to yard. I would appreciate any detailed information concerning this matter. I am sure that convincing simplifications will be welcome.

Looking forward to your kind consideration of my remarks and, maybe, your response I remain with best regards yours sincerely,

Michael Schmiechen.