SPD Report No. 00-003-2

Local Velocity Field Measurements

around the KCS Model

(SRI M.S. No. 631)

in the SRI 400m Towing Tank

Report of Ship Performance Division

SHIP PERFORMANCE DIVISION SHIP RESEARCH INSTITUTE

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Research on Quality Control for Evaluating Propeller Performance

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2,

Local Velocity Field Measurements around the KCS Model (SRI M.S.No.631) in the SRI 400m Towing Tank

1. Introduction

The present report describes the local velocity field measurements around a model of a Korea Research Institute of Ships and Ocean Engineering (KRISO) 3,600TEU container ship (KCS) for the International Workshop on CFD in Ship Hydrodynamics, Gothenburg 2000. The Ship Research Institute (SRI) was asked to provide validation data on this ship to the workshop. The purpose of this investigation is to obtain reliable experimental data on the local velocity field around a modern and practical hull form ship with a bulbous bow, transom stern and stern bulb.

The information on geometrical shape and the experimental conditions of the KCS [1] was provided by KRISO. The ship model was manufactured at the SRI model workshop based on the lines drawn by KRISO and a Japanese company and made by a different manufacturing method and materials.

The measurements were performed at the SRI 400m towing tank. The propeller model, SRI M. P. No.460, was offered from KRISO to use for self-propulsion tests, surface pressure on the hull and local velocity field measurements. The local velocity field measurements were conducted at two stations around the stern including the propeller plane. One of the measurements was performed immediately behind the propeller, that is, 0.25 diameters downstream of the propeller plane under the propeller working condition.

The measurement results obtained through the present careful experiments could provide valuable information for the CFD and EFD community.

2. Experimental Setup

2.1 Ship Model

The principal particulars and the geometrical hull form shape of the ship model, SRI M. S. No. 631 are given in **Table 1** and **Fig. 1**, respectively. The ship model was manufactured to the same size as that used at KRISO, and was made of a combination of paraffin and wood.

The lines of this ship model were slightly modified and drawn by SRI and a Japanese company based on the lines given by KRISO with a scale ratio of 31.5994, so as to be able to manufacture the model at the SRI model workshop. A noticeable difference in the lines drawn at SRI and KRISO could be observed mainly around the bulbous bow and flat stern hull above the propeller.

Unfortunately the ship model made at SRI shrank non-uniformly by about 5mm in the longitudinal direction, especially around the aft body. The deformation in other directions was within 1mm and occurred primarily during the first measurement at the SRI 400m towing tank.

In spite of slight modification of the lines and deformation of the ship model, reasonable correlation on the local velocity field measurements at the propeller plane was found between the SRI and KRISO data [1].

The square station (S.S.) described in this report is defined as the length between the fore and the aft perpendiculars divided by 10, and the aft and the fore perpendiculars are denoted as S.S. 0 and 10, respectively. The maximum sectional area of this ship is located at S.S. 4 3/4, not at the midship, that is, S.S. 5.

Studs with trapezoidal heads for turbulence stimulation were placed at S.S. 9 1/2 and the middle of the bow bulb with 10mm intervals to make the flow around the hull fully turbulent. The height and front width of studs were 1.5mm. The rudder shape was simplified and made to measure rudder forces not only in resistance tests but also in self-propulsion tests as shown in **Fig. 1** but not attached during the present measurement.

The present model was also used for resistance tests [2], self-propulsion tests [2], wave profile measurements [3], local velocity field measurements, and surface pressure measurements [4]. For the surface pressure measurement, 161 pressure taps were equipped on the hull mainly from S.S. 3 to S.S. 1/4 on the port side of the model. The measurements on the propeller plane were conducted before the equipment of pressure taps.

2.2 Propeller Model

The principal particulars and the geometrical shape of the propeller model, SRI M. P. No. 460 (KRISO KP505) are given in **Table 2** and **Fig. 2**, respectively. This model was manufactured by KRISO and sent to SRI for rental use. The curves of propeller open water characteristics measured at SRI [5] are shown in **Table 3** and **Fig. 3** The measured thrust Kr and torque K_Q at SRI are larger than those measured at KRISO at the same advance ratio J. The propeller model was equipped at x/L=0.4825, that is, 0.0175L (127.3mm) upstream from A.P.

2.3 Experimental Apparatus

The measurements were performed at the SRI 400m towing tank with dimensions of 400m in length, 18m in breath and 8m in depth. The maximum speed of the towing carriage was usually 15 m/sec in the 1960's, but it is currently around 12m/s. The adjustment of the draft of a ship model was made in the trimming tank through glass windows.

For three-dimensional velocity field measurements around the stern, a spherical type eight-hole Pitot tube was employed. The diameters of the probe and each hole are 8mm and 0.6mm, respectively. A drawing of the probe shape is shown in **Fig. 4**. The calibration of the Pitot tube [6] was carried at the SRI 400m towing tank.

The calibration curves are shown in **Fig. 5**. The present calibration was carried out by simply changing the angle of the Pitot tube relative to the vertical and horizontal directions independently. The Pitot tube was calibrated at 48 angles in the range from -35 to 60 degree

pitch and from – 35 to +35 degree yaw, keeping the other angle zero. Such a calibration was not sufficient to get accurate calibration curves for an eight-hole Pitot tube used for local velocity field measurements. The calibration coefficients to determine the magnitudes and angles of local flow for the current experiment were used by assuming a similarity in each coefficient, but will be improved in the future.

A two-dimensional traversing system was installed on the ship model and one Pitot tube scanned the vertical planes including the propeller disk. This device is equipped with a balancing weight to prevent heel of the ship model due to the traverse of a Pitot tube.

Eight holes of the Pitot tube were connected to each pressure transducer by vinyl tubing whose inner and outer diameters were 1.6 and 2.0 mm, respectively. Eight semi-conductor type pressure transducers (Toyoda PD104, capacity; 3,000mmAq) were used and connected to separate amplifiers. The pressure signals were amplified 500 or 1,000 times by eight measuring amplifiers (Toyoda AA3004 and 3000). The cut-off frequency of the low pass filters (Kyowa LFV-21A) was set to 20Hz. The filtered signals were monitored by a multi-pen recorder (Graphtec MC 6625) and the un-filtered pressure signals were recorded by an analogue data recorder (Kyowa RTP-650B) at a tape speed of 1.2cm/s and over a frequency range of DC to 625Hz.

The data acquisition of mean velocities was made by a personal computer through an A/D signal board where the sampling rate and period were 100Hz and 5 seconds, respectively. The measured signal was simply averaged and normalized by the ship speed U.

To measure the relative speed of the ship model to the tank water during each run, a turbine meter was set 171mm below the tank water level corresponding to half of the draft and 10.9m in front of the ship model. In order to correct for the effect of variation in the rail height and tank water level during the present measurement, a reference Pitot tube was utilized.

3. Experimental Procedure and Conditions

The measurements of wave profile and local velocity field on the KCS were carried out at the KRISO towing tank under fixed conditions. The trim and sinkage of the ship model were not allowed at the given draft using two clamping devices. This method could not be applied to the measurement at the SRI 400m towing tank due to a leakage of tank water.

In order to conduct the measurements under similar experimental conditions to the KRISO measurements, the initial trim and the weight arrangement were sought by a trial and error method to realize zero trim and sinkage of the ship model in a free running condition. This condition of the ship model was called the even keel condition. The carriage speed relative to the ground was kept at 2.196m/s corresponding to Fr=0.2600 under the even keel condition.

The measurements were performed by adjusting the displacement of the model to the given value, 1,649.0kg. The weight of the traversing system and a Pitot tube was 57.4kg. A weight of 1kg was used as the balancing weight in the present case. When the Pitot tube traversed

420mm to the port side (from the center line), the ship model heeled by around 0.3mm. Measurements at 7~11 positions were possible during one carriage run.

All of the measurements were performed without a rudder. Under the resistance test condition, that is, the without propeller condition, total resistance coefficient C_{TM} and residuary resistance coefficient C_R were estimated to be 0.003534 and 0.0006888, respectively. Reynolds number Re was 1.362×10^7 at 13.9° C. The density of tank water ρ was assumed to be 101.88kg*s²/m⁴ in this report.

The revolution rate of the propeller model was set to 9.5rps with an even keel and selfpropulsion condition at the "ship point", that is , the ship self-propulsion condition. The thrust K_T and Torque coefficients K_Q were 0.1703 and 0.02880, respectively. Thrust loading coefficient C_{Th} was 0.5074 and advance coefficient J was estimated 0.728 from the propeller open water characteristics curves measured by SRI as shown in Fig.3. Re was 1.348x10⁷ at 13.5°C.

4. Results of Local Velocity Field Measurement

4.1 Measured Quantities

In the present measurement, each head of the eight-hole Pitot tube, the speed of the ship model relative to the tank water, the resistance, the dipping at both perpendiculars and the heel were measured. Additionally thrust and torque were measured in the self-propulsion condition. The heel was measured by an inclinometer.

In the presentation of the measurements, a Cartesian coordinate system was adopted and the x-, y-, z- axis are in the direction of aftship, starboard side of the hull, upper desk, respectively. The origin was defined to be at the intersection of the water plane at load water line and the midship.

A few measured values under the propeller operating condition were discarded because the local flow angle was out of the calibration range. The measurements at SRI were carried out in two planes, the propeller plane (x/L=0.4825) and 0.25 diameter behind the propeller (x/L=0.4911).

