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Open Water Test Series of Modified AU-type Five-Bladed Propeller Models of Area Ratio 0.80

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Summary

This paper presents the results of the tank tests of a systematic series of modified AU-type five-bladed propeller models, the expanded area ratio of which is 0.80. The $J-K_T$, K_Q , η_0 curves and $\sqrt{B_p}-\delta$ design diagram are given.

I. Introduction

The authors have reported the results of tank tests on the AU-type five-bladed propellers with the expanded area ratio of 0.50 and 0.65 (1).

Further to the work, the authors conducted a systematic testing work with same type of propeller models with the expanded area ratio of 0.80 in the Mejiro No.2 Experiment Tank. In this paper, the authors present the results of the open water tests and the $\sqrt{B_p}-\delta$ design diagram.

II. Model Propellers and Open Water Tests

Model propellers used here are made of aluminium alloy and they have the diameter of 0.25 m. Their principal particulars are given in Table 1, and the model propellers are shown in Fig.1

Open water tests were carried out in the No.2 Experiment Tank according to the ordinary practice.

To obtain the net thrust, the correction for the resistance of the screw hub was made at various speed of advance for the measured thrust.

The Reynolds number R_n of the tests are shown in Table 1.

Table 1

<i>Particulars of Propeller Models</i>	
	<i>Modified AU5-80</i>
Diameter (m)	0.250
Boss Ratio	0.180
Exp. Area Ratio	0.800
Max. Blade Width Ratio	0.364
Blade Thickness Ratio	0.050
Angle of Rake	10° 0'
Number of Blades	5
Reynolds Number ($R_n = nD^2/\nu$)	$6.34 \sim 6.61 \times 10^5$

III. Tests Results and Design Diagrams

The results of tests are shown in Fig.2 in the form of $J-K_T$, K_Q , η_0 diagram. Values of K_T , K_Q and η_0 read from the figure above are tabulated in Table 2.

Fig. 3 shows the $\sqrt{B_p}-\delta$ type design diagram. In this diagram, the metric units are used, and the density of sea water is assumed as 104.51 kgsec²/m⁴.

IV. Acknowledgements

The authors wish to valuable co-operation and assistance of Mr. Tadashi YAMAMOTO and the staff of Ship Research Institute.

V. Reference

- (1) K. Tsuchida, A. Yazaki and M. Takahashi; Open Water Test Series with Modern Five-Bladed Propeller Models, Journ. of Zosen Kiokai Vol. 102, 1958

原稿受付 昭和 42 年 7 月 8 日

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TABLE 2
VALUES OF $J-K_T$, K_0 , η_0

H/D J	0.4			0.6			0.8			1.0			1.2		
	K_T	$10K_0$	η_0	K_T	$10K_0$	η_0	K_T	$10K_0$	η_0	K_T	$10K_0$	η_0	K_T	$10K_0$	η_0
0	0.1590	0.1370	0	0.2690	0.2730	0	0.3870	0.4760	0	0.4970	0.7230	0	0.6020	1.0140	0
0.05															
0.10	0.1310	0.1230	0.1693	0.2390	0.2500	0.1520	0.3540	0.4420	0.1274	0.4615	0.6810	0.1078	0.5650	0.9610	0.0935
0.15															
0.20	0.1000	0.1070	0.2972	0.2040	0.2220	0.2922	0.3180	0.4040	0.2502	0.4235	0.6360	0.2118	0.5270	0.9070	0.1848
0.25	0.0825	0.0980	0.3351	0.1855	0.2065	0.3575	0.2985	0.3840	0.3094	0.4045	0.6120	0.2630	0.5090	0.8780	0.2307
0.30	0.0630	0.0870	0.3460	0.1660	0.1900	0.4176	0.2770	0.3620	0.3658	0.3840	0.5860	0.3132	0.4890	0.8490	0.2753
0.35	0.0430	0.0760	0.3151	0.1445	0.1735	0.4639	0.2545	0.3385	0.4187	0.3630	0.5590	0.3617	0.4695	0.8190	0.3193
0.40	0.0210	0.0630	0.2723	0.1220	0.1550	0.5014	0.2315	0.3140	0.4696	0.3410	0.5310	0.4091	0.4490	0.7880	0.3630
0.45	-0.0005	0.0495		0.0955	0.1370	0.5200	0.2080	0.2895	0.5144	0.3175	0.5010	0.4537	0.4270	0.7560	0.4044
0.50				0.0760	0.1180	0.5126	0.1840	0.2650	0.5526	0.2940	0.4710	0.4969	0.4040	0.7240	0.4440
0.55				0.0510	0.0975	0.4577	0.1600	0.2390	0.5858	0.2705	0.4410	0.5367	0.3795	0.6895	0.4821
0.60				0.0240	0.0760	0.3016	0.1365	0.2130	0.6120	0.2460	0.4100	0.5730	0.3545	0.6550	0.5168
0.65				-0.0010	0.0515		0.1130	0.1880	0.6220	0.2220	0.3790	0.6063	0.3295	0.6195	0.5505
0.70							0.0890	0.1620	0.6120	0.1980	0.3470	0.6360	0.3050	0.5830	0.5828
0.75							0.0620	0.1330	0.5566	0.1735	0.3145	0.6587	0.2800	0.5450	0.6135
0.80							0.0350	0.1040	0.4288	0.1495	0.2820	0.6754	0.2545	0.5050	0.6420
0.85							0.0070	0.0720	0.1315	0.1245	0.2490	0.6765	0.2295	0.4660	0.6663
0.90							-0.0220	0.0380		0.0930	0.2130	0.6592	0.2040	0.4260	0.6863
0.95										0.0710	0.1760	0.6100	0.1790	0.3860	0.7011
1.00										0.0430	0.1350	0.5072	0.1540	0.3450	0.7106
1.05										0.0140	0.0955	0.2449	0.1290	0.3030	0.7114
1.10										-0.0140	0.0550		0.1035	0.2670	0.6944
1.15													0.0760	0.2170	0.6410
1.20													0.0470	0.1710	0.5249
1.25													0.0190	0.1245	0.3035
1.30													-0.0110	0.0730	

