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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	$\phi := \dfrac{V}{L \cdot B \cdot Tg}$	$\phi = 0.86335$
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
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