4.2 Measurements in the Propeller Plane

First of all, measurement of the local velocity field was carried out in the propeller plane to compare with the data from the KRISO towing tank. The measurements in the even keel condition with a 40mm traverse step are shown in **Fig. 6**, along with the KRISO data mainly with a 20mm traverse step. The present measurements are so coarse that the agreement with KRISO data seems to be not so good. However, if the KRISO data at the points not measured at SRI are added to the SRI data or data only at the points measured at SRI are compared with SRI data, reasonable agreement between them was observed. Therefore, more detailed measurements with a 20mm traverse step at SRI would give better agreement on the measured local velocity field between the two measurements. Nominal wake fractions, 1-w_N at the even keel conditions were 0.686 at SRI and 0.709 at KRISO. The coarse measurement at SRI would cause the deference in wake faction, because by more detailed measurements nominal wake fraction was 0.712 [7].

4.3 Measurement at 0.25D behind the Propeller Plane

Two measurements of local velocity field without and with working propeller model at an even keel condition were carried out at 0.25D behind the propeller plane not only on the port side but also the starboard side. The measured results looking upstream are shown in **Figs. 7** and **8**.

Fig. 7 shows the measurements of the local velocity field without a propeller. The measured velocity field shows reasonable symmetry with respect to the centerline of the ship model. Except on the centerline, upward flow from the bottom was observed. Near the centerline above the propeller shaft, downward flow was found. On both sides near the upper corner of the propeller boss, a weak vortex flow was found.

Under the propeller working condition, clockwise rotational flows generated by the propeller model appeared in the propeller slipstream, especially on the port side. Around 0.5 - 0.7 radius positions above the propeller shaft on the starboard side, circumferential flows disappeared and only axial flows were observed due to the interference between rotational flows by the propeller and wake as shown in **Fig. 8**

5. Concluding Remarks

This report describes the measurements of local velocity field around a modern and practical 3,600TEU container ship. The ship model was manufactured at the SRI model workshop by using the lines offered by KRISO but used a different manufacturing method and materials. In spite of slight modification of the lines and deformation of the ship model, reasonable correlation on the local velocity field measurements at the propeller plane was found between the SRI and KRISO data.

The local velocity field measurements immediately behind the operating propeller, 0.25 diameters downstream of the propeller plane and those without a propeller behind the ship model were obtained. It is expected that the data will be useful data for validating CFD computations.

In the present experiments, the calibration coefficients for an eight-hole Pitot tube were obtained by a simple calibration and used for analyzing the magnitudes of velocity and flow angles of the wake behind not only the ship model but also the working propeller model. It is assumed that the averaged values of the velocities measured by the Pitot tube were not affected by unsteady velocity fluctuations.

Repeat tests [7] were performed to carry out uncertainty analysis and the results will be published in near future.

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Nomenclatures

Am	Midship Section Area [m ²]
A_0	Propeller Disk Area [m ²], =(π Dp ²)/4
ae	Expanded Area Ratio [-]
В	Breadth of Ship [m]
Св	Block Coefficient [-]
$\mathbf{C}_{\mathbf{F}}$	Frictional Resistance Coefficient [-], =R _F /($1/2\rho U^2 S_W$)
См	Midship Section Coefficient [-], =A _M /BT
$\mathbf{C}_{\mathbf{P}}$	Pressure Coefficient [-], =(P- Po)/($1/2\rho U^2$)
$\mathbf{C}_{\mathbf{P}}$	Prismatic Coefficient [-], $=\nabla/(A_M L_{PP})$
$\mathbf{C}_{\mathbf{R}}$	Residuary Resistance Coefficient [-], =R _R /($1/2\rho U^2 S_W$)
\mathbf{C}_{Th}	Thrust Loading Coefficient [-], =T/(1/2pU ² A ₀)
Стм	Total Resistance Coefficient [-], = $R_{TM}/(1/2\rho U^2 S_W)$
D	Depth of Ship [m]
$\mathbf{D}_{\mathbf{p}}$	Propeller Diameter [m]
d	Draft of Ship [m]; T
Fh, Fh8	Function to determine Horizontal components of Flow Angle for Each Five-Hole
	System [-]
Fv, Fv8	Function to determine Vertical components of Flow Angle for Each Five-Hole System
	[-]
$\mathbf{F}_{\mathbf{r}}$	Froude Number Based on Length between Perpendiculars, L; F_n , =U/(gL) ^{1/2}
G_{h}, G_{h8}	Function to determine Horizontal component of Inflow Velocity [-]
Gv, Gv8	Function to determine Vertical component of Inflow Velocity [-]
g	Acceleration of Gravity [m/s ²]
Нт,Нв,Н	$I_{C},H_{P},H_{S},H_{T1},H_{P1},H_{S1}$
	Head at Each Pressure Hole, T, B, C, P, S, T ₁ , P ₁ and S ₁ of Eight-Hole Spherical Type
	Pitot Tube [Aq]
Ι	Propeller Immersion [m]
J	Advance Coefficient [-], = $V_A / n_P D$
$ m K_Q$	Torque Coefficient [-], =Q/ ρ n _P ² D ⁵
Kт	Thrust Coefficient [-], =T/ ρ n _P ² D ⁴
\mathbf{L}	Length between Perpendiculars [m]; LPP
L_{PP}	Length between Perpendiculars [m]; L
${ m L}_{ m WL}$	Length at Load Water Line [m]
lсв	Center of Buoyancy from Midship [%LPP, Backward +]
Ν	Number of Individual Readings [-]
nP	Propeller Revolution Rate [1/s, Hz]
Р	Pressure [kg/ m ²]

Po	Reference Pressure at Infinity [kg/ m ²]
р	Pitch Ratio [-]
R_{e}	Reynolds' Number Based on Length between Perpendiculars [-]
$\mathbf{R}_{\mathbf{F}}$	Frictional Resistance [kg]
$\mathbf{R}_{\mathbf{R}}$	Residuary Resistance [kg]
\mathbf{R}_{T}	Total Resistance [kg]
$\mathbf{S}_{\mathbf{R}}$	Wetted Surface Area of Rudder [m ²]
$\mathbf{S}_{\mathbf{W}}$	Wetted Surface Area of Naked Hull without Rudder [m ²]
Т	Draft of Ship [m]; d
Tw	Temperature of Tank Water [°C]
U	Speed of Ship Model [m/s]
u,v,w	Local Mean-Velocities in (x,y.z) directions
VA	Propeller Advance Speed [m/s]; =(1-w _T)U
$V_{\rm e}$	Speed of Ship Model to the Ground [m/s]
V_{h}	Horizontal Component of Inflow Velocity to Pitot Tube [m/s]
$V_{\rm v}$	Vertical Component of Inflow Velocity to Pitot Tube [m/s]
WT	Axial Wake Fraction determined by Propeller Thrust [-]
x	Coordinate for Longitudinal Direction of Ship [m]
x _B	Propeller Boss Ratio [-]
у	Coordinate for Transverse Direction of Ship [m]
Z	Number of Blade [-]
Z	Coordinate for Vertical Direction of Ship [m]
$\beta_{\rm h}$	Flow Angle between Horizontal Component of Inflow and X-Axis [deg]
$\beta_{\rm v}$	Flow Angle between Vertical Component of Inflow and X-Axis [deg]
η_{o}	Propeller Efficiency [-]; =(JK _T)/($2\pi K_Q$)
$\Theta_{\rm R}$	Rake Angle [deg]
$\Theta_{\rm S}$	Skew Angle [deg]
θ	Sensitivity Coefficient
ν	Coefficient of Kinematic Viscosity [m ² /s]
ρ	Density of Water [kg*s ² /m ⁴]
∇	Displacement Volume of Ship Model [m ³]

Ship Model Name			KRISO Container Ship
SRI M. S. No.			631
KRISO M. S. No.		m	KS621
Length between Perpendiculars	L_{PP}	m	7.2786
Length of Load Water Line	L_{WL}	m	7.3568
Breadth (Moulded)	В	m	1.0190
Depth (Moulded)	D	m	0.5696
Draft (Moulded)	d	m	0.3418
Wetted Surface Area w/o Rudder*	$\mathbf{S}_{\mathbf{W}}$	m^2	9.4984
Rudder Surface Area	\mathbf{S}_{R}	m^2	0.0741
Displacement w/o Rudder*	∇	m^3	1.6497
Center of Buoyancy from Midship	l_{CB}	$\% \ \mathrm{L_{PP}}$	1.48
(Backward, +) *			
Blockage Coefficient*	C_B	-	0.6508
Midship Coefficient*	C_{M}	-	0.9849
Prismatic Coefficient*	C_{P}	_	0.6608

Table 1 Principal Particulars of Tested Ship

* These values were calculated by Japanese Company

 Table 2 Principal Particulars of Tested Propeller

Propeller Name			KCS Propeller
SRI M. P. No.			460 & 465
KRISO M. P. No.			KP505
Diameter	DP	m	0.2500
Boss Ratio	XB	-	0.1800
Pitch Ratio at 0.7R	р	-	0.9967
Expanded Blade Area Ratio	aE	-	0.800
Rake Angle	$\Theta_{\rm R}$	deg	0.000
Skew Angle	Θ_{s}	deg	32.0
Number of Blade	Ζ	-	5
Direction of Rotation			Right
Blade Section			NACA66 Thickness
			+a=0.8 Camber