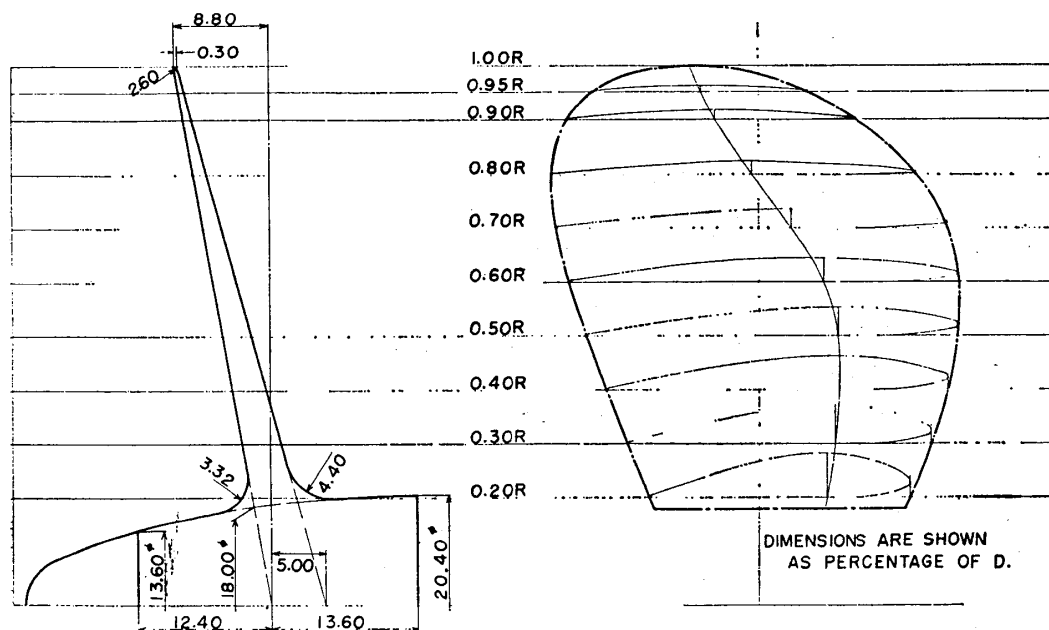
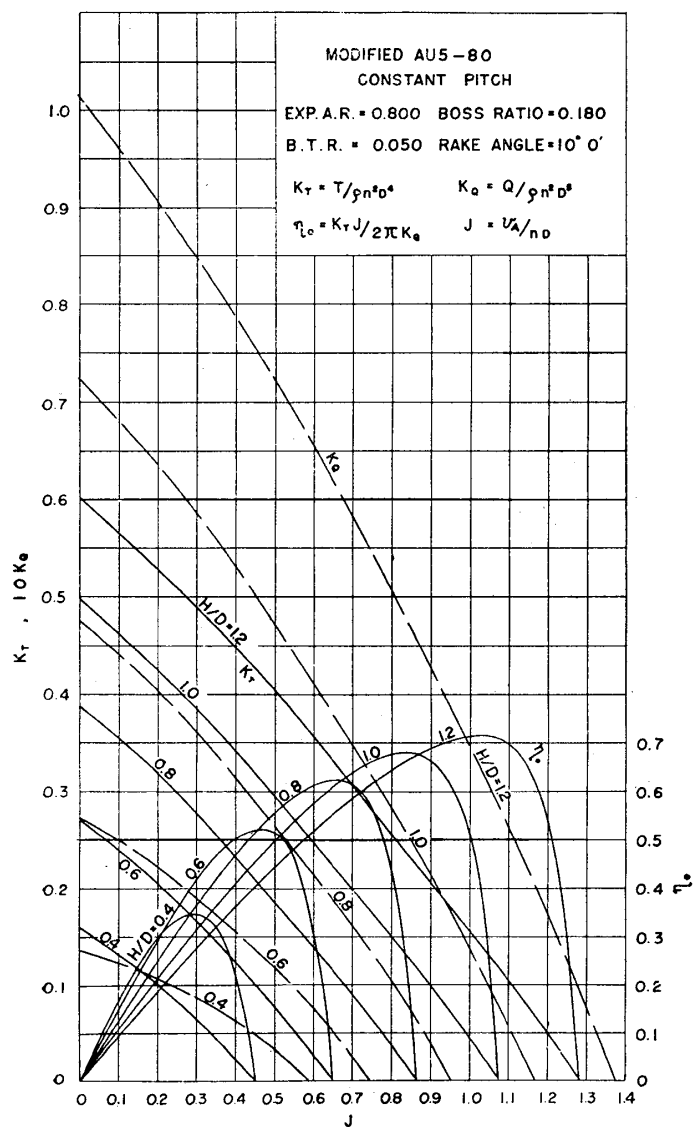
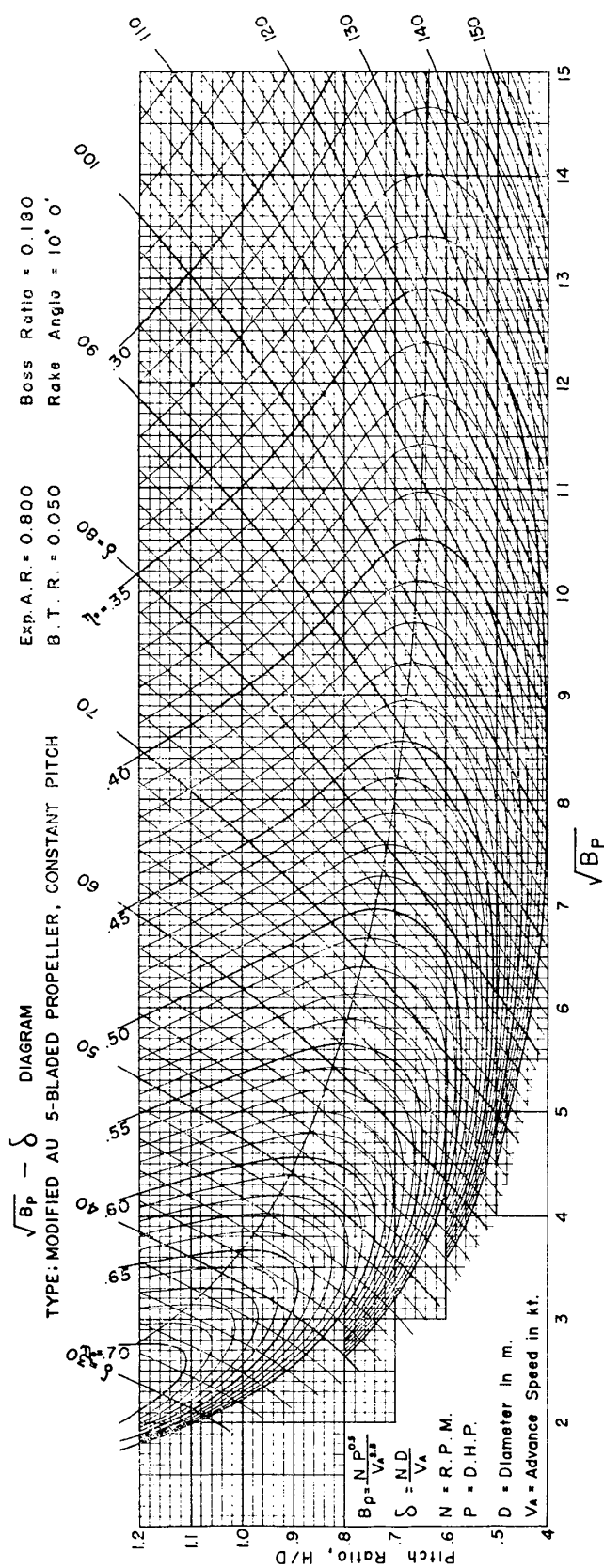


Fig. 1 General plan of modified AU 5-80 propeller model.

Fig. 2 $J-K_T, K_Q, \eta_0$ Curves

Fig. 3 $\sqrt{B_P} - \delta$ Diagram (AU 5-80)