Saving time with quasi-steady technique

The quasi-steady measurement technique, the latest development in propulsion testing, comes under the spotlight.

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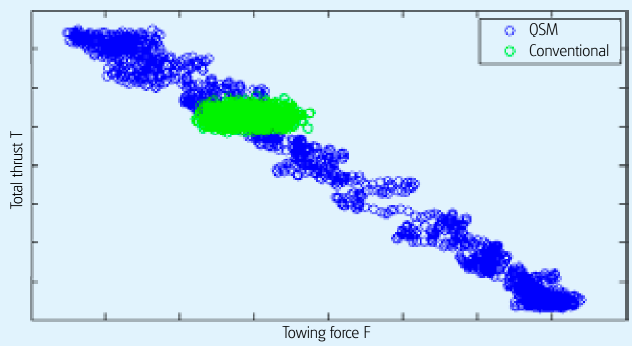
In the quasi-steady technique a gradual variation of the rotative speed of the propeller is imposed, while the forward speed of the model is kept constant. Thus, the load of the propellers continuously changes during the measurement run.
An essential assumption of quasi-steady experiments is that each instantaneous condition encountered during the quasi-steady test is representative for the corresponding steady condition.
In a conventional propulsion measurement each run is represented by a single set of average values of the towing force, the propeller thrust and torque for one particular combination of model speed and propeller rotation rate. In the quasi-steady technique a range of loadings is covered, not just one, as seen in the figure. Now each measurement run is represented by three sets of measured values, corresponding to the minimum, average and maximum loading covered.

Accurate analysis A clear advantage of the quasi-steady method over the conventional one is that separate load-variation runs can be dispensed with. This means that a complete and accurate analysis can already be made while the carriage is being returned to its starting position and a full-scale prediction for the tested speed is also included. The analysis may help to select the next test condition.
For complex/hybrid propulsor configurations, an independent variation of the load of the two different sets of propulsors is essential to capture the possible interaction between these sets and to account for separate scale-effect corrections. By the quasi-steady technique these loadings can be varied simultaneously during a single run, instead of having to test a large matrix of relative propulsor loadings.
Of course, the quasi-steady method offers time savings because of the smaller number of runs needed. Hence, quasi-steady propulsion testing is ideally suited for a large series of propulsion tests, e.g. a program with several trim/draught combinations. In addition, experiments with only one single test speed can be done very cost effectively by MARIN's new measurement procedure.



Thrust-Towing-force samples of one run by the Quasi-steady method versus the Conventional method