Table 3Propeller Open Test Results in SRI Towing Tank

\mathbf{J}	Kt	10Kq	Eta0
0.000	0.518	0.725	0.000
0.100	0.482	0.677	0.113
0.150	0.458	0.646	0.169
0.200	0.435	0.622	0.223
0.250	0.412	0.589	0.278
0.300	0.387	0.557	0.332
0.350	0.361	0.531	0.379
0.400	0.336	0.497	0.431
0.450	0.310	0.466	0.477
0.500	0.285	0.437	0.519
0.550	0.259	0.405	0.561
0.600	0.235	0.376	0.597
0.650	0.209	0.343	0.631
0.700	0.185	0.311	0.665
0.750	0.161	0.278	0.691
0.800	0.137	0.247	0.705
0.850	0.111	0.215	0.697
0.900	0.083	0.181	0.654
0.950	0.053	0.140	0.575
1.000	0.022	0.096	0.373
1.050	-0.012	0.046	-0.437

'	Table 4(a)	Local	Velocities	at 0.25Dp	behind th	ie Prope	eller Plane	without	Propeller
n1	z[mm]	u/U	v/U	w/U	v[mm]	z[mm]	u/U	v/U	w/U

y[mm]	z[mm]	u/U	v/U	w/U	y[mm]	z[mm]	u/U	v/U	w/U
-180	-340	0.9305	-0.0230	-0.0849	-100	-220	0.9119	-0.0213	-0.1323
-180	-320	0.9285	-0.0258	-0.0882	-100	-200	0.9091	-0.0326	-0.1440
-180	-300	0.9259	-0.0292	-0.0909	-100	-180	0.9004	-0.0460	-0.1501
-180	-280	0.9224	-0.0327	-0.0941	-100	-160	0.8923	-0.0590	-0.1520
-180	-260	0.9224	-0.0353	-0.0987	-100	-140	0.8746	-0.0683	-0.1493
-180	-240	0.9180	-0.0406	-0.1020	-100	-120	0.8562	-0.0712	-0.1454
_180	-220	0 9182	-0.0467	-0 1057	-100	-100	0 8212	-0 0742	-0 1387
100	220	0.0172	0.0407	0.1000	100	100	0.0212	0.0742	0.1007
-180	-200	0.9173	-0.0518	-0.1089	-100	-80	0.7739	-0.0769	-0.1285
-180	-180	0.9137	-0.0582	-0.1118	-100	-60	0.7153	-0.0770	-0.1183
-180	-140	0.8880	-0.0637	-0.1182	-100	-40	0.6312	-0.0659	-0.1013
-180	-100	0.8099	-0.0656	-0.1116	-80	-360	0.9196	-0.0118	-0.0884
-160	-340	0.9295	-0.0200	-0.0866	-80	-340	0.9278	-0.0041	-0.0902
-160	-320	0.9258	-0.0219	-0.0898	-80	-320	0.9200	-0.0048	-0.0945
-160	-300	0.9254	-0.0249	-0.0937	-80	-300	0.9119	-0.0064	-0.0989
-160	-280	0.9236	-0.0277	-0.0979	-80	-280	0.9014	-0.0058	-0.1046
-160	-260	0.9212	-0.0305	-0.1023	-80	-260	0.8942	-0.0074	-0.1117
-160	-240	0.9166	-0.0357	-0.1067	-80	-240	0.8892	-0.0098	-0.1209
-160	-220	0.9154	-0.0406	-0.1114	-80	-220	0.8831	-0.0150	-0.1376
-160	-200	0 9150	-0 0481	-0 1157	-80	-200	0 8725	-0 0359	-0 1554
160	100	0.9130	0.0401	0.1105	00	100	0.0725	0.0555	0.1629
-160	-160	0.9124	-0.0556	-0.1105	-00	-160	0.0047	-0.0531	-0.1636
-160	-160	0.9075	-0.0616	-0.1223	-80	-160	0.8600	-0.0691	-0.1635
-160	-140	0.8901	-0.0646	-0.1252	-80	-140	0.8487	-0.0760	-0.1566
-160	-120	0.8532	-0.0632	-0.1222	-80	-120	0.8302	-0.0799	-0.1470
-160	-100	0.8171	-0.0640	-0.1201	-80	-100	0.8035	-0.0829	-0.1377
-160	-80	0.7683	-0.0673	-0.1135	-80	-80	0.7663	-0.0844	-0.1293
-160	-60	0.7204	-0.0645	-0.1007	-80	-60	0.7092	-0.0822	-0.1200
-160	-40	0.6878	-0.0676	-0.0974	-80	-40	0.6160	-0.0730	-0.1033
-140	-340	0.9287	-0.0161	-0.0879	-60	-360	0.9202	-0.0095	-0.0890
-140	-320	0.9251	-0.0181	-0.0913	-60	-340	0.9239	-0.0020	-0.0909
-140	-300	0 9252	-0 0208	-0 0956	-60	-320	0 9097	-0 0006	-0 0944
-140	-280	0.9232	-0.0231	-0 1003	-60	-300	0 8969	0 0001	-0 0984
_140	-260	0.9210	-0.0251	-0 1059	- 60	- 200	0.0000	0.0001	-0 1029
-140	-200	0.9204	-0.0207	-0.1039	-00	-200	0.8765	0.0001	-0.1029
-140	-240	0.9163	-0.0299	-0.1116	-60	-260	0.0554	-0.0135	-0.1082
-140	-220	0.9160	-0.0369	-0.1168	-60	-240	0.7772	-0.0400	-0.1067
-140	-200	0.9140	-0.0450	-0.1220	-60	-220	0.6826	-0.0466	-0.1061
-140	-180	0.9099	-0.0529	-0.1257	-60	-200	0.6407	-0.0543	-0.1073
-140	-160	0.9059	-0.0594	-0.1298	-60	-180	0.6791	-0.0768	-0.1188
-140	-140	0.8894	-0.0633	-0.1320	-60	-160	0.7421	-0.0944	-0.1284
-140	-120	0.8655	-0.0648	-0.1319	-60	-140	0.7792	-0.0966	-0.1350
-140	-100	0.8290	-0.0658	-0.1282	-60	-120	0.7878	-0.0944	-0.1288
-140	-80	0.7733	-0.0674	-0.1171	-60	-100	0.7680	-0.0911	-0.1252
-140	-60	0.7189	-0.0654	-0.1080	-60	-80	0.7396	-0.0914	-0.1164
-140	-40	0.6613	-0.0639	-0.0939	-60	-60	0.6784	-0.0851	-0.1104
-120	-340	0.9293	-0.0120	-0.0888	-60	-40	0.5982	-0.0764	-0.0996
_120	-320	0 92/9	-0 0137	-0 0925	-50	_190	0 5316	-0.0646	-0 0832
_120	-300	0.9245	-0.0116	-0 0973	-50	_180	0.5510	-0.0752	-0 0883
120	200	0.0240	0.0140	0.0075	50	170	0.5555	0.0752	0.0005
-120	-280	0.9213	-0.0165	-0.1022	-50	-170	0.5685	-0.0779	-0.0858
-120	-260	0.9203	-0.0194	-0.1093	-50	-160	0.6344	-0.0939	-0.0892
-120	-240	0.9157	-0.0234	-0.1167	-50	-150	0.6784	-0.0996	-0.0950
-120	-220	0.9149	-0.0299	-0.1244	-50	-140	0.7018	-0.0988	-0.1005
-120	-200	0.9126	-0.0383	-0.1310	-50	-130	0.7167	-0.0995	-0.1061
-120	-180	0.9094	-0.0484	-0.1373	-50	-120	0.7379	-0.1035	-0.1096
-120	-160	0.9010	-0.0576	-0.1394	-50	-110	0.7347	-0.0966	-0.1050
-120	-140	0.8875	-0.0645	-0.1428	-50	-100	0.7375	-0.0989	-0.1113
-120	-120	0.8658	-0.0681	-0.1411	-50	-90	0.7223	-0.0967	-0.1082
-120	-100	0.8221	-0.0696	-0.1332	-40	-360	0.9172	-0.0061	-0.0889
-120	-80	0.7810	-0.0723	-0.1257	-40	-340	0.9191	0.0003	-0.0909
-120	-60	0.7078	-0.0682	-0.1122	-40	-320	0.8954	-0.0004	-0.0921
_120	- 10	0 6/05	-0.0640	_0 1002	- 40	_ 200	0 8730	0 0030	-0 0020
100	-40	0.0495	-0.0040	-0.1003	-40	- 300	0.0/30	0.0038	-0.0929
-100	-360	0.9182	-0.0144	-0.0886	-40	-280	0.8353	-0.0063	-0.1042
-100	-340	0.9288	-0.0074	-0.0895	-40	-260	0.7164	-0.0542	-0.1021
-100	-320	0.9252	-0.0084	-0.0931	-40	-240	0.5151	-0.0609	-0.0666
-100	-300	0.9234	-0.0098	-0.0980	-40	-220	0.3506	0.0121	-0.0180
-100	-280	0.9194	-0.0119	-0.1036	-40	-200	0.3946	0.0094	-0.0276
-100	-260	0.9175	-0.0131	-0.1112	-40	-180	0.4728	-0.0395	-0.0338
-100	-240	0.9119	-0.0158	-0.1201	-40	-160	0.5488	-0.0628	-0.0384

'	Table 4(a)	Local	Velocities	at 0.25Dp	behind th	le Prop	eller Plane	without	Propeller
1	≂[mm]	11 /TT	37/TT	347 / T T	v [mm]	≂[mm]	11/11	37/TT	w/TT

y[mm]	z[mm]	u/U	v/U	w/U	y [mm]	z[mm]	u/U	v/U	w/U
-40	-140	0.6480	-0.0894	-0.0521	10	-180	0.4183	0.0116	0.1488
-40	-120	0.6985	-0.0959	-0.0725	10	-170	0.4466	0.0286	0.1517
-40	-100	0.7031	-0.0904	-0.0841	10	-160	0.4552	0.0391	0.1465
-40	-80	0.6907	-0.0901	-0.0889	10	-150	0.4796	0.0483	0.1334
-40	-60	0.6352	-0.0900	-0.0908	10	-140	0.4882	0.0504	0.1177
-40	-40	0.5509	-0.0709	-0.0969	10	-130	0.4888	0.0548	0.1035
-30	-200	0.3536	0.0461	0.0526	10	-120	0.4995	0.0621	0.0849
-30	-190	0.3886	0.0161	0.0394	10	-110	0.4918	0.0567	0.0668
-30	-180	0.4167	-0.0061	0.0323	10	-100	0.5057	0.0637	0.0495
-30	-170	0.4806	-0.0245	0.0343	10	-90	0.5127	0.0633	0.0268
-30	-160	0.5141	-0.0414	0.0252	20	-360	0.9170	0.0018	-0.0881
-30	-150	0.5614	-0.0641	0.0205	20	-320	0.8855	0.0028	-0.0876
-30	-140	0.5878	-0.0703	0.0020	20	-300	0.8502	0.0036	-0.0894
-30	-130	0.6318	-0.0859	-0.0109	20	-280	0.7501	0.0392	-0.1035
-30	-120	0.6373	-0.0875	-0.0210	20	-240	0.4019	0.0434	-0.0825
-30	-110	0.6583	-0.0943	-0.0402	20	-220	0.3000	-0.0254	-0.0504
-30	-100	0.6481	-0.0886	-0.0520	20	-200	0.3642	-0.0370	0.1000
-30	-90	0.6405	-0.0893	-0.0533	20	-180	0.4287	0.0074	0.0835
-20	-360	0.9171	-0.0021	-0.0899	20	-160	0.4960	0.0426	0.0850
-20	-340	0.9119	-0.0003	-0.0894	20	-140	0.5533	0.0613	0.0652
-20	-320	0.8831	0.0022	-0.0887	20	-120	0.5640	0.0696	0.0371
-20	-300	0.8499	0.0061	-0.0873	20	-100	0.5940	0.0715	0.0031
-20	-280	0.7591	-0.0116	-0.1067	20	-80	0.5752	0.0710	-0.0314
-20	-260	0.5646	-0.0575	-0.1019	20	-60	0.5569	0.0750	-0.0625
-20	-240	0.3631	-0.0319	-0.0819	20	-40	0.4594	0.0643	-0.0869
-20	-220	0.2681	0.0334	-0.0445	30	-200	0.3550	-0.0310	0.0361
-20	-200	0.3632	0.0587	0.1130	30	-190	0.3822	-0.0066	0.0395
-20	-180	0.4432	0.0078	0.0968	30	-180	0.4158	0.0258	0.0334
-20	-160	0.5006	-0.0360	0.0854	30	-170	0.4572	0.0398	0.0233
-20	-140	0.5436	-0.0547	0.0635	30	-160	0.5009	0.0595	0.0225
-20	-120	0.5839	-0.0702	0.0315	30	-150	0.5558	0.0723	0.0212
-20	-100	0.5994	-0.0769	-0.0019	30	-140	0.5786	0.0763	0.0030
-20	-80	0.5830	-0.0737	-0.0360	30	-130	0.6035	0.0830	-0.0054
-20	-60	0.5530	-0.0805	-0.0649	30	-120	0.6095	0.0825	-0.0212
-20	-40	0.4825	-0.0639	-0.0862	30	-110	0.6213	0.0778	-0.0304
-10	-200	0.4311	0.0080	0.1784	30	-100	0.6261	0.0830	-0.0389
-10	-190	0.3924	0.0274	0.1530	30	-90	0.6295	0.0803	-0.0490
-10	-180	0.4268	-0.0029	0.1573	40	-360	0.9179	0.0043	-0.0866
-10	-170	0.4375	-0.0196	0.1544	40	-340	0.9186	0.0080	-0.0889
-10	-160	0 4702	-0 0329	0 1483	40	-320	0 9018	0 0084	-0 0899
-10	-150	0.4771	-0.0391	0.1390	40	-300	0.8793	0.0045	-0.0937
-10	-140	0.4933	-0.0546	0.1238	40	-280	0.8421	0.0218	-0.1009
-10	-130	0.5053	-0.0587	0.1005	40	-260	0.7176	0.0733	-0.0932
-10	-120	0.5013	-0.0652	0.0834	40	-240	0.5332	0.0733	-0.0462
-10	-110	0 5121	-0.0684	0 0644	40	-220	0 3881	0 0090	-0 0170
-10	-100	0.5192	-0.0623	0.0487	40	-200	0.4096	0.0210	-0.0285
-10	-90	0 5299	-0 0699	0 0139	40	-180	0 4843	0 0419	-0 0293
0	-360	0.9143	-0.0003	-0.0884	40	-160	0.5678	0.0682	-0.0398
0	-340	0.9074	0.0042	-0.0893	40	-140	0.6528	0.0881	-0.0512
0	-320	0 8807	0.0012	-0.0862	40	-120	0.6658	0 0873	-0.0636
0	-300	0.8435	0.0030	-0.0876	40	-100	0.6687	0.0871	-0.0756
0	-280	0.6947	0.0057	-0 0989	40	-80	0.6611	0.0781	-0.0810
0	-260	0.5397	0.0131	-0 1105	40	-60	0.6433	0.0701	-0 0920
0	-240	0.3337	-0.0004	-0 1472	40	-40	0.6499	0.0693	-0.0920
0	-240	0.4143	-0.0004	-0.1473	40	260	0.5280	0.0093	-0.0900
0	-220	0.2012	-0.0170	0.0778	60	-340	0.9109	0.0079	-0.0808
0	_100	0.3950	0.0214	0.2312	60	-330	0.944	0.0090	_0 0000
0	-160	0.4230	0.0130	0.1/0	60	-320	0.913/	0.0102	-0.0909
0	_140	0.1437	0.0038	0.1000	60	_ 200	0.0010	0.0090	_0 1001
0	-140	0.4500	0.0040	0.1002	60	-200	0.094/	0.0138	-0.1001
0	-120 -100	0.4039	0.001Z	0.1093	60	-20U	0.051/ 0.7706	0.0244	-0.106Z
0	-100	0.4600	-0.0036	0.0648	60	-240	0.7706	0.0518	-0.0984
0	-80	0.4579	-U.U155	-0.0202	6U	-220	0.6718	0.0540	-0.0868
0	-60	0.4431	-0.0194	-0.0306	60	-200	0.0451	0.0032	-0.0980
0	-40	0.4046	-0.0142	-0.0/44	6U	-100	0.0911	0.0765	-0.1102
10	-200	0.3555	-0.0086	0.1440	60	-160	0.7324	0.0882	-0.1107
ΤU	-190	0.396/	-0.0096	0.1449	6U	-140	0./589	0.0898	-0.119/

Τε	able 4(a) Local	Velocities	at 0.25Dp	behind the	Prope	eller Plane	withou	t Propeller
v[mm]	z[mm]	u/U	v/U	w/U	v[mm]	z[mm]	u/U	v/U	w/U
60	-120	0.7652	0.0896	-0.1247	140	-140	0.8700	0.0598	-0.1314
60	-100	0.7442	0.0845	-0.1168	140	-120	0.8358	0.0605	-0.1267
60	-80	0.7159	0.0883	-0.1111	140	-100	0.7964	0.0631	-0.1243
60	-60	0.6693	0.0829	-0.1086	140	-80	0.7447	0.0626	-0.1139
60	-40	0.5778	0.0727	-0.0996	140	-60	0.6937	0.0618	-0.1070
80	-360	0.9193	0.0103	-0.0868	140	-40	0.6584	0.0674	-0.0983
80	-340	0.9235	0.0126	-0.0883					
80	-320	0.9258	0.0110	-0.0924					
80	-300	0.9202	0.0118	-0.0958					
80	-280	0.9181	0.0131	-0.1003					
80	-260	0.9042	0.0135	-0.1099					
80	-240	0.8897	0.0123	-0.1229					
80	-220	0.8715	0.0249	-0.1378					
80	-200	0.8559	0.0405	-0.1527					
80	-180	0.8420	0.0527	-0.1564					
80	-160	0.8285	0.0647	-0.1536					
80	-140	0.8281	0.0757	-0.1481					
80	-120	0.8054	0.0791	-0.1417					
80	-100	0.7855	0.0801	-0.1345					
80	-80	0.7399	0.0818	-0.1232					
80	-60	0.6896	0.0790	-0.1168					
80	-40	0.6027	0.0699	-0.1010					
100	-360	0.9207	0.0144	-0.0866					
100	-340	0.9235	0.0152	-0.0882					
100	-320	0.9240	0.0149	-0.0923					
100	-300	0.9251	0.0144	-0.0968					
100	-280	0.9209	0.0191	-0.1009					
100	-260	0.9133	0.0177	-0.1092					
100	-240	0.9136	0.0196	-0.1191					
100	-220	0.9108	0.0246	-0.1307					
100	-200	0.8992	0.0378	-0.1410					
100	-180	0.8897	0.0444	-0.1500					
100	-160	0.8763	0.0579	-0.1519					
100	-140	0.8535	0.0648	-0.1473					
100	-120	0.8276	0.0709	-0.1419					
100	-100	0.8040	0.0727	-0.1343					
100	-80	0.7496	0.0743	-0.1253					
100	-60	0.68/1	0.0723	-0.1138					
100	-40	0.6186	0.0674	-0.0978					
120	-360	0.9198	0.0169	-0.0858					
120	-340	0.9242	0.0197	-0.0877					
120	-320	0.9242	0.0201	-0.0914					
120	-200	0.9233	0.0223	-0.1012					
120	-260	0.0240	0.0244	-0.1056					
120	-240	0.9143	0.0259	-0.1140					
120	-220	0.9095	0.0375	-0.1208					
120	-200	0.9056	0.0443	-0.1283					
120	-180	0.9012	0.0472	-0.1370					
120	-160	0.8902	0.0567	-0.1402					
120	-140	0.8690	0.0608	-0.1399					
120	-120	0.8366	0.0633	-0.1354					
120	-100	0.8032	0.0659	-0.1311					
120	-80	0.7494	0.0679	-0.1198					
120	-60	0.6935	0.0665	-0.1113					
120	-40	0.6287	0.0683	-0.0943					
140	-340	0.9259	0.0236	-0.0868					
140	-320	0.9228	0.0253	-0.0903					
140	-300	0.9271	0.0278	-0.0947					
140	-280	0.9237	0.0304	-0.0989					
140	-260	0.9148	0.0333	-0.1037					
140	-240	0.9125	0.0366	-0.1096					
140	-220	0.9110	0.0434	-0.1145					
140	-200	0.9077	0.0504	-0.1199					
140	-180	0.9030	0.0498	-0.1270					
140	-160	0.8938	0.0563	-0.1298					

Tabl	e 4(b) I	local Vel	ocities at	0.25Dp b	ehind the	Propelle	r Plane	with Work	ing Propeller
y[mm]	z[mm]	u/U	v/U	w/U	y[mm]	z[mm]	u/U	v/U	w/U
-180	-360	0.9345	-0.0411	-0.0970	-120	-60	0.7056	-0.0969	-0.0950
-180	-340	0.9224	-0.0444	-0.1006	-120	-40	0.6327	-0.0967	-0.0851
-180	-320	0.9259	-0.0499	-0.1040	-100	-360	0.9171	-0.0285	-0.1111
-180	-280	0.9230	-0.0547	-0.1071	-100	-340	0.9103	-0.0323	-0.1226
-180	-260	0.9186	-0.0646	-0.1131	-100	-300	0.8963	-0.0384	-0.1272
-180	-240	0.9136	-0.0739	-0.1150	-100	-280	0.8877	-0.0411	-0.1375
-180	-220	0.9149	-0.0807	-0.1166	-100	-260	1.0339	0.0159	-0.1860
-180	-200	0.9109	-0.0881	-0.1170	-100	-240	1.0378	-0.0428	-0.2196
-180	-180	0.9078	-0.0930	-0.1172	-100	-220	1.0406	-0.0744	-0.2296
-180	-160	0.9021	-0.0982	-0.1170	-100	-200	1.0232	-0.1085	-0.2315
-180	-140	0.8802	-0.0967	-0.1154	-100	-180	1.0089	-0.1268	-0.2194
-180	-120	0.8405	-0.0977	-0.1125	-100	-160	0.9810	-0.1319	-0.2012
-180	-100	0.8004	-0.0929	-0.1005	-100	-140	0.8740	-0.1310	-0.1391
-180	-80 -60	0.7384	-0.0950	-0.0951	-100	-120	0.8170	-0.1184	-0.1113
-180	-40	0.7149	-0.1004	-0.0961	-100	-80	0.7449	-0.1099	-0.1025
-160	-360	0.9322	-0.0389	-0.1006	-100	-60	0.6940	-0.0997	-0.0932
-160	-340	0.9236	-0.0430	-0.1046	-100	-40	0.6098	-0.0949	-0.0846
-160	-320	0.9205	-0.0479	-0.1086	-80	-360	0.9154	-0.0232	-0.1148
-160	-300	0.9202	-0.0530	-0.1121	-80	-340	0.9064	-0.0275	-0.1193
-160	-280	0.9157	-0.0598	-0.1162	-80	-330	0.9059	-0.0286	-0.1210
-160	-260	0.9149	-0.0643	-0.1206	-80	-320	0.9050	-0.0288	-0.1238
-160	-240	0.9071	-0.0748	-0.1226	-80	-300	1 0500	-0.0235	-0.1310
-160	-220	0.9087	-0.0829	-0.1239	-80	-260	1 0831	0.0173	-0.2339
-160	-180	0.9015	-0.0981	-0.1220	-80	-240	1.0829	-0.0228	-0.2708
-160	-160	0.8973	-0.1034	-0.1212	-80	-220	1.0667	-0.0705	-0.2826
-160	-140	0.8803	-0.1032	-0.1197	-80	-200	1.0458	-0.1201	-0.2841
-160	-120	0.8446	-0.1021	-0.1162	-80	-180	1.0335	-0.1563	-0.2596
-160	-100	0.8057	-0.0962	-0.1104	-80	-160	1.0271	-0.1729	-0.2303
-160	-80	0.7511	-0.0964	-0.1028	-80	-140	1.0157	-0.1661	-0.1943
-160	-60	0.7192	-0.0940	-0.0957	-80	-120	0.8154	-0.1364	-0.1/22
-140	-40	0.6892	-0.0989	-0.0918	-80	-110	0.804/	-0.1261	-0.1084
-140	-340	0.9177	-0.0402	-0.1085	-80	-90	0.7676	-0.1201	-0.1002
-140	-320	0.9164	-0.0453	-0.1135	-80	-80	0.7223	-0.1133	-0.0945
-140	-300	0.9149	-0.0504	-0.1179	-80	-60	0.6791	-0.1028	-0.0867
-140	-280	0.9041	-0.0589	-0.1238	-80	-40	0.5806	-0.0927	-0.0807
-140	-260	0.9057	-0.0629	-0.1274	-60	-360	0.9120	-0.0189	-0.1162
-140	-240	0.8995	-0.0746	-0.1309	-60	-340	0.8998	-0.0225	-0.1202
-140	-220	0.8957	-0.0845	-0.1325	-60	-330	0.8992	-0.0226	-0.1214
-140	-200	0.8918	-0.0961	-0.1335	-60	-320	0.8953	-0.0199	-0.1651
-140	-160	0.8902	-0 1101	-0 1268	-60	-280	1 0841	0.0430	-0 2196
-140	-140	0.8767	-0.1078	-0.1237	-60	-260	1.0929	0.0627	-0.2677
-140	-120	0.8429	-0.1082	-0.1190	-60	-240	1.0654	0.0179	-0.3193
-140	-100	0.8046	-0.0990	-0.1130	-60	-220	1.0302	-0.0612	-0.3381
-140	-80	0.7525	-0.1001	-0.1067	-60	-200	1.0010	-0.1383	-0.3314
-140	-60	0.7028	-0.0954	-0.0930	-60	-180	1.0017	-0.1885	-0.2917
-140	-40	0.6611	-0.0972	-0.0877	-60	-160	1.0186	-0.2084	-0.2461
-120	-360	0.9214	-0.0330	-0.1082 -0.1127	-60	-140	1.0442	-0.2047	-0.2039
-120	-320	0.9100	-0 0422	-0 1184	-60	-110	0.9009	-0 1641	-0 2106
-120	-300	0.9049	-0.0463	-0.1227	-60	-100	0.7619	-0.1253	-0.0938
-120	-280	0.8957	-0.0528	-0.1300	-60	-90	0.7334	-0.1218	-0.0876
-120	-260	0.8966	-0.0574	-0.1365	-60	-80	0.7020	-0.1176	-0.0843
-120	-240	0.8942	-0.0710	-0.1435	-60	-60	0.6569	-0.1067	-0.0790
-120	-220	0.8894	-0.0845	-0.1508	-60	-40	0.5421	-0.0906	-0.0781
-120	-200	0.8820	-0.1015	-0.1529	-40	-360	0.9112	-0.0120	-0.1185
-120	-180	0.8840	-0.1112	-0.1425	-40	-340	0.8986	-0.0160	-0.1220
-120 -120	-140 -140	U.8811 0 8021	-U.II79 -0 1146	-U.1337 -0 1267	-40	-330 -320	0.883U	-U.U145 0 0146	-0.1219 -0.1122
-120	-120	0.8403	-0,1159	-0.1212	-40	-300	1,0798	0.0863	-0.1770
-120	-100	0.8243	-0.1077	-0.1137	-40	-280	1.0975	0.1282	-0.2199
-120	-80	0.7488	-0.1041	-0.1053	-40	-260	1.0697	0.1437	-0.2802

Tabl	e 4(b)	Local Vel	ocities at	0.25Dp b	ehind the	Propelle	r Plane	with Worl	sing Propel	ler
y[mm]	z[mm]	u/U	v/U	w/U	y[mm]	z[mm]	u/U	v/U	w/U	
-40	-240	0.9825	0.0926	-0.3654	20	-90	0.5647	-0.0363	-0.0637	
-40	-220	0.8620	-0.0829	-0.4018	20	-80	0.5444	0.1108	-0.0452	
-40	-200	0.7725	-0.1859	-0.3180	20	-60	0.4861	0.0948	-0.0573	
-40	-180	0.8529	-0.2329	-0.2684	20	-40	0.4072	0.0698	-0.0814	
-40	-160	0.9646	-0.2527	-0.2212	40	-360	0.9112	0.0121	-0.1191	
-40	-140	1.0468	-0.2425	-0.1779	40	-340	0.8937	0.0176	-0.1228	
-40	-120	1.0209	-0.2332	-0.1479	40	-330	0.8896	0.0186	-0.1228	
-40	-110	0.9937	-0.2132	-0.1323	40	-320	0.8721	0.0257	-0.1078	
-40	-100	0.8801	-0.1963	-0.2085	40	-300	1.0963	0.1225	-0.0944	
-40	-90	0.6840	-0.1131	-0.0645	40	-280	1.1362	0.1726	-0.0663	
-40	-80	0.6463	-0.1122	-0.0638	40	-260	1.1364	0.2041	-0.0224	
-40	-60	0.6109	-0.1019	-0.0661	40	-240	1.0297	0.2333	0.0692	
-40	-40	0.4998	-0.0869	-0.0729	40	-220	0.8843	0.2226	0.2172	
-20	-360	0.9123	-0.0049	-0.1203	40	-200	0.8733	0.0790	0.3017	
-20	-340	0.8918	-0.0078	-0.1227	40	-180	0.9846	-0.0358	0.2752	
-20	-330	0.8818	-0.0053	-0.1218	40	-160	1.0680	-0.0962	0.2041	
-20	-320	1.0421	0.0975	-0.0629	40	-140	1.1073	-0.0943	0.1240	
-20	-300	1.1007	0.1208	-0.1617	40	-120	1.0897	-0.0648	0.0440	
-20	-280	1.1030	0.1766	-0.1925	40	-110	1.0718	-0.0379	0.0174	
-20	-260	1.0070	0.2338	-0.2421	40	-100	0.9085	-0.0870	-0.1609	
-20	-240	0.8277	0.2557	-0.3605	40	-90	0.6594	0.1004	-0.0654	
-20	-180	0.6982	-0.2570	-0.1253	40	-80	0.6331	0.1166	-0.0750	
-20	-160	0.8970	-0.2782	-0.0910	40	-60	0.5740	0.1046	-0.0709	
-20	-140	1.0451	-0.2615	-0.0762	40	-40	0.4841	0.0792	-0.0777	
-20	-120	1.0477	-0.2505	-0.0706	60	-360	0.9102	0.0197	-0.1170	
-20	-110	1.0292	-0.2409	-0.0712	60	-340	0.9021	0.0234	-0.1218	
-20	-100	1.0164	-0.2524	-0.1153	60	-330	0.8992	0.0254	-0.1224	
-20	-90	0.6090	-0.0965	-0.0462	60	-320	0.8903	0.0259	-0.1247	
-20	-80	0.5683	-0.1061	-0.0278	60	-300	1.0705	0.0934	-0.0750	
-20	-60	0.5158	-0.0859	-0.0475	60	-280	1.1242	0.1374	-0.0593	
-20	-40	0.4142	-0.0645	-0.0839	60	-260	1.1658	0.1630	-0.0156	
0	-360	0.9120	0.0024	-0.1203	60	-240	1.1512	0.1563	0.0305	
0	-340	0.8893	0.0005	-0.1245	60	-220	1.1126	0.1260	0.0792	
0	-330	0.8802	0.0042	-0.1200	60	-200	1.1057	0.0710	0.1058	
0	-320	1.0728	0.0917	-0.0838	60	-180	1.1323	0.0122	0.1020	
0	-300	1.1055	0.1421	-0.1368	60	-160	1.1478	-0.0223	0.0621	
0	-280	1.1175	0.2009	-0.1436	60	-140	1.1388	-0.0325	0.0137	
0	-260	0.9815	0.3031	-0.1546	60	-120	1.0938	-0.0038	-0.0340	
0	-240	0.6817	0.3925	-0.1290	60	-110	1.0123	-0.0600	-0.1646	
0	-200	0.5597	-0.2735	0.3651	60	-100	0.7158	0.1049	-0.0961	
0	-180	0.7677	-0.2605	0.1706	60	-90	0.6978	0.1219	-0.0977	
0	-160	0.9403	-0.2831	0.1593	60	-80	0.6748	0.1149	-0.0914	
0	-140	1.0590	-0.2684	0.1376	60	-60	0.6136	0.1064	-0.0812	
0	-120	1.0444	-0.2484	0.1079	60	-40	0.5439	0.0920	-0.0795	
0	-110	1.0269	-0.2239	0.0725	70	-240	1.1/09	0.1367	0.0208	
0	-100	0.9023	-0.3243	-0.0830	70	-260	0 0150	0.0247	-0 1145	
0	-90	0.4087	-0.0700	0.0337	80	-340	0.9130	0.0255	-0.1143	
0	-60	0.3599	-0.0107	-0.0200	80	-330	0.9042	0.0301	_0 1212	
0	-40	0.3302	0.0160	-0 0888	80	-320	0.9049	0.0257	_0 1237	
20	-360	0.9087	0.0000	-0 1202	80	-300	0.0011	0.0313	-0 1233	
20	-340	0 8931	0 0114	-0 1243	80	-280	1 0751	0.0963	-0.0664	
20	-330	0.8836	0.0112	-0.1227	80	-260	1.1313	0.1207	-0.0344	
20	-320	1 0270	0 0822	-0 0292	80	-240	1 1676	0 1185	-0 0003	
2.0	-300	1,1063	0.1404	-0.1136	80	-220	1,1678	0.0962	0.0240	
20	-280	1.1235	0.1968	-0.0978	80	-200	1.1714	0.0624	0.0373	
20	-260	1.0555	0.2683	-0.0599	80	-180	1.1747	0.0307	0.0198	
20	-240	0.7815	0.3561	0.0853	80	-160	1.1583	0.0117	-0.0092	
20	-220	0.6792	0.2929	0.4224	80	-140	1.1150	0.0155	-0.0494	
20	-200	0.8158	-0.0400	0.5436	80	-120	0.7943	0.0501	-0.1437	
20	-180	0.9128	-0.1843	0.4653	80	-110	0.7602	0.1151	-0.1168	
20	-160	0.9634	-0.2369	0.3830	80	-100	0.7464	0.1174	-0.1146	
20	-140	1.0731	-0.1865	0.2792	80	-90	0.7344	0.1129	-0.1093	
20	-120	1.0729	-0.1461	0.1725	80	-80	0.7157	0.1142	-0.1047	
20	-110	1.0375	-0.0920	0.1109	80	-60	0.6437	0.1076	-0.0918	
2.0	-100	1.0117	-0.1158	-0.0762	80	-40	0 5768	0.0948	-0.0829	

y (mm) z (m) v/u w/u y (mm) z (mm) u/u v/u w/u 90 -240 1.1421 0.1051 -0.034 140 -60 0.6848 0.0935 -0.1027 90 -180 0.1100 0.0428 -0.1091 140 -60 0.6848 0.0933 -0.0849 100 -340 0.9107 0.0418 -0.1329 -40 0.6558 0.9124 0.0875 101 -320 0.9031 0.4197 -0.1239 -1191 -0.1239 100 -200 0.8821 0.4849 -0.1239 -1191 -0.1239 100 -200 1.1311 0.6817 -0.0232 -1191 -0.1276 -1101 -0.1276 -1101 -1120 -1223 -1191 -1126 -11276 -1101 -1120 -1223 -1192 -1192 -1192 -1192 -1192 -1193 -1192 -1193 -1192 -1193 -1193 -1193 -1193	Table	e 4(b)	Local Velo	ocities at	0.25Dp	behind the	Propeller	Plane	with Work	ing Propeller
90 -440 1.4211 0.1021 -0.0134 -0.024 -0.009 140 -60 0.0333 -0.1037 100 -460 0.9163 0.0312 -0.1115 140 -40 0.6558 0.0933 -0.0849 100 -320 0.9125 0.0397 -0.1162 -0.0879 -0.0879 100 -300 0.8872 0.0397 -0.1226 -0.0126 -0.0126 100 -300 0.8922 0.0419 -0.1226 -0.0126 -0.0126 101 -400 0.0517 -0.0412 -0.0413 -0.0413 -0.0413 100 -400 0.1107 -0.0136 -0.1136 -0.1136 -0.1136 -0.1136 100 -100 0.7661 0.1094 -0.1130 -0.0136 -0.0136 -0.0136 100 -40 0.6366 0.0194 -0.1136 -0.0136 -0.0136 100 -40 0.6366 0.0191 -0.00136 -0.0136 -0.0136	y[mm]	z[mm]	u/U	v/U	w/U	y[mm]	z[mm]	u/U	v/U	w/U
90 -180 0.0323 -0.0494 100 -340 0.9117 0.0314 -0.1105 140 -40 0.6558 0.0311 -0.0879 100 -340 0.9125 0.0377 -0.1234 -0.1244 -0.1234 -0.1244 -0.1244 -0.1244 -0.1244 -0.1244 -0.1244 -0.1244 -0.1244 <	90	-240	1.1421	0.1051	-0.0194	140	-80	0.7276	0.0935	-0.1027
100 -360 0.9163 0.0346 0.1162 100 -330 0.9128 0.0377 -0.1177 101 -330 0.9128 0.0397 -0.1244 100 -300 0.8922 0.0494 -0.1226 101 -240 1.0817 0.0393 -0.1244 101 -240 1.0817 0.0126 102 -240 1.0817 0.0126 103 -240 1.0817 0.0126 104 -240 1.0117 0.0515 105 1.1027 0.0515 -0.0413 106 -120 0.7970 0.1136 107 -120 0.7970 0.1132 108 1.074 0.0515 -0.0421 109 -100 0.7661 0.1904 100 -100 0.7661 0.1904 100 -40 0.6346 0.1914 110 -200 0.8903 0.0493 110 -200 0.8904 0.0194 110 -200 0.8904 0.0194 110 -200 0.8904 0.0194 110 -200 0.8904 0.0197 110 -200	90	-180	1.1708	0.0428	-0.0099	140	-60	0.6848	0.0933	-0.0949
100 -340 0.9107 0.0374 -0.1177 100 -320 0.9015 0.0397 -0.1204 100 -320 0.8820 0.0419 -0.1234 101 -240 1.8817 0.0533 -0.201 102 -240 1.1124 0.8827 -0.0439 103 -240 1.1124 0.8817 -0.0251 104 -240 1.1127 0.8857 -0.0251 105 -100 1.1127 0.1867 -0.0251 106 -100 1.1127 0.1807 -0.0176 107 -110 0.7862 0.1170 -0.1040 108 -120 0.7970 0.1125 -0.1042 109 -100 .7661 0.0124 -0.1464 100 -60 0.4640 -0.0454 -0.1249 110 -80 0.9903 0.4513 -0.1249 110 -80 0.9903 0.4514 -0.1249 110 -80 0.9903 0.4514 -0.1249 110 -	100	-360	0.9163	0.0312	-0.1105	140	-40	0.6558	0.0910	-0.0879
100 -340 0.9128 0.0397 -0.1204 100 -300 0.8922 0.0419 -0.1236 101 -260 1.8817 0.0639 -0.0201 102 -260 1.8817 0.0649 -0.1226 103 -260 1.131 0.0651 -0.0413 104 -240 1.1131 0.0651 -0.0413 105 -1117 0.0651 -0.0413 106 -160 0.7621 0.1166 -0.0743 106 -160 0.7621 0.1164 -0.1170 107 -17661 0.1164 -0.1170 108 -100 0.7621 0.1164 -0.1170 109 -100 0.7621 0.1052 -0.1652 100 -40 0.6356 0.0210 -0.6326 110 -20 0.6356 0.0127 110 -20 0.6356 -0.1276 110 -20 0.6356 -0.127 110 -20 0.6356 -0.1284 110 100	100	-340	0.9107	0.0345	-0.1162					
100 -430 0.9015 0.0439 -0.1234 100 -280 0.8820 0.0434 -0.1226 101 -280 0.8820 0.0434 -0.1226 101 -280 1.0817 0.0653 -0.0421 101 -240 1.1024 0.0657 -0.0421 101 -100 1.1177 0.0517 -0.0421 100 -100 1.1074 0.0517 -0.0421 100 1.0074 0.0167 -0.0421 100 1.00 0.7822 0.1106 -0.1130 100 -100 0.7823 0.1034 -0.1824 100 -00 0.7626 0.0828 1.0944 100 -00 0.7620 0.1034 -0.1824 100 -00 0.7620 0.1034 -0.1824 100 -00 0.6635 0.9904 -0.1244 100 -00 0.9903 0.0449 -0.1247 110 -200 1.1051 0.0484 -0.1249 110 -200 0.	100	-330	0.9128	0.0370	-0.1177	1				
100 -300 0.8922 0.0439 -0.1229 100 -260 1.0017 0.0053 -0.0201 100 -260 1.01017 0.0053 -0.0201 100 -260 1.1014 0.0861 -0.0251 100 -200 1.1191 0.0811 -0.0155 101 -100 0.1116 0.01316 100 -100 0.7760 0.1122 -0.1176 100 -100 0.7761 0.1052 -0.1180 100 -100 0.7762 0.1052 -0.1052 100 -00 0.7863 0.0897 -0.1180 100 -60 0.6430 0.9914 -0.1870 100 -60 0.6460 0.9914 -0.1881 110 -200 0.6453 -0.1224 0.1881 110 -300 0.9023 0.4453 -0.1274 110 -200 1.0551 0.0384 -0.517 110 -200 1.1051 0.4444 -0.577 110 -200 0.	100	-320	0.9015	0.0397	-0.1204					
110 -260 0.0820 0.0033 -0.0201 100 -240 1.1024 0.0866 -0.0201 100 -240 1.1024 0.0867 -0.0221 100 -200 1.1231 0.0657 -0.0222 100 -160 1.1074 0.0167 -0.0413 100 -160 1.1074 0.0167 -0.0413 100 -160 0.7970 0.1125 -0.1216 101 -1700 0.7861 0.1090 -0.1316 100 -100 0.7861 0.1092 -0.1316 101 -200 0.7970 0.1128 -0.1270 101 -400 6.6036 0.9910 -0.0281 110 -400 6.6036 0.9910 -0.1284 111 -200 0.9908 -0.0271 -0.1284 111 -200 0.9916 -0.9927 -0.4644 110 -200 1.0551 -0.414 -0.557 110 -200 0.9916 -0.1265 110 -0.04584	100	-300	0.8922	0.0419	-0.1239					
100 -420 1.032.1 0.0860 -0.0479 100 -220 1.1191 0.0861 -0.0255 100 -200 1.1131 0.0657 -0.0255 100 -160 1.1177 0.0515 -0.0413 100 -160 0.0770 0.0167 -0.743 100 -120 0.7970 0.1125 -0.1216 101 -140 0.8271 0.0900 -0.1316 100 -120 0.7970 0.1125 -0.1226 100 -00 0.7630 0.1034 -0.1201 100 -00 0.7335 0.1052 -0.1226 110 -60 0.6480 0.9944 -0.9828 110 -300 0.9933 0.0493 -0.1226 110 -200 1.1051 0.0414 -0.1227 110 -200 1.1051 0.0414 -0.5276 110 -200 1.1051 0.0434 -0.1226 110 -200 1.1051 0.3986 -0.1227 110 <td< td=""><td>100</td><td>-280</td><td>0.8820</td><td>0.0494</td><td>-0.1226</td><td>)</td><td></td><td></td><td></td><td></td></td<>	100	-280	0.8820	0.0494	-0.1226)				
100 -220 1.1191 0.0811 -0.0305 100 -160 1.1271 0.0515 -0.0413 100 -160 1.1077 0.0515 -0.0413 100 -160 1.1074 0.0515 -0.0413 100 -120 0.7970 0.1125 -0.1276 100 -100 0.7621 0.1046 -0.1170 100 -100 0.7620 0.1034 -0.1049 100 -60 0.7200 0.0404 -0.0828 110 -300 0.9903 0.0498 -0.1276 110 -300 0.9033 0.0498 -0.1274 110 -300 0.9090 0.0419 -0.1274 110 -200 0.4988 -0.1274 110 -200 1.1055 0.0488 110 -200 0.1028 -0.0474 110 -200 1.1055 0.0484 110 -200 0.1028 -0.1364 <tr< td=""><td>100</td><td>-200</td><td>1 1024</td><td>0.0053</td><td>-0.0201</td><td></td><td></td><td></td><td></td><td></td></tr<>	100	-200	1 1024	0.0053	-0.0201					
100 -200 1.1231 0.0657 -0.0222 100 -160 1.1074 0.0167 -0.0743 100 -160 0.8271 0.900 -0.1316 100 -120 0.7970 0.1125 -0.1276 100 -100 0.7661 0.1094 -0.1170 100 -60 0.7200 0.1094 -0.1410 100 -60 0.7200 0.1094 -0.0828 100 -60 0.6036 0.0897 -0.1052 100 -60 0.6036 0.0494 -0.128 110 -320 0.8003 0.0498 -0.1228 110 -220 0.8030 0.0498 -0.1249 110 -220 0.8030 0.0498 -0.1249 110 -220 0.8040 -0.0454 110 -240 0.9408 -0.0149 110 -240 0.8494 -0.0454 110 140 0.8400 0.0421 <td>100</td> <td>-220</td> <td>1.1191</td> <td>0.0811</td> <td>-0.0305</td> <td></td> <td></td> <td></td> <td></td> <td></td>	100	-220	1.1191	0.0811	-0.0305					
100 -160 1.1074 0.0515 -0.0743 100 -120 0.07970 0.1125 -0.1276 100 -120 0.77970 0.1125 -0.1276 100 -120 0.77070 0.1125 -0.1276 100 -100 0.7685 0.1082 -0.1070 100 -60 0.7200 0.1034 -0.1040 100 -60 0.6480 0.0697 -0.1028 100 -60 0.6480 0.0697 -0.1276 100 -60 0.6480 0.0697 -0.1278 100 -60 0.6480 0.0697 -0.1249 110 -200 0.8979 0.0561 -0.1249 110 -200 1.1051 0.0388 -0.1249 110 -200 1.1051 0.0388 -0.1261 110 -160 0.8596 -0.1271 110 -160 0.9342 0.1398 -0.1167 110 -16	100	-200	1.1231	0.0657	-0.0252					
100 -160 1.1074 0.0187 -0.0743 100 -120 0.7970 0.1125 -0.1276 100 -110 0.7861 0.1094 -0.1170 100 -100 0.7861 0.1094 -0.1170 100 -80 0.7385 0.1082 -0.082 100 -60 0.6480 0.0994 -0.0828 110 -300 0.9090 0.0419 -0.1124 110 -300 0.9023 0.0498 -0.1228 110 -200 0.8033 0.0498 -0.1249 110 -200 0.8049 -0.0576 110 -200 1.1051 0.0414 -0.0576 110 -160 0.8896 0.0791 -0.1346 120 -300 0.9147 -0.1449 120 -300 0.9147 -0.1346 120 -300 0.9147 -0.1346 120 -300 0.9147 -0.1206 <tr< td=""><td>100</td><td>-180</td><td>1.1177</td><td>0.0515</td><td>-0.0413</td><td></td><td></td><td></td><td></td><td></td></tr<>	100	-180	1.1177	0.0515	-0.0413					
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110-3200.50300.0443-0.1228110-2800.89030.0498-0.1257110-2400.8403-0.0274-0.0454110-2201.10510.0414-0.0576110-2001.10510.0414-0.0576110-1801.0791-0.0398-0.1301110-1600.85960.0791-0.1301111-1400.84000.1028-0.1169120-3400.91420.0398-0.1169120-3300.91470.0421-0.1130120-3400.90220.0466-1.207120-3400.977-0.1266120-3200.86770.0521120-3200.87520.0705120-2800.88770.0521120-2800.88770.0521121-2000.87520.0705122-2200.87520.0145123-2200.87520.1266124-1800.86660.0879125-1800.8679-0.1316126-1800.86660.0879127-2800.88730.0657128-2900.87520.0464129-400.62760.0929120-400.62760.0929121-500.36730.1035122-400.87330.6655123-400.62760.0929	110	-40	0.6036	0.0910	-0.0828	i				
100-2800.89030.0498-0.1257110-2600.88790.0561-0.1249110-2001.10550.0399-0.0517110-2001.10550.0414-0.0576110-1801.0791-0.0398-0.0885110-1800.92160.0348-0.1301110-1400.84500.0791-0.1301111-1400.84000.1028-0.1346120-3300.91470.0421-0.1301120-3300.91470.0421-0.1301120-3300.91470.0421-0.1207120-3000.90020.0466-0.1207120-2000.87540.0752-0.1266120-2400.87830.0677-0.1268120-2000.87540.0752-0.1268120-1400.84690.1044-0.1284120-1400.84590.1044-0.1281120-1400.87620.0929-0.0839130-2400.87520.0255120-400.62760.0929-0.0839130-2400.88730.0665-0.1255120-400.62760.0929-0.1035130-1800.87620.0916-0.1255130-1800.87620.0916-0.1255130-2400.88730.0665-0.1255140-3200.91470.0256	110	-320	0.9090	0.0419	-0.1228					
1.10-2600.88790.00501-0.12249110-2400.9408-0.0274-0.0454111-2201.10550.0389-0.0517110-1201.10510.0414-0.0576110-1301.0791-0.0388-0.0885110-1400.85960.0791-0.1301110-1400.91420.0388-0.1669120-3600.92160.0348-0.1169120-3000.90990.0437-0.1130120-3000.90990.0437-0.1261120-3000.90990.0437-0.1260120-2800.88770.0561-0.1206120-2800.88770.0561-0.1260120-2800.88770.0572-0.1260120-2000.87520.0752-0.1268120-1400.86660.0879-0.1314120-1400.84690.1044-0.1181120-1400.84690.1044-0.1284120-1400.84690.1045-0.1284120-400.62760.0929-0.0839130-2400.87330.6655-1.1257140-3600.91470.0544-0.1161140-3600.91470.0544-0.1257140-3600.91470.0544-0.1257140-3600.91470.0545-0.1257140-360	110	-280	0.9023	0.0498	-0 1257	1				
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110 -140 0.8400 0.1028 -0.1346 120 -340 0.9142 0.0398 -0.1115 120 -330 0.9147 0.0421 -0.1130 120 -300 0.9099 0.0437 -0.1207 120 -300 0.9099 0.0466 -0.1207 120 -200 0.8877 0.0561 -0.1232 120 -240 0.8752 0.0752 -0.1255 120 -200 0.8754 0.0752 -0.1266 120 -160 0.8666 0.0879 -0.1316 120 -160 0.8669 0.0976 -0.1314 120 -160 0.8669 0.0976 -0.1314 120 -160 0.8669 0.0976 -0.1314 120 -140 0.8469 0.1044 -0.1284 120 -100 0.7775 0.1019 -0.1281 120 -60 0.6730 0.0929 -0.1060 120 -60 0.6730 0.0929 -0.1255 130 <t< td=""><td>110</td><td>-160</td><td>0.8596</td><td>0.0791</td><td>-0.1301</td><td></td><td></td><td></td><td></td><td></td></t<>	110	-160	0.8596	0.0791	-0.1301					
120 -360 0.9216 0.0348 -0.115 120 -330 0.9147 0.0421 -0.1130 120 -320 0.9099 0.0437 -0.1167 120 -320 0.8077 0.0561 -0.1207 120 -260 0.8807 0.0624 -0.1232 120 -240 0.8783 0.0677 -0.1266 120 -220 0.8752 0.0705 -0.1255 120 -220 0.8754 0.0752 -0.1316 120 -140 0.8666 0.0879 -0.1314 120 -140 0.8669 0.0976 -0.1314 120 -140 0.8669 0.0976 -0.1218 120 -140 0.8669 0.0922 -0.1660 120 -160 0.8702 -0.1284 120 -120 0.8752 0.0922 -120 0.8750 -0.1218 120 -160 0.7702 0.0922 -120 0.8750 -0.1284 120 -120 0.8762 -0.1255 120 -40 0.6276 0.9929 -0.0839 -0.1265 130 -240 0.8762 0.0916 -0.1255 140 -360 0.9308 0.364 -0.1205 140 -280 0.9914 0.589 -0.1255 140 -280 0.9920 0.773 0.1225 140 -280 0.9920 0.773 0.1225	110	-140	0.8400	0.1028	-0.1346	,				
120 -340 0.9142 0.0398 -0.1115 120 -320 0.9099 0.0421 -0.1130 120 -300 0.9092 0.0466 -0.1207 120 -260 0.8877 0.0561 -0.1226 120 -260 0.873 0.0677 -0.1260 120 -240 0.8752 0.0705 -0.1268 120 -200 0.8754 0.0752 -0.1268 120 -140 0.8666 0.0879 -0.1314 120 -140 0.8469 0.1045 -0.1284 120 -140 0.8469 0.1045 -0.1284 120 -120 0.8150 0.1044 -0.1218 120 -140 0.8469 0.1045 -0.1265 120 -60 0.6730 0.9942 -0.0950 120 -60 0.6730 0.9942 -0.0839 130 -240 0.8873 0.0685 -0.1255 130 -240 0.8762 0.9916 -0.1257 140 <td< td=""><td>120</td><td>-360</td><td>0.9216</td><td>0.0348</td><td>-0.1069</td><td>)</td><td></td><td></td><td></td><td></td></td<>	120	-360	0.9216	0.0348	-0.1069)				
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$	120	-100	0.7775	0.1019	-0.1121					
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	120	-80	0.7302	0.0992	-0.1060					
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	120	-60	0.6730	0.0942	-0.0950					
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	130	-240	0.6276	0.0929	-0.0839					
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	130	-180	0.0073	0.0005	-0 1257	,				
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	140	-360	0.9308	0.0363	-0.1035					
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	140	-340	0.9257	0.0408	-0.1075					
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	140	-320	0.9187	0.0464	-0.1116	i				
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	140	-300	0.9147	0.0524	-0.1149)				
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	140	-280	0.9049	0.0589	-0.1176	;				
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	140	-260	0.9001	0.0648	-0.1205	5				
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	140	-240	0.8925	0.0700	-0.1233					
140 -200 0.8819 0.0866 -0.1256 140 -180 0.8823 0.0940 -0.1255 140 -160 0.8771 0.0996 -0.1255 140 -140 0.8569 0.1001 -0.1240 140 -120 0.8266 0.1002 -0.1202 140 -100 0.7830 0.0970 -0.1135	140	-220	0.8920	0.0773	-0.1242					
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140 -160 0.8771 0.0996 -0.1255 140 -140 0.8569 0.1001 -0.1240 140 -120 0.8266 0.1002 -0.1202 140 -100 0.7830 0.0970 -0.1135	140	-180	0.8823	0.0940	-0.1255					
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	140	-100	0.7830	0.0970	-0.1135					

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Fig. 3 Propeller Open Characteristics of Tested Propeller Model

8-Hole Pitot Tube



Fig. 4 Geometrical Shape of Eight-Hole Pitot Tube



(a) Correlation Curves of Horizontal Flow Angle βh versus Fh and Fhs



(b) Correlation Curves of Gh and Gh8 versus Horizontal Flow Angle β h

Fig. 5 Calibration Curves of Eight-Hole Pitot Tube



(c) Correlation Curves of Vertical Flow Angle β v versus Fv and Fvs



(d) Correlation Curves of Gv and Gv8 versus Vertical Flow Angle βv

Fig. 5 Calibration Curves of Eight-Hole Pitot Tube



Fig. 6 Comparison of Local Velocity Field Measurements in the Propeller Plane between SRI and KRISO





Fig. 7 Measured Results of Local Velocity Field at 0.25D behind the Propeller Plane without Propeller

Local Velocity Field Measurements (u contours & v-w vectors) 0.25D behind the Propeller Plane (x/L=0.491) Fr=0.26, Re=1.348x10⁷, With Propeller at $n_p = 9.5$ rps Measured at SRI 400m Towing Tank



with the Working Propeller